

Raptors MOU Second Conservation Status Assessment Report (CSAR2)

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List of Abbreviations:

IBA: Important Bird and Biodiversity Area
IUCN: International Union for Conservation of Nature
KBA: Key Biodiversity Area
MOS: Meeting of Signatories
MOU: Memorandum of Understanding
OECM: Other Effective Area-based Conservation Measures
SPA: Special Protection Area
CMS: Convention on Migratory Species
CMP: Conservation Measures Partnership
TAG: Technical Advisory Group
CSAR: Conservation Status Assessment Report
MsAP: Multi-species Action Plan
EDGE: Evolutionarily Distinct and Globally Endangered
NSAID: Non-steroidal anti-inflammatory drug
HPAI: Highly pathogenic avian influenza
IKB: Illegal killing of birds
RLI: Red List Index
RE: Regionally Extinct
CR: Critically Endangered
EN: Endangered
VU: Vulnerable
NT: Near Threatened
LC: Least Concern

¹ Proof-reading by Tess Appleby

Contents

1. Introduction	4
2. Global conservation status	5
3. Regional conservation status	7
3.1 European Conservation Status	8
3.2 Conservation status of breeding raptors in the Mediterranean.....	9
3.3 Conservation status of raptors in South Africa, Lesotho and Eswatini.....	11
4. Global conservation status over time - Red List Index	13
5. Global population trends	15
6. Regional population trends	17
6.1 European Vulture Trends.....	17
6.2 African Population Trends	20
6.3 Population Trends of vultures in India.....	21
7. Annex 3, Table 1 Category changes over time.....	22
8. Threats to species globally.....	25
8.1 Threats to Annex 1 species	26
8.1.1 Level 1 threats.....	26
8.1.2 Level 2 threats.....	27
8.2 Causes of mortality identified from tracking data	32
8.3 Threats to vultures.....	33
8.4 Emerging threats	33
8.4.1. Recent HPAI outbreaks.....	33
8.4.2. Impacts of changing rodent cycles at northern latitudes	38
8.4.3 Impacts of armed conflicts.....	39
8.4.4. Intraguild effects of recovering raptor populations.....	40
9. Internationally important sites.....	42
9.1 Gaps in the current Raptors MOU List of Sites network.....	42
9.1.1 Background	42
9.1.2 Methodology.....	42
9.1.3 Results overview	43
9.1.4 Improving the site network represented by the List of Sites.....	44
9.2 Protection of Raptors MOU List of Sites	48
9.2.1 Calculating site protection	48
9.2.2 Calculating global area covered by the List of Sites.....	53

10. Habitats for migratory raptors.....	55
11. Conservation actions	57
11.1 Case Study 1: Flyway-Scale Collaboration to Conserve the Balkan Egyptian Vulture.....	58
11.2 Case Study 2: Flyway-Scale Conservation of the Eastern Imperial Eagle (Pannonian Region)	59
11.3 Case Study 3: Flyway-Scale Conservation of the Saker Falcon in Bulgaria & Southern Romania	60
12. Knowledge gaps	61
12.1 Geographic and taxonomic bias in research and monitoring.....	63
12.2 Incomplete basic ecological knowledge and uncertain migratory status.....	64
12.3 Lack of coordinated long-term population monitoring	64
12.4 Threat quantification, interactions and cumulative impact across the annual cycle	65
12.5 Assessing emerging and overlooked threats	65
12.6 Socio-economic and governance gaps.....	66
13. International species action plan gaps	66
14. Conclusions	67
15. References	71
16. Annex A.....	79
17. Annex B.....	80

1. Introduction

The second Conservation Status Assessment Report (CSAR) for the Raptors MOU is presented to MOS4 following the presentation of the first CSAR² at MOS3. The text of the Raptors MOU³ outlines several fundamental principles, including principle 5 ‘The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate’. The purpose of the CSAR is to give the Meeting of Signatories (MOS) an up-to-date overview of whether a favourable conservation status is being achieved and maintained for the migratory raptor species on Annex 1 of the MOU throughout their range.

BirdLife International in its role of IUCN Red List authority for birds maintains comprehensive data on all bird species worldwide, including Red List assessments, population trends, threats, habitats, conservation actions, and key sites. These data can be explored through the BirdLife DataZone⁴, which provides searchable species, site, country and flyway profiles and associated ecological and conservation information.

Species listed on the Raptors MOU Annex 1 are categorised in Table 1 (Annex 3)⁵ as follows: Category 1 - Globally threatened and Near Threatened species according to the latest IUCN Red List; Category 2 - Species considered to have Unfavourable Conservation Status at a regional level within the Range States and territories listed in Annex 2 to the MOU; Category 3 - all other migratory raptor species.

Throughout this document, “Category” refers to Table 1, Annex 3 Category. Raptors MOU Annex 3, Table 3⁶ is a list of internationally important sites for migratory birds of prey in Africa and Eurasia. The list includes internationally important sites for migratory birds of prey identified as Important Bird and Biodiversity Areas (IBAs)⁷, EC Birds Directive Special Protection Areas (SPAs) and other Signatory-recognised sites that meet criteria of international importance. Hereafter, “List of Sites” refers to Annex 3, Table 3.

In this report, we provide an overview of the conservation status, population trends, Table 1 (Annex 3) Category changes over time, threats, important sites, habitats, conservation actions, and knowledge gaps of Annex 1 species. We focus on what has changed since the

² <https://raptors.cms.int/document/conservation-status-assessment-report>

³ <https://raptors.cms.int/page/agreement-text>

⁴ <https://datazone.birdlife.org/>

⁵ Hereafter referred to as Table 1

⁶ Hereafter referred to as Table 3

⁷ Over time since the establishment of Table 3 some countries have identified Key Biodiversity Areas (KBAs). An evolution from the IBA approach, KBAs are sites of global significance for the persistence of all biodiversity and recognise international importance of areas for multiple taxa including birds

last CSAR⁸ and new relevant information published in the interim. Finally, we identify gaps in species action plans.

2. Global conservation status

Migratory birds worldwide, including raptors, are facing population declines and an increasing risk of extinction, highlighting the urgent need for strengthened conservation efforts (BirdLife International, 2026). In this context, BirdLife International serves as the official IUCN Red List Authority for birds, responsible for assessing their conservation status. Red List updates for a selection of species are published annually, while comprehensive reassessments of all recognised bird species are carried out on a four- to six-year cycle.

The analyses presented here are based on the 2025 IUCN Red List datasets maintained by BirdLife International (Fig.1, 2) and cover all 94 species included in Annex 1 of the Raptors MOU. The previous CSAR⁸ report prepared for MOS3 (2023), used 2021 IUCN Red List datasets. Between 2021 and 2025, three of the 94 Annex 1 species were re-assessed. The hooded vulture (*Necrosyrtes monachus*) was reassessed in 2022, with its classification as Critically Endangered retained. In 2025, both the northern boobook (*Ninox japonica*) and the eastern imperial eagle (*Aquila heliaca*) were reassessed, and their classifications as Least Concern and Vulnerable, respectively, were confirmed.

As in CSAR1⁸ 34% of the Annex 1 species are classified as CR, EN, VU or NT and therefore face an elevated risk of extinction (Fig. 1). Vultures remain the most threatened group, comprising eight CR species and the highest proportion of globally threatened or NT species (93%). Eagles represent the second most threatened group, with two EN species and half of all Annex 1 eagle species classified as threatened or NT. Hawks and harriers have the lowest proportion of species in these categories, at 5% (Fig. 2).

EDGE scores were calculated for 94 species listed in Annex 1 (McClure et al. 2023a). The EDGE (Evolutionarily Distinct and Globally Endangered) score helps conservationists rank which species need protection first by combining two factors: how evolutionarily unique a species is and how likely it is to go extinct. A higher score means a species is both highly distinct and facing severe threat. The score simply represents the unique evolutionary history we can save if we step in to prevent extinction of that specific species.

Table 1 presents the ten Annex 1 species with the highest EDGE scores. Eight of these are vultures, supporting the finding in Fig. 2 that vultures are the most threatened raptor group.

⁸https://raptors.cms.int/sites/default/files/document/MOS3_DOC.%2012.3_Annex%201_Conservation%20Status%20Assessment%20Report_EN.pdf

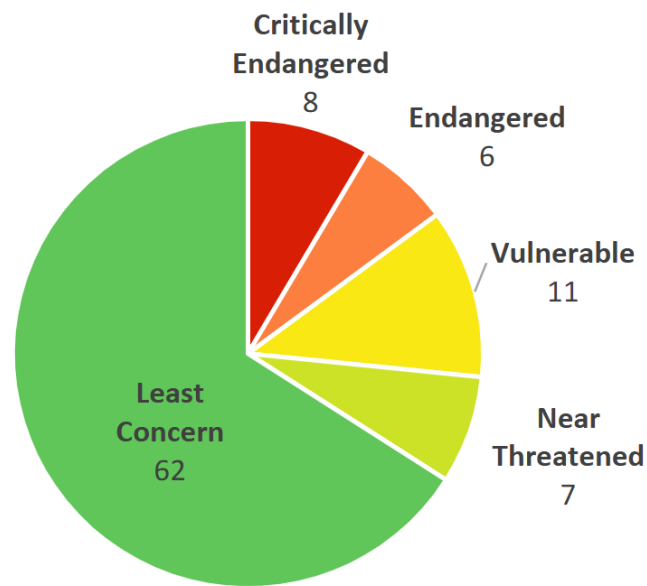


Figure 1. Global IUCN Red List Category (2025) for the 94 species on Annex 1 of the Raptors MOU.

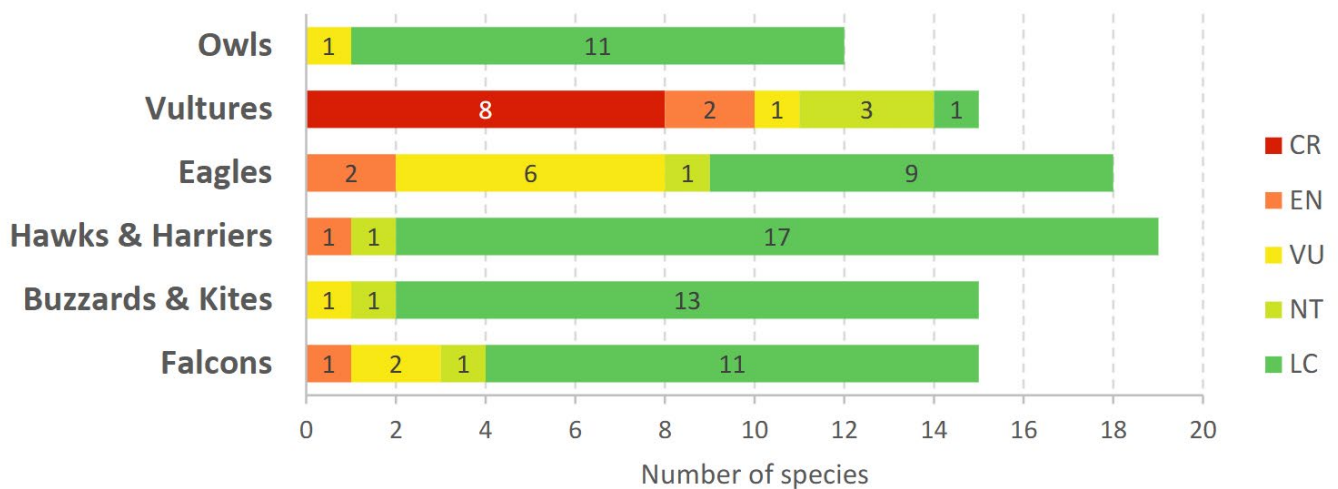


Figure 2. Global IUCN Red List Category (2025) by taxonomic group for the 94 species on Annex 1 of the Raptors MOU.

Table 1. Top 10 Raptors MOU species with the highest EDGE scores.

Common Name	Annex 3, Table 1 Category (MOS3)	EDGE	RL	Trend
Bearded vulture	1	3.7	NT	Decreasing
Egyptian vulture	1	12.5	EN	Decreasing
Red-headed vulture	1	12.3	CR	Decreasing
White-headed vulture	1	7.5	CR	Decreasing
Hooded vulture	1	11.7	CR	Decreasing
White-rumped vulture	1	2.5	CR	Decreasing
White-backed vulture	1	3.4	CR	Decreasing
Pallas's fish-eagle	1	3.9	EN	Decreasing
Lappet-faced vulture	1	2.9	EN	Decreasing
Scissor-tailed kite	1	2.6	VU	Decreasing

3. Regional conservation status

Regional conservation status is taken into account when identifying species that are not threatened or NT but are considered to have unfavourable conservation status and are therefore eligible for Category 2. However, the TAG recognised that, although the European Red List of Birds and the associated SPEC (Species of European Conservation Concern) classification currently appear to be the only sources providing conservation status information at the level of an entire region (where regions are understood as Europe, Africa, the Middle East and Asia), other potential sources cover different parts of the geographic area of the Raptors MOU and may also merit consideration. TAG Workplan for the period 2023-2026 included the clarification of how “regional level” should be interpreted and applied under Category 2. This work, discussed in UNEP/CMS/RAPTORS/MOS4/Doc. 14.1⁹, should help ensure that information collected at an appropriate scale across the MOU area can contribute to the identification of species with an unfavourable conservation status. At the same time, the geographic coverage of the information should be sufficiently broad to represent the conservation status of the species across the region concerned. Pending the outcome of further TAG work, this CSAR presents regional information for Europe, together

⁹ <https://raptors.cms.int/document/proposed-amendments-annex-1-species-list-and-table-1-annex-3-action-plan-raptors-mou>

with available conservation-status information from other parts of the MOU area at multi-country or subregional scales.

3.1 European Conservation Status

Approximately half of the species listed in Annex 1 of the Raptors MOU occur in Europe. At the regional level, their conservation status is more favourable than at the global level, with a smaller proportion classified as threatened or Near Threatened. Overall, 23% of Annex 1 species occurring in Europe are categorised as regionally threatened or Near Threatened in the European Red List of Birds (BirdLife International 2021; Fig. 3).

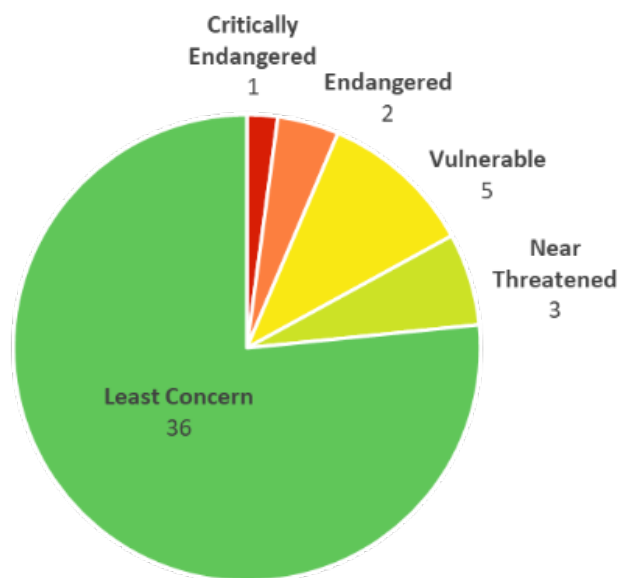


Figure 3. Regional IUCN Red List Category for the 47 European migratory raptor species included in Annex 1.

Among the taxonomic groups, eagles and falcons have the highest proportions of species classified as threatened or Near Threatened at the European level, at 33% and 40%, respectively (Fig. 4). Buzzards and kites are the only groups with no species in either category.

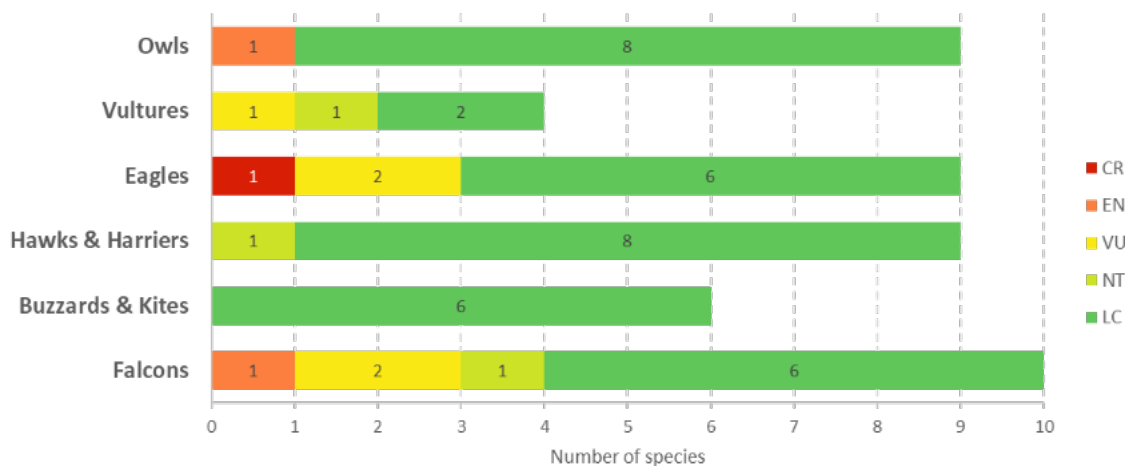


Figure 4. Conservation status of European migratory raptor species on the 2021 European Red List of Birds by taxonomic group

No new European Red List of Birds assessment has been released since the previous CSAR¹⁰. An updated assessment at EU27 level has begun in 2025 and is expected for completion in December 2026 so will be available for the third CSAR to be presented at MOS5. However, this assessment, as mentioned above, will include only EU countries.

Since last CSAR¹⁰, the snowy owl has been declared extinct in Sweden (Swedish University of Agricultural Sciences, Swedish Species Information Centre 2026)¹¹. Climate change may be contributing to the decline by disrupting the species' fragile Arctic habitat and food supply. The snowy owl is also considered to be at high risk of extinction in Norway and Finland (Hyvärinen et al. 2019, Artsdatabanken 2021). Tracking such national extinctions/ extirpations within CMS would be beneficial, so that wider patterns of distributional change for CMS listed species are understood and can be acted upon.

3.2 Conservation status of breeding raptors in the Mediterranean

In 2022, regional IUCN Red List status of these species was assessed at the Mediterranean level (Westrip et al. 2022). The assessment considered breeding status only, drawing on previously compiled data and distribution maps from global (BirdLife International 2021b), European (BirdLife International 2021a) and North African (Garrido et al. 2021) assessments, taking into account the proportion of the range that falls within the Mediterranean region.

Of the 38 species assessed that were listed on Annex 1 of the Raptors MoU, six were assessed as CR, four as EN, six as VU, three as NT and 19 as LC (Table 2).

¹⁰https://raptors.cms.int/sites/default/files/document/MOS3_DOC.%2012.3_Annex%201_Conservation%20Status%20Assessment%20Report_EN.pdf

¹¹<https://www.birdlife.org/news/2025/12/11/sweden-has-lost-the-snowy-owl/>

Several species have a poorer regional conservation status than their global status: bearded vulture *Gypaetus barbatus*, marsh owl *Asio capensis*, pallid scops-owl *Otus brucei*, lesser spotted eagle *Clanga pomarina*, tawny eagle *Aquila rapax*, hen harrier *Circus cyaneus*, white-tailed eagle *Haliaeetus albicilla*, red-footed falcon *Falco vespertinus*, sooty falcon *Falco concolor*, osprey *Pandion haliaetus*, lanner falcon *Falco biarmicus* and saker falcon *Falco cherrug* (Table 2).

By contrast, Egyptian vulture *Neophron percnopterus* and cinereous vulture *Aegypius monachus* have a lower regional threat status than their global status (Table 2).

Table 2. Regional Red List assessments for breeding raptors in the Mediterranean for species listed on Annex 1 of the Raptors MOU.

Common Name	Annex 3, Table 1 Category	Mediterranean Category	Global Category
Bearded vulture	1	EN	NT
Egyptian vulture	1	VU	EN
Rüppell's vulture	1	CR	CR
Cinereous vulture	1	LC	NT
Tawny eagle	1	CR	VU
Spanish imperial eagle	1	VU*	VU
Eastern imperial eagle	1	VU°	VU
Red-footed falcon	1	CR	VU
Sooty falcon	1	CR	VU
Saker falcon	1	CR	EN
Hen harrier	2	VU	LC
Montagu's harrier	2	VU	LC
Levant sparrowhawk	2	LC°	LC
Lesser kestrel	2	LC	LC
Common kestrel	2	LC	LC
Eurasian hobby	2	LC	LC
Lanner falcon	2	NT	LC
Pallid scops-owl	2	EN	LC
Short-eared owl	2	NT°	LC
Osprey	3	EN	LC
European honey-buzzard	3	LC	LC
Short-toed snake-eagle	3	LC	LC
Griffon vulture	3	LC	LC
Lesser spotted eagle	3	NT°	LC
Golden eagle	3	LC	LC
Booted eagle	3	LC	LC
Western marsh-harrier	3	LC	LC
Eurasian sparrowhawk	3	LC	LC
Northern goshawk	3	LC	LC

White-tailed sea-eagle	3	EN [°]	LC
Red kite	3	LC	LC
Black kite	3	LC	LC
Eurasian buzzard	3	LC	LC
Long-legged buzzard	3	LC	LC
Eleonora's falcon	3	LC	LC
Peregrine falcon	3	LC	LC
Boreal owl	3	VU	LC
Marsh owl	3	CR	LC

* Retained at higher category to match global and European assessments, following the Five-Year Rule.

[°] Regional adjustment applied.

3.3 Conservation status of raptors in South Africa, Lesotho and Eswatini

In 2025 a new Red List assessment¹² was carried out for South Africa, Lesotho and Eswatini which updated the previous assessments from 2015 (Table 3). The conservation status of 15 species covered by the Raptors MOU were reviewed in 2025. A comparison of conservation status between 2015, 2020 and 2025 can be seen in Table 3. Three species were assessed for the first time in 2025: forest buzzard (*Buteo trizonatus*; NT), steppe eagle (*Aquila nipalensis*; EN) and marsh owl (*Asio capensis*; NT). Pallid harrier (*Circus macrourus*), which had been assessed previously, was not reassessed in 2025.

Between 2015 and 2025 three species were assessed to have poorer conservation status in this geographic area and were uplisted on the Red List. These were lappet-faced vulture (*Torgos tracheliotos*: EN to CR), lesser kestrel (*Falco naumanni*: LC to VU) and red-footed falcon (*Falco vespertinus*: NT to VU). These are all genuine changes that reflect recent evidence of declining regional population trends.

Two species were also downlisted on the Red List for this geographic area because of improved conservation status, lanner falcon (VU to NT) and cape vulture (*Gyps coprotheres* - EN to VU). lanner falcon was downlisted due to recent evidence of stable population trends in the region (Jenkins et al. 2023, Lee 2024). Cape vulture has been shown to potentially be increasing in the region by 30% (Shaw et al. 2025b) but has been assigned to Vulnerable due to a predicted future population decline owing to a suite of threats which are projected to increase in the future (e.g. poaching, collisions with powerlines and wind turbines, and poisoning).

Table 3. Red List assessments for South Africa, Lesotho and Eswatini in 2015, 2020 and 2025 for species listed on Annex 1 of the Raptors MOU.

Common Name	Annex 3, Table 1	2015 RL status	2020 RL status	2025 RL status
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¹² <https://www.birdlife.org.za/red-data-book/>

	Category (MOS3)			
Bearded vulture	1	CR	EN	CR
Egyptian vulture	1	RE	RE	RE
White-headed vulture	1	CR	VU	CR
Hooded vulture	1	CR	VU	CR
White-backed vulture	1	CR	VU	CR
Cape vulture	1	EN	VU	VU
Lappet-faced vulture	1	EN	VU	CR
Tawny eagle	1	EN	VU	EN
Steppe eagle	1	NA	NA	EN
Black harrier	1	EN	NT	EN
Pallid harrier	1	NT	NT	NA
Forest buzzard	1	NA	NA	NT
Red-footed falcon	1	NT	LC	VU
Lesser kestrel	2	LC	VU	VU
Lanner falcon	2	VU	NT	NT
Marsh owl	3	NA	NA	NT

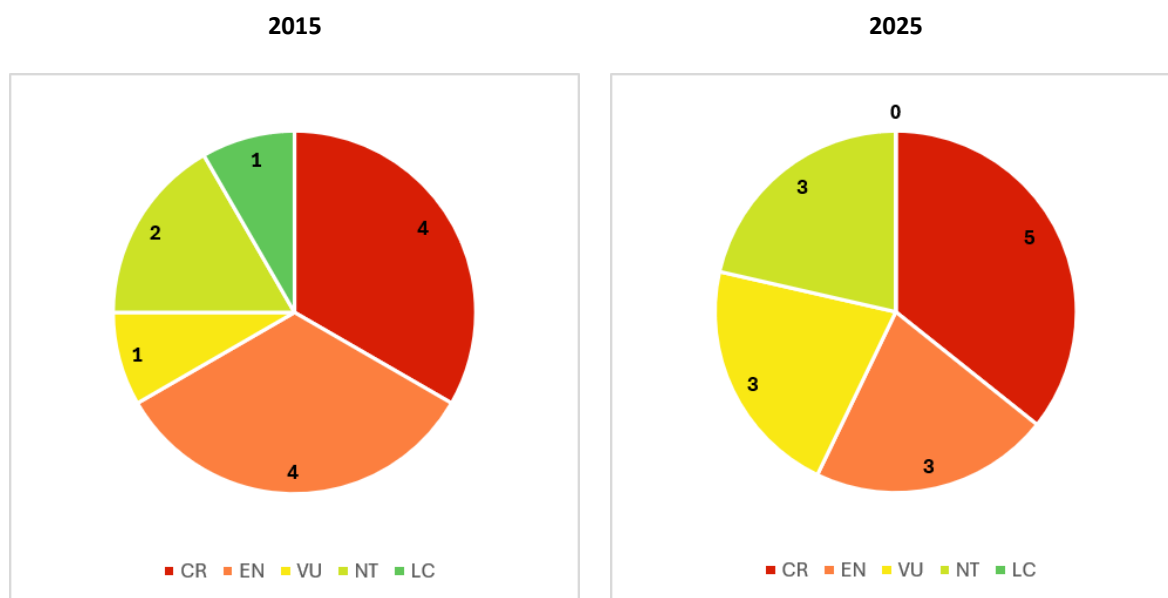


Figure 5. 2015 (left) and 2025 (right) regional Red List assessments for South Africa, Lesotho and Eswatini for species listed on Annex 1 of the Raptors MOU

4. Global conservation status over time - Red List Index

The Red List Index (RLI) has been developed as an indicator of trends in the status of biodiversity. It illustrates the rate of biodiversity loss in terms of the rate that species are slipping towards (or moving away from) extinction. The index is based on the number of species in different categories of extinction risk on the IUCN Red List and the movement of species between categories owing to genuine improvements or deteriorations in status (Butchart et al. 2004, 2005, 2007, 2025). The RLI integrates the net impacts of species improving in status and being downlisted to lower categories of threat (usually a consequence of conservation interventions) and those deteriorating in status and being uplisted to higher categories of threat (owing to declining populations and increasing threats).

RLI values relate to the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct. A downward trend in the graph line (i.e. decreasing RLI values) means that the expected rate of species extinctions is increasing (i.e. that the rate of biodiversity loss is increasing). An upward trend in the graph line (i.e. increasing RLI values) means that there is a decrease in the expected future rate of species extinctions (i.e. a reduction in the rate of biodiversity loss).

To analyse trends in conservation status, RLIs were calculated from 1988 to 2025 for four different groups (Fig. 6): all bird species, all raptors, migratory raptor species included in Annex 1 at MOS1 (73 species), and migratory raptor species in Annex 1 at MOS4 (94 species). To calculate the Red List Index the IUCN Red List data from 2025 was used, including all genuine changes in the extinction risk category.

Between 1988 and 2000 MOS1 species had a higher RLI value than the other groups, indicating a better conservation status. The steeper downward trend for this group shows that over the whole period 1988 to 2025, conservation status deteriorated at a faster pace for MOS1 Annex 1 species than for all bird species or all raptor species. However, the deterioration appears to have slowed after 2008 when the Raptors MOU came into force, with the trajectory between 2008 and 2025 being like that for all birds and all raptors.

The RLI for the species on Annex 1 at MOS4 shows the steepest downward trajectory among the four Red List indices shown, indicating deteriorating conservation status that is particularly marked between the mid-1990s and 2012. The trend appears to level off somewhat between 2012 and 2025. The 2025 conservation status of MOS4 raptor species remained poorer than that for all raptors and considerably poorer than that for all bird species. Recent levelling off in the Red List index for MOS4 Annex 1 species could suggest that the rate of increase in extinction risk has slowed down; however, this also reflects the

fact that relatively few Annex 1 raptor species have been reassessed on the IUCN Red List in recent years and the trajectory remains one of gradual deterioration.

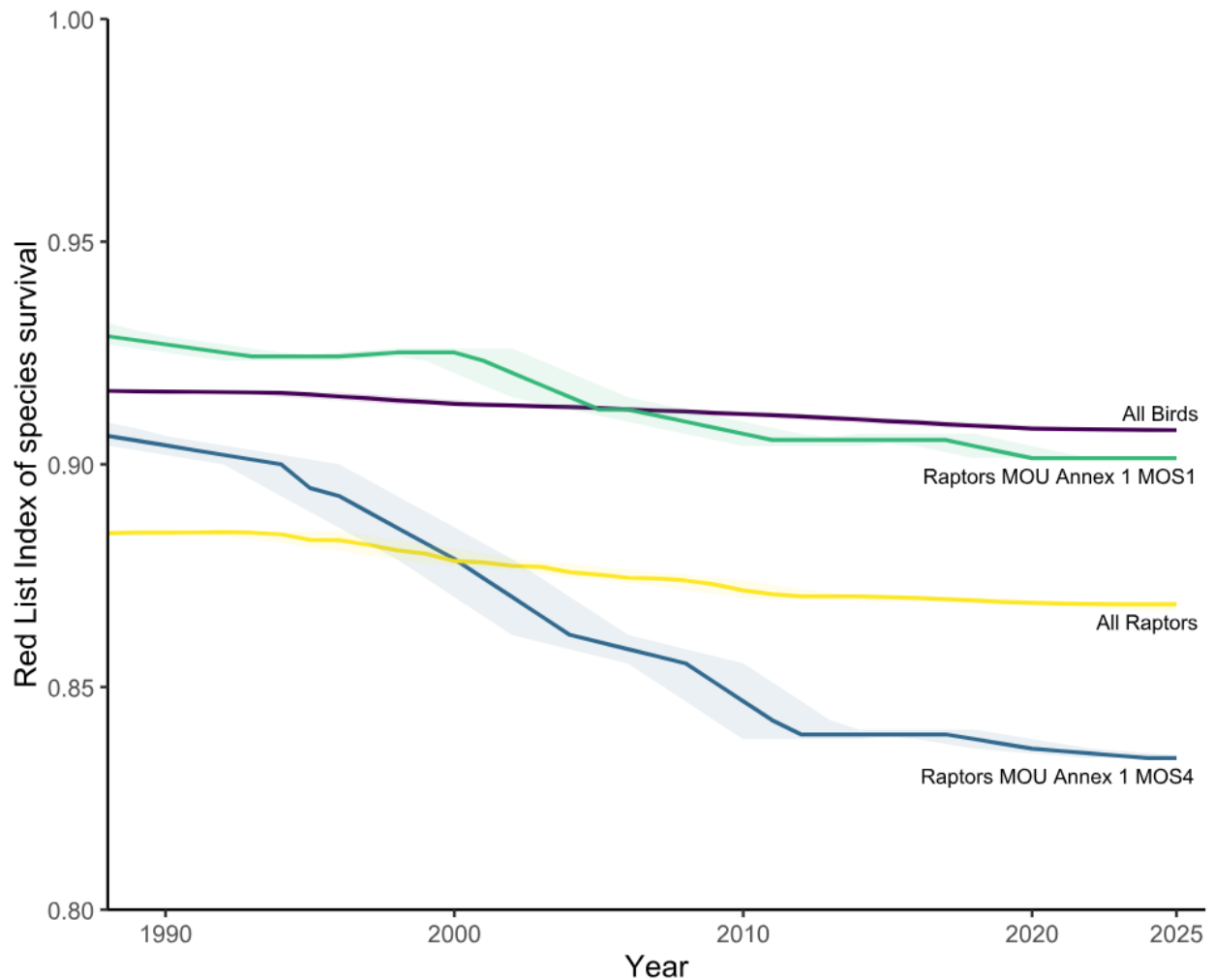


Figure 6. RLI change over time for three groups of species: all species of bird, all raptors and raptors included in Annex 1 for MOS1 (73 species) and MOS4 (94 species).

The levelling off of MOS1 Annex 1 species index (Fig. 6) could be interpreted as listing on the Raptors MOU is having a beneficial effect in slowing deterioration of conservation status since its inception or that conservation efforts more generally have helped to reduce the threats being faced by this set of species. This may indicate that listing the species had an impact on their conservation status with more attention given to them by governments and NGOs, or that action has generally been upscaled for these species by a variety of stakeholders. Fig. 6 shows that for the expanded species list on Annex 1 at MOS4 the conservation status trajectory since 1988 has been in steep decline until 2012 and more moderate decline since then. The hope would be that listing on the Raptors MOU Annex 1 could help to slow this deterioration in conservation status by guiding the targeting of conservation interventions.

The listing of 18 new species on Annex 1 of the Raptors MOU at MOS2 (2015) included 12 vulture species, all of which are threatened or Near Threatened has certainly increased the conservation challenge faced by the Raptors MOU and its Signatories. As highlighted by McClure et al. (2018) and Buechley and Şekercioğlu, (2016) Old World vultures have experienced the greatest deterioration in Red List status of any raptor group since 1988, and possibly of any group of birds. The Multi-species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP)¹³, adopted by CMS Parties in 2017, identified the main threats to 15 Old World vulture species and set out 12 objectives and 124 actions (Botha et al. 2017) and the mid-term implementation review of the multi-species action plan to conserve African-Eurasian vultures¹⁴ gives indication of where work should be targeted to fully implement the objectives of the Vulture MsAP (Botha et al. 2024).

The fact that 10 of these Raptors MOU Annex 1 listed globally threatened species of vulture and the globally threatened steppe eagle (*Aquila nipalensis*) were also added to CMS Appendix I in 2017 and that the globally threatened snowy owl was listed on CMS Appendix II in 2026 may also assist in encouraging effective action for these species.

5. Global population trends

Although substantial changes in population size are generally required before an IUCN Red List Category is changed, changing population trends can provide early information to indicate that a species' conservation status is changing (worsening or improving). This is one of the reasons why accurate monitoring is essential. Further details on IUCN Red List global population size and trends for individual bird species are available through species searches on the BirdLife DataZone³.

Population trends extracted from the 2025 IUCN Red List dataset show that more than half of all MOU Annex 1 species are still decreasing (53%), around one third remain stable (34%), and only 11% are increasing (Fig. 7).

Taken together, the comparison between conservation status and population trend remains concerning. The proportion of species with declining populations (53%) is substantially higher than the proportion currently classified as threatened or Near Threatened (34%). Many species currently classified as LC are declining and without stronger conservation action some may soon reach thresholds to be reclassified as NT or threatened.

When examined by group (Fig. 8), vultures and eagles show the highest proportions of decreasing populations, at 93% and 56%, respectively, followed closely by falcons, and by hawks and harriers.

¹³ <https://raptors.cms.int/workinggroup/multi-species-action-plan-protect-african-aurasian-vultures>

¹⁴ https://raptors.cms.int/sites/default/files/publication/MTIR%20Report_Final_V2.pdf

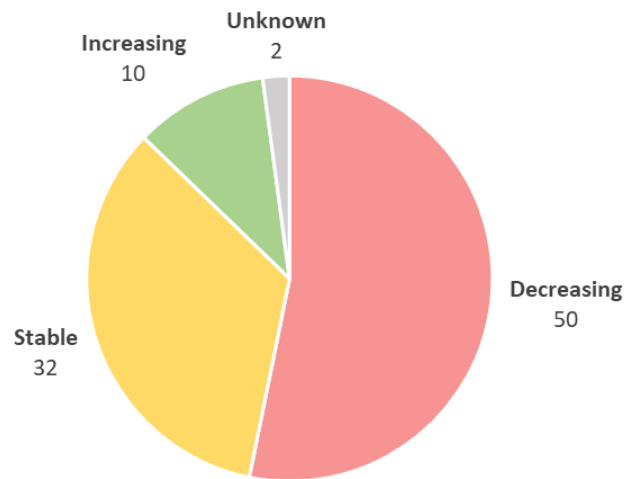


Figure 7. Global population trends for the 94 species in Annex 1 of the Raptors MoU

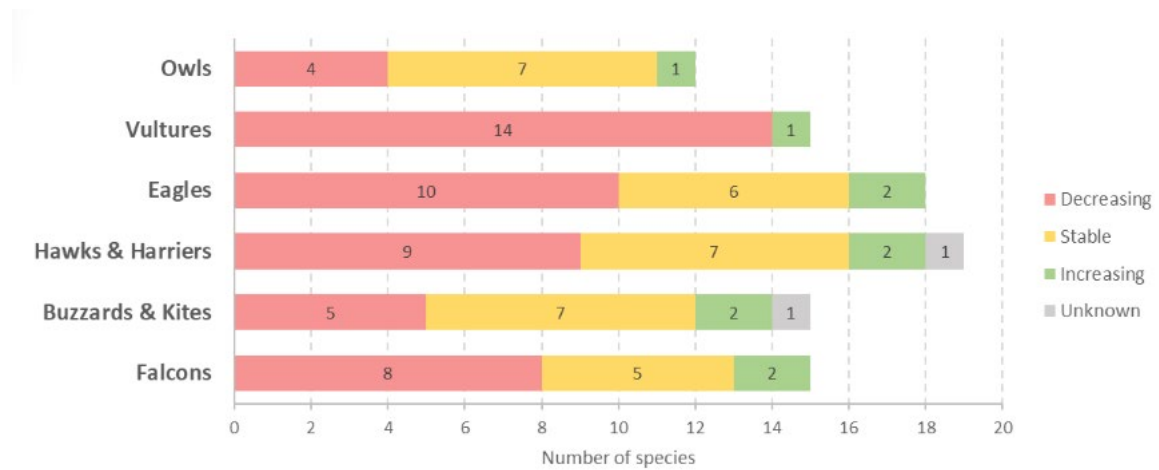


Figure 8. Global population trends of Annex 1 species by taxonomic group.

6. Regional population trends

6.1 European Vulture Trends

The 2022 Vulture Conservation Foundation report (Terraube et al. 2022) presents breeding population estimates and trends for five European and Mediterranean vulture species: Egyptian, bearded, griffon, Rüppell's, and cinereous vultures, covering populations in Europe and Mediterranean-bordering countries including Morocco, Algeria, Türkiye and Israel. The study draws on governmental, NGO, and expert data, reviewing trends over the past 5 and 10 years, identifying where species are increasing, stable, or declining. We present these reported trends for each species over the last 5 years for key countries and regions in Table 4.

In summary, Terraube et al. (2022) report that griffon, bearded, and cinereous vultures are increasing in much of Western Europe, supported by reintroductions, legal protection, and improved food availability. These gains are reportedly most pronounced in Spain, France, Portugal, and parts of the Balkans, where targeted conservation actions have reversed decades of decline. Egyptian vulture populations have reportedly stabilised in several regions but remain vulnerable to poisoning, electrocution, and direct persecution, with some key populations still falling. Rüppell's vulture is reported to be in the early stages of establishment in Iberia, its long-term viability uncertain. Eastern populations, particularly in Türkiye and North Africa, are reported to remain under-documented and often in decline. These trends are similar to those reported for European countries in European Red List of Birds 2021¹⁵.

¹⁵ <https://datazone.birdlife.org/publications/european-red-list-of-birds>

Table 4. Five-year breeding population trends (2017-2022) reported by Terraube et al. (2022) for the five species of Vulture occurring in Europe. Trends are broken down by key countries or regions (e.g. Balkans and North Africa). *n/d* indicates that no new data was collected in the 5 years between 2017-2022 so the longer 10-year population trend is given. *NA* indicated countries where the given species does not occur. For a more detailed breakdown see Terraube et al. (2022).

Species	Annex 3, Table 1 Category	Species population trend in country or region								
		Portugal	Spain	France	Italy	Balkans	Greece	Türkiye	North Africa	Israel
Bearded vulture	1	NA	↑ Moderate Increase	↑ Moderate Increase	↑ Small Increase	NA	↑ Small Increase	n/d (decline over 10 years)	n/d (decline over 10 years)	NA
Egyptian vulture	1	↓ Moderate Decline	→ Stable	↓ Small Decline	↑ Small Increase	→ Stable	→ Stable	n/d (decline over 10 years)	n/d (decline over 10 years)	↑ Small Increase
Rüppell's vulture	1	↕ establishing	↕ establishing	NA	NA	NA	NA	NA	NA	NA
Cinereous vulture	1	↑ Moderate Increase	↑ Moderate Increase	↑ Moderate Increase	NA	↑ Small Increase	→ Stable	n/d (decline over 10 years)	NA	NA

Griffon vulture	3	↑ Large Increase	↑ Moderate Increase	↑ Small Increase	↑ Moderate Increase	↑ Moderate Increase	↑ Small Increase	n/d (small decline over 10 years)	↑ Small Increase	↑ Small Increase
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6.2 African Population Trends

Since the last CSAR¹⁶ Shaw et al. (2024) collated and analysed survey data on raptor encounter rates from several regions across Africa, including Kenya, northern Botswana, South Africa, northern Cameroon, and countries in West Africa such as Mali, Niger, and Burkina Faso. The study aimed to understand trends in raptor populations across the continent and revealed concerning patterns. It is important to note that not all species assessed had encounter rate data available from each of these regions.

The analysis showed encounter rate declines in 88% of the 42 raptor species assessed. This trend was also seen in 87% of the 23 species covered by the study that are listed under Annex 1 of the Raptors MOU (Fig. 9). Declines were observed across all regions studied, including within protected areas. However, the rate of decline was found to be twice as severe outside of these protected areas. Alarming, the species showing the greatest declines were those most reliant on the existence of protected areas. However, regional assessments of non-breeding species do not necessarily reflect the conservation status. For example, western marsh harriers tend to stay in Europe in increasing numbers as the climate warms, and that may be the main reason behind the trend in the wintering area.

Western Africa, particularly on unprotected land, emerged as the region with the most severe overall declines, particularly affecting larger raptors. In this study, a median decline over three generations of 60% is reported for black/ yellow-billed kite, and 33% for fox kestrel. These species may warrant further assessment for reclassification in Annex 3 Table 1. However, these results should be interpreted with some caution, as uncertainty around the median rates of decline may be underestimated because the analysis did not account for uncertainty in the encounter rates.

¹⁶https://raptors.cms.int/sites/default/files/document/MOS3_DOC.%2012.3_Annex%201_Conservation%20Status%20Assessment%20Report_EN.pdf

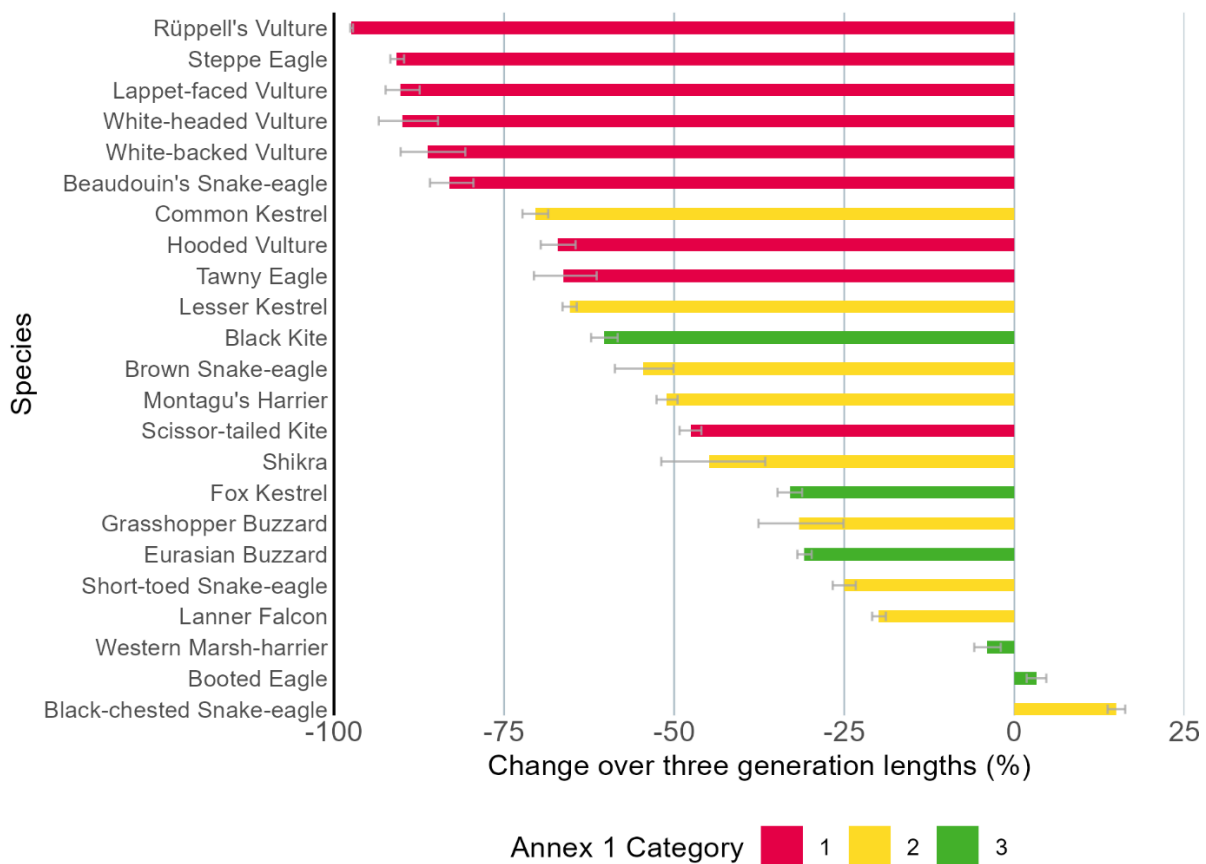


Figure 9. Shaw et al. (2024) reported percentage declines in population sizes over three generations for the 23 species listed on Annex 1 of the Raptors MOU. Values were derived from analysis of survey data on raptor encounter rates from Kenya, N. Botswana, N. Cameroon and West Africa (Mali, Niger, Burkina Faso). Note that short-toed snake eagle and booted eagle were only surveyed in one of the four regions, the remaining species were surveyed in at least two regions.

6.3 Population Trends of vultures in India

Prakash (2024) reported the results of the eighth road-transect survey of *Gyps* vultures conducted across northern, central, western and north-eastern India since the early 1990s. Populations of white-rumped vulture *Gyps bengalensis*, Indian vulture *G. indicus* and slender-billed vulture *G. tenuirostris* underwent steep declines beginning in the mid-1990s, largely as a consequence of poisoning from the veterinary use of the non-steroidal anti-inflammatory drug (NSAID) diclofenac in cattle. Although the ban on veterinary diclofenac introduced in the mid-2000s appears to have halted the rapid declines, the most recent survey reported no evidence of sustained population recovery. Instead, populations of all three species were reported to remain at low levels and having shown little overall change in recent years.

The study found no clear indication of consistent population growth following 2003. Compared to 2002 baselines, average population indices from 2003–2022 revealed severe declines across all three species: white-rumped vultures dropped by an average of 67% (ratio of 0.3278), Indian vultures by 48% (ratio of 0.5162), and slender-billed vultures by 89% (ratio of 0.1087).

Unlike India, where vulture populations have failed to recover, Nepal has seen a rapid rebound in white-rumped and slender-billed vulture populations since approximately 2013 (Galligan et al. 2020). This difference is highlighted by white-rumped vulture numbers increasing by 22% annually and slender-billed vultures by 41% in Nepal, which significantly exceeds the natural maximum breeding capacity calculated for a closed population (Niel and Lebreton 2005; Galligan et al. 2020). Consequently, researchers suggest that Nepal's recovery is being driven by net immigration from India, made possible by the birds' very large home ranges (Gilbert et al. 2007) and strong social attraction to other vultures when foraging (Jackson et al. 2008; Galligan et al. 2020).

Additional evidence from the State of India's Birds project (SoIB 2020), which uses citizen-science checklist data collected across the country, also indicated substantial long-term declines. Between the pre-2000 period and 2018, occurrence indices decreased by 97% for white-rumped vultures and 90% for Indian vultures. These trends suggest continued declines during a period when road-transect surveys indicated relative stability. One explanation may be that road-transect surveys are concentrated around protected areas, where vulture populations tend to occur at higher densities and have experienced less severe declines, whereas citizen-science records are more broadly distributed across the landscape. As a result, checklist-based indices may better reflect population changes in places outside protected areas.

Taken together, these findings indicate that only a small fraction of the populations present in the early 1990s remain today, and that none of the three species shows clear evidence of recovery in India. However, the recent bans in India of veterinary drugs ketoprofen, aceclofenac, and nimesulide are critical milestones, building on the 2006 diclofenac prohibition. These restrictions, including the 2023 and 2024 bans on additional NSAIDs if effectively implemented will significantly reduce this threat to vultures and improve the prospects of long-term recovery for these species ^{17,18}.

7. Annex 3, Table 1 Category changes over time

Changes over time in the Category assigned in Table 1 to species listed in Annex 1 provide a useful indication of the overall direction of change. Species moving from Category 1 to

¹⁷ <https://www.birdlife.org/news/2023/09/01/bans-on-two-more-veterinary-drugs-linked-to-vulture-deaths-in-india/>

¹⁸ <https://www.rspb.org.uk/helping-nature/what-we-do/protecting-species-and-habitats/species-spotlight/species-spotlight-asian-vultures>

Category 2, or from Category 2 to Category 3, do so because of evidence of improving conservation status or population trend. Conversely, movements from Category 3 to Category 2, or from Category 2 to Category 1, reflect deteriorating conservation status or population trend.

Between MOS1 and MOS4, 41% of Annex 3, Table 1 category changes reflected improving conservation status or trajectory, while 59% reflected deterioration. Negative changes have therefore outnumbered positive ones, clearly reinforcing the need to intensify conservation efforts for Annex 1 species. When examined by period, however, there are notable differences between MOS1–MOS2 (2012–2015), MOS2–MOS3 (2015–2023), and MOS3–MOS4 (2023–2026). These periods were not equal in length, with three years between MOS1 and MOS2, almost eight years between MOS2 and MOS3, and three years between MOS3 and MOS4. Even so, the longer MOS2–MOS3 period did not show a higher number of category changes (Fig. 10).

Between MOS1 and MOS2, category changes were evenly split, with 50% reflecting improvement and 50% deterioration. In contrast, between MOS2 and MOS3, 75% of category changes reflected deterioration and only 25% improvement. This is a concerning indication that the situation for Annex 1 species worsened substantially during that period. These deteriorations were not limited to one group, but occurred across several groups in both periods, including falcons, eagles, hawks and harriers, buzzards and kites, and owls.

Newly listed Annex 1 species, which were subsequently assigned to a Category, were not counted as category changes. The results above are therefore not influenced by the addition of many vulture species to Annex 1 at MOS2. Indeed, no Table 1 category changes were recorded for any vulture species between MOS1 and MOS3.

No species changed category between MOS3 and MOS4. This does not necessarily mean that there were no species deteriorating or improving in status between MOS3 and MOS4. Category changes are likely to result when raptor species are a focus for re-assessment as part of the global IUCN Red List process or regional processes and significant change has been detected. However relatively few Annex 1 raptor species have been reassessed on the IUCN Red List between MOS3 and MOS4 and although a new European Red List of Birds assessment is currently underway, for the moment the 2021 assessment remains the most recent.

TAG was tasked at MOS3 with clarifying the criteria for inclusion of a species in Category 2 of the MOU's Action Plan and this is further discussed in UNEP/CMS/RAPTORS/MOS4/Doc.14.1¹⁹. If approved by MOS4, application of a refreshed

¹⁹ <https://www.cms.int/document/proposed-amendments-annex-1-species-list-and-table-1-annex-3-action-plan-raptors-mou>

approach to assigning species to Category 2 between MOS4 and MOS5 may result in some current Category 3 species being assigned to Category 2 on the basis of deteriorating regional status.

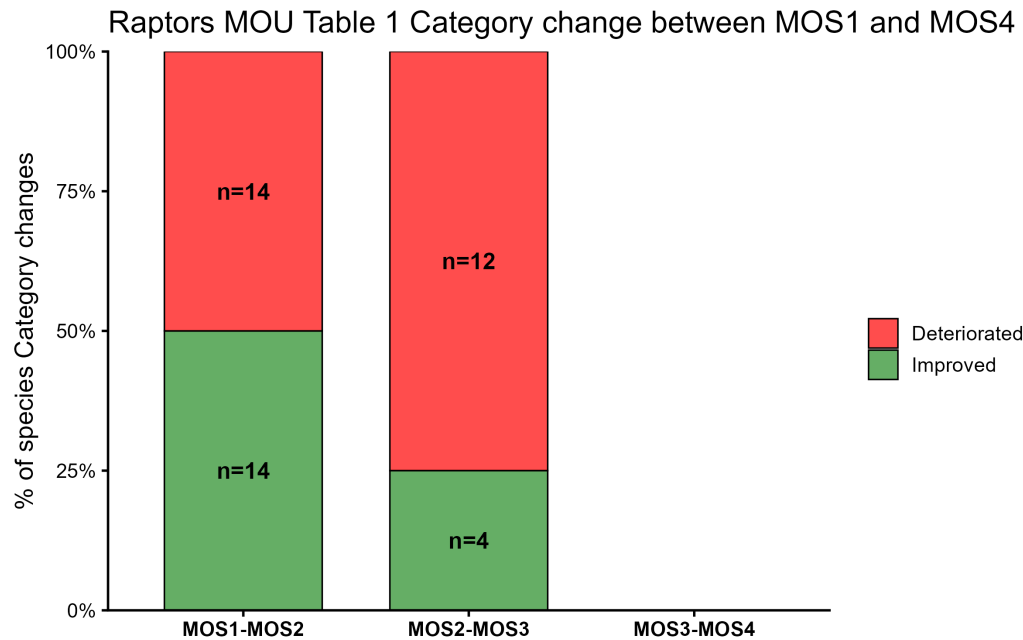


Figure 10. Percentage of Annex 3, Table 1 category changes representing improving or deteriorating conservation status or trajectory between Raptors MOU MOS1 and MOS2 (the categorisation of new Annex 1 species was not counted as a change for the purpose of this analysis).

8. Threats to species globally

As the IUCN Red List Authority for birds, BirdLife collates and maintains information on the threats impacting bird species. Under the IUCN Red List framework, direct threats are the proximate human activities or processes that have impacted, are impacting, or may impact the status of the taxon. Examples include agriculture, logging, hunting, fishing and infrastructure development.

Threats are classified using the IUCN–Conservation Measures Partnership (CMP) Unified Classification of Direct Threats (Salafsky et al. 2008). This hierarchical system groups threats at three levels of increasing specificity. For example, the broad Level 1 category ‘Agriculture & Aquaculture’ includes the Level 2 category ‘Livestock farming and ranching’, which can in turn be divided into more specific Level 3 categories such as ‘Small-holder grazing, ranching or farming’. Threats are assessed for the species across its range, and assessors identify those considered relevant to its conservation status.

For each threat, its timing, scope, and severity are assessed to estimate its overall impact. High-impact threats generally affect a large proportion of the population and are associated with rapid declines, whereas lower-impact threats affect a smaller proportion of the population or are associated with slower declines. Further information on IUCN threat classification system and the calculation of threat impact scores is available²⁰.

The IUCN threat classification²¹ provides a standardised framework that allows threats to be compared across species and taxonomic groups. However, some categories are less well suited to providing an intuitive overview of the principal pressures affecting raptors, particularly at Level 1.

For example, poisoning can occur under several different IUCN threat categories depending on its source. Poisoning resulting from pesticides or rodenticides in prey is classified under the Level 1 category ‘Pollution’ and the Level 2 category ‘Agricultural and forestry effluents’. By contrast, unintentional poisoning of vultures from poison baits intended for carnivores during human–wildlife conflict is classified under the Level 1 category ‘Biological resource use’, the Level 2 category ‘Hunting & collecting terrestrial animals’, and ultimately the Level 3 category ‘Unintentional effects (species being assessed is not the target)’.

A similar issue applies to mortality associated with energy and transport infrastructure. Electrocution and collision with power lines are classified under the Level 1 category ‘Transportation & service corridors’ and the Level 2 category ‘Utility and service lines’, whereas collision with wind-energy infrastructure falls under ‘Energy production & mining’.

²⁰ <http://datazone.birdlife.org/species/spcthreat>

²¹ <https://www.iucnredlist.org/resources/threat-classification-scheme>

and, at Level 2, 'Renewable energy'. Consequently, related forms of mortality may be distributed among several broad IUCN categories. The results below should therefore be interpreted alongside the underlying IUCN threat classification, rather than assuming that each Level 1 category represents a single, distinct conservation problem.

The IUCN threat data also primarily describe direct anthropogenic pressures. Other ecological constraints may limit population recovery even where direct threats are reduced. These may include low prey availability, scarcity of suitable nesting sites or other limitations on reproduction and recruitment. The threats identified below therefore indicate important areas for conservation action, but additional measures may also be required to enable raptor populations to recover.

8.1 Threats to Annex 1 species

For each species, we identified its most severe recorded threat or threats, defined as those with the highest IUCN impact score. Some species have no threats assessed as high or medium impact, meaning that their highest-ranked threat may still be classified as low impact.

Where more than one threat category shared the highest impact score for a species, that species' contribution was divided equally among the tied categories. Each species therefore contributed a total weight of one, irrespective of the number of equally ranked threats. Weighted species counts were then calculated by summing these contributions across species within each threat category.

Results are presented for three groups of species covered by the Raptors MOU: Annex 1, comprising all listed species; Category 1, comprising species classified in Annex 3, Table 1 as threatened or Near Threatened; and Category 2, comprising the remaining Annex 1 species with an unfavourable regional conservation status. Threat categories are ordered according to the weighted contribution of medium- and high-impact threats, highlighting those most strongly associated with conservation concern.

Further information on threats affecting individual species is available through the BirdLife DataZone. Species listed in Annex 1 of the Raptors MOU can be searched individually by species name. Summary information for all Annex 1 species can also be accessed through the 'Explore Our Data' function by applying the 'CMS Raptors MOU' filter under 'Policy Instrument'.

8.1.1 Level 1 threats

At the broadest level of the IUCN classification – level 1, two threat categories stand out across Annex 1 species: 'Agriculture & Aquaculture' and 'Biological resource use' (Fig. 11).

Category 1 species show a very similar pattern, with these same two categories accounting for a large proportion of the highest-impact threats recorded across species (Fig. 11). Because Level 1 categories combine a wide range of underlying pressures, however, these results are best understood by examining the more specific Level 2 threats.

8.1.2 Level 2 threats

At Level 2, the most frequent highest-impact threats among Annex 1 species are ‘Annual & perennial non-timber crops’ and ‘Hunting & trapping terrestrial animals’ (Fig. 12). The same two categories are also prominent among Category 1 species, although ‘Hunting & trapping terrestrial animals’ is particularly important within this group (Fig. 12). Corresponding results for Category 2 species are presented in Annex A.

Agricultural conversion and habitat loss

‘Annual & perennial non-timber crops’ primarily reflects the loss or modification of habitats used by raptors. Conversion of grasslands, woodland and other natural or semi-natural habitats to cropland can reduce prey availability, remove nesting habitat and simplify landscapes that would otherwise provide foraging and breeding opportunities. Because agricultural conversion is widespread across the ranges of many Annex 1 species, it emerges as one of the most important Level 2 threats across the group.

‘Logging and wood harvesting’ represents another important form of habitat loss and degradation. Many Annex 1 species depend directly on woodland habitats, while species associated primarily with open landscapes may nevertheless rely on trees or woodland edges for nesting, roosting or hunting. Removal of mature trees can therefore affect species whose broader habitat associations might not initially suggest a strong dependence on woodland.

Hunting, trapping and poisoning

‘Hunting & trapping terrestrial animals’ includes both intentional and unintentional mortality. It is among the most important Level 2 threats to Annex 1 species and is particularly prominent among Category 1 species.

This category encompasses several distinct pressures on raptors. These include illegal shooting, trapping and taking of birds, which remain important threats in parts of the Mediterranean (BirdLife International 2025) and, for certain groups such as falcons, across a much broader geographical scale, as well as several forms of poisoning²². Poisoning may

²² <https://www.cms.int/raptors/en/page/illegal-poisoning>

result from deliberate persecution of raptors, poison baits intended for carnivores during human-wildlife conflict, pesticides deliberately used as poisons, poisoning associated with poaching, or exposure to toxic substances such as lead ammunition.

Additional pressures include the capture or killing of vultures and owls for belief-based use, as well as illegal or unsustainable trapping of falcons.

Old World vultures are particularly vulnerable to both intentional and unintentional poisoning because of their scavenging ecology. They may be killed deliberately by poachers, poisoned after feeding on carcasses or baits intended for carnivores, or taken for belief-based uses including traditional medicine (Buij et al. 2015; Buechley and Şekercioğlu 2016; Ogada et al. 2016; Botha et al. 2017). There is also evidence that Old World vultures can be exposed to substantial levels of lead from spent hunting ammunition, adding another source of toxic exposure in some regions (Garbett et al. 2018).

Other threats

‘Other threat’ is the third most frequent highest-impact threat among Annex 1 species. This threat is related to the use of NSAIDs (Non-Steroidal Anti-Inflammatory Drugs) for veterinary purposes. NSAIDs currently in use or being approved for use have not been tested for safety in scavenging raptors, suggesting that several species may be at risk. Although progress has been made in restricting veterinary diclofenac use in some Asian countries, considerable challenges remain in protecting Asian vulture populations from NSAID exposure (Cuthbert et al., 2016; Margalida and Ogada, 2018). Despite lessons learned from the Asian vulture crisis, diclofenac has been approved for veterinary use in several EU countries, raising concerns that existing carcass management measures may not adequately prevent vultures from consuming contaminated carcasses (Margalida and Ogada, 2018). These risks are supported by reports of Griffon vultures found dead in Spain with kidney failure associated with flunixin exposure (Zorrilla et al., 2014) and a Cinereous Vulture that died on its nest after ingesting diclofenac (Herrero-Villar et al., 2021).

Electrocution and collisions

The fourth and fifth highest-impact threats to Annex 1 species are ‘Utility & service lines’ and ‘Renewable energy’. This includes electrocution and collisions with power infrastructure, and collisions with wind turbines²³. Raptors are particularly vulnerable to electrocution when perching on poles, while species such as vultures may collide with powerlines due to their visual adaptations for scanning the ground (Martin et al., 2012).

²³ <https://www.cms.int/raptors/en/page/collision>

Infrastructure can also attract raptors as perching or nesting sites, increasing exposure to electrical hazards. Saker Falcons experience high electrocution mortality²⁴ (Kovács et al., 2014), while vultures and Steppe Eagles are also affected by electrocution and collisions. Although bird-safe designs and sensitivity mapping can reduce these risks²⁵, dangerous infrastructure continues to be installed worldwide, and existing hazardous powerlines and poles require urgent mitigation²⁶.

²⁴<https://birdelectrocution.org/>

²⁵ One such example is AVISTEP: <https://avistep.birdlife.org/>

²⁶ An interactive guide to mitigation can be found here: <http://datazone.birdlife.org/info/transmit>

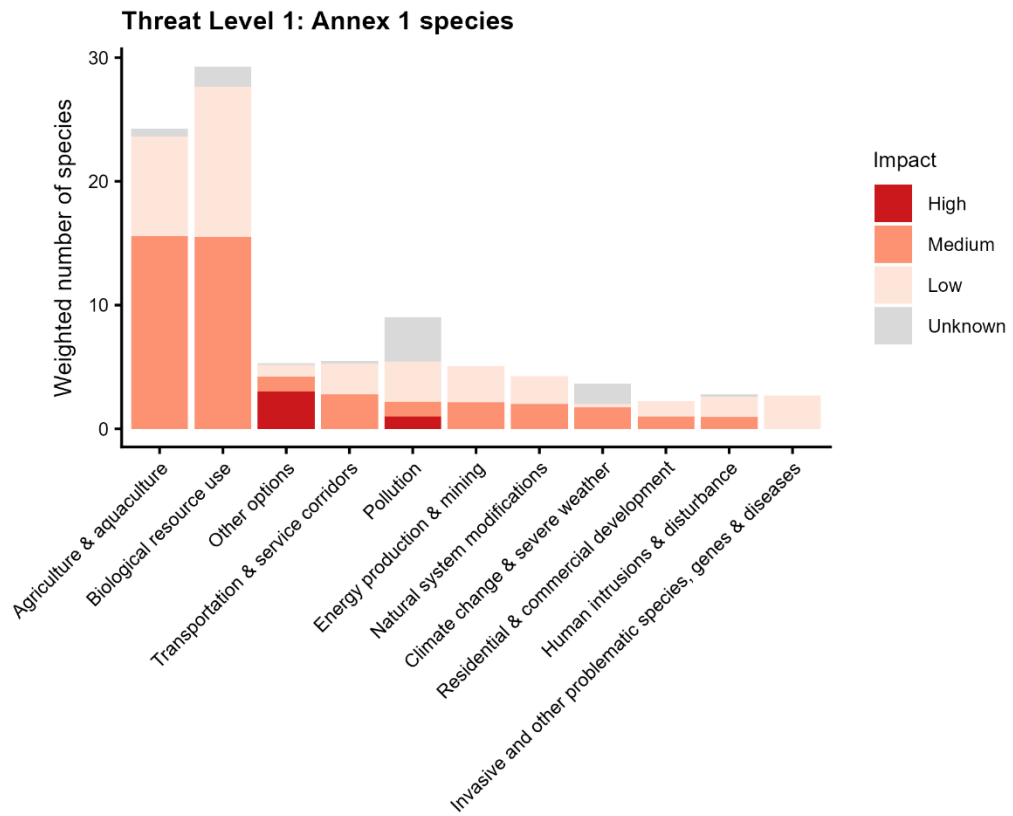
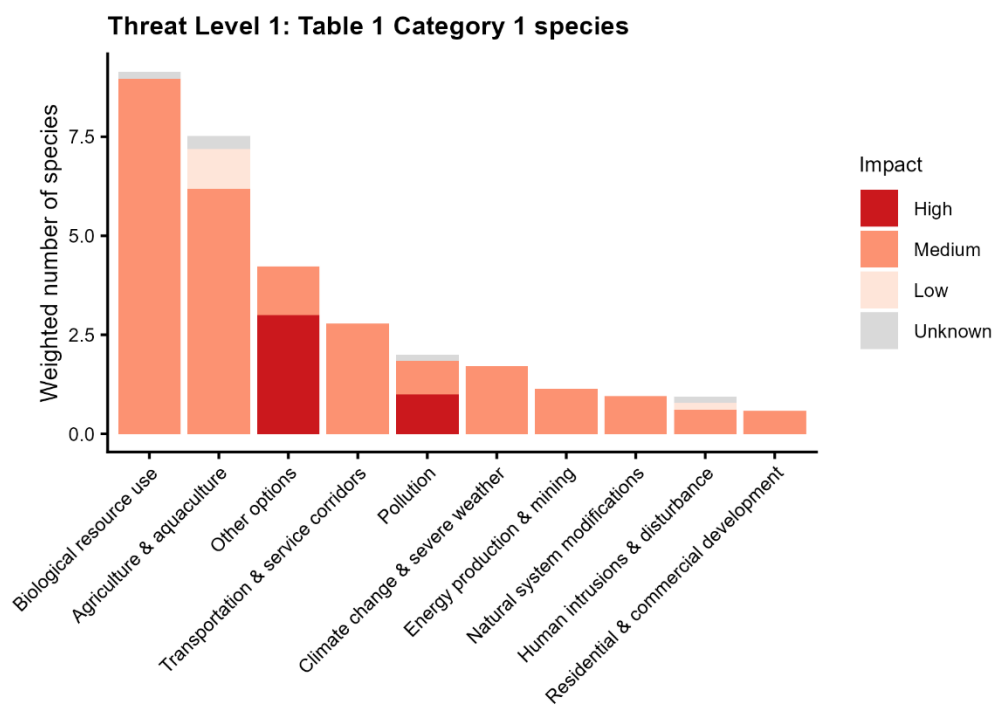


Figure 11. Highest impact Level 1 threats for (top) Annex 1 species and (bottom) Annex 3, Table 1 Category 1 species.

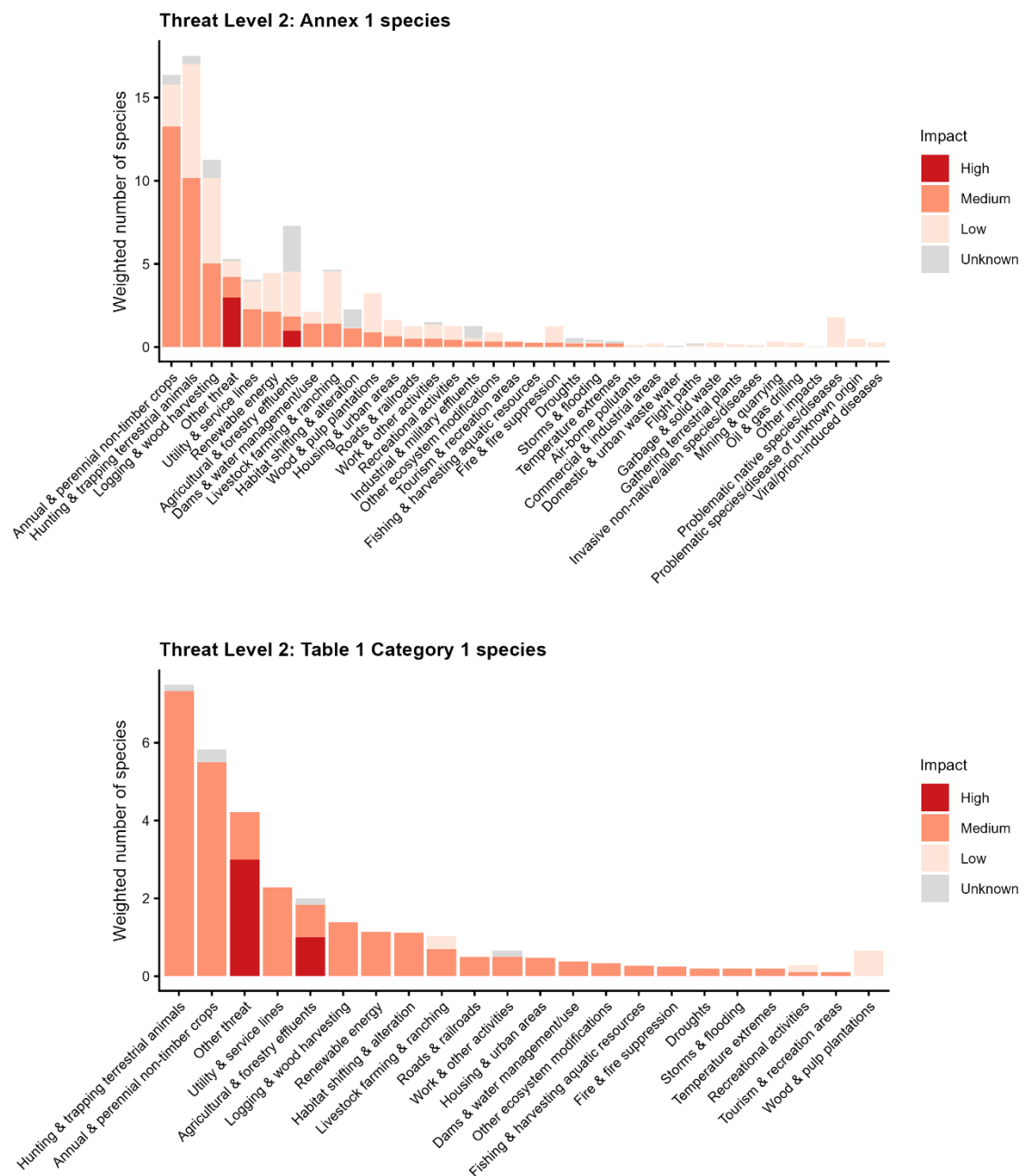


Figure 12. Highest impact Level 2 threats for (top) Annex 1 species and (bottom) Annex 3, Table 1 Category 1 species.

Agricultural effluents

Raptors may be attracted to areas with high concentrations of agricultural pests, increasing their exposure to pesticides through direct contact or through consumption of contaminated insect, bird and mammal prey treated with insecticides, avicides or rodenticides (Thomsett, 1987; Keith and Bruggers, 1998; McWilliam and Cheke, 2004). Pesticide use may also reduce the abundance of invertebrate and small vertebrate prey, contributing to food shortages for species such as the red-footed falcon alongside other pressures including persecution, habitat degradation and infrastructure development. The effects of chemicals used in quelea and locust control are thought to be substantial for some raptors but remain poorly quantified, while contamination of water bodies may affect fish eating species such as the osprey (Amar et al. 2018). Chronic exposure to other toxins, including neonicotinoids may also pose a significant but insufficiently understood threat to some populations (SolB, 2020). An extensive meta-analysis has shown that neonicotinoids directly impair bird health, behaviour, reproduction, and survival (Molenaar et al. 2024). These findings demonstrate that in addition to reduced food availability the direct exposure to neonicotinoids might contribute to population declines. Although this threat is included in the IUCN classification under Pollution and Agricultural and forestry effluents, its importance may be underestimated because the scale of population level impacts remains poorly documented.

8.2 Causes of mortality identified from tracking data

Through a broad collaboration of researchers tracking 45 different species coordinated by BirdLife International, Serratos *et al.* (2024) assembled data on human-induced and natural mortality among large migratory landbirds tracked across the African–Eurasian flyway. The dataset included 251 human-induced mortality events involving Accipitridae and 151 involving vultures. Among raptors other than vultures, electrocution was the most frequently identified cause of death, accounting for more than one-third of recorded mortality events. This was followed by illegal killing not involving poisoning, which represented one-quarter of events, and poisoning, which was the third most common cause. Among vultures, poisoning was the leading cause of mortality, responsible for almost 40% of recorded deaths, followed by electrocution and illegal killing not involving poisoning.

Similar methods are being used by Ginel *et al.* to examine causes of mortality in African raptors and by the LIFE EUROKITE project to examine mortality in Red Kites in Europe and these studies will be reported on in CSAR3.

8.3 Threats to vultures

According to the Mid-term Implementation Review of the Vulture Multi-species Action Plan to conserve African-Eurasian Vultures²⁷ (Botha et al. 2024), vultures (the most threatened group of raptors) continue to face poisoning, hunting and trade, collisions with wind turbines, electrocution on power lines, and reduced food availability. Intentional poisoning and hunting for belief-based use, bushmeat and trade are more serious than previously recognised, particularly in West Africa. The rapid expansion of renewable energy infrastructure is increasing collision and electrocution risks, while climate change and Highly Pathogenic Avian Influenza are emerging concerns for already depleted populations. Reduced food availability may now be less important in parts of Europe following targeted conservation measures.

According to the SAVE Opinion on Ex Situ Safety Net Populations of South Asian Gyps Vultures²⁸, toxic veterinary drugs remain a major threat to the three Critically Endangered South Asian *Gyps* species, alongside poisoning, electrocution and collisions with power infrastructure. These threats have not yet been reduced sufficiently across the species' ranges, and conditions for releasing captive bred birds remain uneven between countries and sites. Viable captive populations are therefore still considered necessary as a safeguard against extinction, supported by careful monitoring and species-specific assessment of any future releases.

8.4 Emerging threats

In the remainder of this section, we will focus on three key emerging threats that are currently impacting raptor populations. These are:

1. Highly pathogenic avian influenza (HPAI)
2. Changing rodent cycles at northern latitudes
3. Impacts of armed conflicts
4. Intraguild effects of recovering raptor populations

8.4.1. Recent HPAI outbreaks

In recent years the H5N1 strain of HPAI has been causing significant mortality across a wide number of bird species. For example, there have been high-profile mass mortality events most often linked to colonial breeding seabirds (Leguia et al. 2023; Burke et al. 2024; Lane et al. 2024) or large non-breeding congregations of geese (Percival et al. 2024). More thorough literature searches highlight that a wide variety of bird species have been infected with

²⁷https://raptors.cms.int/sites/default/files/publication/MTIR%20Report_Final_V2.pdf

²⁸ <https://save-vultures.org/wp-content/uploads/2025/06/SAVE-Opinion-on-Ex-Situ-Safety-Net-Populations-of-South-Asian-Gyps-Vultures.pdf>

HPAI, including raptors (see for example Shearn-Bochsler et al. 2019). Studies on populations during and after HPAI outbreaks show individuals can recover post-infection (Lane et al. 2024) and one population of barnacle geese is showing signs of post-outbreak population recovery despite a third of the population dying (Griffin & Peach 2024). However, in many cases the ongoing population declines amplified by outbreaks are likely to be lasting and perhaps unrecoverable (Tremlett et al. 2024).

Links have been made between scavenging and predatory behaviours and increased susceptibility to HPAI (Veen et al. 2007; Bertran et al. 2012). This is either through ingestion of infected individuals (Veen et al. 2007) or kleptoparasitism of food from infected individuals (Gorta et al. 2024). These direct interspecies transmission mechanisms make raptors a potentially vulnerable group to HPAI transmission (Pearce-Higgins et al. 2025). Many raptor species have been observed foraging on infected individuals during large HPAI-related mortality events, e.g. hooded vultures foraging on large tern wrecks in the Gambia (Barlow et al. 2023). In the remainder of this section, we will focus on how HPAI has affected demographic parameters, behaviour and consider the consequences for population trends. We focus on species on Annex 1 of the Raptors MOU, drawing on wider species examples where informative.

8.4.1.1 Annex 1 species with confirmed HPAI cases

Table 5 provides a list of species on Annex 1 of the Raptors MOU with confirmed cases of HPAI from the scientific literature in since 2017. This is not an exhaustive list of species as not all cases have been reported in the scientific literature and there are spatial biases in monitoring and detection of HPAI. Therefore, if a species does not appear in Table 5 then it does not necessarily mean that the species has been unaffected by HPAI.

Table 5. A list of species on Annex 1 with confirmed cases of HPAI reported in the scientific literature since 2017.

Species	Annex 3, Table 1 Category	References
Bearded vulture	1	Adlhoch et al. (2022); Martinez et al. (2025)
Saker falcon	1	Károly et al. (2017)
Snowy owl	1	Ringenberg et al. (2024)
Rough-legged buzzard	2	Günther et al. (2024); Paprocki et al. (2025)
Common kestrel	2	Günther et al. (2024)
Gyrfalcon	2	(Náttúrufræðistofnun 2024)

Eurasian scops owl	2	Günther et al. (2024)
Long-eared owl	2	Günther et al. (2024)
Griffon vulture	3	Adlhoch et al. (2022); Duriez et al. (2023)
Golden eagle	3	Wilson et al. (2023)
Eurasian sparrowhawk	3	Wilson et al. (2023); Günther et al. (2024)
Northern goshawk	3	Günther et al. (2024)
White-tailed sea-eagle	3	Wilson et al. (2023); Günther et al. (2024)
Red kite	3	Wilson et al. (2023)
Eurasian buzzard	3	Wilson et al. (2023); Caliendo et al. (2024); Günther et al. (2024)
Amur falcon	3	El Zowalaty et al. (2021)
Peregrine falcon	3	Günther et al. (2024); Caliendo et al. (2025); Caliendo et al. (2024); Ringenberg et al. (2024); Hall et al. (2024); Esaki et al. (2026); Badia-Boher et al. (2026); Watts et al. (2026)

8.4.1.2 Population-level impacts of HPAI on migratory raptors

The impacts of HPAI on raptors have perhaps not been as conspicuous as the mass mortality events that have occurred in seabirds and waterbirds. However, ongoing surveillance studies, e.g. Günther et al. (2024), Hall et al. (2024) and Ringenberg et al. (2024), have detected high levels of HPAI amongst tested dead wild raptors. Caliendo et al. (2024) found that 80% (28/32) of dead peregrine falcons collected in the Netherlands tested positive for HPAI, while a larger study in North America, testing nearly 10,000 birds, found around a third of dead peregrine falcons and snowy owls tested positive for HPAI (Ringenberg et al. 2024). These positive tests show HPAI is causing mortality of raptors, but it is often hard to determine wild population-level mortality or infection rates due to biases introduced by sampling already dead or injured birds.

While some birds die from HPAI infection there is evidence that birds can recover from infection and that this can even leave behind visible signs, e.g. many northern gannets (*Morus bassanus*) that recover from HPAI have altered iris colouration (Lane et al 2023). A recent study on griffon vultures in France was able to follow the daily movements of birds using GPS tags during a HPAI outbreak in spring 2022 (Duriez et al 2023). Of 31 tracked birds 21 showed a long, uncharacteristic period of immobility at the nest, averaging 5.6 days, that was assigned to HPAI infection (confirmed with testing). This resulted in the death of 3 individuals and 9 nest abandonments meaning productivity more than halved (from 0.69 between 2019-2021 to 0.27 in 2022). These kinds of outbreaks can seemingly have

population-level impacts on breeding success. For instance, across Scotland nest monitoring showed that golden eagle breeding success (the percentage of territorial pairs that successfully reared young) declined from 48% to 28% and white-tailed eagle breeding success declined from 67% to 45% (Wilson et al. 2025). There are no studies yet that show any longer-term effects of HPAI infection on fitness that carry over across seasons, life history stages or years.

HPAI infection in raptors can cause mortality and reduce productivity in surviving individuals. Whether these decreases in survival and productivity are driving population declines is key to understanding the potential conservation implications. Some studies have shown that detected HPAI outbreaks are associated with worsening population trends. For example, when HPAI was confirmed locally, the number of Eurasian buzzard territories from a population in Northern Scotland fell from 58 to 42 territories (Swann & Beckmann 2025). There have also been links drawn between HPAI outbreaks and worsening population trends at the broader national level. A 57% decrease in sightings of gyrfalcons in the Icelandic national winter bird census between 2020 and 2023 has been partly ascribed to HPAI (Náttúrufræðistofnun 2024) as well as declining population trends in peregrine falcon across most of the Netherlands (Caliendo et al. 2024).

Evidence suggests that the impacts of HPAI on raptors are highly species- and region-specific, largely determined by whether species prey upon or scavenge infected taxa. For example, a multi-species monitoring study in Scotland found declines in breeding productivity in golden eagles and white-tailed eagles, with the strongest effects occurring in coastal and marine habitats. This pattern was consistent with greater exposure through predation or scavenging of infected seabirds and waterfowl. In contrast, no clear reductions in productivity were detected in Eurasian buzzards, hen harriers, common kestrels or peregrine falcons in the Scottish study, although this pattern should not be generalised across species' ranges. Even where transmission to raptors occurs, wider demographic effects may remain limited, and HPAI outbreaks have not always coincided with reduced productivity (Günther et al. 2024; Smith et al. 2025). Transmission within raptor populations may also be reduced by behavioural responses of infected individuals. In griffon vultures, for example, infected birds remained sedentary for approximately six days during the period when they were likely to be most infectious, potentially reducing transmission to other individuals and surrounding populations (Duriez et al. 2023).

More recent demographic analyses provide stronger evidence that HPAI can affect peregrine falcon populations through reductions in adult survival. Using an Integrated Population Model for the Dutch population, Badia-Boher et al. (2026) estimated that adult survival declined from pre-pandemic values of 0.73–0.86 to 0.57 in 2022, while the number of breeding pairs declined by approximately 25% between 2021 and 2023. In contrast, productivity remained broadly unchanged, indicating that mortality of established breeders rather than reproductive failure was the principal demographic mechanism. The estimated

floater population also declined substantially, potentially weakening the demographic buffer that normally allows lost breeders to be rapidly replaced. Population projections suggested that recovery to the pre-panzootic breeding population could take approximately a decade.

Importantly, HPAI risk within peregrine populations appears to be strongly dependent on diet and habitat. In the mid-Atlantic USA, Watts et al. (2026) found dramatic declines in adult survival and subsequent territory occupancy among coastal peregrines, whereas inland populations remained comparatively stable. Coastal peregrines obtained more than 70% of their diet from waterbirds, particularly migratory shorebirds, while inland peregrines primarily consumed passerines. Coastal adult survival declined from 0.82 in 2022 to 0.25 in 2024, followed by a 50.6% decline in territory occupancy between 2024 and 2025. These findings indicate that population-level HPAI impacts may form a spatial mosaic driven by exposure to infected prey rather than reflecting species-level susceptibility alone. However, despite these documented cases, evidence of HPAI causing detectable population-level declines in raptors remains relatively limited.

The number of instances where HPAI has seemingly caused declines at the population-level are limited to several species and studies at the national-level or sub-national level. This is at least in part due to limitations and spatial biases in population trend monitoring (Buechley et al. 2018) and surveillance for HPAI in wild populations. Another contributing factor could be that HPAI has mainly reduced the breeding productivity of populations without causing massive adult mortality. This would make it hard to detect short-term population declines of raptors as they are long-lived species where reproductive rates often have a weaker influence on the rate of population change, compared to adult survival (Sæther and Bakke 2000).

Pearce-Higgins and Pollock (2024) evaluated a range of possible interventions for reducing the effects of highly pathogenic avian influenza on wild bird populations. They found no intervention that was likely to substantially reduce the risk of high mortality in wild birds. Carcass removal and vaccination emerged as the most promising options, but both present considerable practical difficulties and are likely to be effective only in particular contexts, with further testing necessary. The authors also cautioned that limiting research activities, such as ringing and tagging, could be counterproductive, as this would reduce the evidence needed to assess impacts and guide conservation action. However, additional measures to protect human health and minimise transmission are needed during outbreaks.

An important finding from recent studies is that territory occupancy and breeding success alone may underestimate the impacts of HPAI on raptor populations. Adult turnover, the age structure of territory holders, floater abundance and direct estimates of survival may provide more sensitive indicators. Another important conclusion is that, even where populations are capable of recovery, this process may take more than a decade, during

which reduced populations may be more vulnerable to other threats. Robust monitoring of raptor populations can therefore provide an important early-warning system and help trigger timely conservation action.

8.4.2. Impacts of changing rodent cycles at northern latitudes

Climate change is increasingly recognized as a major driver of ecological change, with cascading effects across trophic levels. Raptors are being affected not only directly by shifting climatic conditions (see Martínez-Ruiz et al. (2023) for a review on this), but also indirectly through changes in the population dynamics of key prey species such as voles and lemmings (Schmidt et al., 2012; Millon et al. 2014). Prey population cycles, particularly those involving voles and lemmings, are undergoing notable changes across the Northern Hemisphere, with climate change playing a significant role in this disruption (Kausrud et al., 2008).

The Arctic tundra is an ecosystem where cyclicity in rodent populations plays a key role in trophic level interactions. Regional collapses in lemming cycles have been documented, e.g. Schmidt et al. (2012), with both reduced densities and a breakdown in regular periodicity. However, a more recent pan-Arctic meta-analysis by Gauthier et al. (2024) suggests that regional lemming cycles are frequently lost and regained, and there has been no consistent trend toward greater instability over the past 27 years. In contrast, boreal and sub-Arctic regions appear more severely affected, with long-term dampening of rodent population cycles documented in areas like southern Finland (Kausrud et al., 2008) and northern Norway (Ims et al., 2011). Cornulier et al. (2013) also reported large-scale dampening of vole cycles across the boreal zone. Although these trends are regionally variable (Ehrich et al. 2020), Gauthier et al. (2024) caution that ongoing climate warming could destabilize rodent population dynamics in the Arctic, as shown by collapses in the Boreal zone.

These changes in rodent population dynamics are having significant effects on raptor species, which rely on small mammals as key prey. Lemming and vole cycles traditionally influenced breeding success and population dynamics for several raptor species, and their dampening or collapse can have cascading ecological consequences. Schmidt et al. (2012) demonstrated that the local collapse of lemming cycles on two Greenland islands led to a 98% decline in snowy owl fledging production. This abrupt decline suggests a nomadic response, with owls abandoning breeding attempts in areas where prey densities fall below critical thresholds, a behaviour supported by Gilg et al. (2006). In temperate regions, a shift from high to low amplitude vole cycles in the UK coincided with a marked decline in tawny owl breeding populations (Millon et al., 2014). While some species may buffer these changes through prey switching, such compensation appears incomplete. Rough-legged buzzards, for example, switched prey from lemming to voles when dampening rodent cycles

became more dominated by voles in a region of low-arctic Russia. Despite adapting to the changing prey base this has still resulted in reduced overall productivity and population declines (Fufachev et al., 2019). Such flexibility is likely to vary considerably among species. Snowy owls appear particularly dependent on lemmings during the breeding season, and recent long-term monitoring in northern Norway found that they bred during a lemming peak but did not respond similarly to repeated vole peaks, suggesting that alternative small rodents may not adequately compensate for reduced lemming availability (Ims et al., 2026).

The implications for raptor conservation are complex. Where dampening of rodent cycles is driven by climate change, opportunities for direct intervention may be limited. However, maintaining extensive networks of suitable habitat across broad geographic scales may offer highly mobile and nomadic species, such as the snowy owl and rough-legged buzzard, greater resilience by allowing them to track spatially variable rodent peaks. For such nomadic predators, changes in the spatial synchrony of rodent cycles may be as important as changes in their amplitude: asynchronous peaks can provide alternative breeding areas, whereas widespread simultaneous low phases may leave few suitable areas to exploit. This is especially important in sub-Arctic and boreal regions, where anthropogenic habitat loss and fragmentation compound the challenges posed by climate-induced prey instability (Wan et al., 2022). Supporting broad landscape-level connectivity could help mitigate local cycle failures, but significant knowledge gaps remain, particularly around how nomadic species respond demographically and behaviourally to changing prey cycles at regional scales. Continued research into the interaction between rodent cycles, climate change, and predator behaviour will be essential to inform effective conservation strategies in a rapidly changing world.

8.4.3 Impacts of armed conflicts

Armed conflicts can have severe and long-lasting impacts on wildlife through direct mortality, increased hunting and persecution, habitat destruction, displacement of people into protected areas, breakdown of environmental governance and disruption of conservation activities.

One growing concern is military interference with Global Navigation Satellite System (GNSS) signals, including both jamming and spoofing. Such interference has increased in recent conflict zones in Eastern Europe and the Middle East and can severely compromise tracking data from tagged wildlife. Jiguet et al. (2025) documented extensive GNSS spoofing affecting multiple bird species, including eagles and falcons, with consequences not only for movement studies but also for conservation programmes that rely on tracking data to detect mortality and identify threats such as electrocution, poisoning and persecution.

GPS tracking of greater spotted eagles migrating through Ukraine in spring 2022 revealed that birds used fewer stopover sites, made substantial route deviations and arrived later at their breeding grounds than in previous years (Russell et al., 2024). These responses likely increased the energetic costs of migration and may generate carry-over effects on subsequent breeding performance and survival. If these behavioural changes occur across entire subpopulations affected by armed conflict, they could have consequences for their long-term persistence. Ukrainian military video shows villages covered in white lines²⁹. These are fiber-optic cables unspooled by battlefield drones. The tangled wires create flight barriers for birds, who are also weaving the debris into nests³⁰. Such material may create entanglement or other physical hazards, although its population-level effects on birds, including raptors, remain largely unstudied.

Warfare may also alter raptor habitats and prey populations through fire, soil disturbance, chemical contamination, unexploded ordnance and destruction of protected areas, although raptor-specific demographic consequences of these processes remain poorly quantified (Filho et al. 2024).

Armed conflicts therefore represent both a direct and indirect emerging threat to migratory raptors. In addition to habitat disturbance and altered migration behaviour, modern warfare can interfere with tracking technology, restrict conservation activities and introduce novel physical and chemical hazards. Many of these effects are poorly quantified, and the increasing use of electronic warfare and remotely operated military technologies creates an important emerging field for raptor conservation research.

8.4.4. Intraguild effects of recovering raptor populations

The recovery of formerly depleted raptor populations can create new conservation challenges through competition, intraguild predation and kleptoparasitism. These are natural ecological interactions, but they may become conservation concerns where a recovering dominant predator overlaps with a small or threatened population of another species. Intraguild predation can influence territory occupancy, breeding success and survival and, where sufficiently frequent, population dynamics (Sergio & Hiraldo, 2008).

One well-documented example involves Eurasian eagle owls *Bubo bubo* and peregrine falcons *Falco peregrinus*. Recovering eagle owls may compete with peregrines for nesting sites and prey upon adults and young. Peregrine productivity was reduced where eagle owls occurred at high density in the central pre-Alps (Brambilla et al., 2006), while in Germany expanding eagle owl populations have affected peregrine distribution and breeding success and increasingly occupy buildings and nest sites also used by peregrines (Lindner, 2018).

²⁹ <https://www.msn.com/en-xl/technology/general/fiber-optic-drones-weave-spiderweb-battlefields-in-ukraine/ar-AA1T4s5Q>

³⁰ <https://www.techspot.com/news/112681-birds-ukraine-weaving-nests-discarded-drone-fiber-optic.html>

A similar challenge may be developing between peregrine and saker falcons *Falco cherrug* in the Pannonian Basin. Since returning as a breeder to Hungary in 1997, peregrines have expanded from mountainous areas into lowland agricultural landscapes, where they have not bred historically, facilitated partly by high-voltage pylons and artificial nest boxes, including boxes originally installed for sakers (Prommer et al., 2026). This increases potential competition for nesting sites. Meanwhile, the decline of European ground squirrels *Spermophilus citellus*, formerly important saker prey, has been accompanied by dietary changes, with Columbiformes remaining dominant and passerines increasing in importance (Bagyura et al., 2025). Peregrine expansion into saker habitats may therefore increase both nesting and trophic overlap, although population-level effects on sakers have not yet been demonstrated.

Besides direct intraguild predation, recovering Eastern imperial eagles *Aquila heliaca* may create similar competitive pressures on saker falcons. Their population and range have expanded considerably across the Hungarian Plain (Horváth et al., 2025), increasing overlap with sakers. Kleptoparasitism by imperial eagles on sakers has been repeatedly documented in Slovakia; in one case, repeated prey theft apparently prevented sufficient food delivery to a saker nest and all chicks died (Danko & Mihók, 2007). Such interactions could become particularly important where prey availability is already declining.

The interaction between recovering white-tailed eagles *Haliaeetus albicilla* and ospreys *Pandion haliaetus* provides another example. In Poland, where fewer than 25 osprey pairs remained, camera monitoring documented white-tailed eagle predation on osprey chicks, adding mortality to an already vulnerable population (Woźniak et al., 2022). Wider Baltic studies suggest that recovering white-tailed eagles may also limit ospreys through competition where the two species strongly overlap (Treinys et al., 2011).

These interactions should not automatically be regarded as negative effects of conservation, as they may represent the restoration of ecological relationships lost during periods of severe persecution. However, they create an emerging conservation challenge where recovering dominant predators interact with populations that remain small, threatened or exposed to other pressures. Monitoring programmes should therefore consider changes in the abundance and distribution of other raptors as potential drivers of population change, while management intervention should only be considered where robust evidence demonstrates population-level impacts.

9. Internationally important sites

9.1 Gaps in the current Raptors MOU List of Sites network

9.1.1 Background

The workplan for the Technical Advisory Group from MOS2 (Activity 2, Task 2.5) included a task to “Advise on gaps in current information on key breeding areas, stopovers, refuelling, bottleneck, other congregational and non-breeding sites along raptor flyways, and: a. make recommendations on how these might be filled; and b. advise on appropriate approaches for the conservation and management of critical areas.”

The approach was outlined in the 2018 TAG workplan³¹ and tested in a pilot analysis of 11 species. Briefly, the agreed upon approach was to overlay the List of Sites onto the BirdLife species’ distribution map, identify major gaps in site coverage, and assess whether those gaps were genuine. Results were presented at MOS3 in 2023^{32,33}, where extending the analysis to all Raptors MOU species was recommended, subject to resources³⁴. Given funding constraints ahead of MOS4, TAG9 in 2025 adopted a modular approach, prioritising Category 1 species³⁵.

This analysis therefore extended the pilot to all Category 1 species and the full report of this work is introduced in UNEP/CMS/RAPTORS/MOS4/Doc12.3.

9.1.2 Methodology

In summary a literature review was used to determine whether each species is congregatory during different stages of the annual cycle, and the current Category 1 List of Sites was overlaid with BirdLife range maps to identify potential gaps in site coverage. Congregatory behaviour was then used to assess whether these gaps were likely to represent genuine deficiencies in the site network or reflected life stages for which site-based conservation is less appropriate. As with the pilot analysis, identifying genuine gaps for Category 1 species the analysis focused on identifying parts of the range and annual cycle where the species congregated in numbers that would meet thresholds of international importance.

Areas already delineated and documented to support internationally important numbers of a Raptors MOU Annex 1 migratory raptor species within the geographic extent of the MOU, but not currently on the List of Sites were identified as a contribution towards future gap-filling. New qualifying species occurring in internationally important numbers at existing sites already on the Raptors MOU List of Sites were also identified. Towards further future identification of sites that could fill gaps, three approaches were used;

³¹ [UNEP/CMS/Raptors/TAG3/Doc.4.2b](#)

³² [UNEP/CMS/Raptors/MOS3/Doc.12.2.](#)

³³ [UNEP/CMS/RAPTORS/MOS3/Report/Rev1](#)

³⁴ [UNEP/CMS/RAPTORS/MOS3/Report/Annex XIII.](#)

³⁵ [UNEP/CMS/RAPTORS/TAG9/REPORT](#)

- o *Literature review* -A rapid literature review was conducted to help identify sites that could potentially support internationally important numbers of Category 1 species.
- o *eBird count data* -Furthermore, to test what citizen science data might be able to contribute for 12 Category 1 species (Table 1) with relatively few sites listed on the List of Sites eBird count data were used to identify areas with internationally important counts outside known sites already identified for these species in the List of Sites or known IBA/KBAs.
- o *eBird abundance estimates* -For a subset of the Category 1 species for which this information was available, modelled eBird abundance maps were used to identify areas outside the current List of Sites with the highest estimated abundance where site identification/survey efforts could potentially be prioritised. These data were only available for 17 out of the 31 Category 1 species.

9.1.3 Results overview

The results of the analysis are summarised in Table 6 where gaps in site coverage of Category 1 species are identified. Further detail and species by species mapping of the results for Category 1 species is available in the site network report (UNEP/CMS/RAPTORS/MOS4/Doc12.3³⁶). The number of sites with the species listed as a qualifying species is broken down for different parts of the species range reflecting different parts of the annual cycle. Recommendations are given on whether the site coverage is 'sufficient' (green fill), represents a genuine gap in site coverage (red fill), or the lack of sites is due the species not exhibiting congregatory behaviour (blue fill). Potential gaps in the site network are highlighted where it is difficult to assess if site coverage is sufficient (purple fill), often due to limited information on congregatory behaviour during a particular phase of the annual cycle.

For a number of Category 1 species no (or very few) sites are currently listed in the List of Sites and these gaps are not justified by their behaviour or the fact a large number of individuals is required to trigger a site as being internationally important. This is particularly the case for the most threatened African vultures, including hooded vulture, lappet-faced vulture, white-headed vulture, white-backed vulture and Rüppell's vulture, but also extends to other species such as scissor-tailed kite, tawny eagle and Steller's sea-eagle. For the African vultures this likely reflects their recent uplisting on the global IUCN Red List from Least Concern to Critically Endangered or Endangered, which significantly lowered the threshold required to qualify a site as internationally important. This is likely also the case for scissor-tailed kite and tawny eagle, which were recently uplisted from Least Concern to

³⁶ <https://www.cms.int/document/site-network-analysis-priority-species>

Vulnerable. Vultures, often range widely over large, arid landscapes, and their seasonal ranges are less well defined than those of other raptors. This makes protection through traditional, fixed-site designations more difficult. For such wide-ranging species, a more effective approach is likely to involve a network of strategically located sites across the full distribution, especially at known breeding colonies and communal roosts. Even so, site-based protection alone will not be sufficient. It must be complemented by broader landscape-level measures to effectively safeguard these species throughout their annual cycle.

Other Category 1 species are well covered in parts of their range, particularly in Europe and during the breeding period, but show significant gaps elsewhere. This was particularly the case for cinereous vulture, pallid harrier, Himalayan griffon, red-footed falcon and Egyptian vulture. For instance, for cinereous vulture no sites on the List of Sites are currently in the species' breeding range in Mongolia, despite it being a global stronghold. In these cases, identifying geographic priorities for gap-filling surveys can greatly improve how comprehensive the site network is. Some Category 1 species benefit from relatively comprehensive coverage. For example, Pallas's fish eagle, greater spotted eagle, cape vulture, bearded vulture, eastern imperial eagle and Spanish imperial eagle are represented by numerous sites across different stages of the annual cycle and geographic areas of the range. We would recommend that efforts to expand the site network for raptors therefore focuses on the species lacking comprehensive coverage as discussed above.

There were also a number of sites listed in the List of Sites that fall outside current species' range maps. This may reflect either outdated range information or recent range contractions or outdated site information. In some cases, these sites may still host the species, while in others they represent areas of historical presence where recolonisation or reintroduction could be possible. For example, sites in the Balkans for bearded vulture, although no longer occupied, may be crucial for long-term recovery efforts. These sites should not be dismissed, but retained as part of a forward-looking conservation strategy encompassing restoration objectives.

9.1.4 Improving the site network represented by the List of Sites

To address some of the identified gaps in the List of Sites network, targeted monitoring and surveys will be necessary to identify sites of international importance across species' full ranges and throughout their annual cycles. For several species, internationally important sites have already been identified, delineated and documented for Annex 1 species, but are not yet included in the List of Sites. These are presented in UNEP/CMS/RAPTORS/MOS4/Doc.14.4³⁷. Further potential sites have been documented in the scientific literature, for example, two known roosts of scissor-tailed kite in Senegal and

³⁷ <https://www.cms.int/document/proposed-approach-reviewing-and-updating-table-3-annex-3-raptors-mou>

Mali meet criteria for international importance, regularly supporting thousands of individuals. The number of qualifying sites is also likely to increase as more countries update their national IBA and KBA inventories, especially for species such as African vultures, which have only recently been uplisted to the higher global IUCN Red List categories.

Citizen science databases may also provide valuable insights by revealing locations where internationally important numbers have been recorded. However, these data are spatially biased towards more developed and densely populated regions, limiting their representativeness in under-surveyed areas, e.g. West Africa.

For some species, especially those that are wide-ranging or not strongly congregatory, site-based measures must be embedded within a broader landscape strategy. For others, especially those that form large breeding colonies or communal roosts, targeted site protection can make a significant contribution. Ongoing monitoring and targeted surveys combined with citizen science data will be critical for filling key geographic and temporal gaps and ensuring that the network represented by the List of Sites supports Annex 1 species across all stages of their annual cycles in which site-based conservation can be effective.

The analysis highlights the importance of keeping under review how the List of Sites might be performing as a network from a species-by-species perspective and using this information to inform survey and monitoring efforts. The approach would be valuable to apply to Category 2 species as well.

Table 6. This section details the number of sites listed in the List of Sites of the Raptors MOU for each Category 1 species, broken down by how they overlap with different parts of their range. Colour-coded recommendations indicate whether these listed sites provide sufficient coverage for an extant species across all stages of its annual cycle. These assessments are based on three key metrics: total site count, congregatory behaviour, and global conservation status. While all Annex 3, Table 1 species would ultimately benefit from identifying and protecting more internationally important areas, "sufficiency" is used here as a relative metric compared to other assessed species.

Common name	Native resident	Native breeding	Native passage	Native non-breeding	Reintroduced	Possibly extant	Possibly extinct	Extinct	Outside range
Bearded vulture	109	NA	NA	0	33	0	1	46	23
Egyptian vulture	41	264	271	0	NA	NA	0	5	23
Beaudouin's snake-eagle	0	NA	NA	NA	NA	NA	NA	NA	NA
Red-headed vulture	14	NA	NA	NA	NA	NA	0	NA	NA
White-headed vulture	1	NA	NA	0	NA	0	0	0	NA
Hooded vulture	1	NA	NA	0	NA	NA	0	0	NA
Himalayan griffon	29	NA	NA	0	NA	NA	NA	NA	2
White-rumped vulture	166	NA	NA	0	NA	NA	35	NA	NA
White-backed vulture	3	NA	NA	2	NA	0	0	0	NA
Indian vulture	51	NA	NA	NA	NA	NA	38	NA	6
Slender-billed vulture	52	NA	NA	NA	NA	NA	10	NA	7
Cape vulture	27	NA	NA	7	NA	NA	0	0	NA
Rüppell's vulture	4	NA	NA	3	NA	NA	0	0	NA
Cinereous vulture	126	4	2	98	13	NA	NA	19	23
Lappet-faced vulture	10	NA	NA	2	NA	0	0	1	5
Mountain hawk-eagle	0	NA	NA	NA	NA	NA	NA	NA	NA
Greater spotted eagle	NA	124	126	164	NA	NA	NA	NA	69
Tawny eagle	0	NA	NA	NA	NA	NA	NA	NA	NA
Steppe eagle	NA	11	5	1	NA	NA	NA	NA	9

Spanish imperial eagle	80	NA	9	NA	NA	NA	NA	NA	3
Eastern imperial eagle	11	195	121	80	NA	NA	NA	NA	29
Black harrier	12	NA	NA	10	NA	NA	NA	NA	NA
Pallid harrier	NA	64	142	45	NA	NA	NA	NA	19
Pallas's fish-eagle	NA	41	42	59	NA	NA	22	NA	8
Steller's sea-eagle	0	0	NA	0	NA	NA	NA	NA	NA
Forest buzzard	6	NA	NA	7	NA	NA	NA	NA	NA
Scissor-tailed kite	0	0	NA	0	NA	NA	NA	NA	NA
Red-footed falcon	NA	127	281	2	NA	NA	NA	NA	24
Sooty falcon	NA	26	10	0	NA	NA	NA	NA	8
Saker falcon	101	83	102	21	NA	NA	NA	NA	13
Snowy owl	NA	4	NA	1	NA	NA	NA	NA	NA

Colour Key

	Genuine gap
	Lack of sites justified by species ecology in this season
	Sufficient Sites
	Potential Gap

9.2 Protection of Raptors MOU List of Sites

The aim of this analysis was to calculate what proportion of each site is covered by a recognised protected area. Average protected area coverage is presented by continent, region and species to help identify priorities for addressing low site protection. We also examine the spatial extent of the List of Sites globally to identify areas with high and low area coverage.

9.2.1 Calculating site protection

The post-MOS 3 List of Sites includes IBAs, EC Birds Directive SPAs, or other Signatory-recognised sites that meet criteria of international importance. This section examines the extent to which the List of Sites is covered by designated protected areas. Protected areas, as defined by the IUCN, are clearly delineated geographical spaces that are recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature, along with associated ecosystem services and cultural values (Dudley, 2008).

Since the MOS1 List of Sites was expanded by TAG in preparation for MOS2 (and later adopted -with some MOS2 advised amendments -at MOS3), the underlying dataset of IBAs maintained by BirdLife International has undergone some updates (and some countries have now identified KBAs). A small number of sites have been delisted, meaning BirdLife no longer collects information on their overlap with protected areas. Additionally, some sites have been amalgamated, while others have been split into multiple sites. These changes identified are described in UNEP/CMS/RAPTORS/MOS4/Doc.14.4³⁸. BirdLife continues to hold data on these reconfigured sites, albeit under different site codes and with adjusted boundaries reflecting these changes.

Most of the sites on the List of Sites have defined boundaries, although a small number are represented only by point locations. Different site types on the List of Sites are listed separately to aid update, but different site types can sometimes overlap spatially. Therefore, in cases where significant overlap between two sites of different types would have led to over-estimation of how comprehensive the site network represented by the List of Sites was for the species, the sites were grouped and only one of the two sites contributed to the analysis³⁹. This enabled the analysis to focus on how the site network is delivering functionally for a species, but also provided the starting dataset for the site protection analysis.

Using the refined list of sites, we calculated the percentage of each site's area covered by protected areas. All SPAs sites were assumed to be 100% protected, as they are officially

³⁸ <https://www.cms.int/document/proposed-approach-reviewing-and-updating-table-3-annex-3-raptors-mou>

³⁹ The threshold used for this process was 50% or more geographical overlap.

designated protected areas. For IBAs, protection coverage was determined through spatial overlap analysis between IBA boundaries (as maintained by BirdLife International) and digital polygons of protected areas from the World Database on Protected Areas (UNEP-WCMC & IUCN, 2020), as well as Other Effective Area-based Conservation Measures (OECMs) from the World Database on OECMs. For full details of the methodology, see ⁴⁰. Protected area coverage could not be calculated for 32 sites for which a digital boundary was not available.

In summary, the List of Sites we were able to calculate protected area coverage for 5,688 sites (99.4%). The protection coverage for these 5,688 sites is illustrated in Fig. 13, while Fig. 14 shows protection coverage for IBAs specifically. On average, 82.2% of the area of these 5,688 sites is protected. SPAs by definition had protection coverage of 100%, while IBAs had an average of 55.9%. At the continental level, average protected area coverage is as follows: Africa (50.7%), Asia (25.5%) and Europe (87.4%). These continental figures are also visualized in the histograms in Fig. 15. Fig.16 presents the same data as Fig. 15 but restricted to only IBAs in each continent. Finally, Fig. 17 and 18 illustrate protection of sites at the regional level, where figure 18 shows IBA sites only.

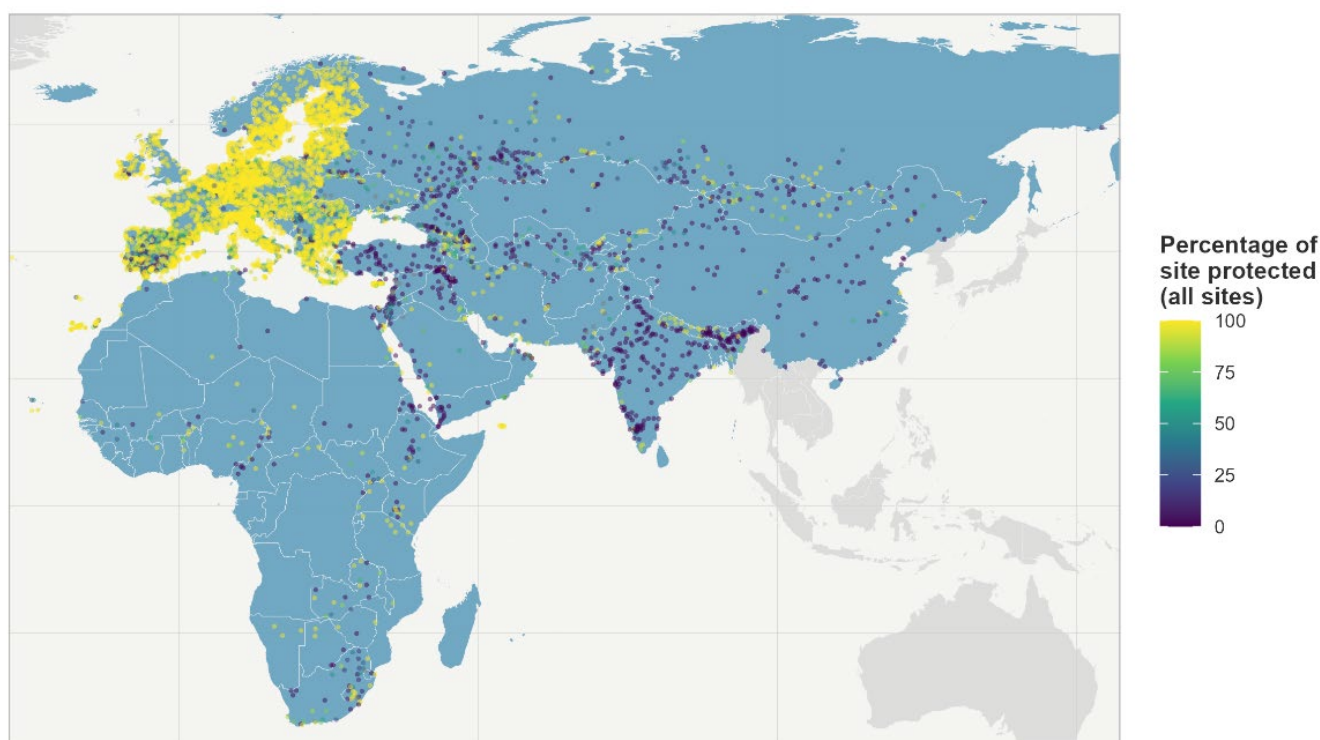


Figure 13. The percentage of each site on the List of Sites (Table 3) of the Raptors MOU that overlaps with a protected area

⁴⁰ <https://unstats.un.org/sdgs/metadata/files/Metadata-15-04-01.pdf>

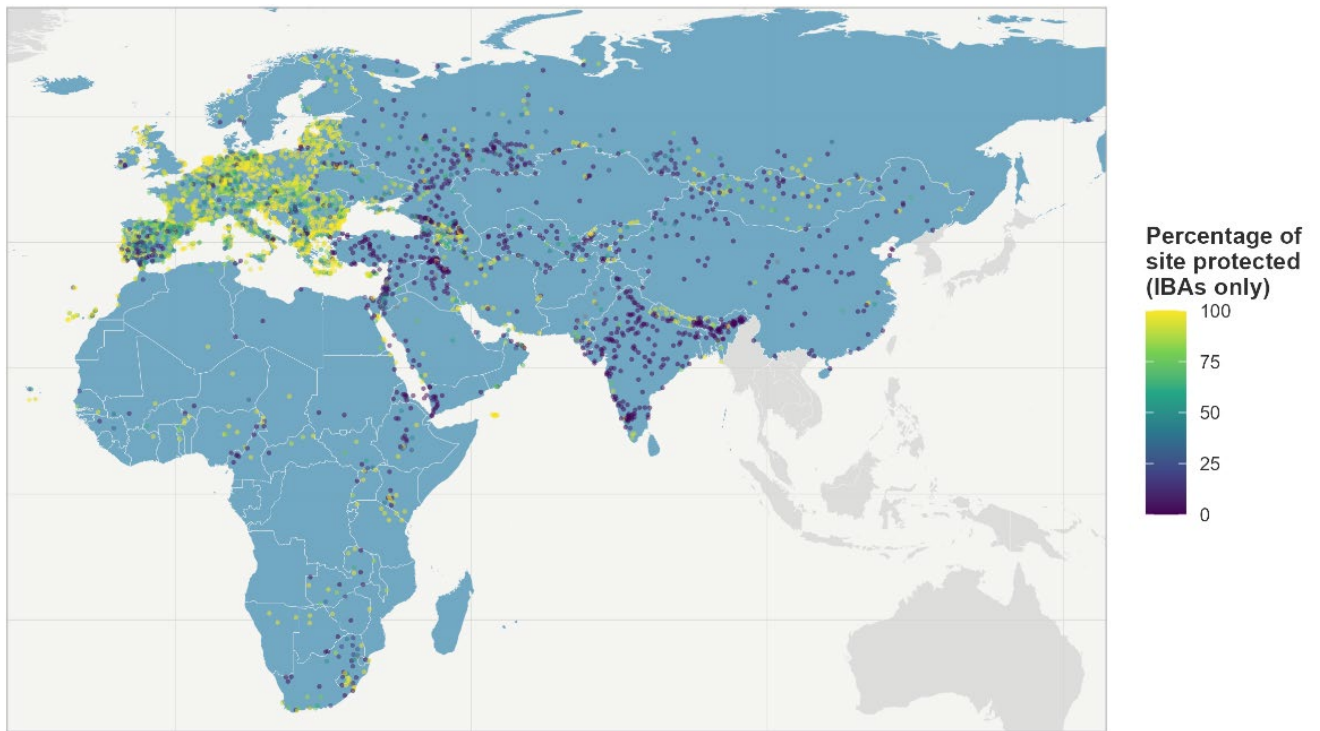


Figure 14. The percentage of each IBA site on the List of Sites (Table 3) of the Raptors MOU that overlaps with a protected area.

At the regional level, there is significant variation in the degree of protection afforded to the List of Sites. While Northern and Western Europe have a high level of site protection, Eastern and Southern Asia have a low level of site protection. This geographic variation in site protection has direct implications for species-level conservation outcomes related to the Raptors MOU. Species with predominantly northern or European distributions tend to benefit from high levels of site protection. For example, the Eurasian hobby, northern goshawk, Eurasian sparrowhawk, and merlin each enjoy over 99% protection at the sites where they are listed. Conversely, species largely confined to the South Asia experience far lower protection levels. Notable examples include the Indian vulture (6.3%), white-rumped vulture (8.7%), slender-billed vulture (11.7%), and Pallas’s fish eagle (22.1%).

Site protection is a powerful conservation tool, offering critical safeguards for the habitats raptors rely on for breeding, roosting, and foraging. It can reduce or mitigate threats such as habitat loss, human disturbance, and other pressures. Protected area designations also allow for the strategic allocation of conservation resources, including research and long-term monitoring. In Africa, for instance, the protected area network now serves as a crucial refuge for many raptor species across the continent (Thiollay 2007; Shaw et al. 2024). However, while protected areas often serve as a cornerstone of conservation strategies, recent studies have highlighted that legal protection alone does not automatically translate to positive conservation outcomes (Wauchope et al. 2022). Raptor numbers could continue

to decline, even within protected sites, if management is not put in place to address threats such as illegal persecution, poisoning, and habitat degradation. This underscores the importance of coupling site protection with active management and enforcement that directly addresses the threats faced by raptors on the ground. Signatories should also ensure that sites included in the Raptors MOU List of Sites are recognised within their contributions towards the Kunming–Montreal Global Biodiversity Framework’s 30×30 target.

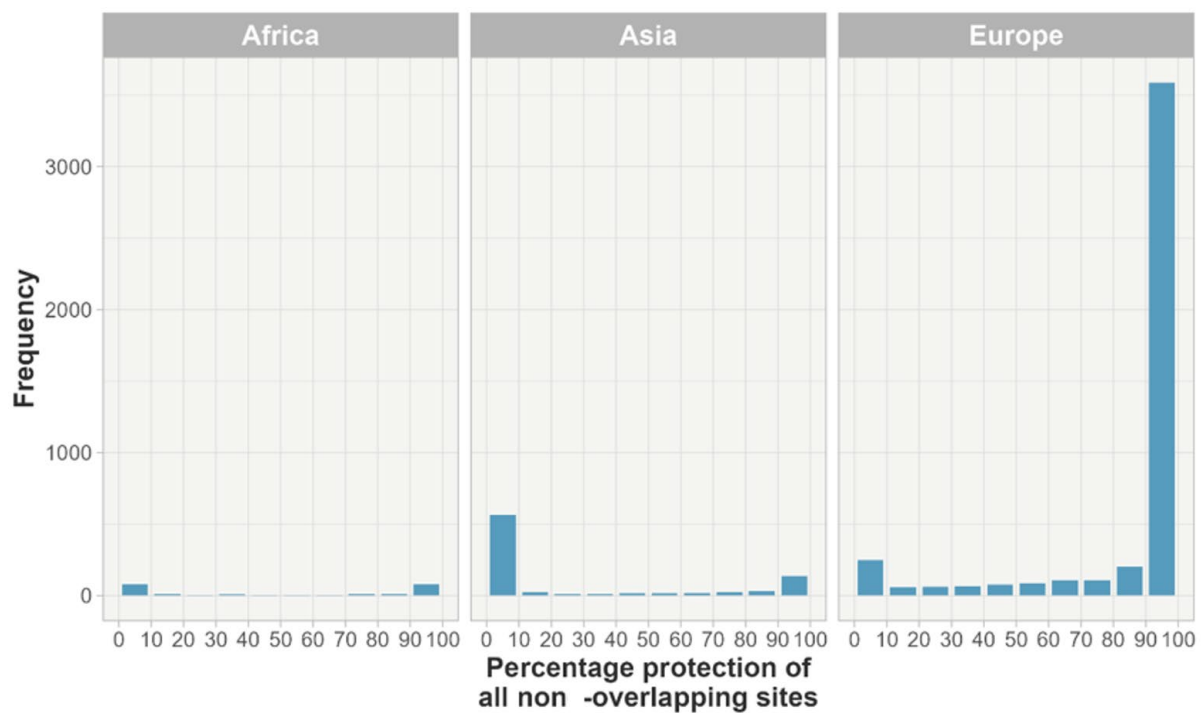


Figure 15. Histogram of the percentage of each site on the List of Sites (Table 3) of the Raptors MOU that overlaps with a protected area. This is broken up into the three continents for Raptors MOU range countries.

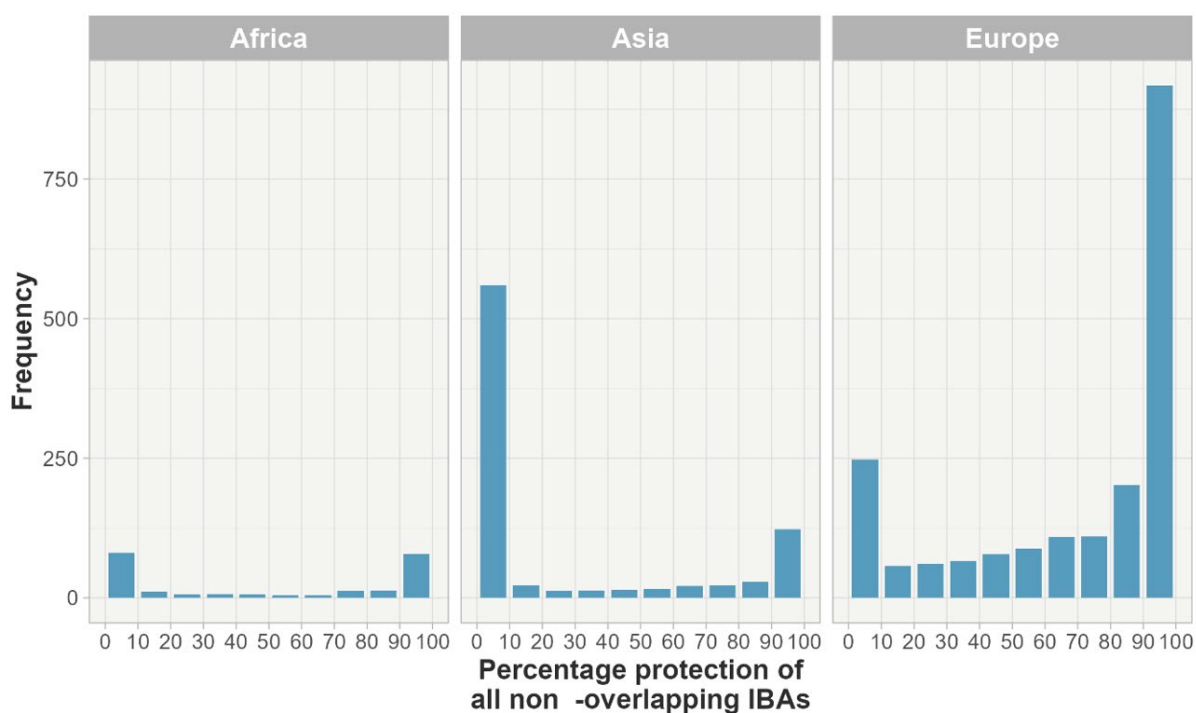


Figure 16. Histogram of the percentage of each site on Annex 3, Table 3 of the Raptors MOU that overlaps with a protected area. This is broken up into the three continents for Raptors MOU range countries.

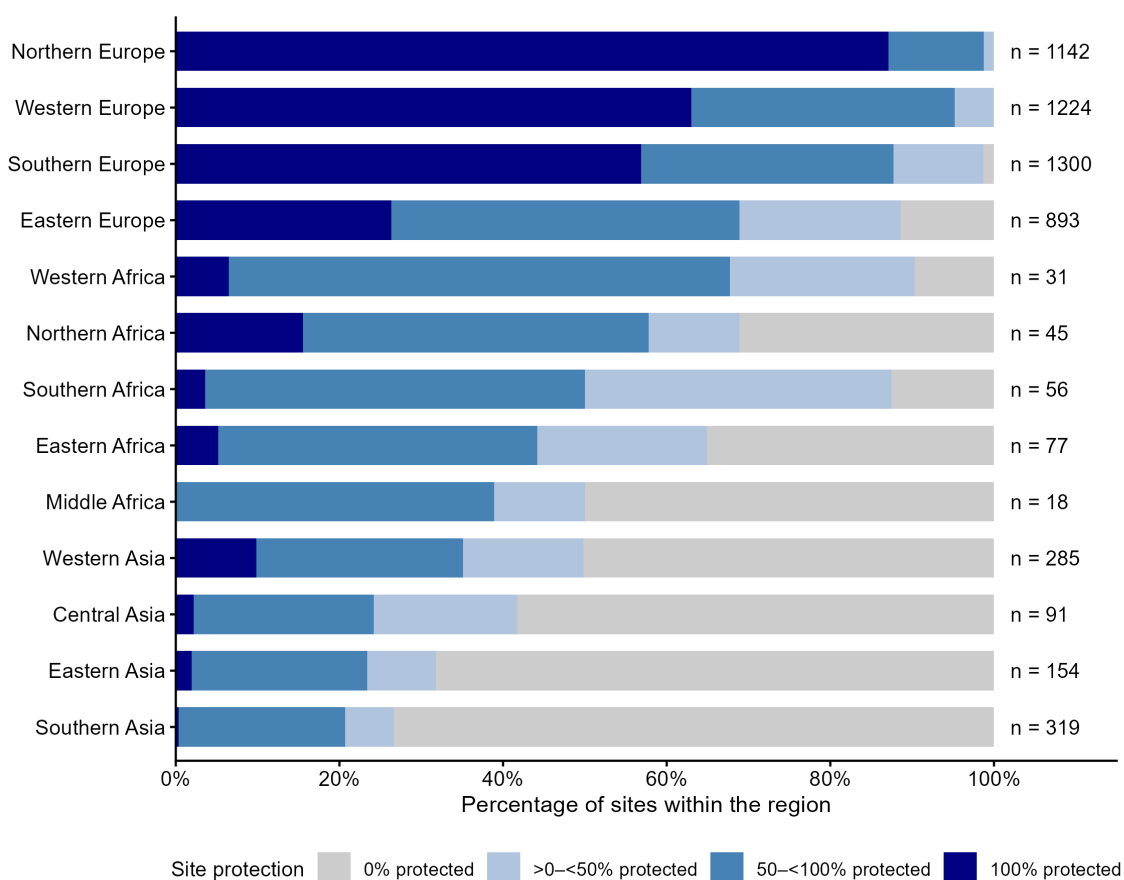


Figure 17. Percentage of each site on Annex 3, Table 3 of the Raptors MoU per region falling within

four protected-area coverage classes: <10%, 10–49%, 50–99% and 100% of the site protected. Values on the right side of the bars indicate the total number of sites on Annex 3, Table 3 in that region.

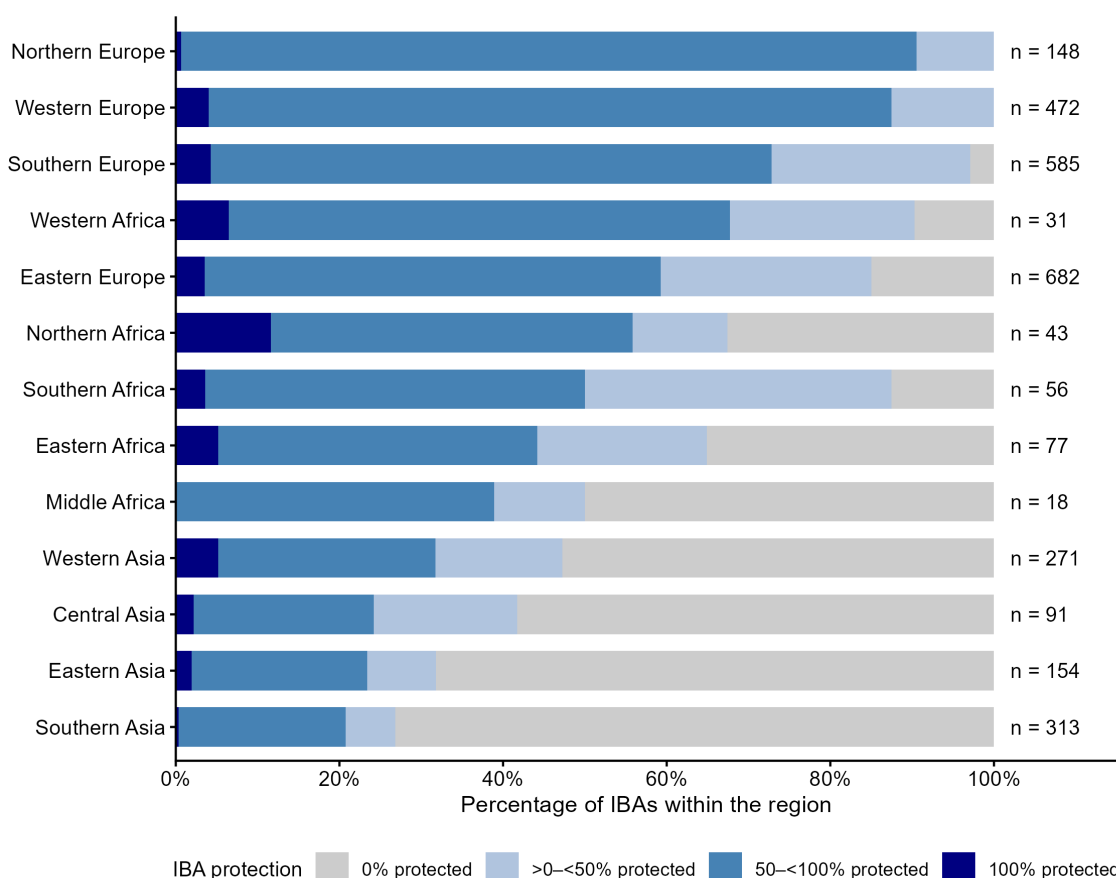


Figure 18. Percentage of each IBA site on Annex 3, Table 3 of the Raptors MoU per region falling within four protected-area coverage classes: <10%, 10–49%, 50–99% and 100% of the site protected. Values on the right side of the bars indicate the total number of sites on Annex 3, Table 3 in that region.

9.2.2 Calculating global area covered by the List of Sites

This analysis was conducted to produce a map illustrating the global area coverage of in the List of Sites. The aim was to quantify the percentage of land area these sites occupy within the geographic scope of the Raptors MOU. To achieve this, we generated a hexagonal grid covering the entire range of the Raptors MOU, with each hexagon having a maximum width of 100 km. We then calculated the proportion of each hexagonal cell that is covered by the List of Sites. For this analysis where sites overlapped, we merged the overlapping polygons into a single composite polygon, ensuring the total area covered by all original sites was retained. For the 27 sites listed in the List of Sites for which only point location data were

available, we created estimated site boundaries by buffering each point. The radius of each buffer was set so that the resulting circular area matched the median area of all sites in the List of Sites with known boundaries.

The global coverage of the List of Sites is highly variable (Fig 19). There are obviously large areas where the site coverage is zero (depicted by the dark purple hexagons) and areas where 100% of the hexagon is covered by a site. There are large patches of 100% coverage in the Sahara and Eastern China due to a small number of very large IBAs. In the Sahara these sites are Parc National de l'Ahaggar (Algeria); NNR Aïr - Ténéré (Niger); and Ouadi Rimé - Ouadi Achim (Chad). In Eastern China the IBAs are Changtang plateau; Sanjiangyuan Nature Reserve; Area between Qinghai Hu and A'nyêmaqên; and Eastern Qilian Shan mountains. Intermediate colours (greens/blues) represent grid cells with intermediate site coverage. Continental Europe is an area with intermediate coverage over a large area due to a large number of smaller IBAs and SPAs. Other areas of more widespread intermediate coverage include: the Himalayas; the Levant region of the Middle East, East Türkiye and the Caucasus; and the region between Kazakhstan and Mongolia that incorporates these two countries as well as part of Russia and China.

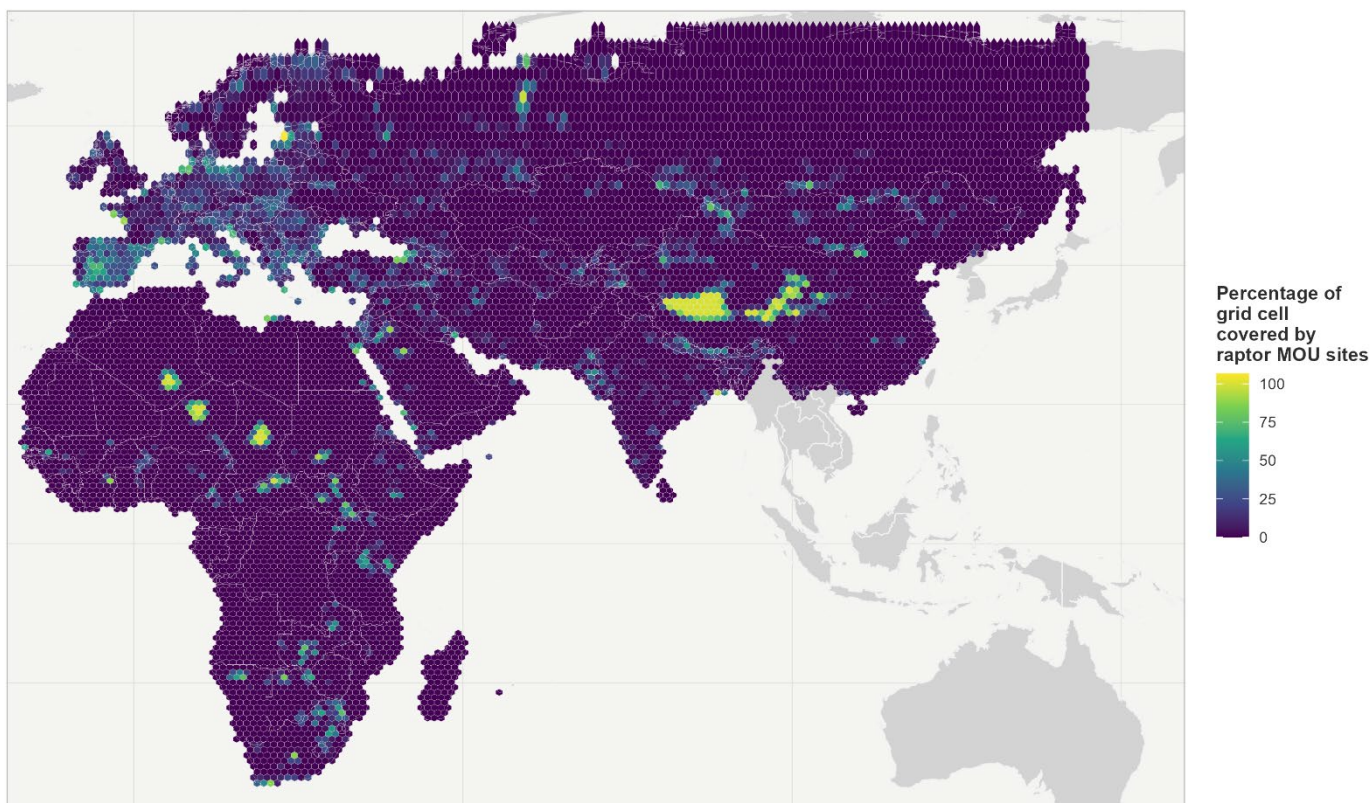


Figure 19. Map depicting the percentage of each grid cell this is covered by sites listed on the List of Sites (Table 3) of the Raptors MOU. Note the deepest purple grid cells indicated 0% coverage.

10. Habitats for migratory raptors

Migratory raptors are found in a very wide variety of different habitats. While some individual species, like merlin, are able to exploit a variety of habitat types, others, like northern goshawk or marsh harrier are more specialists. Many migratory raptor species have relatively specific nest site requirements, with several species showing a strong association with cliffs. However, observed nest-site use can also be shaped by human disturbance and historical persecution, and some species may be capable of using a wider range of nesting sites than is suggested by their current distribution (Martínez-Abraín et al. 2021; Baumbusch et al. 2026). BirdLife International records the habitats used by the world's bird species following the standard terms used in the IUCN Red List Habitats (Version 3.1)⁴¹ with a similar hierarchical structure of two levels as previously showed for threats. The two levels of the hierarchy are self-explanatory, as they use familiar habitat terms that take into account biogeography and latitudinal zonation. Moreover, each habitat is scored regarding its importance for the species as suitable, major, marginal, or unknown. For this report, only habitats recorded as 'Suitable' and 'Major importance'⁴² are included. 'Suitable' meaning that the species occurs in the habitat regularly or frequently and 'major' meaning that the habitat is suitable, and furthermore it is important for the survival of the species.

The analysis included three species groups: Annex 1, Category 1, and Category 2. For each species, a total value of one was allocated across all suitable habitat categories. Where a species was associated with both importance classes within the same habitat, its contribution was split equally between them, so that the total contribution for that species-habitat combination remained one. Weighted species counts were then calculated for each habitat category by summing these contributions across species. In the graphs, habitats are ordered by the decreasing total number of species for which each habitat is considered of major importance.

Across the different species groupings, four Level 1 habitats consistently ranked highest in importance: forest, grassland, savanna, and rocky areas (Fig.20). This highlights the importance of these habitat types for a large proportion of species covered by the Raptors MOU, and therefore the relevance of their conservation. Additional graphs for Level 2 habitats and Category 2 species are provided in the Annex B to this document.

Forest habitats are especially important since most raptors depend on forests for survival and widespread forest loss driven by agriculture and logging since 2001 has left forest-dependent raptor species, including some Raptors MOU Annex 1 species, with only half of

⁴¹ <https://www.iucnredlist.org/resources/habitat-classification-scheme>

⁴² <https://datazone.birdlife.org/about-our-science/terms-and-definitions#habitat>

forest cover (O'Bryan et al. 2025). Protecting these critical habitats is essential to conserving raptor populations.

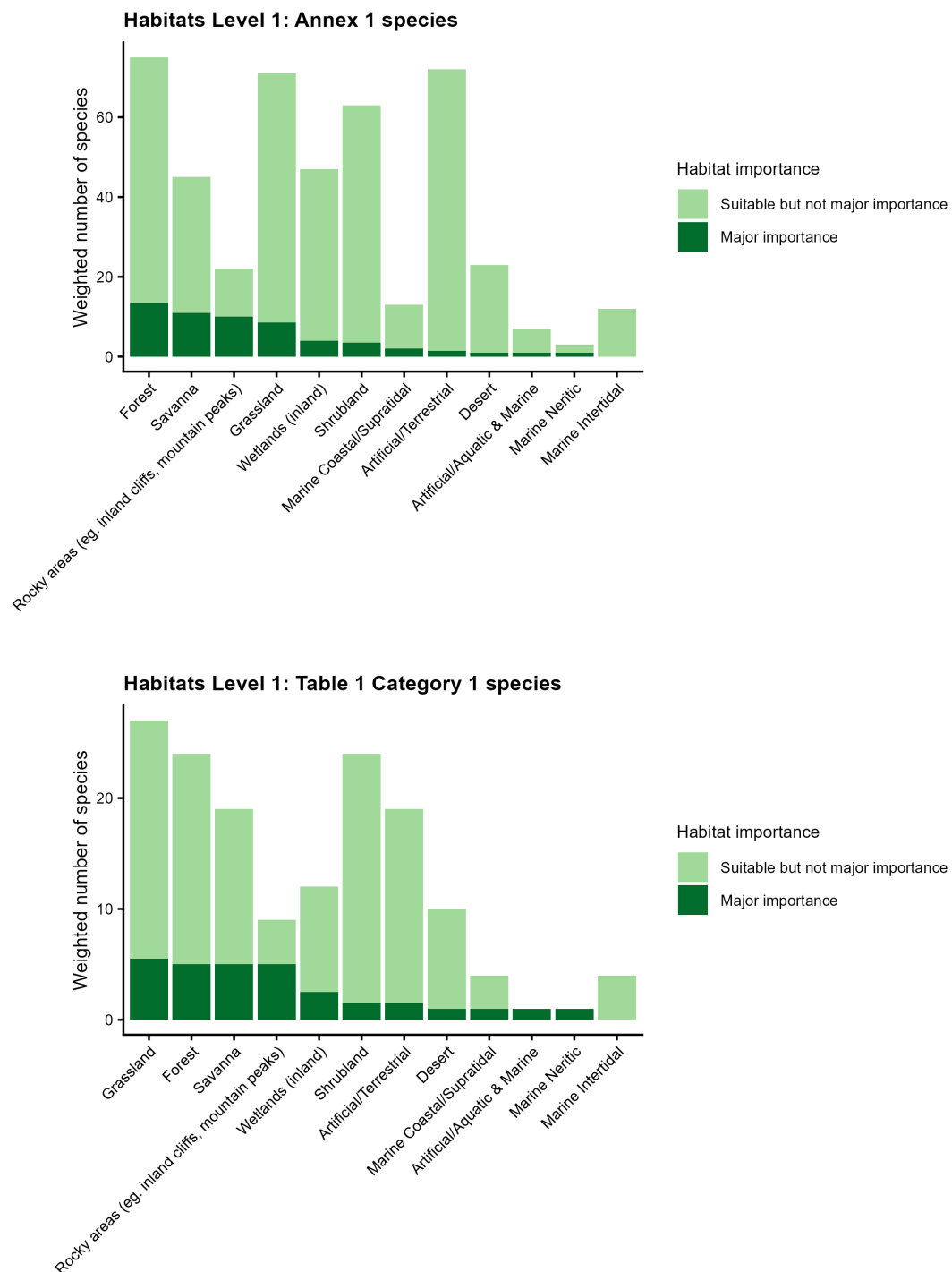
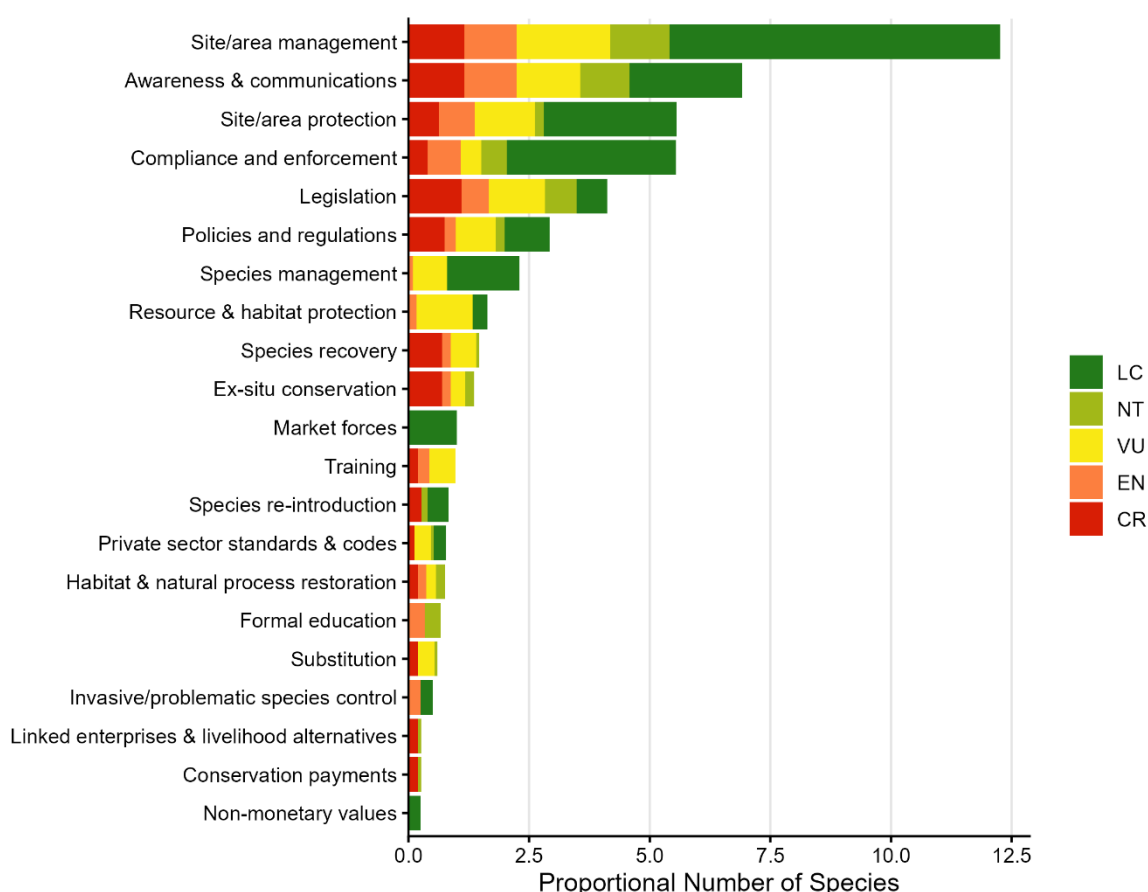


Figure 20. Level 1 Habitat preferences for (top) Annex 1 species and (bottom) Annex 3, Table 1 Category 1 species.

11. Conservation actions

In its role as IUCN Red List Authority for birds, BirdLife International documents and categorises the conservation actions required to safeguard all globally threatened and Near Threatened species across the species' range. Analysing the most recent information on conservation actions from the data associated with the 2025 IUCN Red List assessment, the most frequently reported conservation actions needed across Annex 1 species are in the categories of site/area management, awareness and communications, site/area protection, compliance and enforcement, legislation, and policies and regulations (Fig. 21). For the Critically Endangered species, species recovery and ex-situ conservation actions are also frequently reported to be required. Note that Fig. 21 scales the data so that multiple actions per species are weighted equally. For insights regarding the conservation actions, see CSAR1⁴³.

In the remainder of this section, we will focus on the case studies showcasing that conservation actions for raptors can be effective.



⁴³https://raptors.cms.int/sites/default/files/document/MOS3_DOC.%2012.3_Annex%201_Conservation%20Status%20Assessment%20Report_EN.pdf

Figure 21. Assessment of conservation actions needed for Annex 1 species in relation to their IUCN Red List status.

11.1 Case Study 1: Flyway-Scale Collaboration to Conserve the Balkan Egyptian Vulture

The Egyptian vulture has suffered a steep decline in the Balkans, with adult territorial birds dropping from 204 in 2006 to 105 in 2022. As a long-distance migrant along the Eastern Mediterranean flyway, this population faces multiple threats across breeding, stopover, and wintering grounds, making conservation a challenge that no single country can tackle alone.

Between 2012 and 2022, two major LIFE Programme projects (*Return of the Neophron*⁴⁴ & *Egyptian Vulture New LIFE*⁴⁵) brought together an alliance of conservation organisations across Europe, the Middle East, and Africa. Their goal was to stabilise the Balkan breeding population through targeted, coordinated action along the entire migratory route.

Key measures included action to reduce poisoning and persecution, mitigate risks from power infrastructure, support breeding and population reinforcement, and strengthen monitoring and engagement. Anti poison dog units located and removed toxic baits and carcasses, while a poisoning database and sensitivity maps helped target prevention efforts. Advocacy also contributed to reducing the use of harmful veterinary drugs, and anti-poaching campaigns in hunting hotspots such as Lebanon led to measurable declines in shooting. More than 1,600 dangerous electricity poles and pylons were insulated, preventing further electrocution incidents at treated sites. Supplementary feeding stations provided safe food for many breeding pairs, nest guarding programmes protected chicks, and captive bred vultures were released using delayed release methods to improve survival (see also Raptors Reintroduction and Reinforcement Programmes: Experience from the field⁴⁶). GPS tracking of 60 vultures identified important threats along migration routes, while outreach campaigns and training for rangers, veterinarians and enforcement officers strengthened local capacity and public support across several countries.

The results so far have been encouraging. Since 2014, adult annual survival had risen from 93.7 % to 95.5 %, juvenile monthly survival from 83.3 % to 91.4 %, and population growth has shifted from decline (0.939) to stability (1.005) after 2018 (Oppel et al. 2024). Despite this success, the population remains only half its 2006 size. Oppel et al. (2024) conclude that ongoing and coordinated management along the flyway, combining threat mitigation, reinforcement, and habitat support, is essential not just to prevent further decline, but to

⁴⁴ <https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE10-NAT-BG-000152/urgent-measures-to-secure-survival-of-the-egyptian-vulture-neophron-percnopterus-in-bulgaria-and-greece>

⁴⁵ <https://www.lifeneophron.eu/#home>

⁴⁶ <https://raptors.cms.int/publication/raptors-reintroduction-and-reinforcement-programmes-experience-field>

enable recovery. The Balkan Egyptian vulture case demonstrates how sustained, multinational cooperation can halt a decline in a migratory species, turning years of loss into a foundation for long-term survival.

11.2 Case Study 2: Flyway-Scale Conservation of the Eastern Imperial Eagle (Pannonian Region)

The eastern imperial eagle is most populous in the Carpathian Basin, especially Hungary, which in 2010 held 62% of the EU's nesting pairs (around 117). Its survival is jeopardized by poisoning, electrocution, habitat loss, shooting, and disturbance. To reduce mortality and support population recovery, the LIFE project⁴⁷ "Conservation of the Eastern Imperial Eagle by decreasing human-caused mortality in the Pannonian Region" launched at the end of 2016. Coordinated by BirdLife Hungary, it expanded conservation efforts across Hungary, Slovakia, Czechia, Austria, and Serbia.

PannonEagle LIFE built on anti-poisoning and monitoring methods developed during the preceding HELICON LIFE project in Hungary and extended them across the Pannonian region. Under HELICON, a specialist detection-dog unit conducted more than 500 field surveys and household surveys, while satellite tracking and a DNA database based on shed feathers were used to investigate mortality and identify areas with unusually high turnover of territorial eagles. PannonEagle expanded this work through additional detection-dog units, standardised field, veterinary and police investigation protocols, continued genetic monitoring, satellite and GPS tracking, and stronger regional cooperation. In Serbia, conservation organisations and volunteers also installed artificial nesting platforms to support the small breeding population, while young eagles were fitted with tracking devices to improve understanding of their movements and mortality risks. Coordinated censuses, conferences and awareness activities further strengthened cooperation across participating countries. During the PannonEagle project period, the known Pannonian population increased from approximately 270 breeding pairs in 2016 to 482 pairs in 2022⁴⁸. This case underscores how multi-country collaboration, backed by law enforcement, field protocols, tracking technology, and public engagement, can significantly reduce human-caused mortality and foster recovery, even for migratory species facing widespread threats.

⁴⁷ <https://imperialeagle.eu/>

⁴⁸

https://www.imperialeagle.eu/sites/default/files/pannoneagle_life_afterlife_plan.pdf?utm_source=chatgpt.com

11.3 Case Study 3: Flyway-Scale Conservation of the Saker Falcon in Bulgaria & Southern Romania

The saker falcon has seen dramatic declines in Europe and is globally Endangered and the subject of a Global Action Plan⁴⁹. In Bulgaria, the species experienced population decline, leaving only one known nesting pair by 2010. In Romania, core populations fared only slightly better, though a handful of breeding pairs remained, particularly near border zones with Bulgaria and the Pannonian basin. Between 2010–2014, the LIFE 09 project “Falco cherrug B-H-R-S⁵⁰” in Hungary, Slovakia, Bulgaria, Romania laid the groundwork for population recovery by implementing best practices across four nations. More recently, the LIFE 20 project “LIFE for Falcons⁵¹” (2021–2026) has been reinforcing and expanding these efforts in Bulgaria and southern Romania.

Key conservation measures focused on reducing electrocution and persecution, improving nesting and feeding habitats, strengthening monitoring, and engaging local communities. The earlier LIFE 09 project insulated nearly 9,000 pylons, while the current LIFE 20 project aims to treat at least 300 more. Managed pigeon lofts were established to provide falcons with an alternative source of pigeons, with the aim of reducing predation on privately owned birds and associated illegal persecution by pigeon keepers. In parallel, training and awareness activities reached more than 1,000 hunters, and several persecution cases were investigated. LIFE 09 also installed 150 nest boxes, with approximately 120 installed under LIFE 20. Habitat work includes restoring and managing 100 hectares of grassland and acquiring another 100 hectares, while prey restoration has involved ground squirrels and planned reintroductions of sousliks, Romanian hamsters and wild pigeons. Satellite tracking of juveniles has improved understanding of wide-ranging movements and informed conservation across the flyway. The projects have also produced guidance on wind farm siting and bird safe pylon design and raised awareness through numerous outreach activities.

Thanks to LIFE 09, breeding and feeding opportunities expanded, infrastructure was improved, and populations in core regions stabilized. LIFE 20 builds on these achievements, focusing on threat reduction, prey and habitat restoration, community engagement, and enhancing nesting options to enable natural recolonization and recovery across the Bulgaria–Romania region.

⁴⁹ <https://raptors.cms.int/publication/saker-falcon-falco-cherrug-global-action-plan-sakergap>

⁵⁰ <https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE09-NAT-HU-000384/conservation-of-falco-cherrug-in-northeast-bulgaria-hungary-romania-and-slovakia>

⁵¹ <https://saveraptors.org/the-project>

In parallel, a reintroduction programme led by Green Balkans and supported by the Mohamed bin Zayed Raptor Conservation Fund has been working to restore the saker falcon as a breeding species in Bulgaria⁵². Following earlier feasibility work and pilot releases, the programme established captive breeding and systematic releases using birds of European origin. Between 2020 and 2024, 84 captive-bred saker falcons were released. By 2024, three wild breeding pairs had become established in Bulgaria, all originating from released birds, meeting the programme's target of establishing 2-4 breeding pairs. The programme also developed breeding facilities, equipment and trained staff to support future raptor reintroductions and population reinforcement (Dixon et al. 2025).

These projects exemplify how cross-border action, recovery of prey species, technical innovations, law enforcement, and community outreach, can reverse declines and pave the way for long-term population recovery of migratory raptors.

12. Knowledge gaps

Following a similar structure to threats and habitats datasets held by BirdLife International, a hierarchical system is implemented to categorise gaps in our knowledge of species. In the dataset associated with the 2025 IUCN Red List, two thirds of the 94 species currently included in Annex 1 have an assessment of priority areas of research. Fig. 22 shows the number of species for which a particular area of research, monitoring or conservation planning has been identified as a priority (several of these areas can be identified for a single species). Note that Fig. 22 scales the data so that multiple knowledge gaps per species are weighted equally.

⁵² <https://www.iucn-ctsg.org/wp-content/uploads/2025/12/ctsg-book-axel-moehrenschlager-2025.pdf>

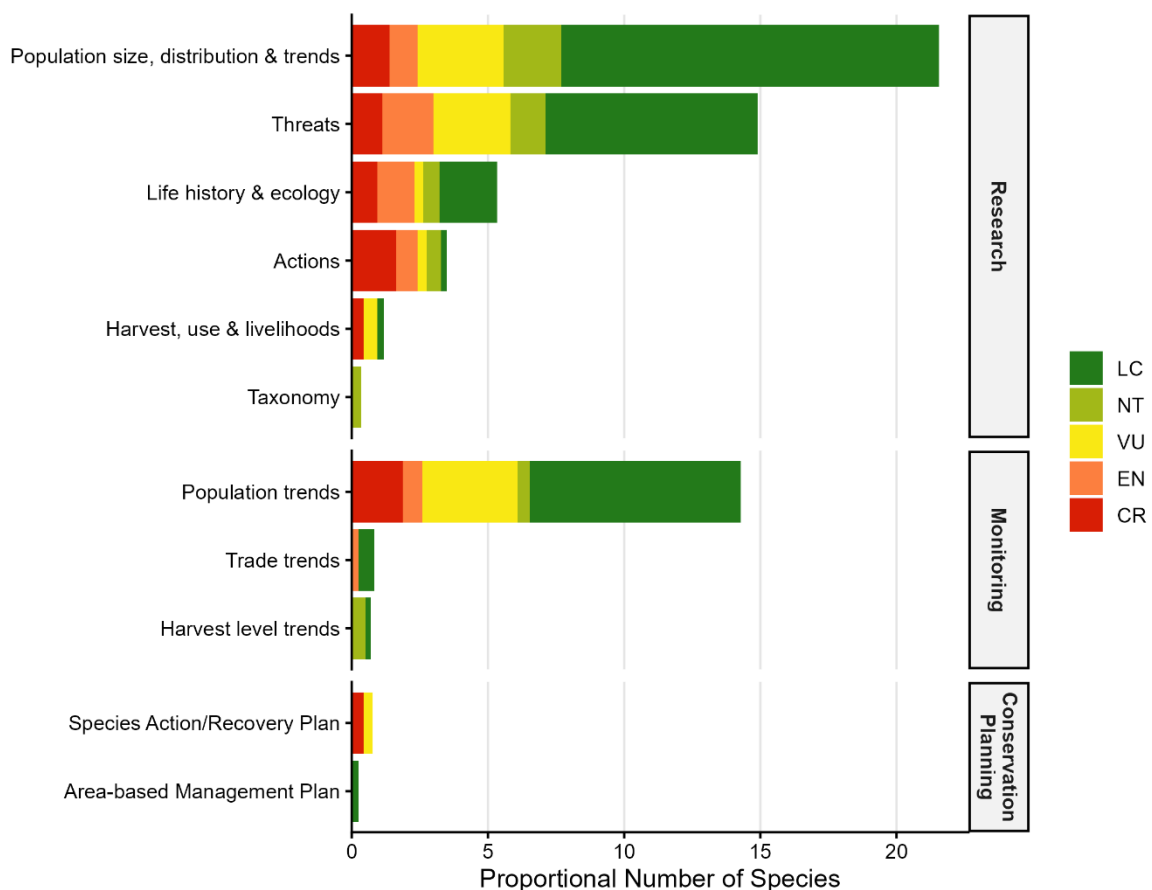


Figure 22. Priority areas of research of Annex 1 species

Despite the importance of assessing conservation status and tracking effectiveness of conservation action, some of the most frequently highlighted gaps relate to population size and trends from both research and monitoring perspectives with most species having this as a priority gap. There is a concerning lack of information for many threatened species. Other main gaps include threats, life history & ecology, and actions. In order to conserve migratory raptors effectively we need basic, reliable information on species' ecology, population size and population trends, the threats they face, and the conservation actions required to address them. For many Raptors MOU species, this information remains incomplete, geographically biased, or absent. Important gaps also remain in knowing whether recommended actions have been implemented and, where they have, whether they have been effective. These limitations constrain our ability to prioritise and implement appropriate conservation actions, evaluate their success, ensure species are categorised in the Raptors MOU in a way that reflects their status across regions and coordinate interventions across flyways.

The remainder of this section places these findings within a broader set of selected research and monitoring priorities. These include geographic and taxonomic biases in research,

incomplete ecological knowledge and uncertain migratory status, the lack of coordinated long term population monitoring, limited understanding of threat exposure and cumulative impacts across the annual cycle, emerging and overlooked threats, and gaps in knowledge of socioeconomic and governance factors.

12.1 Geographic and taxonomic bias in research and monitoring

Research and monitoring remain uneven across the geographic range of the Raptors MOU, with a relatively small number of countries, subregions and species accounting for much of the available evidence. Geographic gaps in raptor monitoring are reinforced by uneven capacity among countries, including differences in funding, technical expertise, personnel, accessibility and security⁵³. This creates important gaps in range wide assessments and may limit the ability of the MOU to identify and prioritise the species and populations of greatest conservation concern. Research on vultures is despite over 500 papers included in the Mid Term Implementation review of the Review of the Vulture MsAP⁵⁴ strongly concentrated in southern Africa and South Africa in particular, while species such as the white-headed vulture *Trigonoceps occipitalis*, lappet-faced vulture *Torgos tracheliotos* and Rüppell's vulture *Gyps rueppellii* remain poorly represented in single species studies (Daniels et al. 2025). Similar biases occur across raptors more broadly, with a small proportion of species receiving a large share of research attention and many species, particularly those with restricted ranges or occurring in less developed countries, receiving little or no study. Recent efforts have helped address some of these gaps for priority species, including special issue on saker falcon⁵⁵ and sooty falcon⁵⁶ Buechley et al. (2019) highlight that Latin America, Africa and Southeast Asia contain especially high concentrations of research priorities but often have limited capacity to address them). These gaps may delay the detection of population declines and emerging threats and reduce the likelihood of timely conservation action. McClure et al. (2023b) suggests that research and monitoring should therefore be directed towards poorly studied species and regions, particularly in the Global South, while supporting local institutions to develop long term monitoring programmes. Where possible, these programmes should follow standardised methods, test clear hypotheses about the causes of population change and promote data sharing and collaboration across countries and organisations (McClure et al. 2023b). Lack of resources for monitoring and research can perpetuate knowledge gaps in parts of the MOU geographic extent which affect our ability at flyway scale to detect declines and understand threats in time to address them

⁵³ <https://raptors.cms.int/sites/default/files/publication/Raptors%20MOU%20-%20Assessing%20capacity-building%20needs%20for%20raptor%20conservation%20in%20Africa%20and%20Eurasia.pdf>

⁵⁴ despite the over 500 paper listed in the Mid Term Implementation review of the Review of the Vulture MsAP

⁵⁵ [http://www.ornis.hu/?contents&lang=eng&idd=49&vol=2025_33\(1\)](http://www.ornis.hu/?contents&lang=eng&idd=49&vol=2025_33(1))

⁵⁶ [http://www.ornis.hu/?contents&lang=eng&idd=52&vol=2026_34\(1\)](http://www.ornis.hu/?contents&lang=eng&idd=52&vol=2026_34(1))

effectively. Signatories could consider how bilateral or flyway scale resource transfer and capacity strengthening between Signatories could be facilitated to help address this issue.

12.2 Incomplete basic ecological knowledge and uncertain migratory status

For numerous raptor species basic ecological questions remain unanswered or poorly documented. For many species it is unclear what proportion of individuals makes regular seasonal long-distance movements, where are critical stopovers, and how strongly breeding and non-breeding subpopulations connect. This knowledge is key to understand how threats impact different populations and to develop effective conservation interventions. In Africa and Asia, several species have poorly documented seasonal movements, meaning it is unclear whether they meet the CMS/Raptors MOU definition of “migratory” in any parts of their ranges. Such knowledge gaps may prevent inclusion of species in Annex 1 of the MoU and limit cross-border or flyway scale cooperation for their conservation. Addressing these knowledge gaps will require further investment in research on movements of these species by tracking individuals using GPS, GSM or light level geolocators, as well as monitoring, potentially including coordinated counts to help clarify what proportion of each population migrates and better understand population connectivity. Identifying distinct biogeographic populations may also help target monitoring and conservation efforts towards those populations where they are most needed, rather than relying solely on species-level assessments.

12.3 Lack of coordinated long-term population monitoring

Across Africa, bird monitoring remains fragmented and uneven, with many schemes limited in spatial or taxonomic coverage and constrained by short-term funding, highlighting the need for more coordinated, standardised and sustained monitoring across countries (Atkinson et al. 2026).

While waterbirds are systematically monitored under the International Waterbird Census, long-term monitoring of migratory raptors is more variable across the African–Eurasian flyway. Extensive breeding-population monitoring exists in parts of Europe, and regular migration counts are conducted at several major bottlenecks, but important geographic, taxonomic and seasonal gaps remain, particularly outside well-monitored regions. Longitudinal monitoring of population sizes is often lacking for many migratory populations and is crucial to identifying population declines. Additional parameters (e.g. breeding productivity, immigration/emigration, survival) can help understand population declines. Where monitoring has been scaled and coordinated, it can detect changes and show the effectiveness of conservation actions, e.g. Egyptian vulture in the Balkans (Oppel et al. 2023). Without reliable information on the scale and direction of population change, declines may go unnoticed and the outcomes of interventions cannot be properly assessed. Standardised monitoring should therefore be established, with particular priority given to poorly understood species and regions, using minimum protocols that remain practical in areas with limited capacity, such as breeding-territory occupancy surveys and standardised counts at migration bottlenecks. Monitoring at bottleneck sites can provide an efficient means of assessing population trends for migratory raptors that are difficult to survey across

their breeding ranges, although counts need to be repeated, standardised and coordinated across sites to account for variation in weather, observer effort and migration routes (Jobson et al. 2021). Where resources allow, these approaches should be complemented by more detailed estimates of breeding productivity and survival obtained through mark–recapture studies or telemetry. A consortium linking existing monitoring schemes and key migration bottlenecks could further improve coverage and coordination for raptors, whose wide-ranging movements and generally low population densities make effective monitoring difficult (Jobson et al. 2021).

12.4 Threat quantification, interactions and cumulative impact across the annual cycle

Migratory raptors are exposed to different threats across breeding, migration and wintering areas (see section 8). These threats are numerous and include poisoning, persecution, and collisions, among others (Madden et al. 2019; Slater et al. 2020; Gomez et al. 2022; Bullock et al. 2024). These threats can also interact, for example habitat loss can increase collision/exposure risk, climate change can shift migration timing and exposure to new threats. Spatially explicit assessments of threat exposure are still lacking for many raptor species, and even fewer studies evaluate cumulative impacts or project how exposure may change in the future. This limits the ability to direct conservation effort towards the threats causing the greatest mortality or reproductive failure in particular populations, seasons and regions. Stronger evidence will require coordinated necropsy and contaminant surveillance that links mortality to causes such as pesticides, deliberate poisoning, veterinary drugs, pathogens such as Highly Pathogenic Avian Influenza, or collision/ electrocution on energy infrastructure with results brought together to support regional threat mapping. GPS telemetry should also continue to be used to estimate threat specific mortality across species, seasons and geographic areas, supported by shared systems for submitting and managing tracking data or collaborations to collate and analyse such data (Serratosa et al. 2024). These data could then inform population viability analyses and spatially explicit models that incorporate multiple threats and climate projections, helping to identify interventions with the greatest likely benefit at population level.

12.5 Assessing emerging and overlooked threats

New threats emerging to migratory raptors that could counteract ongoing conservation efforts. The recent HPAI outbreaks since 2021 have demonstrated that disease can cause substantial mortality in raptors, particularly scavengers and predators that consume infected birds. The spatial extent and population-level consequences remain incompletely quantified for many migratory raptors; surveillance and integration with population models are needed. Other threats may also be known but their full impact remains unquantified. Widespread use of organophosphate/carbamate pesticides and other agrochemicals pose substantial, often cryptic risks. Although the effects of veterinary NSAIDs on South Asian vultures are well documented, current large-scale surveys of contaminants and emerging diseases remain limited. This is a particular concern for long lived raptors because additional mortality among adults can lead to rapid population declines. Effective management

requires better information on the frequency of exposure, effects on survival and reproduction, sublethal impacts, and periods and areas of greatest risk. HPAI testing should therefore be incorporated into existing necropsy networks, supported where possible by serological and virological testing and by telemetry studies that estimate both immediate mortality and longer-term demographic effects. Contaminant sampling of dead raptors and their prey should also be expanded, with harmonised laboratory methods and closer links to studies of pesticide and veterinary drug use.

12.6 Socio-economic and governance gaps

The root causes of many threats to migratory raptors (e.g. poisoning, unsafe veterinary drugs, conflict zones) are socio-political. At the same time, conservation actions often lack impact because of limited local capacity, funding instability, and sociopolitical constraints (e.g. conflict zones, weak enforcement). These governance and socio-economic factors are generally under-researched relative to ecological issues. Without addressing the underlying socioeconomic drivers of threats, including human wildlife conflict, access to and use of toxic drugs and chemicals, and markets for wildlife parts, ecological measures are unlikely to achieve lasting success. The Killing 3.0 report (BirdLife International 2025) and Understanding the Drivers and Motivations behind IKB in the Mediterranean Region⁵⁷ also highlights the need to address the social and institutional drivers of illegal killing alongside enforcement measures. Greater investment is needed in social science research to understand the causes of poisoning, illegal killing and unsafe veterinary drug use, and to develop interventions jointly with affected communities through engagement, incentives and alternative livelihoods. Conservation work should also be more closely integrated with public health, veterinary and agricultural sectors, particularly in relation to disease and pesticide risks.

13. International species action plan gaps

Species action plans are an important tool in achieving conservation outcomes and international cooperation for migratory raptor species. Since MOS3⁵⁸ the Global Action Plan for the Conservation of the Steppe Eagle (*Aquila nipalensis*) (2026-2035) and the International Single Species Action Plan for the Sooty Falcon 2024 – 2036, both endorsed by CMS Parties, have been published.

Two regional action plans were put forward including the West African Vulture Conservation Action Plan 2023-2043 endorsed by CMS which focuses on six species of vulture found in West Africa: Egyptian vulture (*Neophron percnopterus*), hooded vulture (*Necrosyrtes monachus*), lappet-faced vulture (*Torgos tracheliotos*), Rüppell's vulture (*Gyps rueppelli*), white-backed vulture (*Gyps africanus*) and white-headed vulture (*Trigonoceps occipitalis*),

⁵⁷ <https://www.cms.int/publication/understanding-drivers-and-motivations-behind-ikb-mediterranean-region>

⁵⁸ https://raptors.cms.int/sites/default/files/document/MOS3_Doc.15.3%28Rev.1%29_TAG%20Workplan%202023-2026_EN.pdf

and the Southern African Development Community (SADC) Vulture Conservation Strategy and Action Plan (VCSAP) 2025-2035 which includes Egyptian vulture (*Neophron percnopterus*), hooded vulture (*Necrosyrtes monachus*), lappet-faced vulture (*Torgos tracheliotos*), Rüppell's vulture (*Gyps rueppelli*), white-backed vulture (*Gyps africanus*), white-headed vulture (*Trigonoceps occipitalis*) and cape vulture (*Gyps coprotheres*). In addition, an NGO-led Black Harrier Conservation Action Plan for South Africa in 2025 has been developed.

While vulture species seems to be well covered by action plans, the focus should be given especially to those Category 1 species without an action plan including Beaudouin's snake-eagle (*Circaetus beaudouini*), tawny eagle (*Aquila rapax*), Pallas's fish-eagle (*Haliaeetus leucoryphus*), and Steller's sea-eagle (*Haliaeetus pelagicus*).

14. Conclusions

This Conservation Status Assessment Report shows that urgent action is needed to improve the conservation status and population trajectories of the 94 species listed on Annex 1 at MOS3. Around one third (34%) of Annex 1 species are globally classified as Critically Endangered, Endangered, Vulnerable or Near Threatened and are therefore listed as Category 1 in the Raptors MOU Table 1, Annex 3. Vultures remain the most threatened group globally, including eight Critically Endangered species and with 93% of species classified as globally threatened or Near Threatened. At the regional level, the picture is more variable. In Europe, 23% of Annex 1 species are regionally threatened or Near Threatened, with particularly high proportions among eagles and falcons. The conservation status of seven Annex 1 species has improved, and although some changes reflect improved knowledge rather than genuine population change, there are encouraging indications that conservation measures are helping to slow or reverse declines in some European populations. In contrast, the situation remains particularly concerning in Africa, where 87% of the 23 Annex 1 species assessed are declining.

Signatories have a range of mechanisms available to support collective action, but the main threats need to be addressed more urgently, and cooperation strengthened with other Signatories and Range States. Agriculture and aquaculture and biological resource use are among the major broad threat categories affecting Annex 1 species globally, with annual and perennial non-timber crops and hunting and trapping of terrestrial animals particularly prominent. These pressures are compounded by emerging threats, some of which are discussed in this report. Threats can also interact: habitat loss may increase exposure to infrastructure and collision risk, while climate-driven changes in migration may alter when and where species encounter threats. Better understanding of cumulative and changing threat exposure will therefore be increasingly important.

In some countries, addressing these threats may require amendments to national legislation to improve protection for migratory raptors, while in many others the greater need is for more effective enforcement of existing laws. Enforcement authorities often lack adequate resources and training, and the detection and reporting of illegal activity frequently depend on NGOs and members of the public. Relatively few cases of illegal killing, taking or trade are brought before the courts, and penalties are even less often applied at a level likely to deter further offences. Training and awareness among members of the judiciary are therefore also important. More broadly, many threats have important social, economic and political drivers, while conservation action can be constrained by limited local capacity, unstable funding, conflict and weak enforcement. Greater integration of social science into raptor conservation could help identify the causes of practices such as poisoning, illegal killing and unsafe veterinary drug use and support the development of interventions with affected communities through engagement, incentives and alternative livelihoods.

Several intergovernmental task forces and associated guidance have already been established under CMS to address major threats, including illegal killing, taking and trade through MIKT⁵⁹ and ITTEA⁶⁰, poisoning⁶¹, and conflicts between energy development and the conservation of migratory birds through the Energy Task Force⁶². Many Signatories already participate in these initiatives, while other Signatory and non-Signatory Range States could benefit from joining, sharing experience and making use of the available guidance.

Species Action Plans also provide an important framework by identifying priority actions that can be implemented within national jurisdictions and in cooperation with other countries. Vultures are relatively well covered by existing international action plans, particularly through the Vulture Multi-species Action Plan, and its continued implementation remains important given their global conservation status. Population trajectories nevertheless differ considerably among regions. Several European vulture populations have stabilised or increased following conservation measures, including reintroductions and improved legal protection, whereas populations elsewhere remain poorly documented or continue to decline. In India, for example, white-rumped vulture, Indian vulture and slender-billed vulture underwent steep declines beginning in the mid-1990s, with recent surveys providing no evidence of sustained population recovery. Alongside stronger implementation of existing plans, particular attention should be given to Category 1 species not currently covered by an international Species Action Plan, including Beaudouin's snake-eagle, tawny eagle, Pallas's fish-eagle and Steller's sea-eagle. For these species, greater international cooperation around shared conservation priorities is needed,

⁵⁹ <https://www.cms.int/en/taskforce/mikt>

⁶⁰ <https://www.cms.int/en/taskforce/ittea>

⁶¹ <https://www.cms.int/en/workinggroup/preventing-poisoning-migratory-birds>

⁶² <https://www.cms.int/en/taskforce/energy-task-force>

and the development of new international Species Action Plans should be considered. The case studies presented in this report under “Conservation actions” demonstrate that focused conservation measures can be highly effective, including reintroduction to parts of a species’ former range. Sharing lessons from such successful cases could help Signatories design and implement similar measures for other declining species. Reversing the declines of Annex 1 migratory raptors will, however, require more than stemming declines within the jurisdictions of current Signatories. Effective conservation measures will also be needed across both present and former Range States where population recovery and range restoration remain possible.

Effective protection of internationally important sites, appropriate habitat management and action to reduce threats within them will be central to supporting Annex 1 populations. The Site Network Report (UNEP/CMS/RAPTORS/MOS4/Doc12.3⁶³) identifies gaps in site coverage for Category 1 species, and together with UNEP/CMS/RAPTORS/MOS4/Doc.14.4⁶⁴ provides opportunities to strengthen the network.

Protection is geographically uneven: Northern and Western Europe have relatively high levels of site protection, whereas important gaps remain particularly in Eastern and Southern Asia, followed by Central and Western Asia and parts of Africa. Forest, grassland, savanna and rocky habitats consistently rank among the most important habitat types for Annex 1 species, highlighting the broad benefits that effective protection and management of these habitats could provide.

Migration bottlenecks are of particular importance because geography, topography, migratory behaviour and physiological constraints can result in a high proportion of a species’ population passing through a relatively small area within a short period. This concentration can make raptors especially vulnerable to illegal shooting and to poorly located infrastructure or other developments capable of causing high mortality. Signatories responsible for such areas therefore have a particular responsibility to reduce threats, manage sites appropriately and avoid granting permission for developments near bottlenecks where impacts on migratory raptors cannot be adequately mitigated.

Substantial knowledge gaps remain despite the prominence and public appeal of raptors. Population size and trends are among the most frequently identified research and monitoring priorities, including for many threatened species, while important gaps also concern threats, life history and ecology, and the effectiveness of conservation actions. These gaps are geographically and taxonomically uneven. Latin America, Africa and Southeast Asia contain particularly high concentrations of research priorities but often have

⁶³ <https://www.cms.int/document/site-network-analysis-priority-species>

⁶⁴ <https://www.cms.int/document/proposed-approach-reviewing-and-updating-table-3-annex-3-raptors-mou>

limited capacity to address them, and basic ecological information remains scarce for numerous species. Long-term monitoring is also uneven across the African–Eurasian flyway. Extensive breeding-population monitoring exists in parts of Europe and regular migration counts are conducted at several major bottlenecks, but substantial geographic, taxonomic and seasonal gaps remain, particularly outside well-monitored regions.

Greater investment in monitoring is therefore needed globally, together with better coordination and exchange of experience among existing monitoring programmes. Tracking technology can provide important additional insights into movements, connectivity and exposure to threats, and the greatest possible use should be made of data obtained from tracked birds. Spatially explicit assessments are particularly needed to identify where and when populations encounter major threats and to understand their cumulative impacts.

Effective conservation of Annex 1 raptors will depend on stronger and more coordinated cooperation among governments, NGOs and other stakeholders. Since MOS3, five new Range States have joined the Raptors MOU partnership: Kazakhstan, Kyrgyzstan, Uganda, Uzbekistan and Zimbabwe. As a result, over 50% of the range states are now Signatories. Existing Signatories and partner organisations can encourage additional Range States to join the Raptors MOU, while countries with experience in monitoring, reintroduction or addressing particular threats can contribute to capacity building through meetings, webinars, training and exchanges. Signatories with greater access to financial resources can support work in lower-income countries or collaborate in raising funds for projects benefiting species of shared concern. NGOs should work with national authorities and local communities to implement projects, support monitoring, reduce threats, develop alternative livelihood opportunities, detect and report illegal activity, raise awareness and help deliver action plans. Prioritising globally threatened and declining species, closing geographic gaps in site protection and monitoring, strengthening implementation of existing conservation instruments, and developing coordinated responses where these remain absent will be central to improving the conservation status of migratory raptors. Through strong national action and sustained cooperation across borders, Signatories can help secure the recovery and long-term conservation of migratory raptor populations.

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16. Annex A

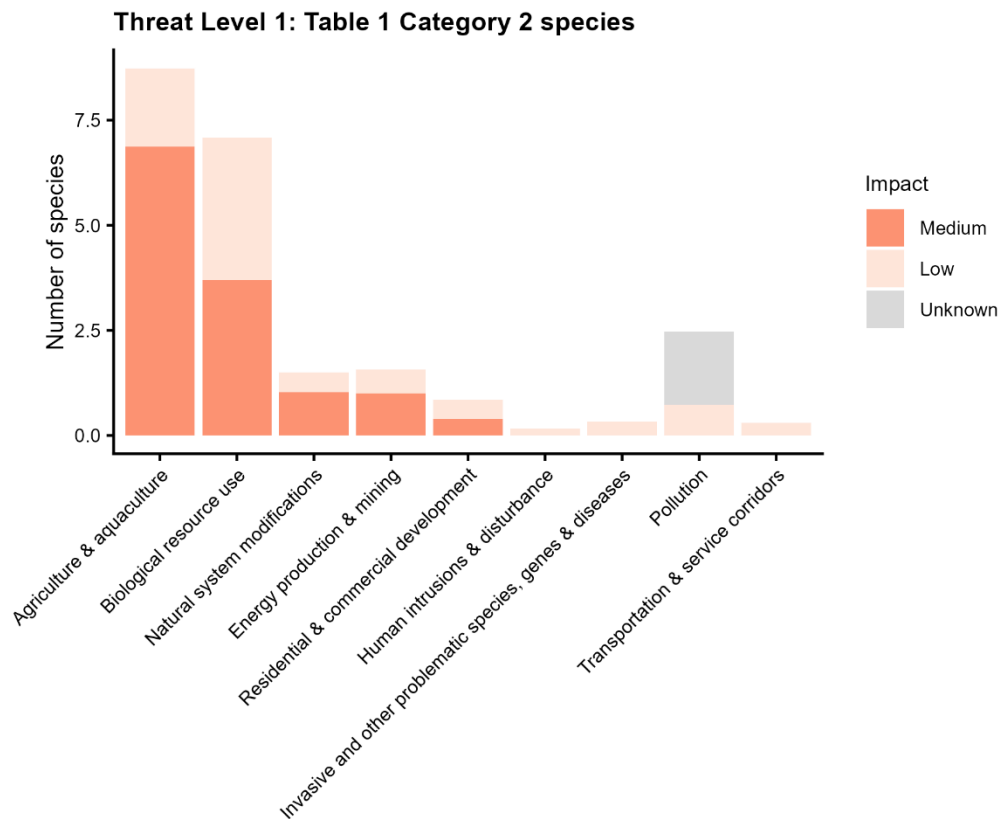
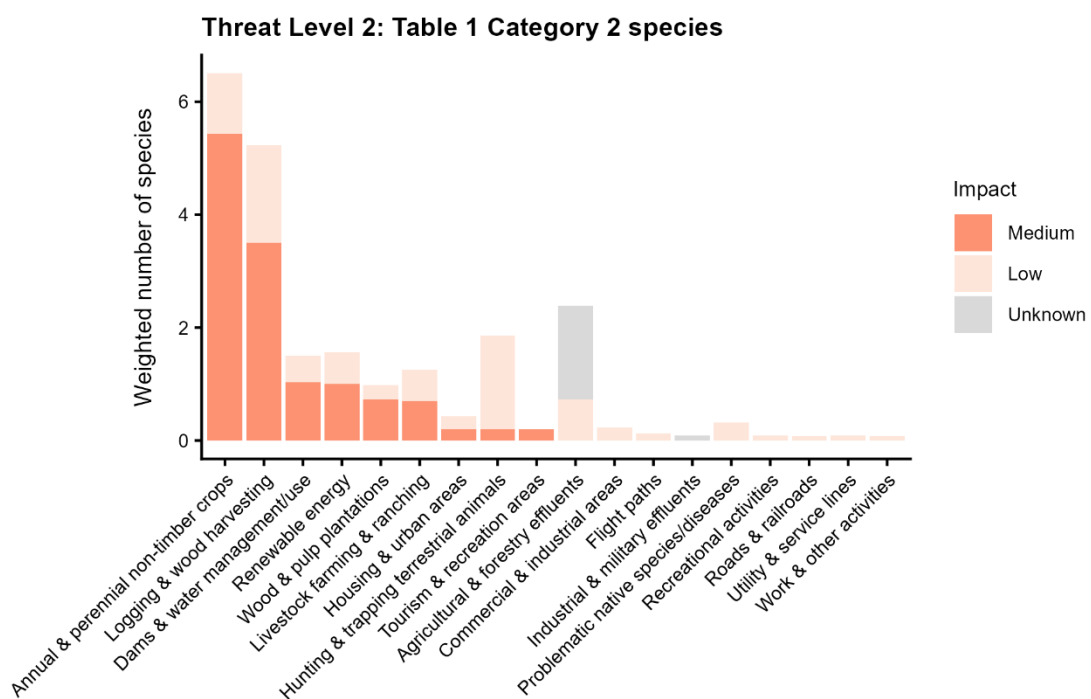


Figure A. (top) Most severe Level 1 threats for Category 2 species and (bottom) most severe Level 2 threats for Category 2 species.

17. Annex B

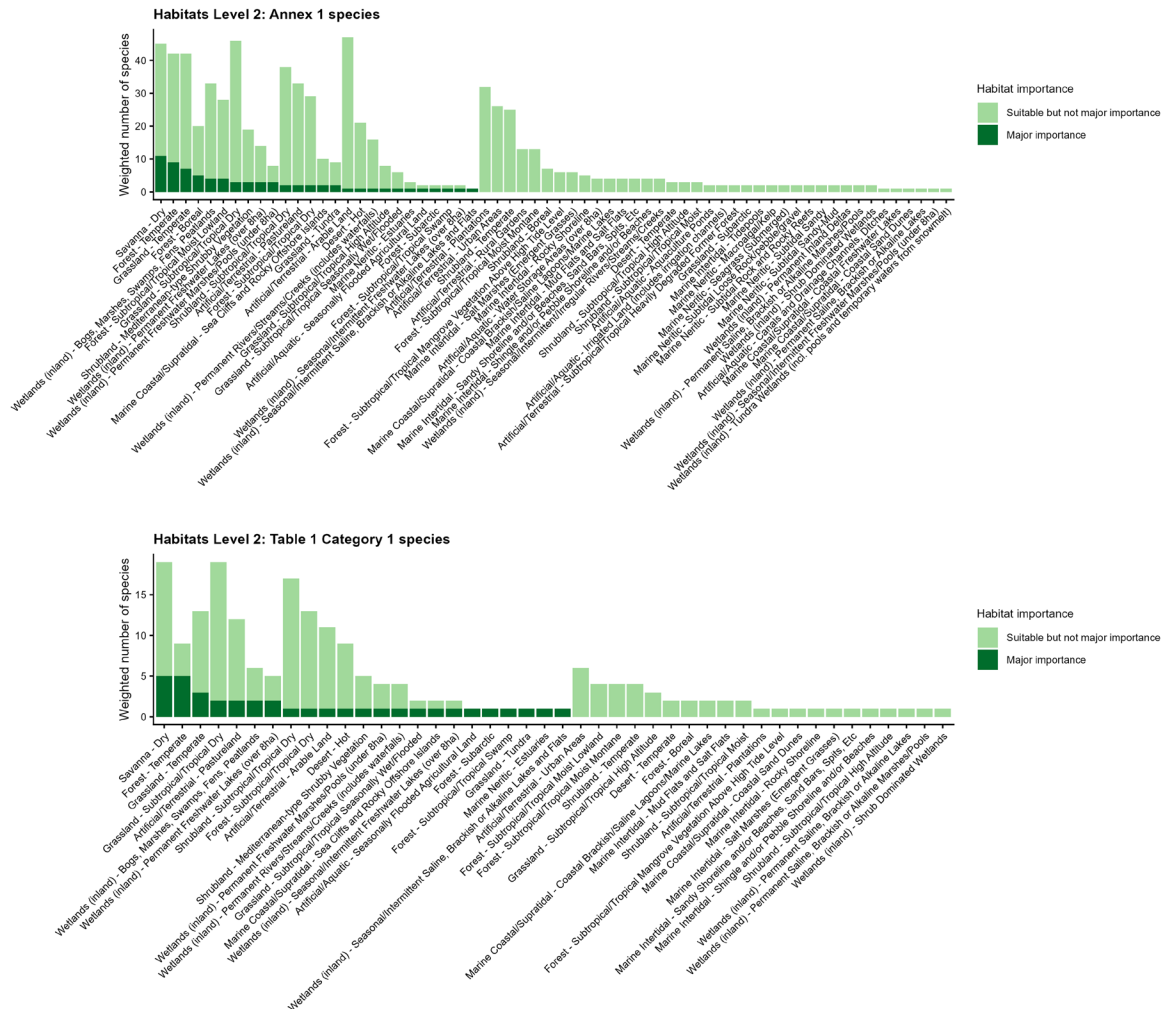


Figure B. Level 2 habitat preferences for (top) Annex 1 species and (bottom) Annex 3, Table 1 Category 1 species.

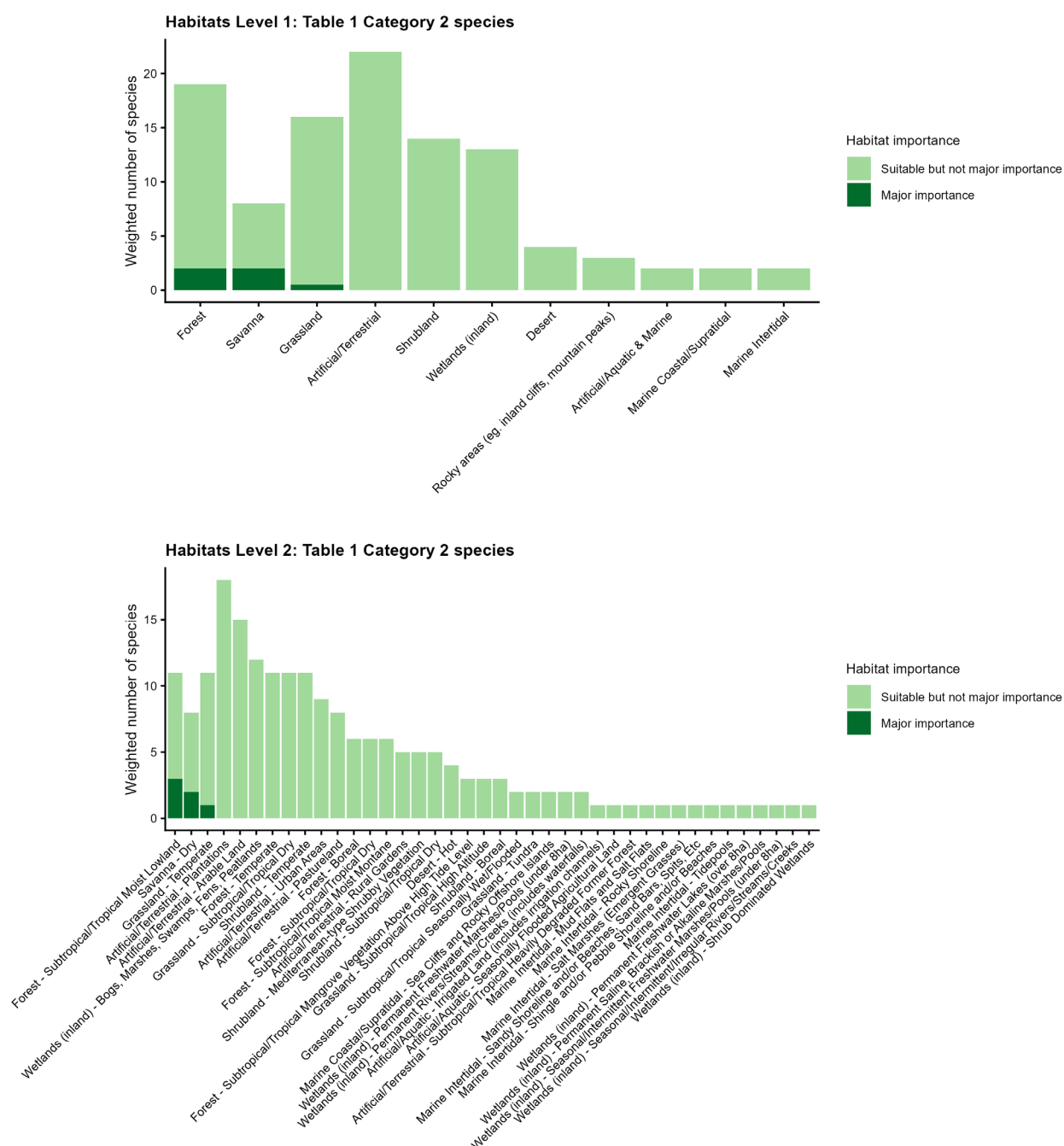


Figure C. (top) Level 1 habitat preferences for Annex 3, Table 1 Category 1 species and (bottom) Level 2 habitat preferences for Table 1 Category 1 species.