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**Assessment of the conservation status of the Wolf
(*Canis lupus*) in Europe**

*Document prepared by
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Introduction

In the last 50 years, wolf populations across Europe have shown a remarkable capacity to take advantage of changing circumstances and landscapes and of new opportunities to reoccupy large areas of suitable habitat. In the last decade only, an increase of over 25% of wolf range has been reported in Europe (Cimatti et al., 2021). After having experienced a severe reduction in the first half of the 20th century, the wolf has become a protected species in many European countries where it had not been extirpated and from where it underwent a relatively rapid increase (Chapron et al., 2014). This expansion is still continuing and has been supported by a set of international conventions, which modified the wolf status from that of pest species to conservation priority, creating the conditions for their legal protection at the national level. The expansion was mainly due to a series of larger social, economic and historical processes, such as reforestation and the progressive abandonment of agricultural land (Cimatti et al., 2021), which reduced human impacts and released space for large carnivores and their wild ungulate prey. The return of the wolf in so many countries, though, does not come without an impact on human activities. On one hand, given the absence of large areas of wilderness in Europe (Venter et al., 2016), wolves have almost entirely re-established their populations in highly human-modified landscapes, where humans raise livestock, hunt wild ungulates, and use forests and mountains for tourism and recreation (Chapron et al., 2014, Bautista et al., 2019). Currently, permanent wolf ranges are characterised by an average density of 90 persons/km², which reflects a high degree of adaptation to human presence. On the other hand, wolves often pay a high price to sharing space with humans, as witnessed by the persistently high levels of illegal killing in several European countries (Kaczensky et al., 2012), often associated with low levels of trust in policies and wider social conflicts.

The generally inefficient policies implemented to tackle different aspects of the interface between human activities and wolf conservation in many European countries have not resolved the conflicts. These conflicts have also triggered processes for requesting a change in European laws, including higher flexibility for applying derogation to strict protection (Meuret et al., 2020) or delisting of wolves from strict protection (Annex II of the Habitats Directive) to protected (Annex V of the Habitats Directive) status and / or from Appendix II to Appendix III of the Bern Convention.

Discussions and decisions of European and national authorities about the legal protection of the wolf must be supported by the most up-to-date information about the conservation status of the species throughout its European range. Most countries perform periodic assessments for their own national adaptive management procedures or national red lists. Member States of the European Union also must report on the status of all species listed in the annexes of the Habitats Directive every 6 years as part of their obligations under Article 17 of the Habitats Directive. Non-EU Contracting Parties to the Bern Convention had to report, for the first time ever, on the conservation status of the wolf within the frame of Resolution No. 8 (2012). The reporting reproduced that of Article 17 of the Habitats Directive and used the same tool. However, these national level assessments are often made using non-standardised procedures and the underlying data quality and field methodology vary widely across Europe. Moreover, the national assessment does not always adequately reflect biological units (i.e. populations) which often encompass several countries and which are needed for ecologically meaningful assessments (Linnell et al. 2008).

This report focuses on the most up-to-date (2022) information on wolf numbers*, trends and key threats and conservation measures at country, population and pan-European levels. This information is used to produce an updated assessment of the conservation status of the wolf in Europe at continental scale (all countries except for the Russian Federation, Belarus, the Republic of Moldova and Ukraine outside the Carpathian mountain range), the scale of the EU 27 (where the Habitats Directive operates) and of the nine main wolf populations in Europe (Fig. 2), which reflects the scale at which ecological processes occur.

Additional information on issues related to large carnivore status assessment is available in other reports. For example, Linnell & Cretois (2018) provides extensive data on large carnivore depredation on livestock, Linnell (2013) summarises data on social conflicts associated with large carnivore recovery, and Boitani et al. (2015) summarises key actions required to address the main threats facing large carnivores in Europe.

* Wolf distribution has not been updated and we refer to the latest map available (Fig.1).

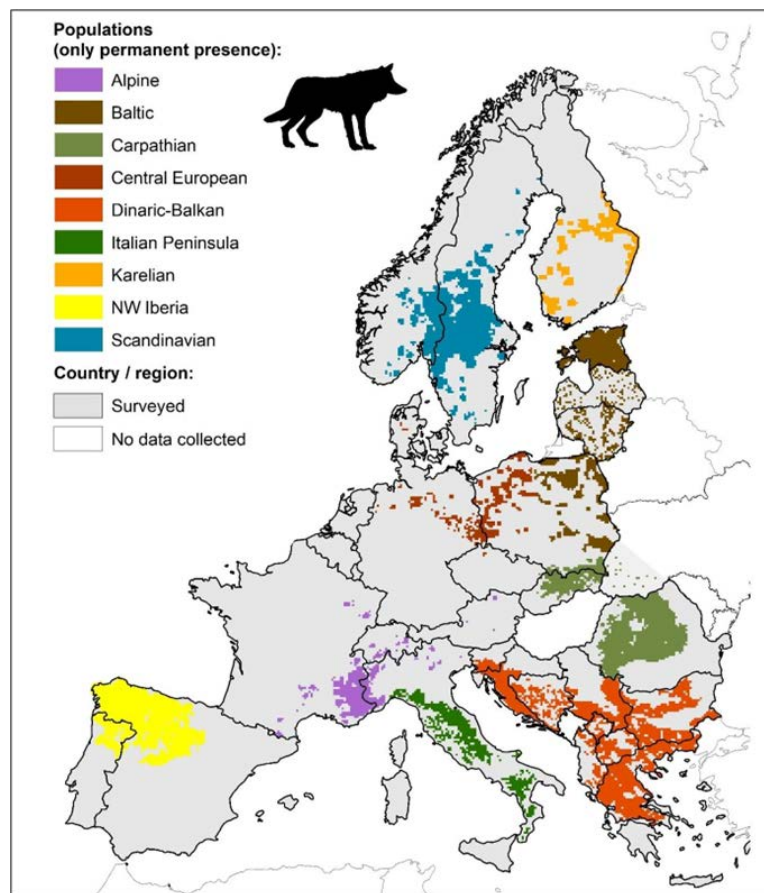
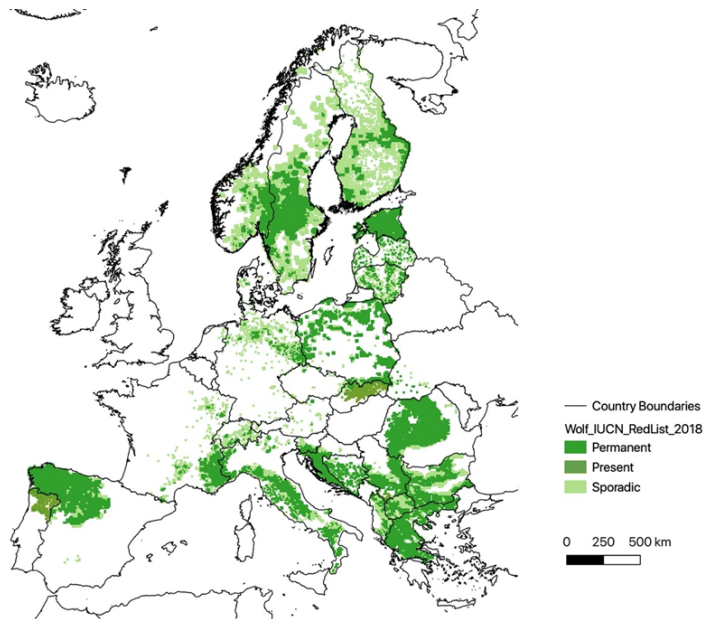


Figure 1 - Wolf distribution in Europe as of 2016, as reported by the IUCN (Boitani 2018).

Figure 2. Wolf populations in Europe as of 2016 (Boitani 2018)
 (Wolves of Türkiye are not included)

1. Methods

Information on population size and trend was collected from multiple sources. A questionnaire was sent out in May/July 2022 to key national experts within our network of the Large Carnivore Initiative for Europe, a Specialist Group of the IUCN – Species Survival Commission. These experts provided the most up-to-date estimates of population size and trends of wolves within their country, as well as details of the methodology

used, the quality of the data, and other information on the legal status, and the main threats and conservation measures. Information was obtained from the most reliable sources and a list of key references is available upon request. The quality of information received varied widely. Some countries / populations are monitored through regular, in some cases even annual, methods based on camera-trapping or non-invasively collected DNA that provided estimates with formal calculations of precision. Others are simply based on expert assessments. There is also variation in the extent to which wolves that are found in transboundary ecosystems are considered by the countries that share them. A final, but non-trivial source of variation occurs when estimates are made for different seasons. This is especially important in hunted populations where there can be considerable loss of individuals between the start and the end of the hunting season.

As well as producing data of varying type and quality, there is also variation in the metrics which are produced. For example, in some countries data reflect the total number of individuals, whereas in others the number of reproductive events or reproductive units (e.g. wolf packs) is assessed. To deal with these cases we used a variety of conversion factors: see the IUCN Red List assessment (Boitani 2018. DOI: <https://doi.org/10.2305/IUCN.UK.2018-2.RLTS.T3746A133234888.en>) for a full description of the nine European wolf populations and for an explanation of the methods used to obtain the numbers for each population including the conversion factors used to convert numbers of packs to numbers of individuals. When available, information on the number of wolves/packs shared by neighboring countries was used to reduce double counting. Finally, a conservative approach was used in combining estimates with different quality and precision.

In this assessment, we present original data, harmonised across methods, years, and countries to obtain the best possible estimates of population sizes. Because it is not possible to present formal error estimates at the population level, we present rounded off averages or gross ranges to reflect the general degree of uncertainty: the numbers of wolves reported in the following tables should be always treated as indicative.

All continental / mainland European countries have been surveyed with the following limitations:

- Belarus, the Republic of Moldova and the Russian Federation: excluded, but connectivity with their wolf populations are taken into account in assessing some of the European populations;
- Ukraine: area limited to the Carpathian mountains;
- Türkiye: area limited to the European portion.

2. Wolf status by country

2.1. Wolf numbers and trends

Estimates of wolf numbers and their precision vary greatly across Europe (Table 1). Each country uses its own methods (effort, timing, unit, etc.), making it difficult to compare numbers between countries. While most countries estimate the number of individuals, a variety of different methods are used, from sophisticated visual or genetic capture-recapture models to extrapolation of local census to habitat suitability models, several countries estimate reproductive units (e.g. packs and pairs) and use conversion factors to estimate numbers of individuals. Pack/pair numbers are an excellent target for monitoring purposes (i.e. keeping track of variation through time and space) but are less suited to meet the requirements of the current Red List system and other international systems for status assessment: pack to individual conversion factors are most frequently between 6 and 8 but may range from 4 (Belgium) to 10 (Sweden). The variation of conversion factors produces large variation in the estimates of wolf numbers and may be relevant when applying thresholds for conservation assessment. See Boitani (2018, Supplementary material) for an explanation of the approach used by the IUCN Red Lists to apply conversion factors.

All mainland European countries now have wolves, some with large numbers (e.g. Bulgaria, Greece, Italy, Poland, Romania, Spain, and Ukraine have more than 1000 individuals) while others, because of their limited size or because they were only recently recolonised, have just a few individuals. Most importantly, 19 out of 34 countries report increasing wolf numbers and only three countries report decreasing numbers. The latter are all in the Dinaric/Balkan region. The high number of wolves declared in Bulgaria is likely to be the result of very imprecise estimates. Table 1 shows the number of European wolf populations in each country and whether the national estimate is based on complete or partial surveys of the wolf distribution range.

TABLE 1. Wolf numbers, precision and trends in each European country

Country - National wolf population	Year estimated	Mean estimate of individuals	Measure of uncertainty (e.g., 95% CI, SD, SE, minimum number)	Current population trend (since 2016)	Different European wolf populations in the country	Conversion factors used to convert packs/pairs to numbers	Wolf area monitored for the most recent wolf abundance estimate
Albania	2005, 2011, 2016, 2017	200-250 (2005-16), 195 (2017, official estimate)	Estimate based on expert assessment and habitat availability	No obvious change	1 population	None	Partial survey (only parts of the known wolf area)
Austria	2021	56 (genotyped wolves, likely additional individuals)	minimum number	Increasing	2 populations	None	Complete survey (most of known wolf area)
Belgium	2022	9 (2 packs)	Min 9 (spring count: excluding vagrants)	Increasing	1 population	1 pack corresponds to 5 wolves	Complete survey (most of known wolf area)
Bosnia and Herzegovina	2022	350	SD estimate (guesswork)	Decreasing	1 population	50-150 packs	Complete survey (most of known wolf area)
Bulgaria	2021	2712	not measured	Increasing	1 population	Only numbers are officially available	Complete survey (most of known wolf area)
Croatia	2020	163 Of 49 packs, 22 are shared with SI or BH	minimum = 81	No obvious change	1 population	Average pack has 4.23 individuals	Partial survey (only parts of the known wolf area)
Czech Republic	2020/2021	100 (18 packs, 4 pairs, 2 territorial wolves) in 2020/21	minimum number based on pack monitoring	Increasing	2 populations	None	Partial survey (only parts of the known wolf area)
Denmark	2021	14	13-15	Increasing	1 population	None	Complete survey (most of known wolf area)
Estonia	2021	240	95%	Fluctuating	1 population	1 reproductive pack x 10 to get the total numbers	Complete survey (most of known wolf area)
Finland	2022 (March)	290 37 (34-41) packs, 23 (19-27) pairs	275-315 (90% probability interval)	Increasing	1 population	32 (29-36) packs and 21 (17-24) pairs fully in Finland, the other shared with the Russian Federation	Complete survey (most of known wolf area)
France	2021	783 [640-978]	95% CI (method CMR)	Increasing	1 population		Complete survey (most of known wolf area)

Germany	2020 / 2021	158 packs, 27 pairs	minimum count	Increasing	1 population	None	Complete survey (most of known wolf area)
Greece	2014	1020 (186 packs)	minimum number	Increasing	1 population	Average pack size estimated from camera trapping is 6	Partial survey (only parts of the known wolf area)
Hungary	2021 / 2022	50-100	No statistical estimates - this range is for the minimum number.	Increasing	1 population	None	Partial survey (only parts of the known wolf area)
Italy	2020-21	3307	CrI 95%: 2945-3608	Increasing	2 populations	The Alpine population was estimated also by the number of packs.	Partial survey (only parts of the known wolf area)
Kosovo*	no yearly estimation.	n/a	n/a	Unknown	1 population	A pack of wolves was 'captured' by camera traps in 2016, in Junik.	Partial survey (only parts of the known wolf area)
Latvia	2020	700	400-1000	Fluctuating	1 population	None	Complete survey (most of known wolf area)
Lithuania	2021 (spring, after hunting season)	504 (63 packs)	minimum number	Increasing	1 population	Pack conversion factor is 8 after the hunting season (at the end of winter)	Complete survey (most of known wolf area)
Luxembourg	2022	0-1 (1 transient wolf in January)	minimum number	No obvious change	1 population	None	Partial survey (only parts of the known wolf area)
Montenegro	2014	727	Absolutely unrealistic number	Decreasing	1 population	None	Partial survey (only parts of the known wolf area)
Netherlands	2022	15	Estimate based on 1 pack plus 3 pairs, plus occasional wolves.	Increasing	1 population	None	Complete survey (most of known wolf area)
North Macedonia	2020	315	Lump-sum	Decreasing	1 population	None	Partial survey (only parts of the known wolf area)
Norway	2021-2022	51-52 live only in Norway, plus 74-77 in packs using areas across the border with Sweden (counted as 0.5)	No statistical estimate - these are ranges of minimum numbers	No obvious change	1 population		Complete survey (most of known wolf area)

Poland	2019	1886	best single value	Increasing	3 populations	None	Partial survey (only parts of the known wolf area)
Portugal	2019-2021	200-400 25% shared with Spain	minimum number	No obvious change	1 population	3.5 - 6 wolves per pack (in winter/spring and summer/autumn)	Complete survey (most of known wolf area)
Romania	2013 -2018	2500 - 3000	90%	No obvious change	1 population	None	Complete survey (most of known wolf area)
Serbia	2019	850	800-900	Fluctuating	2 populations	None	Complete survey (most of known wolf area)
Slovak Republic	2020	c. 600	Extrapolated from a model area (95% CI) to total distribution range. Includes cross-border animals.	Increasing	1 population	None	Partial survey (only parts of the known wolf area) for model area; complete survey for distribution.
Slovenia	2020/21	138 (121–168). If corrected for cross-border animals:120 (106-147)	CI: 95%	Increasing	1 population		Complete survey (most of known wolf area)
Spain	2012-2014 in Spain; Asturias and Madrid in 2021	304 packs	It should be considered as a minimum number	No obvious change	1 population	No official conversion factor to estimate n. of wolves but 7 or 8 is reasonable	Complete survey (most of known wolf area)
Sweden	2022	460	364 - 598 (range)	Increasing	1 population	The raw data is number of reproductions and the conversion factor is 10	Complete survey (most of known wolf area)
Switzerland	2021	153 (minimum number)	Number of genetically identified individuals in 12 months including dead wolves and pups	Increasing	1 population	None	Complete survey (most of known wolf area)
Türkiye (European part)	2016	100-115	'---	Increasing	1 population	None	Partial survey (only parts of the known wolf area)
Ukraine (only Carpathians)	2020	whole country: 2000 Carpathians: 500	minimum number	No obvious change	2 populations	None	Complete survey (most of known wolf area)

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2.2. Wolf legal status

Wolves are included as species of conservation concern in the Habitats Directive, the Bern Convention, and CITES and are often assessed using the IUCN Red List system at the country level. With few exceptions wolves are a protected species and are managed through a national management plan. The non-EU countries of the Dinaric/Balkan region and the EU countries (except Poland) that made exceptions or reservations from strict protection consider wolves a game species and in some cases have no national plan. Transboundary cooperation is often good at a technical level but almost non-existent at the institutional level. Red Listing at country level is extremely diversified and often not updated to the current situation.

TABLE 2. Wolf legal status at country level

Country	EU Habitats Directive annex:	Bern Convention appendix:	National legal status	Official "Favourable conservation status" (FCS)	National management plan	Transboundary cooperation in management	Nature of the transboundary agreement	Country level Red List status and year
Albania	Not applicable	II	Protected	Not relevant	No	No		Near threatened 2013
Austria	The Habitats Directive is implemented within the hunting and/or nature conservation laws of the 9 federal states	II	Protected / Game species / Culled only in special cases	Don't know / Not relevant	Yes, national plan	No		Regionally extinct 2005
Belgium	II and IV	II	Protected	Don't know / Not relevant	Yes, sub-national plan	Yes	Develop common policy on bold wolves, jointly define Favourable Conservation Status in the region (in progress)	Regionally extinct 2014
Bosnia and Herzegovina	Not applicable	II	Game species	Yes	No	No		
Bulgaria	II and V	reservation	Game species	No	No	No		
Croatia	IV	II	Protected / Culled only in special cases	Yes	Yes, national plan	No		Near Threatened 2014
Czech Republic	II and IV	reservation	Protected	No	Yes, national plan	No		Critically Endangered 2017

Denmark	IV	II	Protected	Don't know / Not relevant	Yes, national plan	No		Vulnerable 2018
Estonia	V	II	Game species	Yes	Yes, national plan	No		Vulnerable 2022
Finland	IV and V in reindeer husbandry region that covers 38% of Finland)	reservation	Protected / Game species	No	Yes, national plan	Yes	Exchange of information and expertise	Endangered 2019
France	IV	II	Protected	Yes	Yes, national plan	Yes	Wolf Alpine Group	Vulnerable/ Endangered 2017
Germany	II and IV	II	Strictly Protected by federal nature conservation act	No	Sub-national management plan	No		Vulnerable 2020
Greece	IV (south of 39 th parallel) and V (north of 39 th parallel)	II	Protected	No	No	No		Vulnerable 2009
Hungary	IV	II	Protected	No	Yes, national plan	No		
Italy	II and IV	II	Protected	Yes	No	Yes	Only scientific cooperation	Near Threatened 2022
Kosovo*	None	None	Protected	Not relevant	No	No		Least Concern 2019
Latvia	V	reservation	Game species	Yes	Yes, national plan	No		
Lithuania	V	reservation	Protected / Game species	Yes	Yes, national plan	No		
Luxembourg	II and IV	II	Protected	No	Yes, national plan	No		
Montenegro	None	II	Game species	Yes	No	No		
Netherlands	II and IV	II	Protected	No	Yes, national plan	No		
North Macedonia	None	reservation	Pest species	No	No	No		Near threatened 2021

Norway	Not applicable	II	Protected / Culled only in special cases	Not relevant	Yes, national plan	Yes	Common monitoring system and status report for Sweden and Norway	Critically Endangered 2021
Poland	II and V	reservation	Protected	No	No	No		Near Threatened 2001
Portugal	II and IV	II	Protected	No	Yes, national plan	No	Research team Portugal-Spain	Endangered 2022
Romania	IV	II	Protected / Game species / Culled only in special cases	Yes	Yes, national plan	Yes	Carpathian Convention	Least Concern 2022
Serbia	II, IV and V	II		No	Yes, national plan	No		Near Threatened 2022
Slovak Republic	V	reservation	Protected / Game species	Yes	Yes, national plan	No		Near Threatened 2001
Slovenia	II	reservation	Protected	Yes	Yes, national plan	No		Endangered 2002
Spain	Annex V north of the river Duero; annex IV south of Duero	II	Protected	No	Yes, sub-national plan	No		Near Threatened 2007
Sweden	II and IV	II	Protected with hunting	Yes	Yes, national plan	Yes	Common monitoring system and status report for Sweden and Norway	Endangered 2020
Switzerland	None	II	Protected / Shot only in special cases	Not relevant	Yes, national plan	No		Vulnerable 2022
Türkiye / European part	None	reservation	Protected	Yes	No	No		
Ukraine	II	reservation	Game / Pest species	No	No	No		

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3.3 Depredations and hybridisation

Wolf depredation of livestock is the main cause of intolerance toward wolves in human-dominated landscapes. Losses can be substantial (about 40,000 head per year, with a few countries suffering disproportionately such as France, Croatia, Italy, Greece, Lithuania, Norway, Türkiye), especially on sheep, semi domestic reindeer and, locally, dogs. However, numbers must be read in the context of local ecological (alternative prey) and socio-economic conditions (husbandry methods, prevention measures, management plans, compensation regulations applied, national institutions responsible) as well as the size of their national distribution range (Gervasi et al., 2021). The figures in Table 3 are striking evidence of the importance of managing conflict with ad-hoc suites of techniques that may often change even within the same country. The absolute figures of the compensation costs are often significant: although they may be tolerable at country level, their concentration at a local level may reveal intolerable pressure on certain areas and categories.

A note of high concern is raised by the finding that wolf-dog hybridisation is widespread across Europe, although with substantial variation in intensity: Italy, and the southern countries in general, report levels of occurrence that are (or can quickly become) very problematic for wolf conservation.

TABLE 3. Livestock depredations, compensation costs and the occurrence of wolf-dog hybridisation

Country:	Year of depredation data	Sheep & goats killed	Cattle	Horses/donkeys	Semi-domestic reindeer	Dogs	Year of compensation data	Amount in Euros of compensation for losses	Rules for compensation	Most important prevention measures	Wolf-dog hybridisation occurrence	Estimated scale of wolf-dog hybridisation
Albania	NA						None	None		Livestock guarding dogs Armed shepherd fencing/enclosure	Only sporadic, random occurrences	Not assessed
Austria	2021	888	18	0	0	0	2021	€ 255.178,64	only documented losses	Fences	No	
Belgium	2021	209	5	3	0	0	2020	26.194	only documented losses	Wolf-proof fences	No	
Bosnia and Herzegovina	2020	85	2	3	0	31	2020	<1.000	only documented losses	Prevention measures (electric fences, dogs) have only just begun to be implemented	No	
Bulgaria	NA						0	0	Other	None	Localised	
Croatia	2016	2.457	122	60	0	122	2020	in the range of 400.000 EUR	Compensation is conditional on effective protection measures	Dogs, shepherds and electric fences	widespread	30% in some areas (Dalmatia)

Czech Republic	2020	781	58	2	0	0	2020	252.968	only documented losses	Electric fences (90 %) guarding dogs (10%)	Only sporadic occurrences	1 case in 8 years
Denmark	2021	76	2	0	0	0	2021	22.409	only documented losses	Wolf proof fences (1.20 m high, two electric wires)	No	
Estonia	2021	481	22	0	0	5	2021	212.464	only documented losses	Electric fences	Only sporadic occurrences	don't know
Finland	2021	278	11	0	1.516	30	2021	2.997.413 € (semi-domestic reindeer 2.746.800 €)	only documented losses	Electric fences for sheep	Only sporadic, random occurrences	0.0-0.5%
France	2020	11.064	224	4	0	0	2019	4.207.895 €	only documented losses	They are implemented in 4 categories of areas delimited by the prefect according to the predation pressure on herds of sheep or goats	No	
Germany	2021	2881 (in 700 attacks)	251 (in 200 attacks)	16 (in 18 attacks)	0	5 (6)	2021	498.433 €	Only documented losses, mostly conditional on minimum protection measures	Electric fences and livestock guarding dogs	Only sporadic, random occurrences	3 cases in 21 years
Greece	2021	3.560	1.292	29	0	NA	2021	1.015.842	only documented losses	Livestock protection dogs, shepherd, fencing, corrals	widespread	unknown, expected to be high in peri-urban areas >10%
Hungary	2021	?	?	0	0	?	2019	0	Other (compensation is not available)	Electric fences, livestock guarding dogs	No	

Italy	2019	8.400	1.400	300	0	0	2019	2.000.000	Other	Livestock guarding dogs and night pens (standard 1.8 m high fixed metal fences), electrified fences on mountain pastures	widespread in the Italian peninsula population	studies on local scale found hybridisation prevalence levels of 50-70%. Recently documented in Alpine regions
Kosovo*	2013	87	5	0	0	0	don't know	don't know	Other	Not detailed in the law	Localised	No information, but in the camera traps most of the wolfs are hybrids
Latvia	2021	45	2	0	0	4	None	None	Other	Hunting wolves is permitted soon after damage is done and right in the conflict area, from 15 th July to 31 st March	Only sporadic, random occurrences	Less than one pack per year
Lithuania	2021	1.183	159	0	0	0	2021	220.000	Compensation only pays for documented losses	Electric fencing and livestock guarding dogs	Only sporadic, random occurrences	On average, <5% of hunted wolves in the last 3 years are found with genetic similarity to the reference population of dogs higher than 10%
Luxembourg	2021	0	0	0	0	0	2021	0	Other	Fencing	No	
Montenegro	NA						don't know	don't know	Other	There are no mitigation measures	Only sporadic, random occurrences	there are rumors, not officially confirmed

Netherlands	2021	209	0	0	0	0	2021	46.093	only documented losses	Wolf-proof fencing of livestock	No	
North Macedonia	NA						None	None	Other	Shepherding, guarding dogs and penning at night	Only sporadic, random occurrences	Few individuals recorded on camera-traps that look like hybrids
Norway	2021	979	0	0	134	2	Not available	Not available	Only a percentage of all claims are inspected so compensation is paid for more than those documented	Conversion from sheep farming to other agricultural activities inside carnivore zones, electric fencing	No	
Poland**	2019	0	0	0	0	0	2020	351.000 Euro	only documented losses	Electric fences, fladry and guarding dogs	Only sporadic, random occurrences	Unknown
Portugal	2017	2064	593	395	0	7	2017	332.387	Compensation is conditional on effective protection measures	Livestock guarding dogs Electric fences Wolf-proof fences	Only sporadic, random occurrences	Only two confirmed cases of F1 hybrids identified by genetic analysis
Romania	2021	-	-	-	-	-	2021	127.580	only documented losses	Shepherds Guardian dogs Electric fences	No	
Serbia	NA						2021	0	only documented losses	No prevention measures	Only sporadic, random occurrences	up to 3-5% (estimated)

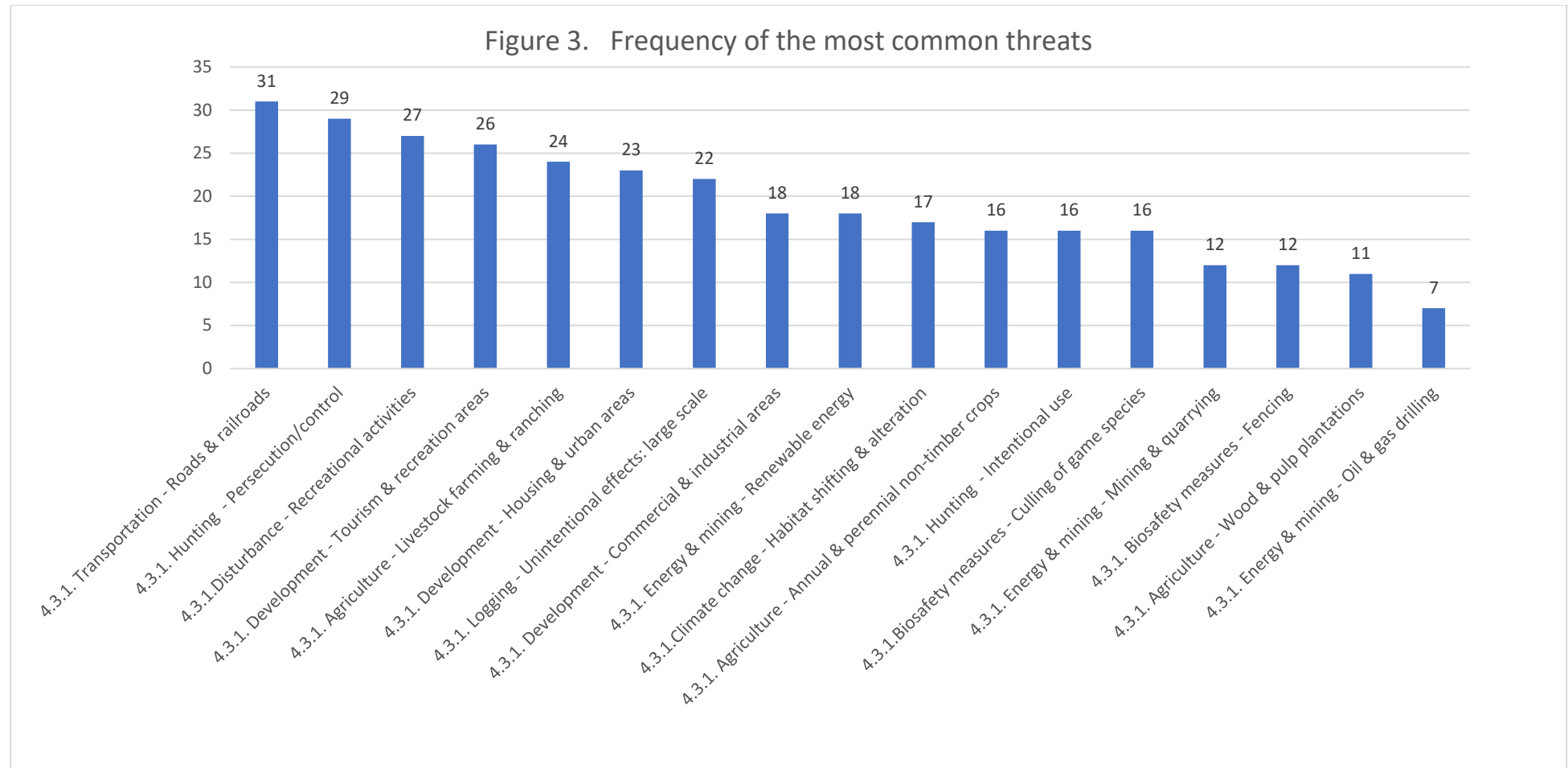
Slovak Republic	2021	733	59	0	0	0	2021	272.397	Documented and verified losses, conditional on use of preventive measures	Shepherds, livestock guarding dogs (mostly kept on chains), fencing (often not used correctly or not designed to be predator-proof).	No	
Slovenia	2021	139	41	6	0	3	2020	149.183,87	only documented losses	Electric fences. To a lesser degree livestock guarding dogs. Rarely shepherds. Consultation support to farmers	Localised / Only sporadic, random occurrences	Occasional occurrences are removed from the populations, so far mostly successfully (0-2 animals per year).
Spain	2020	3360	6730	1120	-	?	2020	>2.845.785	only documented losses	The most important is damage compensation	Localised	4%-5% of animals according to limited research
Sweden	2021	286	0	0	0	11	2021	1.7 M SEK	only documented losses	Electric fences	No	
Switzerland	2021 (until 31.10.21)	830	20	3	0	0	2021	don't know	only documented losses	Electric fences, livestock guarding dogs	Only sporadic occurrence	
Türkiye (European part)	2022	115	1	4	0	3	don't know	don't know or non-existent	Other	Guarding dogs are widely used in Türkiye.	Localised / sporadic occurrences	not estimated
Ukraine	NA						NA	0	Other	None	sporadic, occurrences	no monitoring

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** For Poland only data on number of depredation cases is available: 993 cases in 2019

3.4 Threats to wolf conservation

Several potential threats to wolf conservation are recurrent across Europe. Figure 3 summarises the frequency of various threats as reported in each country according to IUCN Red List threat categories. Roads, illegal killing and disturbance from tourism-related activities are all reported in more than a quarter of all countries followed by other disturbances due to housing, industrial development and forestry. However, threats vary in strength and persistence depending on local conditions and their assessment should always be supported by concrete evidence of negative impacts on wolf survival. Wolves are very adaptable to all types of habitats and in general very tolerant to human activities and landscapes. It should be noted, however, that the IUCN threat categories do not cover the wider social conflicts and institutional weaknesses that are widely regarded as being the most important threats for wolf conservation in Europe.



3. Wolf status at population and continental levels

European regional assessment: Least Concern (LC)

EU 27 regional assessment: Least Concern (LC)

Following the bottleneck of the 1960s and 1970s, the European wolf populations have generally increased in number and have expanded their distribution ranges. The overall European wolf population can be viewed as a large metapopulation with several distinct fragments, although dispersal could theoretically connect almost all fragments, and connections are being re-established in many areas. Dispersing animals can potentially be found anywhere in mainland Europe, as revealed by the appearance of transient individuals even in the most densely populated areas.

Based on the best available data, in 2022, the total number of wolves in the 27 EU member States is likely to be in the order of 19,000, and the number of wolves in geographic Europe (excluding Belarus and the Russian Federation) is likely to exceed 21,500, a significant increase over the last five years. Consequently, the species qualifies as Least Concern at both the European and EU 27 levels. The quantity and quality of data on population size and structure varies greatly between European countries: see the IUCN Red List assessment (Boitani 2018) for a description of the nine main European populations and for an explanation of the methods used to obtain the numbers for each subpopulation. The European wolf population is currently a large metapopulation with several distinct subpopulations defined by significantly different levels of connectivity (Linnell et al 2008). Their size, trends and conservation status are summarised in Table 4.

1. Iberian

Wolves are found mainly in the north-western quadrant and centre of Iberia (both Spain and Portugal). The Iberian population does not extend as far east as the Pyrenees (although some individuals are now recolonising the Pyrenees from the Alps, via France). Wolves are expanding southwards in Spain and are now found on both banks of the river Duero in both Spain and Portugal. The population segment in the Sierra Morena mountains in southern Spain seems to be extinct.

Red List category: Near Threatened. The Iberian population is large, about 2,500 individuals (2024-2990), and rather stable, slowly expanding towards the south and east. Although recently (2021) declared nationally protected in Spain, it is maintained in the Near Threatened category because of fragmentation in management regimes, lack of a population level management plan, the occurrence of largely unpredictable events of human persecution (poisoning, shooting, etc.) that may threaten the population at the local level and the near isolation of some of its southern population segments.

2. Western-Central Alps

The population in 2021 occupies a large area that includes most of the Western Alps in France and Italy, many wolf packs territories being transboundary along the French-Italian border and occupies large areas of south-eastern France up to the Massif Central, and in Italy to lowlands of Piemonte and Liguria, also far from the Alps. Increasing numbers of wolves are found in Switzerland and in eastern Alpine regions of Italy, with numbers rapidly building up in Veneto, Friuli Venezia-Giulia and Trentino, and will likely further expand through most of the central Alps. Several packs have been formed by individuals from the Alps and animals from the Dinaric-Balkan population, especially in the easternmost part of its range.

Red List category: Near Threatened. The Alpine population was founded based on a recent expansion of the Italian peninsula wolf population and has grown rapidly and steadily (10-20% /year) in each country of the Alpine arch. Accurate estimates from each country cannot be simply added up to estimate the population because an unknown % of wolves are shared among countries and the effect of running independent capture-recapture estimates could significantly inflate double counts. This concern is especially serious for the Italian-French part of the population. The total number of about 1900 individuals should be considered as indicative. Dispersion over a large range, fragmentation among several countries, and the first signs of hybridisation (North-East in the western Alps of Italy and France, and eastern Alps of Italy) justify its assessment in category Near Threatened.

3. Italian peninsula

Wolves occur in the whole Apennines range from Emilia to Calabria (Aspromonte) and extending into northern Lazio and central western Tuscany (provinces of Siena, Grosseto and Pisa).

Red List category: Near Threatened. The Italian peninsula wolf population is estimated to number 2020-2645 individuals. The shape of the range is narrow and elongated, mainly restricted to the Apennines mountains. In spite of the recent increase in numbers and range, the Italian peninsula wolf population is locally vulnerable to local extermination from human pressures (poisoning, shooting) and the locally high prevalence of wolf-dog hybridisation. The stochastic nature of these events suggests that the current positive status of the population may easily be reversed.

4. Dinaric-Balkan

The population covers a vast area from Slovenia in the North to central Greece in the South, including the whole Dinaric Mountain range through Slovenia, Croatia, Bosnia-Herzegovina, western Serbia and Kosovo*, Montenegro, North Macedonia, Albania, the western and southern parts of Bulgaria and the European part of Türkiye.

Red List category: Least Concern. This wolf population does not qualify for any Threatened categories because of its large size (c. 5000-5500 individuals) and wide distribution. However, several parts of the range may be subject to excessive pressure from lethal control and poorly regulated hunting. In many countries the data quality is poor, and management plans are poorly developed or absent. Moreover, there are also very different management regimes amongst countries, lack of any compensation system in many of them (e.g. Albania, Bulgaria, Serbia, North Macedonia), lack of robust population monitoring in some of the countries (uncertainties on population estimates and trends), widespread poaching even in protected populations and probably excessive wolf hybridisation with dogs. It is worth noting that all cases of decreasing wolf population in Europe are from this population. There is an acute need for better data from throughout the southern part of this population.

5. Carpathian

The population extends across several countries, from northern Bulgaria and eastern Serbia through Romania, south-western Ukraine, Slovakia, south-eastern Poland and eastern part of the Czech Republic. Small (but increasing) numbers of wolves are also present in northern Hungary on the periphery of the distribution.

Red List category: Least Concern. This large wolf population (c. 3900-4700 individuals) appears to be maintaining its conservation status mainly due to the management implemented in Romania, Poland and Slovak Republic. Some of the peripheral areas of the range may be subject to excessive hunting and poaching pressure (e.g. Hungary, Bulgaria) and may require appropriate conservation measures to limit mortality. In Poland and the Czech Republic wolves are fully protected while quotas for wolf hunting have decreased substantially in Slovak Republic. There is no common management plan at the population level and completely different management regimes are implemented in neighbouring countries (Ukraine, Poland, Slovak Republic, Hungary and the Czech Republic).

6. Baltic

This population covers eastern lowlands of Poland, Lithuania, Latvia, Estonia, northern Ukraine and would naturally extend to Belarus and the neighbouring parts of the Russian Federation (including the oblasts of Kaliningrad, Leningrad, Novgorod, Pskov, Tver, Smolensk, Bryansk, Moscow, Kursk, Belgorod and Orel). However, the connectivity with Belarus and Russia is being increasingly reduced by the recent dramatic increase of border fence construction.

Red List category: Least Concern. The relatively large (and increasing) number of wolves (c. 2190–2790) in the EU member States (Estonia, Latvia, Lithuania and Poland) and the natural continuity of its range

into the Russian Federation and Belarus support its assessment in the category of Least Concern. A large part of the population is fully protected in eastern Poland (1040 wolves). However, the portions of the population in some of the Baltic States are intensively hunted with high hunting quotas at 40-50% and may require careful monitoring to ensure their long-term persistence. The recent increase in solid border security fencing along the borders to Belarus and the Russian Federation are grounds for concern as they will decrease the degree of connectivity. Accurate monitoring is necessary as without this connectivity the population might be down-listed to Near Threatened.

7. Central European

This population is expanding rapidly into the central European lowlands from its core in the western half of Poland and the eastern part of Germany. Several packs are also found in the Czech Republic. Its expansion is likely to continue.

Red List category: Near Threatened. The population has grown very rapidly since 2000 and it is now estimated to number in the order of 1850 individuals. This population is highly dynamic and dispersing animals have reached all Central European countries with confirmed packs established in Austria, Denmark, Belgium and the Netherlands. In the German part of the population, the expansion is mainly occurring in a north-westerly direction, whereas the expansion to the Southwest is slower. Although the geographic gap between the Central European population and the Baltic population is nearly closed, genetic exchange between these populations still appears to be limited. New connections with the expanding populations in the Alps are also likely to occur soon. However, an increasing number of fences built to contain the spread of African Swine Fever may become a serious threat by contributing to population fragmentation.

8. Karelian

Wolves occur in Finland (mainly in the southern half of the country) and Russian Karelia. The Karelian wolf population is the western extremity of the large Russian population. However, of the three main connectivity areas allowing continuity of the Russian Karelian population with the rest of Russia, one is completely blocked by megapolis St. Petersburg and its satellites. Wolves in Russian Karelia are estimated about 300 and they are heavily hunted: bounties are paid and the annual wolf harvest is often equivalent to annual breeding.

Red List category: Near Threatened. The total population, shared by Finland and Russian Karelia is estimated to 750 individuals and would qualify for Vulnerable. However, the Karelian population is generally considered to have connections with the very large Russian population, and there could potentially be a rescue effect, so the population level assessment is downgraded by one step to Near Threatened. The total population in Finland is small (c. 275 – 315) and it would qualify for the category of Endangered (D1) if it were isolated. The number of wolves in Russian Karelia is not well-known but is likely to be in the order of 500 and may be declining as a result of excessive persecution. The degree of fragmentation is not known. Very little information is currently available on the status of the wolf in Russian Karelia, and this population should be reassessed if any new relevant data become available.

9. Scandinavia

The distribution range of the population is in central Sweden and, to a lesser extent, in south-eastern Norway. It is spreading slowly toward southern Sweden but is being prevented from expansion in Norway because of government policy.

Red List category: Vulnerable (D1). The population size is well known (550 of which 460 (364 – 598 95% CI) in Sweden) and the estimated number of mature individuals justifies the category Vulnerable. The population has low genetic variability due to a small number of founders and has little genetic exchange with the Karelian population. The management policies (low population goals and high hunting/control quotas) in Norway (and recently proposed in Sweden) dramatically affect the future conservation prospects of the overall population, and there is no common management plan at the population level.

TABLE 4. European Wolf Populations size, trend and Red List assessment (2022)

Estimates for 2016 LCIE) and 2018 (from countries' reports in 2018 under art.17 and Resolution No. 8 (2012)) are reported in columns 2 and 3 for comparison with estimates used for the present assessment. (Years of data are in italics)

1. Iberia (Sierra Morena: extinct)

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Spain	297 packs (2014)	1225-2375	304 packs ^ (2014)	packs	stable	
Portugal	41 + 17 (2004) (shared with SP)	120 (60 packs ^^)	200-400 ind	packs	probably stable	
Total	338 + 17 (1775-2130)	1345 -2495	c. 2550 (2024-2990)		stable	Near Threatened

^1 pack = 6-8 individuals; ^^ 1 pack= 2 individuals

2. Western Central Alps (includes Eastern Alps, lowlands, Massif Central, Ligurian Appennines)

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Switzerland	29	78	153	indiv	increase	
France	360	430 (387-477)	783 [640-978]	indiv	increase	
Italy	188	293	946 (CrI 95%: 822 – 1099)	indiv	increase	
Austria	?	6-8	28	indiv	increase	
Total	577	820-965	c. 1900		increase	Near Threatened

3. Italian peninsula

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Italy	1580 (1000 -2400)	1034-2390	2388 (IF 95%: 2020 – 2645)	indiv	increase	
Total	1580	1034-2390	2388 (2020-2645)		increase	Near Threatened

4. Dinaric Balkan

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Slovenia	73	72-78	120 (106-147)	indiv	increase	
Croatia	50 packs^	185	163 (2020)	Indiv	stable/ decrease	
Albania	200-250	---	195 (200-250)	indiv	stable	
North Macedonia	466 (2012)?	---	315	indiv	decrease	
Greece	795 (156 packs)	1020 (907 – 1134)	1020 (2014) min. numb.	indiv + packs	increase	
Serbia	900^^	850-1100	850 (800 – 900)	indiv	stable (increase)	
Bosnia and Herzegovina	350	---	350	indiv	stable/ decrease	
Montenegro	--	--	720 ? **	Indiv.	decrease	
Bulgaria	790 (2013)	740 - 1200	2700 **	indiv	Increase	

Kosovo *	??	---	10-20?	indiv	unknown	
Türkiye (European)			100 - 115	indiv	unknown	
Total	3800		5800 – 6500 (most likely 5000-5500)			Least Concern

^ 46% shared with SI and BIH

^^ official estimate, poor quality, likely too high

5. Carpathian

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Slovak Republic	300 - 400	300 - 600	c. 600	indiv	increase	
Poland ^	389	294	294	indiv	stable	
Czech Republic	sporadic	5-80 all country	13	indiv	increase	
Serbia	10	---	3 - 10	indiv	stable/ increase	
Romania	2400-2600	2500 - 3000	2500 – 3250 (2018)	indiv	stable/incr	
Hungary	---		50-100	indiv	increase	
Ukraine^^	381	---	500	Indiv	increase	
Total	3630		c. 4500 (3900-4700)		increase	Least Concern

^ The most recent estimates for Carpathian Poland are for 2019

^^ The total for Ukraine is 2000

6. Baltic

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Lithuania	292 (2015)	136 - 200	504 (63 packs)	packs / indiv	increase	
Latvia	450	1126 - 1187	700 (400 – 1000)	indiv	stable	
Estonia	27 packs	180 - 260	240	packs and indiv	increase	
Poland ^	1046	1050	1050	indiv	increase	
Total ^^	1913		c. 2490 (2190–2790)		increase	Least Concern

^ For 2021 the estimates from 2016 were taken because the most recent estimates (for 2019, 1592 wolves) are for all PL lowlands and do not consider division on Baltic and Central European populations

^^ Neighboring Belarus is estimated to host 1500-2500 wolves

7. Central European

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Poland^	60 packs + 2 pairs	550	550	packs / indiv	increase	

* All references to Kosovo, whether to the territory, institutions or population, in this text shall be understood in full compliance with United Nations Security Council Resolution 1244 and without prejudice to the status of Kosovo.

Germany	60 packs* + 13 pairs	As in 2016	158 packs + 27 pairs (1002 indiv) (403-429 min. number adults confirmed)	packs / indiv	increase	
Czech Republic	3 packs	80	87 (16 packs +3 pairs + 1 ind.	packs	increase	
Austria		23-28	28	indiv	stable	
Netherlands	1	---	15	indiv	increase	
Luxembourg	--	1-2	1	indiv	stable	
Belgium	--	2-4	9	indiv	increase	
Denmark	3	---	14 (13 – 15)	indiv	increase	
Total	770		c.1850		increase	Near Threatened

* 3 packs shared with Poland and the Czech Republic

^ For 2021 estimates from 2016 were taken because the most recent estimates (from 2019 – 1592 wolves) are for all PL lowlands and do not consider division on Baltic and Central European populations

8. Karelian (without RU)

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Finland	204-234	180 (165 – 190)	290 (275 – 315) (c. 750 including Russian Karelia)	25 packs is the national goal	stable / increase	Near Threatened

9. Scandinavian

Country	2016 LCIE	2018 art. 17/Res 8	2021-22 LCIE	Unit	Trend	Assessment
Norway	82	69	51-52 + 50% of 74- 77 shared with Sweden	indiv. (family groups)	increase	
Sweden	355	352 (305 – 415)	460 (364 – 598 95% CI)	indiv. (family groups)	increase	
Total	437	375 - 485	550			Vulnerable

Europe: c. 21,500 (17,000 in 2016). Red List category: Least Concern

EU27: c. 19,000 (14,300 in 2016). Red List Category: Least Concern

4. Assessment at level of Biogeographical Regions

Species assessment at the level of biogeographical regions is a necessary step to assess conservation status under Article 17 of the Habitats Directive and Resolution No. 8 (2012) of the Bern Convention as well as being the basis for the sufficiency evaluation of Natura 2000 and the Emerald Network. However, several obstacles impede a meaningful assessment of wolves at this level. Firstly, the biogeographical regions are not a continuous stretch of land where population dynamics and source-sink dynamics (e.g. dispersal) can occur naturally. For example, the Alpine biogeographic region is made up of at least 10 distinct and isolated land areas stretching from the Pyrenees to the Rodopi. Secondly, the biology and management of wolves across any given biogeographical region are the result of very diverse conditions under a variety of pressures, each with

its own pattern on a particular area: this makes application of the Red List criteria theoretically possible but meaningless from a biological and conservation perspective. Thirdly, the boundaries of the biogeographical regions are designed based on criteria other than the biology of medium/large mammals with the result that the boundaries often cut through the middle of populations whose health and viability are based on their integrity and continuity. Fourthly, the number and status of wolves that, in each European country, contribute to different biogeographical regions is difficult to assess, often limited to a few individuals with high margins of uncertainty. The nine populations of wolves which we use here for assessment, have been proposed and adopted at the EU level explicitly to overcome the intrinsic limitations of the biogeographical regions approach when applied to large carnivores.

Taking these caveats into account, from a purely numerical (composite) point of view, all biogeographical regions of Europe with wolves would qualify for the Red List category of Least Concern with just two possible exceptions: the Pannonian region is only marginally occupied by wolves and would likely qualify for the category of Vulnerable, like the Atlantic region as wolf numbers are still building up in this region. The Arctic and the Black Sea biogeographic regions would probably qualify as Endangered or Critically Endangered as they are marginal to wolf ranges in Europe.

5. Concluding remarks

Despite the existence of European-level conservation frameworks provided by the EU Habitats Directive and the Bern Convention, the monitoring and management of wolves does not occur at the European scale. It is rather left to the initiative and responsibilities of national (and often sub-national) authorities. The fragmentation of management authority results in a high diversity of monitoring approaches. Methods vary from the detailed knowledge of the wolf population in Sweden (where the genetic pedigree of the entire wolf population is known right back to the first recolonisers in the 1980's) to the diversity of field methods (focusing on individual animals, packs, territories, partial vs. total surveys, use of snow-tracking or genetics and/or capture/recapture techniques) of most countries to the complete lack of any regular structured monitoring activities in few countries. This heterogeneity in data quality makes constructing a coherent description of the overall European wolf population difficult, and significant uncertainties remain unresolved in some parts of the European range. However, the magnitude of the numbers and the changes in the last decades allow the conclusion that wolf numbers in Europe have increased during the last decade and the overall positive trends appears to be stable or increasing. The conservation status at European scale is undeniably positive and the species can be classified as “Least Concern” in the IUCN Red List system when the assessment is made at the continental scale.

As management is currently carried out at national level, the reference status for setting and monitoring the management actions must necessarily be at national level. Wolf status across European countries varies depending on the size of the country, the local ecological and socio-economic conditions, the level of tolerance for wolf-livestock conflicts, the efficiency of prevention and compensation measures to reduce and mitigate the conflicts, the number and densities of wild prey, the phases of historical wolf return to its original ranges, and other factors. The lack of any formal agreements on sharing management responsibility at inter-national level (at either pan-European level or among some neighboring countries) and the resulting responsibility being limited to the national level creates the paradox that wolf management must be carried out as if in Europe there were as many independent wolf populations as the number of countries. The Red List assessment at the national level reflects this condition. The outcome of this situation is that several small countries have, and will always have, small numbers of wolves requiring full protection even though there is a continuous distribution of wolf populations in the neighboring countries. Only a very few European countries are large enough to host a fully viable (non-threatened) population by themselves.

Wolf status assessment and management would best be approached through the intermediate level between pan-European and country levels, i.e. the population level. The conservation status of the 9 main biological wolf populations is assessed as “Least Concern” or “Near Threatened” except for the Scandinavian population which is assessed as “Vulnerable”. Formally coordinated management at the population level would provide more options and flexibility than at the national level because of the large size and positive demographic trends of most populations. However, management at this level requires the formal approval of an action plan agreed upon and implemented by all countries involved. Requests to manage a local/national

population counting on the continuity with neighboring countries, but without formally engaging in a common action plan, are not acceptable because the impact of management decisions at local level would necessarily reverberate on the whole population. Despite the obvious benefits of the population level approach and the widespread cooperation at the technical level for monitoring and research, no neighboring European countries have so far engaged in a formal institutional action plan for a shared population.

Despite the overall positive trend for Europe's wolves there are a number of threats that need to be monitored or addressed. Beside the well-known threats to the conservation of European wolves (e.g. livestock depredation, competition with hunters for wild prey, fear and intolerance by humans), at least four emerging threats call for particular attention and dedicated actions. Firstly, the border fences being built to control human migrations and the veterinary fences built to control the spread of the African swine fever in wild boar have an increasingly serious impact on the connectivity towards the east, and within the populations of several eastern and central European wolf populations. These fences will soon reduce the viability and conservation status of several wolf populations. Secondly, the status of the large wolf population distributed across the Balkans is suffering from a lack of detailed monitoring, poor management and regulation of hunting, widespread illegal killing and a general lack of political and institutional support for their conservation. This region is currently the highest Europe-wide conservation priority for wolves and other large carnivores, and it requires support to assess the connectivity, status and trends of the population and to ensure that current harvest and lethal control is sustainable. Thirdly, wolf-dog hybridisation is insidiously increasing its impact on several southern and eastern wolf populations: it is urgent to approve adequate policies and implement appropriate management means to prevent the spread of this serious conservation threat. Finally, there are many areas where social conflicts surrounding wolves (typically cases where wolves become symbolic of wider societal divisions or tensions) are high and / or increasing, and where these conflicts are being instrumentalised in wider political struggles. Such situations threaten to decrease public tolerance for wolves and undermine the role of science in guiding their management.

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