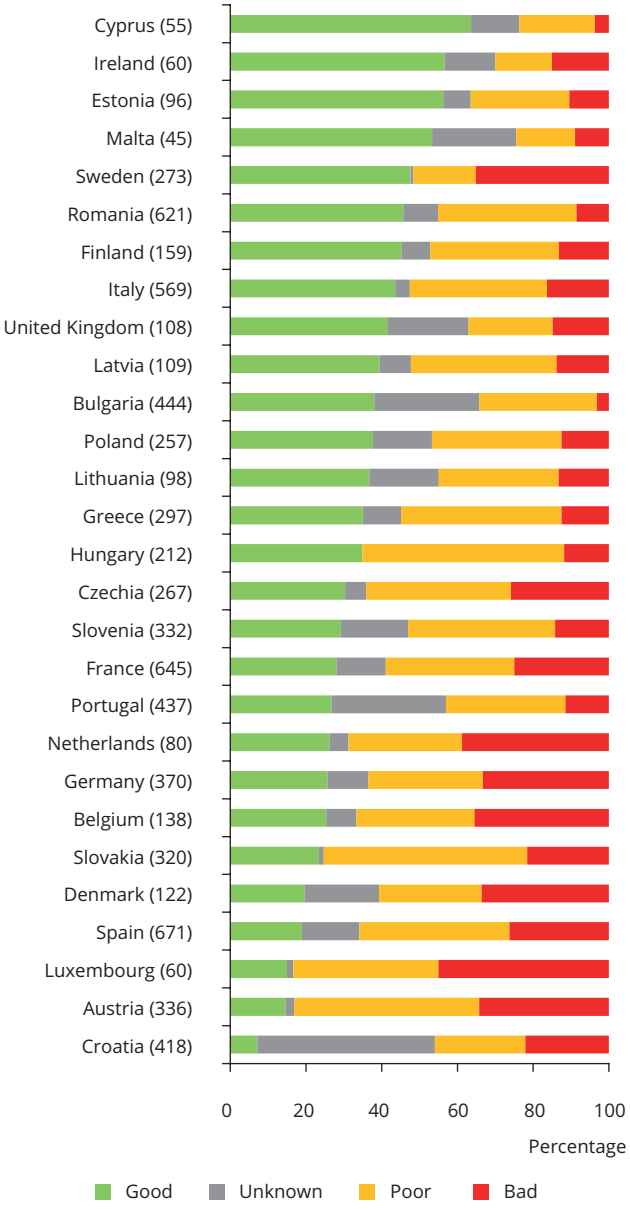
Looking at individual Member State assessments (Figure 3.13), the biggest proportion of species assessments showing a good conservation status were reported by Cyprus, Ireland, Estonia and Malta (over 50 %). The Common Pipistrelle (*Pipistrellus pipistrellus*), for example, is reported as having a good status in all four countries. In seven Member States, the species assessments showing a bad conservation status exceed 30 % (i.e. Austria, Luxembourg, Netherlands, Sweden, Denmark, Belgium and Germany). Generally, Member States reported a higher proportion of unknown assessments for species than for habitats, with the newest EU Member State, Croatia, having the biggest knowledge gaps (unknown conservation status for 47 % of the assessments). Data on marine mammals are particularly lacking.

Figure 3.13 Conservation status of species at Member State level



Note: Statistics are based on the number of species assessments. The number of assessments per Member State is indicated in parentheses. The total number of assessments is 7 589.

Source: Article 17 Member States' reports and assessments.

Box 3.4 Closer Look: Status of the Atlantic biogeographical region

Photo: French Atlantic coast © Pixabay

The Atlantic region includes over half of Europe's coastline. Altogether, 117 habitat types and 52 plant and 81 animal species listed in the Habitats Directive are found in the Atlantic region. It has specific, regional features: low, flat land, a very varied and dynamic coastline rich in habitats and species and an oceanic climate.

The Atlantic region is one of the most heavily populated (by almost one third of the EU population) and intensely managed areas in Europe, putting massive pressure on the natural environment. Therefore, many natural and semi-natural habitats only exist as isolated, fragmented patches in a largely artificial landscape. This badly affects the conservation status of habitats and species in this region.

Around half of the coastal habitats in the directive are present in this region, as are 17 of the 21 coastal and inland dunes. Specifically, the wide range of sand dunes is one of the typical characteristics of this region that also faces particular distress: shifting 'white dunes' (2120), for example, have a poor or bad conservation status in eight of the nine countries with this habitat. The sandy coastal grasslands called machair (21A0) are one of the few habitats restricted to the Atlantic region and currently exhibit a good (United Kingdom) and a poor (Ireland) conservation status. Endemic plant species that rely on these habitats, such as the Shore Dock (*Rumex rupestris*) are consistently reported with a poor conservation status.

Further inland, much of the conservation interest lies in those habitats that were originally formed by low-key management practices, such as the natural and semi-natural grasslands. Overall, grasslands cover around 30 % of the Atlantic region, and, although most have been transformed or impoverished by intensive agriculture, important vestiges of species-rich habitats remain. Seventeen different types listed in the Habitats Directive are found here, including various forms of calcareous grasslands. The status of these habitats is nonetheless critical: seven of the eight assessments on calcareous grasslands (6110 and 6120) report a bad conservation status.

The first priority for conservation is to protect the remaining areas from further development. However, this requires determined efforts across the broader countryside to help reconnect the otherwise isolated habitats.

Sources: Article 17 reports and assessments, and European Commission (2020a).

Key messages

- Only 15 % of **habitat** assessments at EU level show a good conservation status, while the majority continues to show poor (45 %) or bad (36 %) status
- Dune habitats and bogs, mires and fens are most frequently identified as having a bad conservation status (over 50 %).
- Around one quarter of **species** have a good conservation status at EU level. However, over 60 % of the assessments report a poor or bad status.
- Reptiles and vascular plants are the species with the highest proportion of good conservation status (more than 35 %), while fish have the highest proportion of bad conservation status (38 %).
- Marine mammals (cetaceans) are among the species with the highest proportion of unknown assessments (over 78 %).
- The Atlantic and Continental regions contain highest share of poor and bad conservation statuses among all biogeographical regions for both habitats and species.
- A high percentage of unknown data indicates a need to establish or reinforce appropriate and ideally coordinated and state-supported monitoring schemes in all Member States.

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Photo: © John Hall, NATURE@work /EEA

3.3 Trends in conservation status

Looking at trends is an essential part of conservation status assessment, as they inform and enable reflection on how statuses are evolving within the reporting period. Reported trends are identified as improving, stable or deteriorating. The category 'unknown' includes both assessments of unknown conservation status and assessments of unfavourable status with an unknown trend; habitats and species with a favourable status are not included in this analysis, although they were reported by Member States. More information on the methodology can be found in the separate methodological technical report (Röschel et al., 2020). The conservation status trends are also available for assessments with a good status. Assessments showing a good conservation status mainly exhibit stable and improving trends; this is the case for 87 % and 12 % of the assessments for habitats and 77 % and 15 % for species at an EU regional level. The trend analysis below thus only focuses on the habitats and species with unfavourable status (poor or bad conservation status). This allows the recognition of subtle changes in both categories and guides the analysis of where more conservation efforts need to be taken.

The following section presents the results for the trends in conservation status of habitats and species at the EU regional and Member State regional levels.

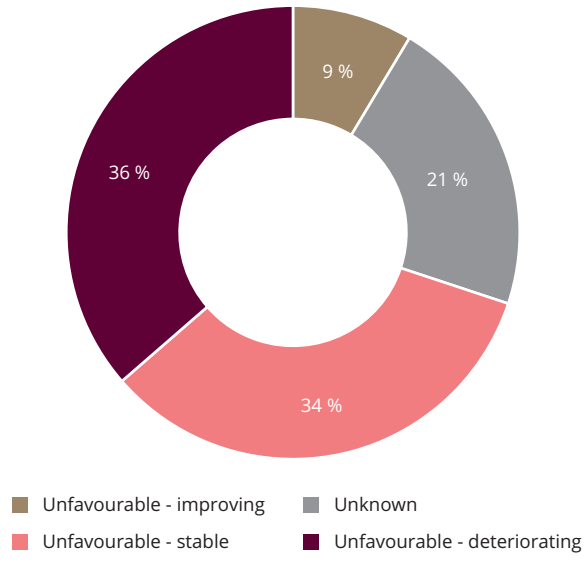
3.3.1 Habitat trends

As presented in Section 3.2.1, 81 % of the habitat assessments show an unfavourable conservation status (poor or bad). The overall results from the EU regional habitat assessment show that the proportion of improvement across these assessments is quite low. Only 9 % show improving trends, while 36 % continue to deteriorate at the EU scale. The share of unknowns remains high (over 20 %) (see Figure 3.14).

Trends in conservation status differ among the various groups of habitats (see Figure 3.15):

- Deteriorating trends are observed for at least 25 % of all assessments across habitat groups, except for rocky habitats (15 %).
- Forest habitats exhibit the highest proportion of improving trends among the assessments (13 %).

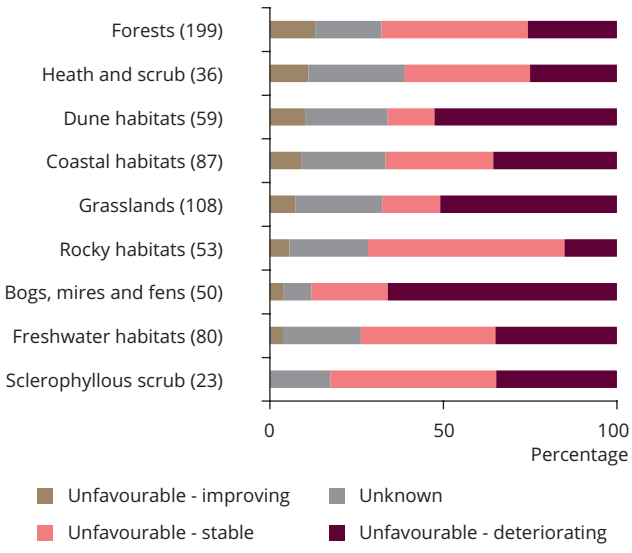
Figure 3.14 Conservation status trends for habitats not in good status at EU level



Note: Conservation status trends are based on EU habitat assessments.

Source: Article 17 Member States' reports and EU assessments.

Figure 3.15 Conservation status trends for habitats not in good status per habitat group at EU level



Note: Conservation status trends are based on EU habitat assessments. The number of assessments is indicated in parentheses. The total number of assessments is 698.

Source: Article 17 Member States' reports and assessments.

Box 3.5 Closer look: Increase in Macaronesian laurel forests in the Azores

Photo: Laurel forest on São Miguel island © Neemo

In the east of São Miguel island (Azores), the survival of the rare endemic Azores Bullfinch (*Pyrrhula murina*) depends on the existence and quality of the Macaronesian laurel forest (*Laurus*, Ocotea 9360). The seeds, flower buds and fleshy fruit of the once-thriving laurel forests provide food for the critically endangered bird, of which there were just 100 remaining pairs in 2003. However, invading alien plant species brought to the archipelago by colonisers are threatening the laurel forests and creating a shortage of food for the birds.

Three consecutive LIFE projects have taken on the main task of saving the forest and the species for future generations — and it seems that they have succeeded. The conservation status of Macaronesian laurel forests improved from poor in 2012 to good in 2018 and stabilised at the favourable level. The Azores bullfinch population stabilised at between 627 and 1 996 specimens and increased in area up to 160 km^2. This was accomplished by, inter alia, enlarging the Pico da Vara/Ribeira do Guilherme Special Protection Area by almost three times, covering the whole species range, and removing invasive species, such as the exotic *Cryptomeria* and *Hedychium* stands, replacing them with more than 300 000 saplings of diverse native plants cultivated in local nurseries, and creating a special nursery dedicated to the production of native plants (PRIOLO LIV03 NAT/P/000013, LAURISSILVA SUSTENTAVEL LIFE07 NAT/P/000630, Life Terras do Priolo LIFE12 NAT/PT/000527).

Bogs, mires and fens, grasslands and dune habitats have the highest proportion of deteriorating trends, each with over 50 %.

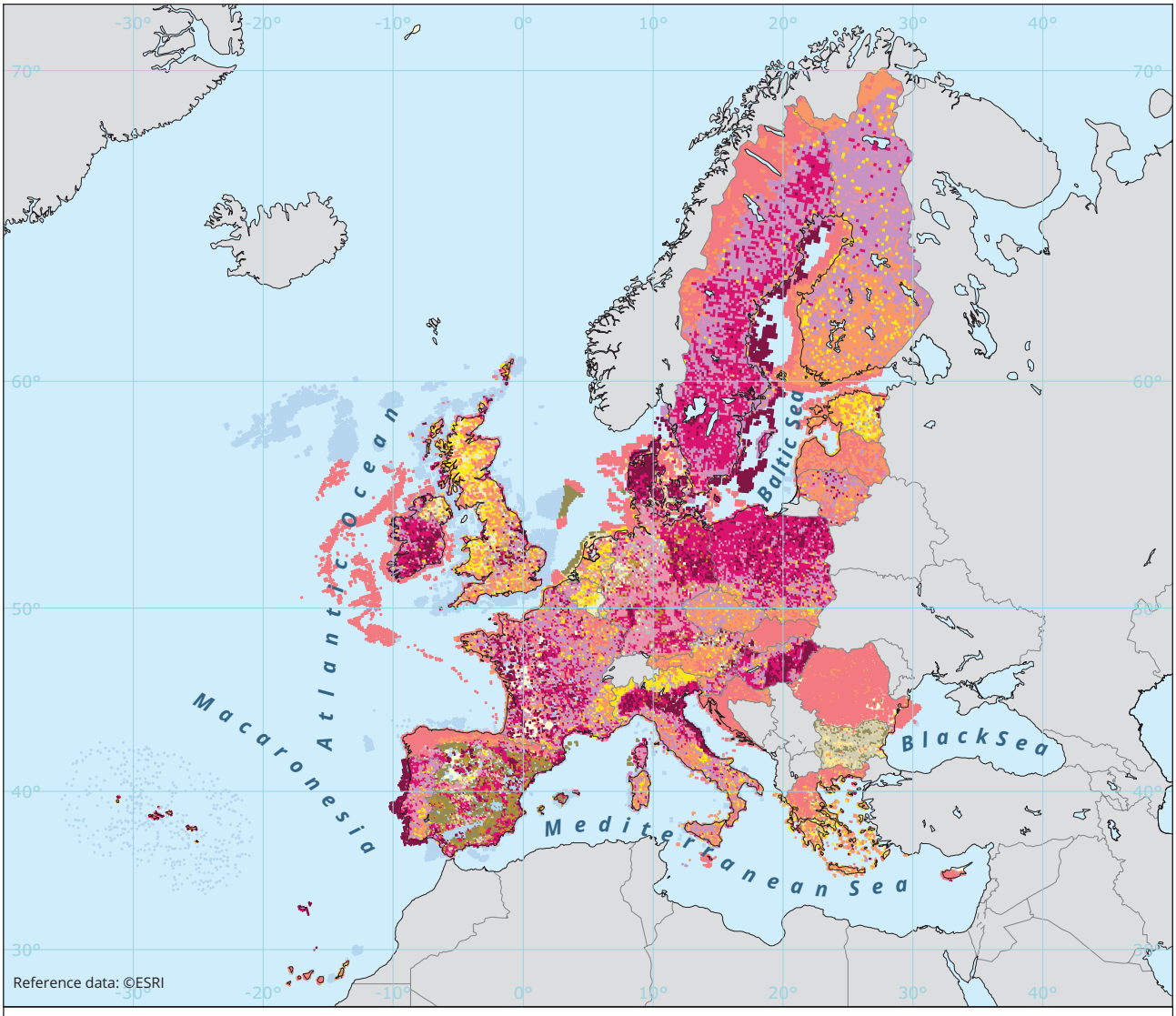
- Among grasslands, mainly hay meadows ([18]), Molinia meadows ([19]) and several types of semi-natural dry grasslands ([20]) show a deteriorating conservation status trend. The main reasons for these trends are their dependency on particular sustainable management measures (see Section 4.2 for more detail).

Trends in the conservation status of habitats are spatially distinct among EU countries and regions. Most regions show predominantly stable or deteriorating trends, especially in northern Italy, Germany, Ireland and Sweden as well as coastal parts of Portugal (see Map 3.6). The predominance of unknown trends in marine regions in the Atlantic is also noticeable. The map illustrates the trends as percentages of trend distributions within a 10 km × 10 km grid.

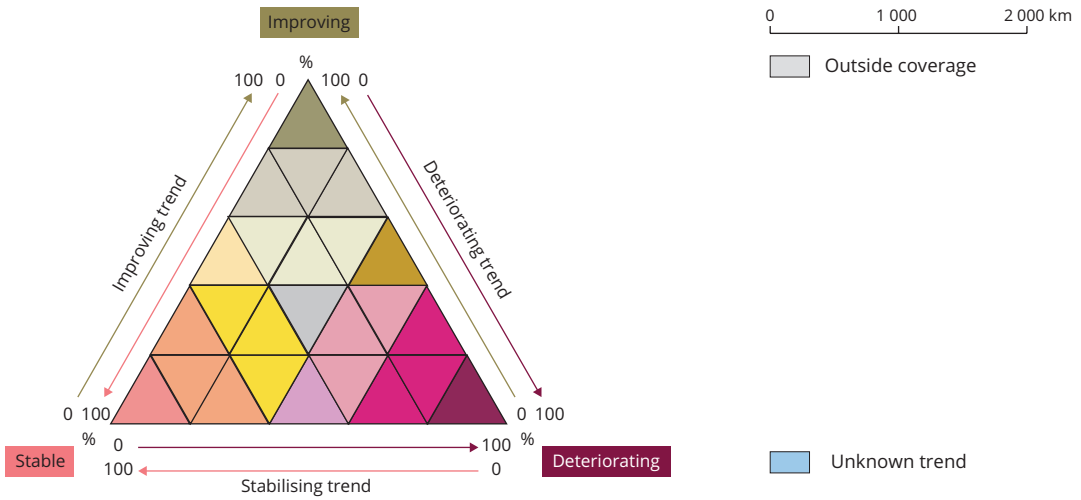
Looking at the habitat assessments at individual Member State level (Figure 3.16), five countries report an improving trend in status for over 20 % of their habitats (Greece, Netherlands, Belgium, Bulgaria and United Kingdom). Bog woodlands, for example, show positive trends in conservation status in three of these Member States. Moreover, Belgium, Bulgaria and Greece have an improving trend that outweighs their respective deteriorating trends in the overall assessment. While seven countries did not report any improvement for habitats with unfavourable status, deteriorating trends were reported by all Member States. Portugal, Hungary, Germany, Ireland and Slovenia reported a deteriorating trend for more than half of their habitat assessments. Overall, the degree of unknown trends in conservation status varies greatly among the Member States, ranging from 0 % (in Hungary) to over 80 % (in Lithuania).

([18]) Habitat types of this group include lowland hay meadows (6510) and mountain hay meadows (6520).
([19]) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410).
([20]) Habitat types of this group include semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (6210) and Nordic alvar and precambrian calcareous flatrocks (6280).

Map 3.6 **Spatial distribution of habitat conservation status trends at Member State level in a 10 km × 10 km grid.**



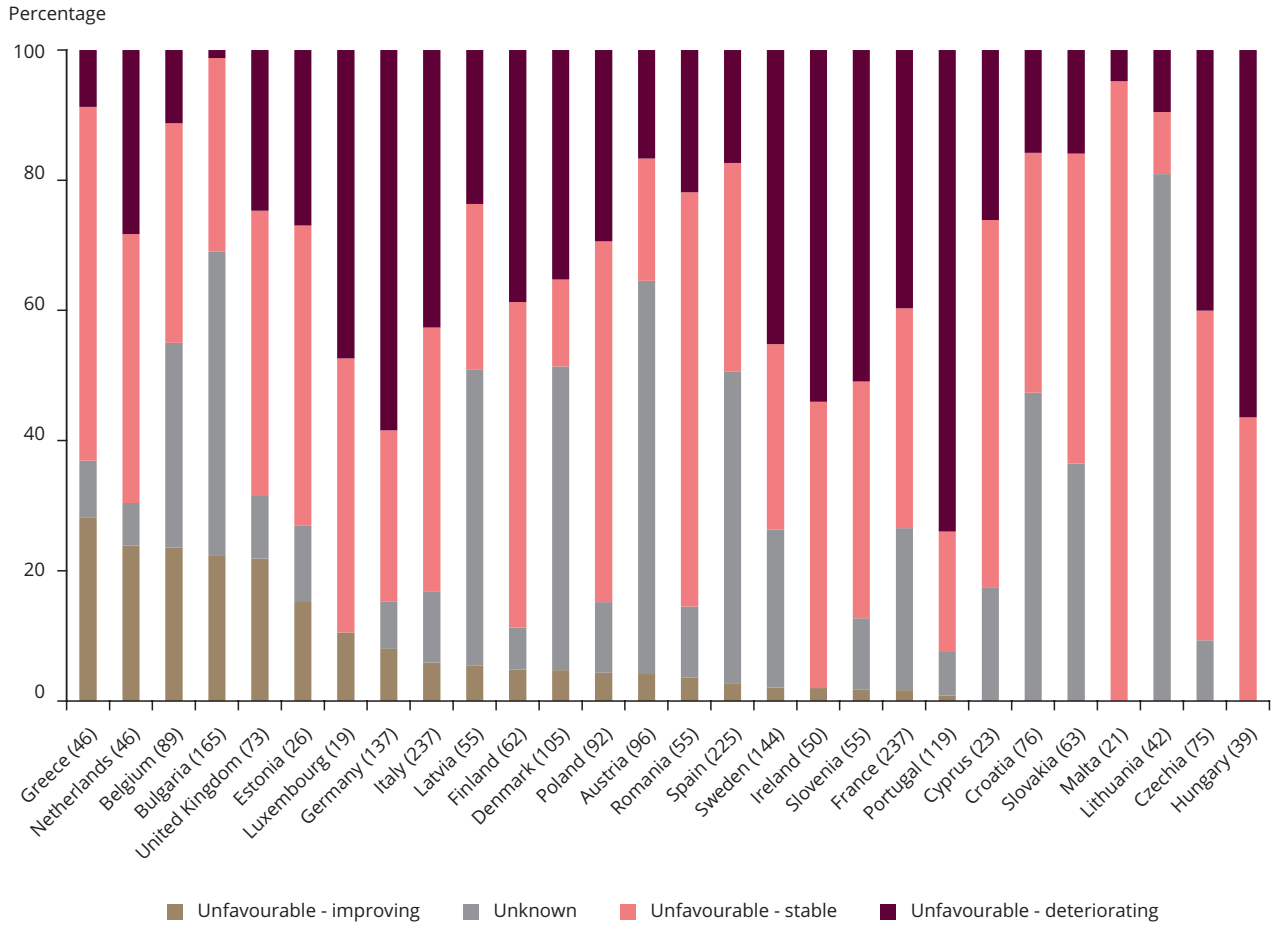
Spatial distribution of species conservation status trends at Member State level represented in a 10 x 10 km grid



Notes: Details on the methodology available from Röschel et al., 2020.
The map shows the percentage of reports with improving (+), stable (=) and deteriorating (-) trends for each 10 km × 10 km grid cell.
Reports with unknown trends are not included in the triangle; thus, grid cells with 100 % unknown trends appear in blue.

Source: Article 17 Member States' reports and assessments.

Figure 3.16 Conservation status trends for habitats not in good status at Member State level



Note: Conservation status trends are based on habitat assessments showing an unfavourable or unknown status. The number of assessments per Member State is indicated in parentheses. The total number of assessments is 2 468.

Source: Article 17 Member States' reports and assessments.

Box 3.6 Closer look: Recovery of the Loggerhead Turtle

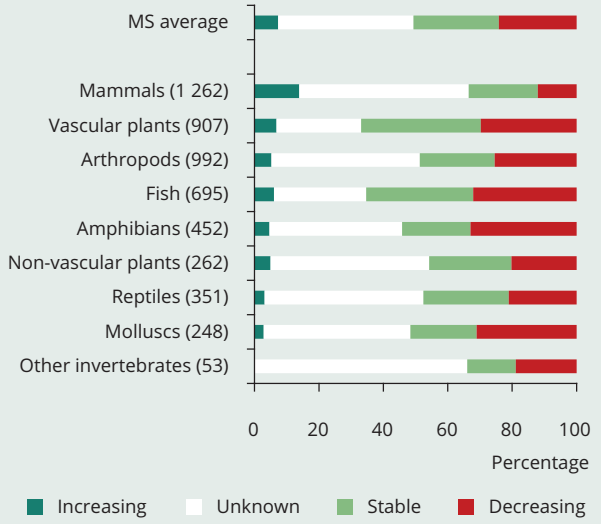
Photo: Loggerhead Turtle © Howard Hall, IUCN Red List

The Loggerhead Turtle (*Caretta caretta*) occurs primarily within the Mediterranean Sea as well as in the north-east Atlantic along the coast of Spain, Portugal, the Netherlands, and the United Kingdom. They are threatened by fishing (bycatch), destruction of their nesting grounds and water pollution. To improve the status of the species, the project LIFE+Migrate (LIFE11 NAT/MT/001070) aimed to improve the state of knowledge in terms of the species' population status and to identify important areas for feeding grounds or migratory routes. To achieve this aim, the project designated three protected areas (Sites of Community Importance) in Malta and assisted in closing important knowledge gaps by establishing the conservation status of the turtle populations. The project 'Reduction of mortality of *Caretta caretta* in the Greek seas' (LIFE02 NAT/GR/008500), which was awarded best LIFE project in 2008, upgraded rescue facilities for wounded turtles, established first aid stations, and used a combination of modelling available oceanographic data and direct boat-based observations to monitor the released turtles.

Box 3.7 Trends in species population sizes and habitat surface area

The population size of species and the surface area of habitats are essential parameters in assessing overall conservation status. The following analysis highlights the key results for the trends reported by Member States for these two frequently used parameters.

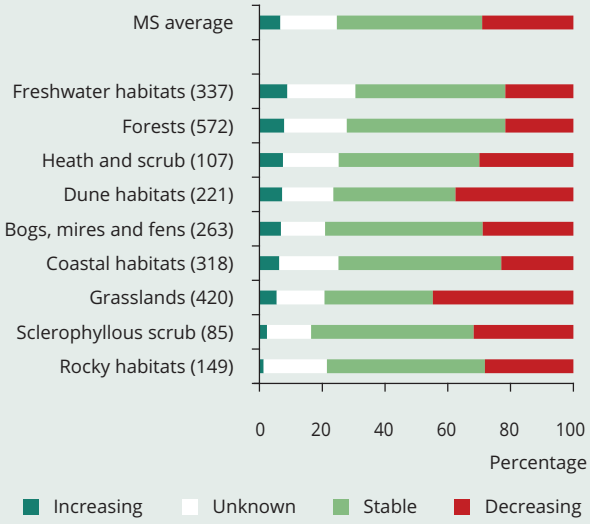
Figure 3.17 Population size trends for species at Member State (MS) level



Note: The total number of species assessments is 5 222.

Source: Article 17 Member States' reports and assessments.

Figure 3.18 Area coverage trends for habitats at Member State (MS) level



Note: The total number of habitat assessments is 2 472.

Source: Article 17 Member States' reports and assessments.

Population size trends are predominantly unknown for most of the species groups, averaging around 40 % of assessments (Figure 3.17). More than half of the trends are unknown for invertebrates other than arthropods (66 %) and for mammals (52 %). Information is scarce predominantly for small mammals, such as the Forest Dormouse (*Dryomys nitedula*) and Hazel Dormouse (*Muscardinus avellanarius*), as well as for marine mammals. Although this prevents us from drawing conclusions, the results show a comparatively high proportion of increasing population trends for mammals. Bat populations, the Eurasian Beaver (*Castor fibre*) and large mammals such as the Grey Wolf (*Canis lupus*) are among the main beneficiaries. For amphibians, fish and molluscs, further decreasing population sizes are reported for around 30 % of species groups.

Most of the habitats show stable area trends (average 50 %), while an increase in area was reported for comparatively few (average 7 %) (Figure 3.18). The highest shares of increasing trends in coverage were identified for freshwater habitats, such as for alpine rivers (3220, 3230, 3240), although the differences between most habitat groups are quite small. Overall, decreasing trends in habitat area are reported for an average of 30 % of the habitats. For grasslands and dune habitats, however, the decreasing trend is significantly higher (45 % and 38 %, respectively). Grassland areas such as semi-natural dry grasslands and scrubland facies on calcareous substrates (6210) and lowland hay meadows (6510) are particularly affected across countries and biogeographical regions.

3.3.2 Species trends

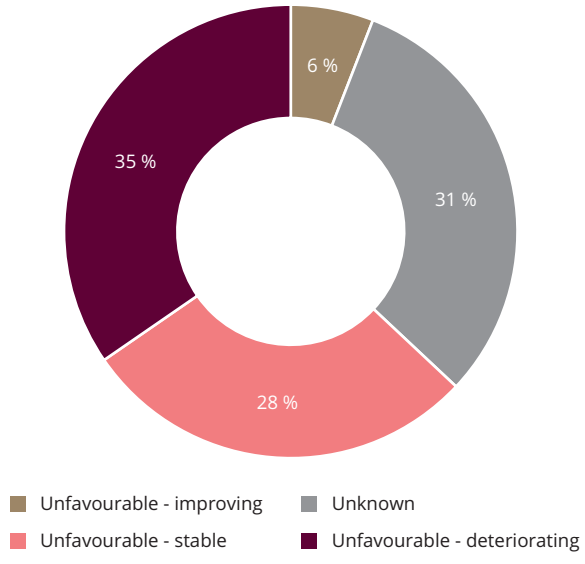
At the EU level (see Figure 3.19), 35 % of the 2 049 species assessments with an unfavourable or unknown status indicate a deteriorating trend. Only 6 % show an improving trend in conservation status. The trend is unknown for an additional 31 % of species.

As stated above, a rather low number of species show an improving trend at unfavourable conservation status. However, there are some differences between species groups (see Figure 3.20).

- Except for mammals, fish and non-vascular plants (10 %, 9 % and 6 %), improvements in unfavourable conservation status are below 5 %.
- While fish have higher improving trends than other species groups, they also have — together with amphibians — the highest proportion of deteriorating trends (close to 50 %).
- Deteriorating conservation trends are also reported for species in other groups, e.g. grassland habitat specialists such as the Marsh Fritillary (*Euphydreyas aurinia*) and the lower plant *Jurinea cyanoides*.

Table 3.2 presents the conservation status of and the trend in one species characteristic of each biogeographical and marine region. Contrasting the conservation status and trends for single species at the Member State level and at the EU level also highlights the fact that the population size of species can vary greatly among countries. Those with a large population size therefore have a large influence on the status of and trends in species at the EU level and have a special responsibility. France, for example, reported on nearly 90 % of the Atlantic population of the Marsh Fritillary, which led to a decreasing EU trend, despite its stable or improving trend in the remaining countries.

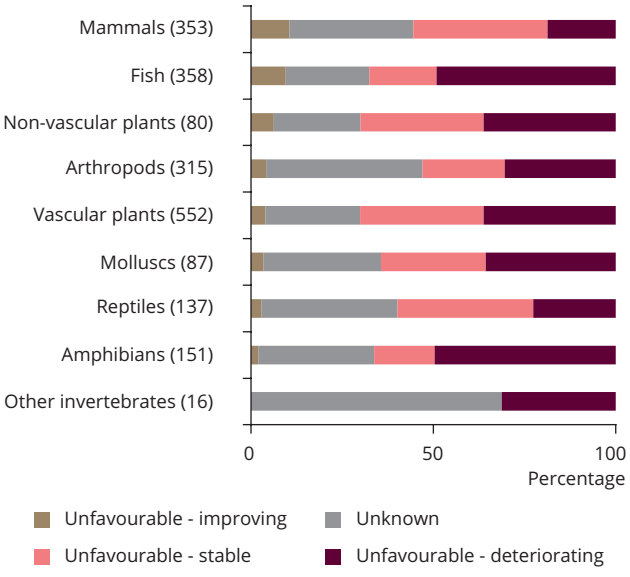
Figure 3.19 Conservation status trends of species not in good status at EU level



Note: Conservation status trends are based on EU species assessments.

Source: Article 17 reports and assessments.

Figure 3.20 Conservation status trends of species not in good status at EU level



Note: Conservation status trends are based on EU species assessments. The number of assessments is indicated in parentheses. The total number of assessments is 2 049.

Source: Article 17 reports and assessments.

Table 3.2 Examples of species' conservation status and trends for each biogeographical and marine region

	Species	Member State	Conservation status	Conservation status trend	Conservation trend at EU level
		Atlantic			
	Marsh Fritillary *(Euphydryas aurinia)*	France	Bad	↘	↘
		Germany	Unknown	↗	
		Ireland	Poor	↗	
		Portugal	Unknown	?	
		Spain	Bad	→	
		United Kingdom	Poor	→	
		Alpine			
	*Trifolium saxatile*	France	Poor	↘	↘
		Austria	Poor	↘	
		Italy	Good	→	
		Boreal			
	The Bulbed Calypso *(Calypso bulbosa)*	Finland	Poor	?	?
		Sweden	Poor	↘	
		Black Sea			
	Stellate Sturgeon *(Acipenser stellatus)*	Romania	Bad	↘	↘
		Continental			
	The Danube Salmon *(Hucho hucho)*	Austria	Bad	↘	↘
		Germany	Bad	↘	
		Romania	Bad	↘	
		Slovenia	Bad	↘	
		Macaronesian			
	*Echinodium spinosum*	Spain	Good	→	→
		Portugal	Bad	↘	
		Mediterranean			
	Four-lined Snake *(Elaphe quatuorlinesata)*	Croatia	Unknown	?	→
		Greece	Good	→	
		Italy	Good	→	
		Pannonian			
	Stag Beetle *(Lucanus cervus)*	Czechia	Good	→	→
		Hungary	Good	→	
		Slovakia	Poor	→	
		Romania	Good	→	
		Steppic			
	Romanian Hamster *(Mesocricetus newtoni)*	Romania	Bad	↘	↘
		Marine Atlantic			
	Fin Whale *(Balaenoptera physalus)*	France	Unknown	?	?
		Ireland	Good	→	
		Portugal	Unknown	?	
		Spain	Unknown	?	
		United Kingdom	Unknown	?	
		Marine Baltic			
	Harbour Porpoise *(Phocoena phocoena)*	Denmark	Bad	→	?
		Germany	Bad	↗	
		Poland	Bad	→	
		Sweden	Bad	?	
		Marine Black Sea			
	Beluga *(Huso huso)*	Bulgaria	Bad	↘	↘
		Romania	Unknown	?	
		Marine Macaronesia			
	Mediterranean Monk Seal *(Monachus monachus)*	Portugal	Poor	→	→
		Marine Mediterranean			
	Leatherback *(Dermochelys coriacea)*	France	Bad	?	?
		Greece	Bad	?	
		Spain	Unknown	?	

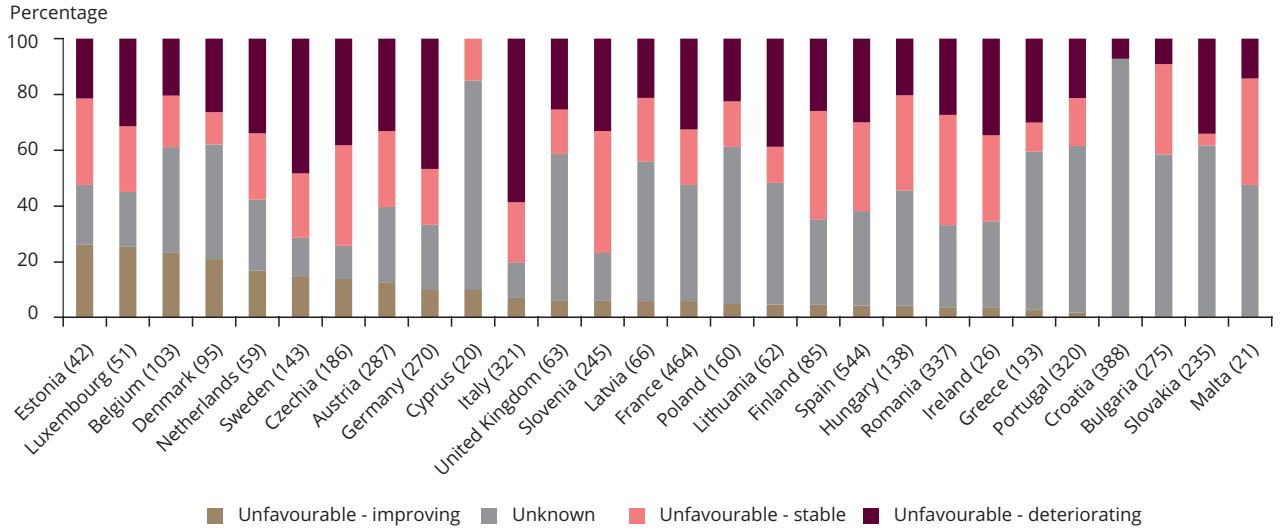
Conservation status Good Poor Bad Unknown | **Conservation status trends** ↗ Increasing → Stable ↘ Decreasing ? Unknown

Source: Article 17 reports and EU assessments

Looking at the species trends across the EU, some regions show more stable and increasing trends for species than for habitats (see Map 3.7). Based on Member States' reporting, some regions in Germany, Denmark, northern France and central Spain reveal predominantly deteriorating trends for species.

Species conservation status trends vary across Member States (see Figure 3.21 and Map 3.7). Those with the highest proportion of improving trends are Estonia, Luxembourg, Belgium and Denmark (over 20 %). Single species that show particularly positive trends within these countries are bat species, such as the Western Barbastelle (*Barbastella barbastellus*), or the Eurasian Otter (*Lutra lutra*). Deteriorating species trends do not score as highly as in the habitat assessments: Italy is the only country with more than 50 % of deteriorating species trends. However, over 80 % of Member States report deteriorating trends for more than one fifth of their species assessments. Cyprus is the only Member State that did not report a single deteriorating trend, but unknown assessments exceed 75 %. Several Member States did not indicate any species assessment with improving trends (Bulgaria, Slovenia and Malta). They are also among the countries reporting more than 40 % of their conservation status trends as unknown.

Figure 3.21 Conservation status trends of species on Member State level



Note: Conservation status trends are based on species assessments. The number of assessments per Member State is indicated in parentheses. The total number of assessments is 7 589.

Source: Article 17 Member States' reports and assessments

Key messages

- 81 % of the **habitat** assessments show a poor or bad conservation status, of which only 9 % show improving trends and 36 % continue to deteriorate at the EU scale.
- Grasslands, dunes and bog, mire and fen habitats have the highest proportion of deteriorating trends (each over 50 %).
- Forest habitats exhibit the highest proportion of improving trends among the assessments (13 %).
- Only 6 % of all **species** assessments show an improving conservation status trend, whereas more than one third are still deteriorating. The trend is unknown for an additional 31 % of species.
- While fish have more improving trends than other species groups — together with amphibians — around half of their assessments show further deterioration.

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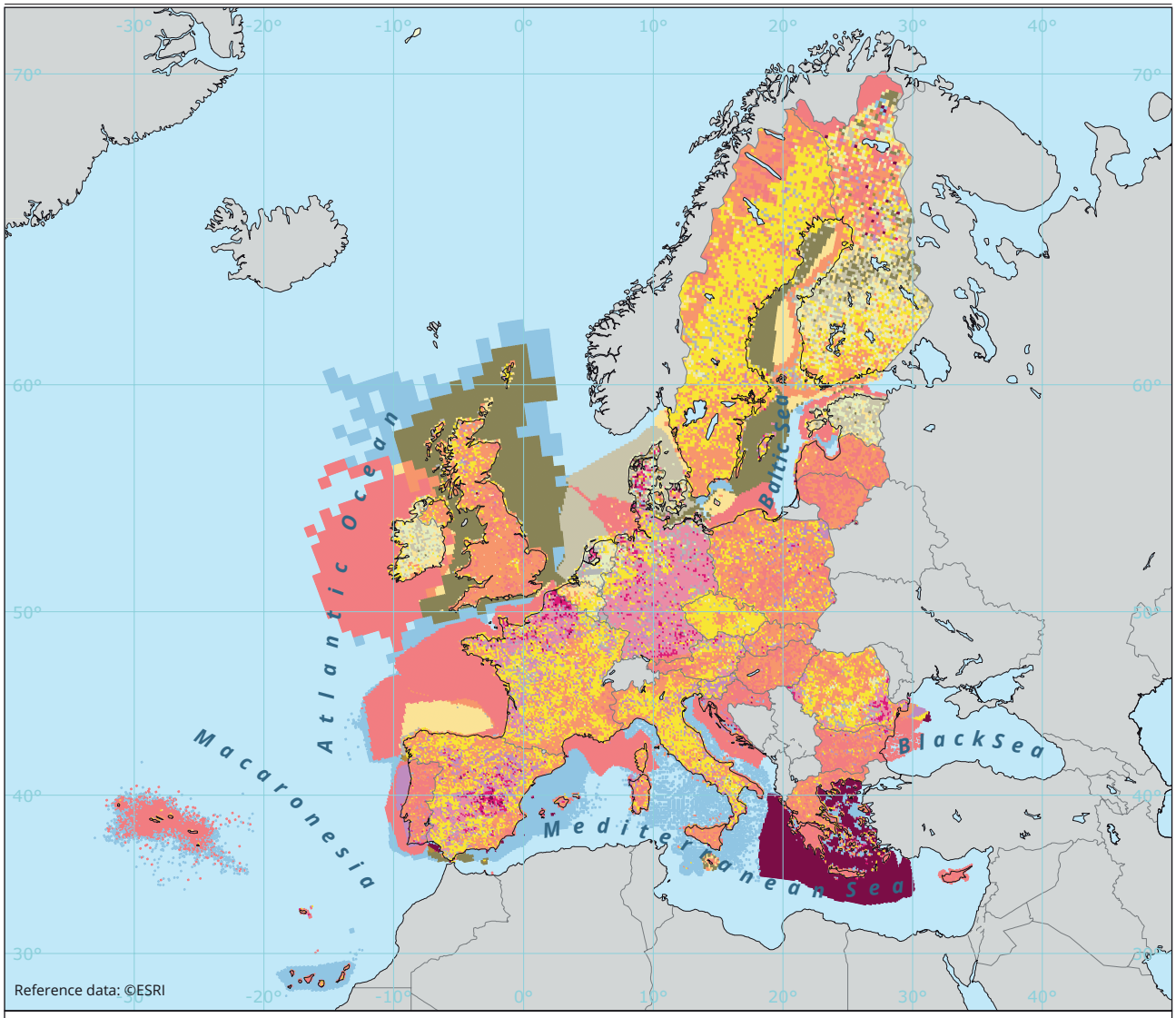
Map 3.7 **Spatial distribution of species conservation status trends at Member State level in a 10 km × 10 km grid**



Notes: The map shows the percentage of reports with improving (+), stable (=) and deteriorating (-) trends for each 10 km × 10 km grid cell. Reports with unknown trends are not included in the triangle; thus, grid cells with 100 % unknown trends appear in blue. In some exceptional cases, such as widely ranging but poorly known cetaceans, Member States submitted maps based on a 50 km × 50 km grid.

Source: Article 17 Member States' reports and assessments.

3.4 Improvement in status and trends

Changes in conservation status reported by Member States can be either 'genuine' or 'non-genuine'. Genuine changes refer to real changes in nature, rather than changes that are due to improved data or knowledge, taxonomic rearrangements or the use of different monitoring methods between subsequent reporting periods (non-genuine changes). The results for habitat and species assessments are very similar, with around 62 % of assessments reporting no change since the 2007-2012 reporting period. Non-genuine changes account for approximately 17 % of all reported changes in both habitat and species groups, due to improved knowledge and the use of different methods (see Figures 3.22 and 3.23).

Genuine changes can include both improvement and deterioration in conservation status. Around 1 % of all **habitat** assessments show improving genuine changes and 3 % show a genuine deterioration. Very few Member States reported genuine improvements in conservation status with the exception of, for example, Austria, France, Germany and the Netherlands.

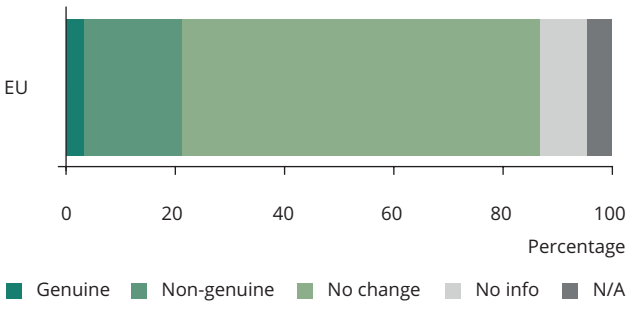
Around 1 % of all **species** assessments present improving genuine changes and 2 % show a genuine deterioration. In total, 17 Member States reported genuine improvements and 25 Member States reported deterioration in conservation status. The highest share of genuine changes with improving status were reported by France, Spain and Sweden.

3.4.1 Identifying improvements in status and trends

Beyond the classification of 'genuine' **improvements** in status, other positive developments are evident from Member States' data, namely improving status trends and stabilising status trends following a deteriorating for species and habitats. In order to not miss out on the cases in which improvements are due to conservation efforts, an amended methodology ([21]) was developed, in which improvement is understood as:

- **improved status** category since 2013 (e.g. U2 (bad) to U1 (poor), U1 (poor) to FV (good), U2 (bad) to FV (good)), which are reported by the Member States as 'genuine' changes in conservation status;
- **improving** conservation status **trends** for habitats/species with unfavourable status (including genuine and other than genuine changes), regardless of what the status was in the previous period; and

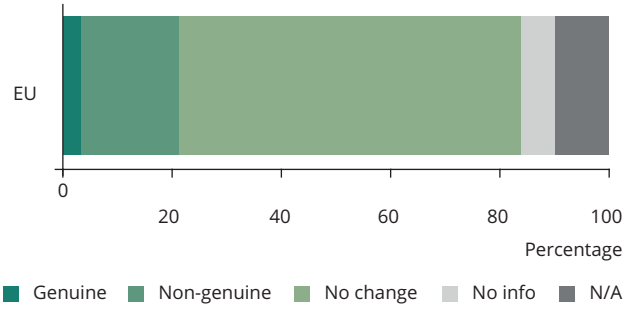
Figure 3.22 Type of change in the conservation status of habitats



Note: Non-genuine: method or data/knowledge improvement. No info: no info or N/A. The total number of assessments is 3 246.

Source: Article 17 Member States' reports and assessments.

Figure 3.23 Type of change in species in the conservation status of species



Note: The values include only species that are marked as 'present' or 'extinct'. Non-genuine: method or data/knowledge improvement. The total number of assessments is 7 612.

Source: Article 17 Member States' reports and assessments.

([21]) This methodology corresponds to the approach deployed for the national summaries.

- **stabilised trend** in assessments of unfavourable status in 2018 that had declining trends in 2013 (which are reported by the Member States as genuine changes).

Given the definition of 'favourable conservation status' in the Habitats Directive, changes in the overall conservation status (e.g. from poor or bad to good or from bad to poor) require relatively major changes in the individual conservation status parameters to be noted. The use of trends (improving, deteriorating, stable) in the overall conservation status allows more subtle changes (improvement or deterioration) of the unfavourable categories to be captured (e.g. U1 (poor); U2 (bad)). Improving conservation status trends refer to a situation in which the status is improving during the reporting period, as determined by a balance of the trends in the different parameters.

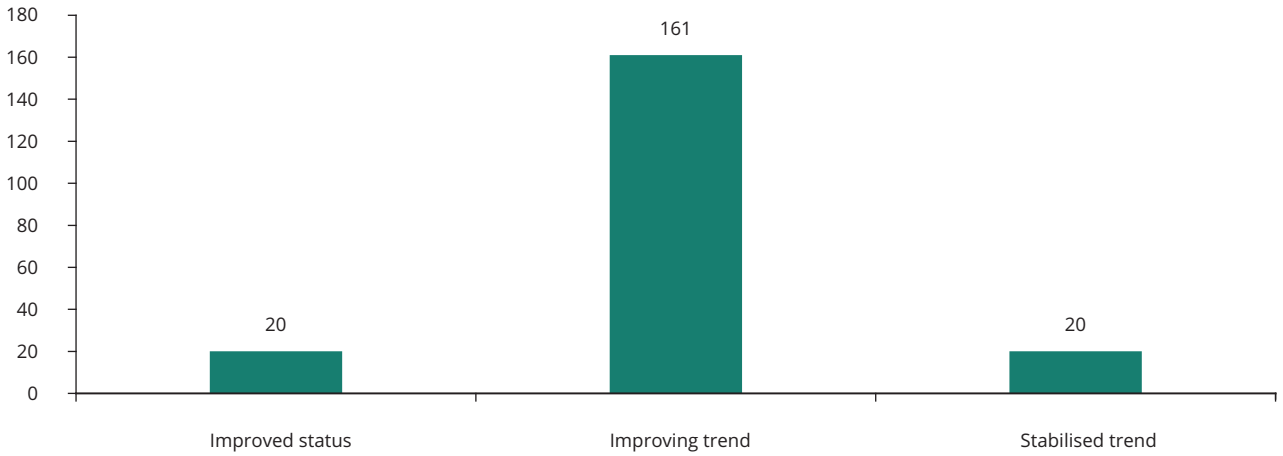
3.4.2 Improvements in habitats

The methodology described is applied in the following paragraphs and provides the basis for linking improvements to conservation measures (see Section 4.2.3). Figures 3.24 and 3.25 illustrate conservation improvements in habitats and species as reported by Member States. Figure 3.24 shows that improvements were recorded for a total of 201 habitat assessments, including 20 cases of improving status, 161 cases of improving trends and 20 cases of stabilised trends. In total, 105 habitat types are represented.

On average 6 % of all habitat assessments show improvements. Forests and freshwater habitats each have 10 % of assessments showing improvements, while heath and scrub have 7 % and bogs, mires and fens, as well as dune habitats, have 6 %. In contrast, improvements are rarely reported for rocky habitats (3 % of assessments). Looking at the distribution of these improvements, some patterns can be identified:

- Most of the improvements in diverse forest types were reported from Bulgaria (37 of 73 cases), e.g. for eastern white oak woods (91AA) or beech forests (9110, 9130, 9150). Apart from these, forests in Belgium and Greece also reportedly improved more than average due to an improving trend.
- Freshwater habitats most frequently improved in Germany (8 of 22 cases), largely represented by alpine river habitat types (3220, 3230, 3240).
- Italy reported the highest share of improvements in grasslands (7 out of 26 cases), including for

Figure 3.24 Improvements in habitats reported by Member States



Note: The total number of habitat assessments showing improvement is 201.

Source: Article 17 Member States' reports and assessments.

mountain hay meadows (6520) and lowland hay meadows (6510).

Further illustrative examples of improvements are presented in Table 3.3.

The highest share of improvements with regard to the overall assessments in the group were recorded in the Black Sea (13 %), Atlantic (10 %) and Continental regions (7 %). These findings are promising, as the conservation status of habitats in the two latter regions are particularly critical (see Section 3.2.1). Four out of five marine regions show improvements. No records are included for the Marine Macaronesian region.

There are a variety of reasons underlying the improvement in habitats, such as targeted management and restoration measures or expanding the habitat area. The conservation status of the *Luzulo-Fagetum* beech forest in Austria, for example, improved in the Alpine and Continental biogeographical regions. The main reasons for these improvements include an increase in its distribution area, improved tree species composition (a decrease in the proportion of non-native tree species, e.g. replacing spruce in the lower montane altitudinal range with native broadleaved trees) and improved management of deadwood and the forest structure.

The Boreal Baltic coastal meadows in Finland (see Box 3.8) illustrate how targeted and strategic nature conservation, restoration and management programmes can successfully contribute to improvements in conservation status.

Table 3.3 Examples of habitats showing improvements in their conservation status and trends

Habitat group	Member State	Habitat group	Habitat code	Habitat name	Improvements in conservation status and trend
Alpine	AT	Forests	9110	Beech forests (*Luzulo-Fagetum*)	U2 = → U1 +
Atlantic	NL	Dune habitats	2120	Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')	U1 + → FV +
Atlantic	DE	Freshwater habitats	3260	Water courses from plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	U2 = → U2 +
Continental	SI	Freshwater habitats	3180	Turloughs	U1 = → FV =
Mediterranean	FR	Coastal habitats	1510	Mediterranean salt steppes (Limonietalia)	U2 = → U1 -
Pannonian	CZ	Heath and scrub	4030	European dry heaths	U1 - → U1 =
Boreal	SE	Forests	9070	Fennoscandian wooded pastures	U2 - → U2 =
Atlantic	UK	Bogs, mires and fens	7140	Transition mires and quaking bogs	U2 - → U2 =

Note Conservation status: FV, good; U1, poor; U2, bad. Trend: '+', improvement, '=', no change; '-'. Incomplete data sets with missing information on 'conservation status' are excluded.

Source: Article 17 Member States' reports and assessments.

Box 3.8 Closer Look: Boreal Baltic coastal meadows in Finland (1630)

Photos: Finnish Boreal Baltic coastal meadows © Mr Tapio Heikkilä, Finnish Ministry of the Environment

Boreal Baltic coastal meadows are low-growing plant communities found around the coastlines of the Baltic Sea on areas subject to land upheaval. Livestock have been grazing in these areas since prehistoric times, preventing the establishment of forests.

Pressures

In Finland, the abandonment of traditional agricultural activities has endangered this habitat. Other pressures include pollution of surface waters and groundwater (eutrophication of the Baltic Sea coastal waters), modification of coastline, estuary and coastal conditions for development and invasive alien species.

Conservation status and trends

Finland reported the overall conservation status of this habitat type as poor but improving (U1). The range of the habitat in Finland has good status, so the main issues to address were increasing the surface area of the habitat type and improving the structure and function of existing areas of habitat. The total surface area increased from 60 to 62 km^2. The status of the structure and function of the habitat improved from unfavourable-bad improving (U2+) to U1+. Approximately 68 % of the total habitat area is now in good condition and the trend is improving.

Drivers of improvement

The Natura 2000 network plays an essential role in the conservation of coastal meadows. Over 90 % of the total area is located within the network. There are currently 98 designated areas of coastal meadows, and six new designations have been given during the current reporting period. Coastal meadows are very important for breeding birds, given that, of the 98 total sites, 56 are also classified as SPAs under the Birds Directive. National funding will be directed to the management of traditional rural biotopes through a new strategic nature conservation, restoration and management programme (HELMI programme, 2020-2030) and coastal meadows are included within a recently launched LIFE project (CoastNet LIFE, LIFE17 NAT/FI/000544) focusing on the restoration of coastal habitats. However, the key funding element for coastal meadows will continue to be the agri-environment payments through the Finnish rural development programme. The continuation of the positive trend in coastal meadows in Finland is dependent on the next period of the common agricultural policy.

Major achievements

The area of managed coastal meadow in Finland has increased by several hundred hectares since 2007. Coastal meadows are also a key breeding habitat for highly protected bird species (Annex I of the Birds Directive), such as Baltic Dunlin (*Calidris alpina schinzii)*, Ruff (*Calidris pugnax*) and Black-tailed Godwit (*Limosa limosa*). Thanks to successful management efforts, especially in the northern parts of Bothnia Bay, the breeding population of these rare species is increasing locally. Environmental education is ongoing, as wetland programmes and weekend tours for families are still taking place 10 years after projects ended (NEEMO LIFE team, 2017). Visitor numbers to the Natura 2000 sites are high; the bird observation towers are very popular and draw thousands of visitors annually.

Source: Keränen et al. (2020).

3.4.3 Species improvements

Improvements were recorded in 419 species assessments, including 108 cases of improving status, 296 cases of improving trends and 15 cases of stabilised trends (as shown in Figure 3.25. In total, 208 individual species are represented.

On average, 6 % of all species assessments show improvements. The species group with the largest number of improvements is mammals, followed by vascular plants, and fish. Approximately 8 % of all recorded mammal assessments show improvements, followed by fish (8 %) and vascular plants (5 %). Amphibians, molluscs, non-vascular plants and reptiles show fewer improvements in their respective groups (between 2 % and 4 %). Nearly 80 % of species showing improvements in status and/or trends are animals and 20 % are plant species.

- For mammals, most of the improvements were reported by France (22 cases), Sweden (20 cases) and Germany (16 cases). Improvements in France include, for example, several bat species (e.g. the Lesser Horseshoe Bat (*Rhinolophus hipposideros*) and the Eurasian Lynx (*Lynx lynx*)). Most of these improvements are due to improving trends.

- Vascular plants improved particularly in Spain (13 of 73 cases), Poland (10 cases) and Austria (9 cases). In Austria, the flowering plant *Dracocephalum austriacum* improved from a bad (U2) to a poor (U1) status in the Continental and Alpine biogeographical regions. In Spain, the endemic plant *Globularia sarcophylla* from Gran Canaria achieved good conservation status. Poland reported that three plants achieved good conservation status: *Agrimonia pilosa*, *Ligularia sibirica* and the near-threatened Linaria loeselii.

- The least improvements were recorded for non-vascular plants, molluscs and reptiles. In detail, 97 out of 208 species (e.g. Grey Wolf (*Canis lupus*) and Eurasian Beaver (*Castor fiber*)) showed improvements in more than one biogeographical region and/or Member State.

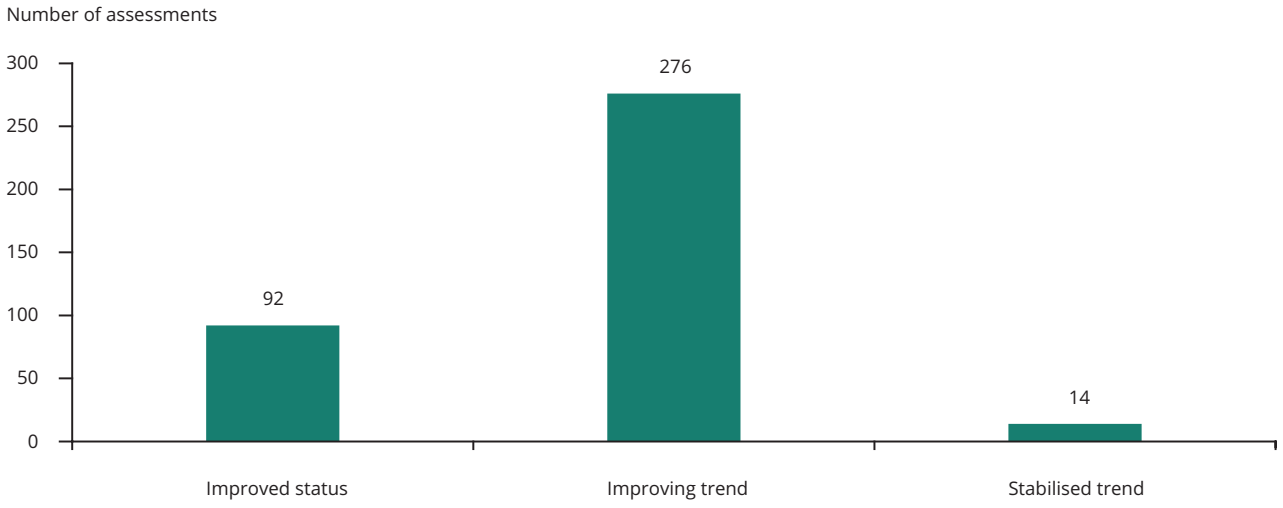
In total, 402 of the 419 assessments with improvements refer to terrestrial species. Within the 17 cases of marine species that showed improvements, most are mammals (e.g. Grey Seal (*Halichoerus grypus*) and Harbour Seal (*Phoca vitulina*)) and one reptile, the Green Turtle (*Chelonia mydas*).

Table 3.4 below presents further examples of species that showed an improvement in their conservation status since the last reporting period (2007-2012).

On the biogeographical level, improvements are present in all regions. Most cases are reported for the Atlantic (10 %), Boreal (7 %) and Continental (7 %) regions. Cases from other regions are less frequent. For the marine regions, only three of five marine regions show improvements. No records are included for the Marine Macaronesian or Black Sea regions.

The overall number of improving habitats and species and examples from some selected biogeographical and marine regions are given in Box 3.9.

Figure 3.25 Improvements in species reported by Member States



Note: The total number of improved cases is 419.

Source: Article 17 Member States' reports and assessments.

Box 3.9 Improvements in habitats and species in biogeographical and marine regions

ALPINE

Wolf (*Canis lupus*), Slovenia

Improved as a result of an action plan based on scientific knowledge, including activities to improve wolf-human coexistence, e.g. electric fences and shepherd dogs to protect flocks of sheep (SloWolf project).

ATLANTIC

Rivers with muddy banks with *Chenopodion rubri* and *Bidention* vegetation, Netherlands

Improved by floodplain restoration and reduction of diffuse pollution to surface waters or groundwaters from agricultural activities.

BOREAL

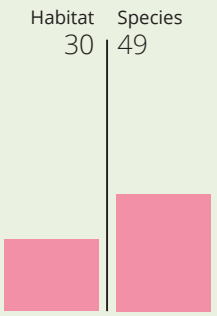
Northern Atlantic wet heaths with *Erica tetralix*, Latvia

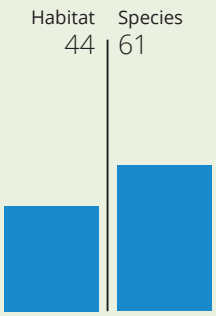
Improved by restoration of at least 40 ha of wet heath within the Adazi military training area (mostly covered by Natura 2000 area).

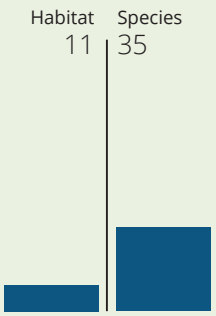
CONTINENTAL

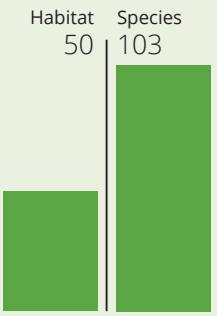
Agile Frog (*Rana dalmatina*), Sweden

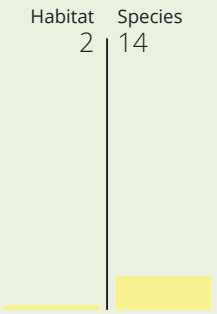
Improved by creation and restoration of wetlands, creation of hibernation spots, site-specific management plans for future conservation and monitoring, increasing awareness and acceptance of restoration measures (SemiAquaticLife project).

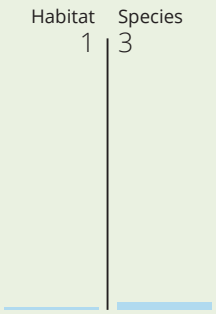


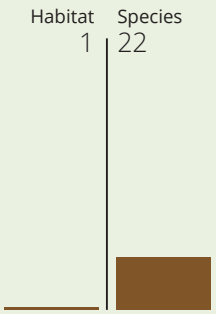


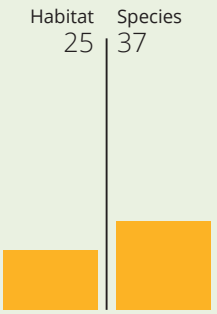












MACARONESIAN

***Teline rosmarinifolia*, Spain**

Improved as a result of habitat improvement and protection from goats, grazing manage-ment, avoidance of trampling due to recreational activities (hunting, fishing), management of harvesting and collection of plants, and close monitoring.

MARINE ATLANTIC

Harbour Seal (*Phoca vitulina*), Netherlands

Improved as a result of rehabilitation centres with a dispensation to rehabilitate sick, orphaned or injured seals and reintroduce rehabilitated seals and of strict conservation of seal populations and environmental sanitation of neighbouring waters.

PANNONIAN

Forest-steppe Mugwort (*Artemisia pancicii*), Czechia

Improved by removal of shrubs, mowing, control/eradication of invasive alien species, and reintroduction of sustainable grazing within Natura 2000 sites.

MEDITERRANEAN

Coastal lagoons, France

Improved by reducing the impact of multipurpose hydrological changes and managing habitats (other than agriculture and forest) to slow, stop or reverse natural processes.

Note: The box shows the exact number of habitats and species for each biogeographical and marine region, not the number of improved assessments (including improving trends, improved statuses and stabilised trends). Further regions, not shown in the figure include Steppic (habitats 0; species 3), Black Sea (habitats 9; species 1), Marine Black Sea (habitats 0, species 0), Marine Baltic (habitat 1; species 6) and Marine Mediterranean (habitats 0; species: 2).

Table 3.4 Examples of species showing improvements in their conservation status and trend by species group

Taxonomic group	Examples			
	Biogeographical regions	Member State	Species name	Improvements in conservation status and trend
Amphibians (23)	Continental	FR	Moor Frog (*Rana arvalis*)	U2- → U2=
	Continental	LU	Yellow-bellied Toad (*Bombina variegate*)	U2= → U2+
Arthropods (55)	Atlantic/ Mediterranean	ES	White-clawed Crayfish (*Austropotamobius pallipes*)	U2+ → U1-
	Alpine	IT	*Saga pedo*	U1= → U1+
Fish (71)	Continental	CZ	European Bitterling (*Rhodeus amarus*)	U2= → U1=
	Mediterranean	IT	Mediterranean Trout (*Salmo cetti*)	U2- → U2+
Mammals (164)	Boreal	SE	Natterer's Bat (*Myotis nattereri*)	U2- → U1+
	Continental	CZ	Eurasian Lynx (*Lynx lynx*)	U1= → U1+
Mollluscs (9)	Continental	CZ	Geyer's Whorl Snail (*Vertigo geyeri*)	U2+ → FV=
Non-vascular plants (10)	Atlantic	NL	Slender Green Feather-moss (*Hamatocaulis vernicosus*)	U2+ → U1+
	Continental	CZ	*Dicranum viride*	U1= → U1+
Reptiles (12)	Mediterranean	ES	Hermann's Tortoise (*Testudo hermanni*)	U2- → U1-
	Atlantic	FR	*Hierophis viridiflavus*	U1= → U1+
Vascular plants (73)	Mediterranean	FR	*Arenaria provincialis*	U1= → FV+
	Macaronesian	PT	*Prunus azorica*	U2= → U2+

Note: Conservation status: FV, good; U1, poor; U2, bad. Trend: '+', improvement, '=', no change; '-', deterioration. Incomplete data sets with missing information on 'conservation status' are excluded. Number of assessments in parentheses; 419 species assessments in total, including 'other invertebrates' (2 cases).

Source: Article 17 Member States' reports and assessments.

Key messages

- On average, 6 % of all habitat and 6 % of all species assessments show improvements in conservation status and/or trends, representing 201 habitats and 419 non-bird species assessments. In total, 105 habitat types and 208 non-bird species show improvements.
- Forests and freshwater habitats show the highest number of improvements among habitats.
- The main reasons for improvements in habitats include targeted management and restoration measures or expansions in the habitat's area.
- Nearly 80 % of species showing improvements in status and/or trends are animals (dominated by mammal and fish) and 20 % are plant species.
- For habitats and species, most improvements were recorded in the Continental region, followed by the Atlantic and Alpine regions.

Photo: © Ivan Banovic, WaterPIX/EEA

Figure 4.1 Summary of pressures and responses

Pressures and responses

The analysis of pressures and responses looks jointly at the results from both nature directives' reporting. Member States have reported over 200 different presssures categorised into 15 overarching sectors, and over 100 conservation measures are listed in 13 main categories, corresponding to the presssure sectors identified.

Member States reported over

67 000 individual pressures

With **21 %, agriculture** is the most frequently reported pressure for habitats and species. Abandonment of grasslands and intensification is particularly impacting pollinator species, farmland birds and semi-natural habitats

Urbanisation and leisure activities account for **13 %** of all reported pressures, representing 48 % of all marine pressures.

Invasive alien species such as the False Indigo-bush, particularly affect dunes and sclerophyllous scrubs as well as species such as breeding seabirds.

The **modification on water regimes**, physical alterations of water bodies and removal of sediments predominantly affect freshwater habitats and fish.

Forestry activities represent **11 %** of all pressures, particularly affecting forest habitats, and woodland species.

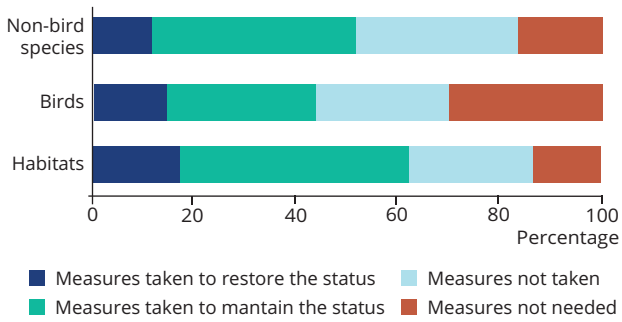
18 % of all presssures for **birds** stem from the exploitation of species, mainly relating to **illegal killing and hunting**. In Europe, the annual hunting bag amounts to at least 52 million birds.

Climate change is reported as a rising threat, particularly due to ongoing changes in the temperature and the decrease of precipitation.

Almost **50 %** of all pressures related to **pollution** can be attributed to air, water and soil pollution caused by agriculture.

How are these pressures addressed?

Over **6 000** targeted **conservation measures** aim to **maintain** or to **restore** the current status.



Birds such as vultures particularly benefit from species action plans, agri-environmental measures and large-scale conservation efforts.

Many **habitats** improved through targeted measures: adapted grassland management, the control of invasive species or the reinforcement of sustainable tourism.

Several **non-bird species,** and especially mammals and fish improved throught targeted measures such as reducing certain human activities and pollution from different sources.

4 Pressures and responses

As one of the most densely populated regions in the world, Europe's human activities have been driving the decline and deterioration of many of its species and habitats. To understand the most critical pressures and threats underlying this trend, the nature directives require Member States to report on what they consider to be the principal causes of species loss and habitat degradation per single species and per habitat. Pressures are considered to be factors that have affected habitats and species within the current reporting period, while threats are factors that are anticipated to be likely to have an impact during the subsequent two reporting periods.

At the same time, Member States report on measures taken to maintain or to restore the species or habitats to achieve good conservation status. Under the nature directives' reporting, conservation measures are principally understood to be practical actions to mitigate the impact of past and present pressures, and they are not covered by many legal or statutory measures (e.g. strict species protection or designation of protected sites). The Natura 2000 network (see also Chapter 5) can be seen as the overarching measure to be implemented by Member States and at the same time as a legal framework for applying practical conservation actions. The LIFE programme is the EU's major dedicated funding instrument for implementing such target conservation measures (among other funding objectives). Its environment sub-programme funds nature conservation projects particularly in the areas of biodiversity and of protected habitats and species. It provides grants for best practice, pilot and demonstration projects that contribute to the implementation of the EU Birds and Habitats Directives and the development, implementation and management of the Natura 2000 network.

This chapter gives an overview of the pressures and threats that were reported by Member States (Section 4.1) and of the implementing status of targeted conservation measures (Section 4.2). As restoration activities in particular play a central role in conserving European biodiversity, a dedicated analysis of restoration needs for habitats is presented in Section 4.3. The analyses are based on Member States' data and were conducted for both directives. Therefore, the results are presented jointly, with birds (all seasons) included in the species category. A more detailed description of the methodology used for the assessment of pressures and conservation measures can be found in the methodological report (Röschel et al., 2020).

4.1 Key pressures for species and habitats

Article 12 ([22]) and Article 17 reporting on pressures and threats is structured into two hierarchical levels, with differing degrees of detail. The first (level 1) comprises 15 overarching categories, while the second (level 2) identifies 203 individual pressures/threats (mostly listed as 'activities'). At the same time, pressures and threats are ranked as being of either 'high importance' or 'medium importance' according to their relative impact; Member States are restricted to selecting a maximum of 10 listed pressures/threats and a maximum of five pressures with a 'high importance'. The following analysis focuses on the 'high importance' category of pressures, given that the results for reported pressures and threats are largely consistent among the categories. The complete results of the analysis, including the frequency of pressures and threats of 'medium importance', can be accessed via the dedicated *State of nature in the EU* web page ([23]).

Member States reported over 67 000 records from one of the above 203 individual pressures for both species (including birds) and habitats. Around one third of these reported pressures are considered to be of high importance, with slightly more pressure records of high importance for non-bird species (35 %) than for habitats and birds (around 32 %).

The most frequently reported pressures for both habitats and species stem from agricultural activities and urbanisation. While the context and dynamics driving habitat degradation and species decline are highly diverse, agricultural activities (or in some cases,

([22]) In the case of Article 12, the reporting on pressures was only mandatory for regularly occurring Annex I species and any other migratory species triggering special protection area designations nationally. So, although Member States were encouraged to provide additional information for Annex II and remaining bird species, this potentially leads to an underestimation of pressures, such as those arising from hunting.

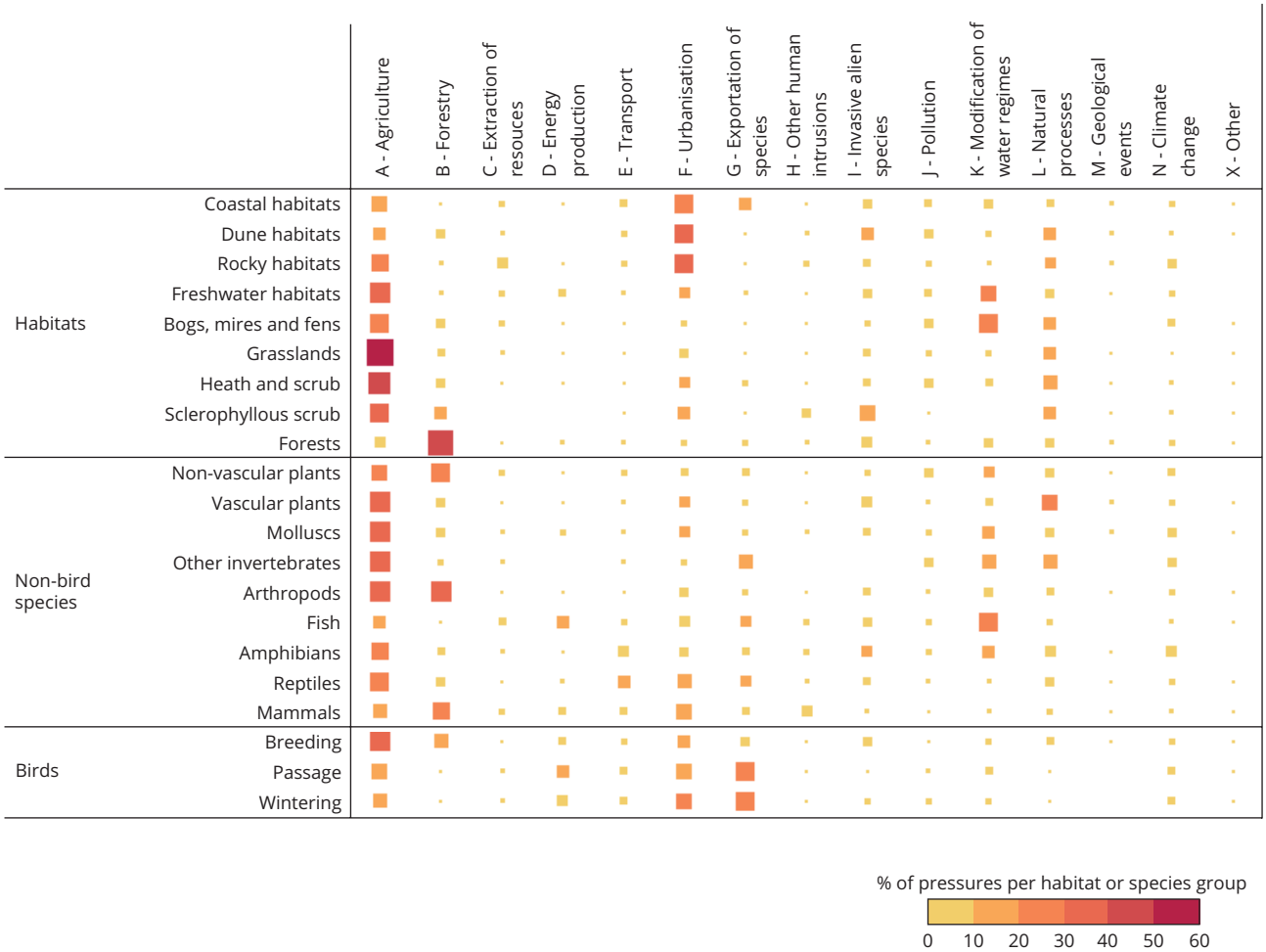
([23]) https://www.eea.europa.eu/themes/biodiversity/state-of-nature-in-the-eu/state-of-nature-2020

the lack thereof) represent the most common group of pressures. As indicated in Figure 4.2, many terrestrial habitats are severely impacted by agriculture, especially grasslands and freshwater habitats, heath and scrub, and bogs, mires and fens. This is also the case for most of the species groups, including reptiles, molluscs, amphibians, arthropods, vascular plants and breeding birds.

Looking at different habitats and species groups, however, a diverging importance of pressure categories can be identified. For example, wintering and passage birds face different key pressures from those experienced by breeding birds. For the former, the exploitation of species (mostly hunting and illegal killing) is reported to be the major impact. Forestry activities are the second largest pressure category for species, affecting in particular arthropods, mammals and non-vascular plants. In contrast, habitats such as dunes or coastal and rocky habitats are primarily affected by urbanisation. Compared with species, most habitat groups are particularly vulnerable to natural processes (e.g. succession of semi-natural habitats). However, succession — contrary to the guidance provided — was in many cases a response to other human intervention or management changes, such as abandonment of agricultural land or drainage of bogs and mires.

When interpreting the broad pressures for habitats and species, it is important to note that the categories 'Modification of water regimes' and 'Pollution' include only multipurpose activities and pollution from mixed sources; the pressures from specific activities, e.g. relating to agricultural pollution or hydrological changes, are included under the corresponding sectoral headers (in this example agriculture). When looking at the global distribution across the different level 1 categories, the modification of hydrological regimes (including both multipurpose changes under

Figure 4.2 Distribution of level 1 pressure categories among habitats and species



Note: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages.

Source: Article 12 and Article 17 Member States' reports and assessments.

the category 'Modification of water regimes' and also changes attributed to other categories) is in fact one of the most important overarching pressures. In the case of pollution, related pressures are in fact mostly covered under agriculture, which accounts for 48 % of all pollution-related pressures.

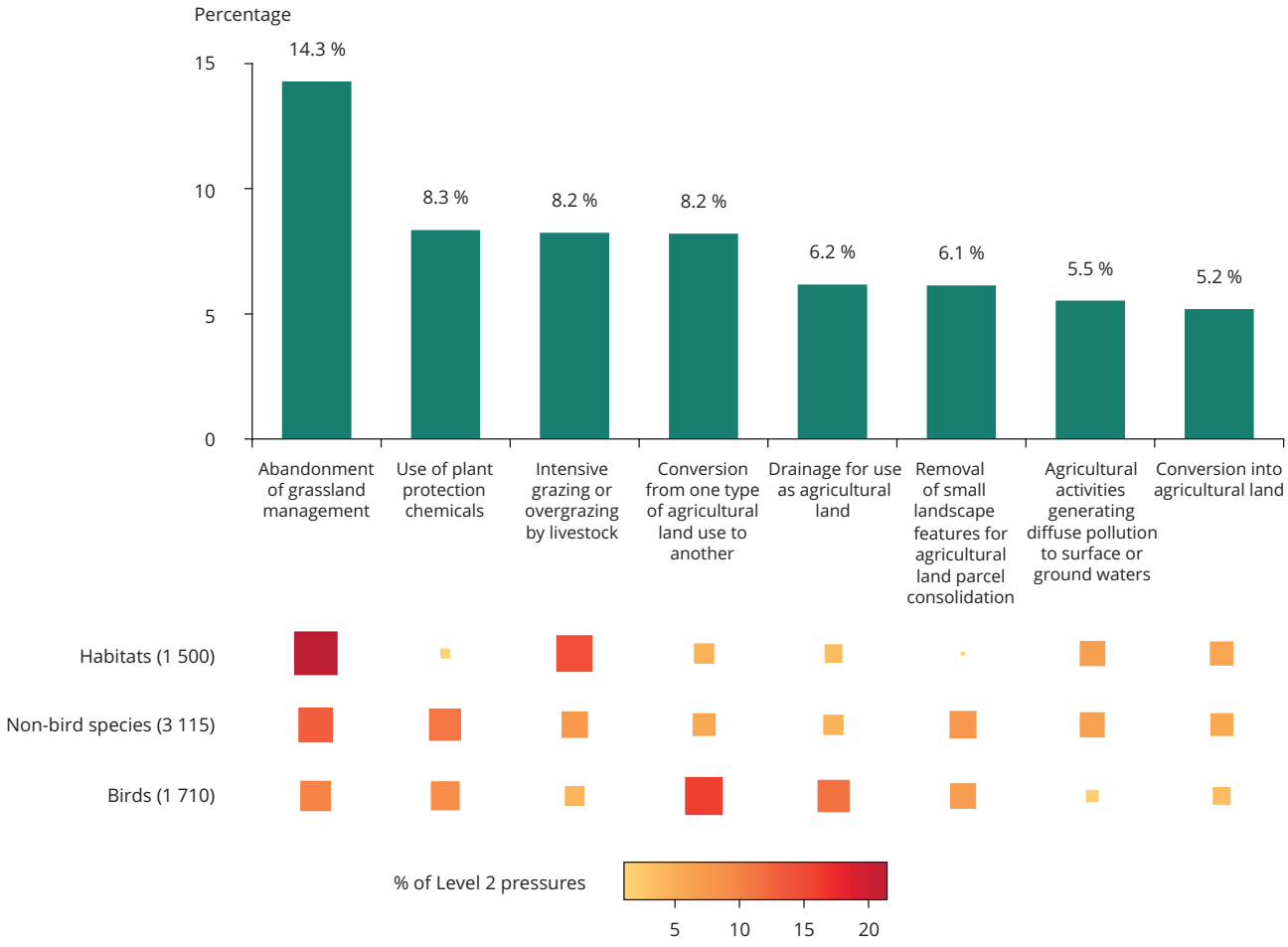
Level 2 of the pressures reported provides in-depth information on the underlying impacts that are relevant in each level 1 pressure category. The following section focuses on the most important pressure categories and their effects on different habitats and species reported as level 2 pressures.

4.1.1 Agriculture

About 40 % of the total land area of the EU-28 is agricultural land (Eurostat, 2020a). Results show, that current agricultural practices are by far the most dominant driver affecting habitats and species (see Figure 4.2). However, the richness and abundance of biodiversity associated with agricultural habitats is strongly correlated with the degree of modification (e.g. draining, ploughing) and the intensification of management (e.g. use of fertilisers, irrigation and pesticides). Extensive agricultural management creates and maintains semi-natural habitats with a diverse fauna and flora. Since the 1950s, however, the intensification and specialisation of the agricultural sector has increasingly contributed to ongoing biodiversity loss.

Changes in agricultural management are thus the most frequently reported type of pressure. When looking at the importance of individual reported pressures (Figure 4.3), terrestrial habitats and non-bird species such as grassland habitats, vascular plants and arthropods such as the Marsh Fritillary (*Euphydryas aurinia*) are particularly impacted by the

Figure 4.3 Distribution of the eight most relevant level 2 agricultural pressures for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

abandonment of grassland management, most importantly the ceasing of traditional or extensive grassland management. Among others, these pressures also badly affect pollination capacities (see Box 6.2). Reptiles and smaller mammals are especially affected by **fragmentation due to the removal of small landscape features**, which reduces landscape connectivity and leads to a loss of habitat area essential for food supply, shelter and breeding sites. Birds, however, are most affected by the **conversion of one type of agricultural land use to another** (e.g. this ranges from conversion from extensive to intensive agricultural land to more subtle changes such as a change in the type of crop grown) and by **drainage**. Drainage activities undertaken in an effort to increase agricultural land area lead to the loss of specialised habitat, and of food supply and breeding sites for species. Wintering birds are particularly affected by ongoing and past drainage activities.

Fertilisers and the **use of plant protection** products are reported to have a considerable impact on many habitats and species. This holds especially true for plant protection chemicals and their effects on amphibians, insects, mammals — mainly bats but also small mammals such as the European Ground Squirrel (*Spermophilus citellus*) or the European Hamster (*Cricetus cricetus*) — and birds. A report on 576 species of butterflies in Europe, for example, found that fertilisers and pesticides negatively affected 80 % of the (often now threatened) species (Sánchez-Bayo and Wyckhuys, 2019). This also indirectly affects insect-eating birds such as the Common Swift (*Apus apus*), a once common and widespread long-distance migrant, which is undergoing major population declines in most Member States. Recent analyses point to the extensive use of pesticides as the primary factor responsible for the decline of birds in farmland ([24]) (Mineau and Whiteside, 2013). Moreover, agricultural **pollution of surface waters or groundwaters** has significant impacts on standing waters, rivers, ponds and marine habitats as well as on their species.

Despite the introduction of provisions for the more sustainable management of natural resources and climate action ([25]) in recent reforms of the common agricultural policy (CAP), these have not significantly reduced the negative effects of agriculture on biodiversity and have not substantially contributed to the conservation and restoration of species and landscapes. This is acknowledged in both the EU Biodiversity Strategy for 2030 and the Farm to Fork strategy (EC, 2020b, 2020c).

4.1.2 Urbanisation

Urbanisation includes development but equally the use of residential, commercial, industrial and recreational areas and dispersed recreational and leisure activities. It is one of the key pressures affecting habitats and species. According to the Member States' reports, major human-induced pressures from this broad group are **sports, tourism and leisure activities** (Figure 4.4). This includes activities such as outdoor sports, leisure aircraft, drones, human trampling and unregulated wildlife watching. Overall, the extension of urban areas and artificial surfaces is the dominant group of pressures for marine and coastal habitats (e.g. dominant for 28 % of the lagoons and for 38 % of sandy coasts). Marine habitats suffer particularly from sports and leisure activities, especially in the Mediterranean and Macaronesian regions. For coastal habitats such as lagoons, estuaries, sandy coasts and rocky shores, **coastline modifications** are a dominant pressure. Tourism-related activities are one of the major underlying causes behind dune habitat degradation and are often related to the broader modification of coastline conditions for commercial and recreational purposes. Urban development — as a consequence of tourism or other drivers — thus considerably decreases the intactness of marine and coastal habitats, critically affecting the species depending on these habitats. Tourism activities, for example, particularly disturb breeding birds, specifically water birds such as ducks, geese, herons and grebes or threatened raptors such as the Egyptian Vulture (*Neophron percnopterus*) or the Bearded Vulture (*Gypaetus barbatus*) when they occur within their nesting areas.

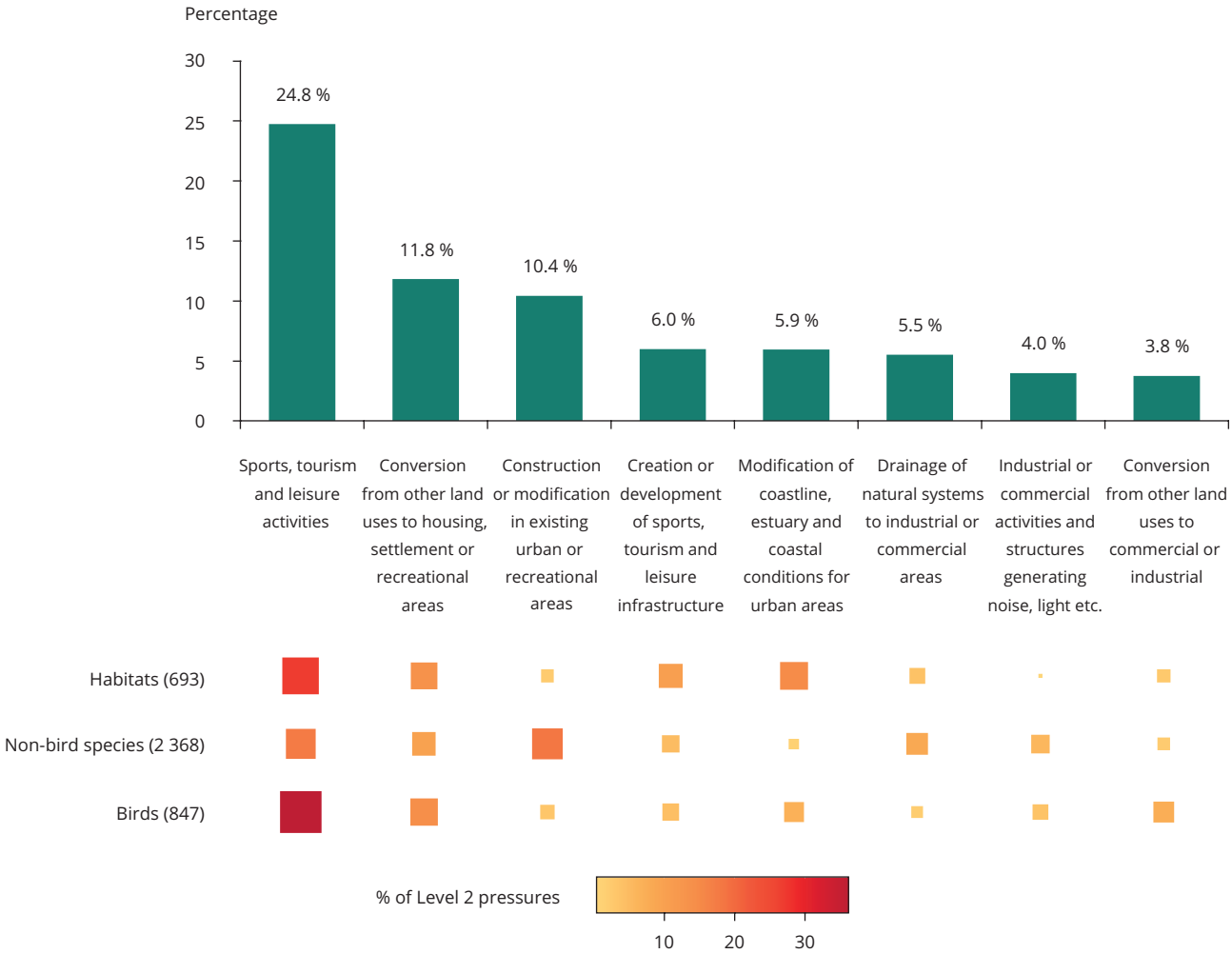
Another important pressure caused by urbanisation is **the conversion of natural and semi-natural land to housing, settlement or recreational areas**. This

([24]) The current status of and trends in farmland and grassland-dependent habitats and species are explored in more detail in Section 6.2.1

([25]) Greening measures under pillar 1 (direct payments) aiming to maintain permanent grassland areas, foster crop diversification and promote areas for nature and habitats, including the maintenance of landscape elements (ecological focus areas). In addition, agri-environmental and climate measures aim to encourage trends towards extensification, promote organic farming and encourage the maintenance of low-intensity management on high nature value farmland.

is particularly relevant for grassland habitats and forests as well as for the species they support, such as insects, reptiles and breeding birds. However, the most frequently reported pressure for non-bird species is **construction or modification within already existing urban or recreational areas**. This could involve, for example, demolishing structures or deliberately closing damaged roofs by repairing them. Such man-made habitats have become important sheltering areas for some species, such as bats ([26]); closing damaged roofs during breeding or hibernation can therefore harm dependent populations.

Figure 4.4 **Distribution of the eight most relevant level 2 urban pressures for habitats and species, shown as the percentage of pressures within this level 1 group**



Note: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

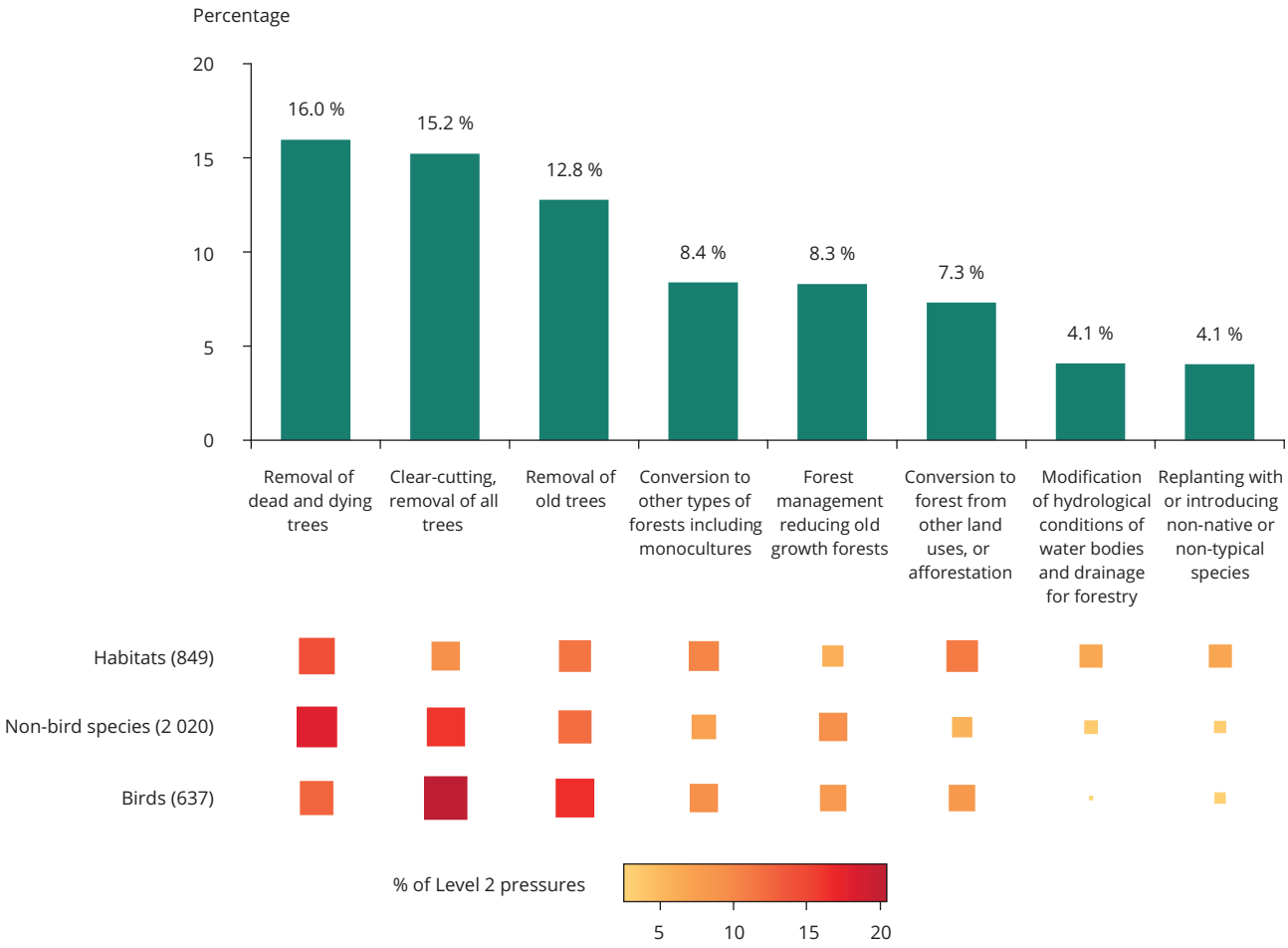
([26]) Bats have a special spectrum of pressures. Pressures related to urbanisation are predominant (28 %), followed by pressures from forestry (24 %) and pressures linked to agriculture (19 %). The reason could be the mobility of these species and their larger ecological valence — use of several different habitat types. Bats use agricultural habitats mostly for foraging, but their resting/breeding places are often in urbanised areas or forest (some species use tree holes).

4.1.3 Forestry

Over the last few centuries, forests managed to varying degrees of intensity have replaced almost all of Europe's natural forests. Currently, less than one third of Europe's forests are uneven-aged, 30 % have only one tree species (mainly conifers), 51 % have only two to three tree species, and only 5 % of forests have six or more tree species (Forest Europe, 2015). These general tendencies are not reflected in the reported pressures on forest habitats and species, as in fact many commercial forests do not classify as Annex I habitat types or do not constitute suitable habitats for protected species. However, the increased extraction of forest products and intensified forestry practices have diverse impacts on the various habitats and species protected under the nature directives. The recently increasing use of forests as a source of renewable energy poses one of the major forest-related policy challenges. Current studies suggest that these harvesting activities lead not only to a decline in forest area but also to potentially a more than 20 % reduction in their capacity for carbon sequestration (Searchinger et al., 2018; Fern, 2020).

Forest-dependent insects, mammals, non-vascular plants and breeding birds such as the Lesser Spotted Woodpecker (*Dryobates minor*) are most heavily affected by an excessive **removal of dead and old trees or the reduction of old-growth forests** (Figure 4.5). The clear-cutting of forested areas is considered to be the most relevant pressure for breeding birds in the context of forestry. Although new trees should be replanted or allowed to regrow after the forest stands have been clear-cut — as required by national forest acts in Europe — deforestation and clear-cutting without regrowth is occurring in Europe (EEA, 2016). Apart from breeding birds that depend on forest habitats, old trees are particularly valuable for some bats and small mammals, such as the Western Barbastelle (*Barbastella barbastellus*), the Caucasian Squirrel (*Sciurus anomalus*) or the Forest

Figure 4.5 Distribution of the eight most relevant level 2 forestry pressures for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

Dormouse (*Dryomys nitedula*). For species other than birds and for habitats, however, the most frequently reported forestry pressure is the r**emoval of dead trees**. Many insects, non-vascular plants, amphibians and reptiles depend on these for food, breeding places and shelter. Dead wood specialists such as the near-threatened Hermit Beetle (*Osmoderma eremita*) need dead, decaying wood for their life cycle. These structures thus represent integral features of healthy forest habitats; their removal can lead to changes in forest structure and diversity (Paillet et al., 2010; Vilén et al., 2015).

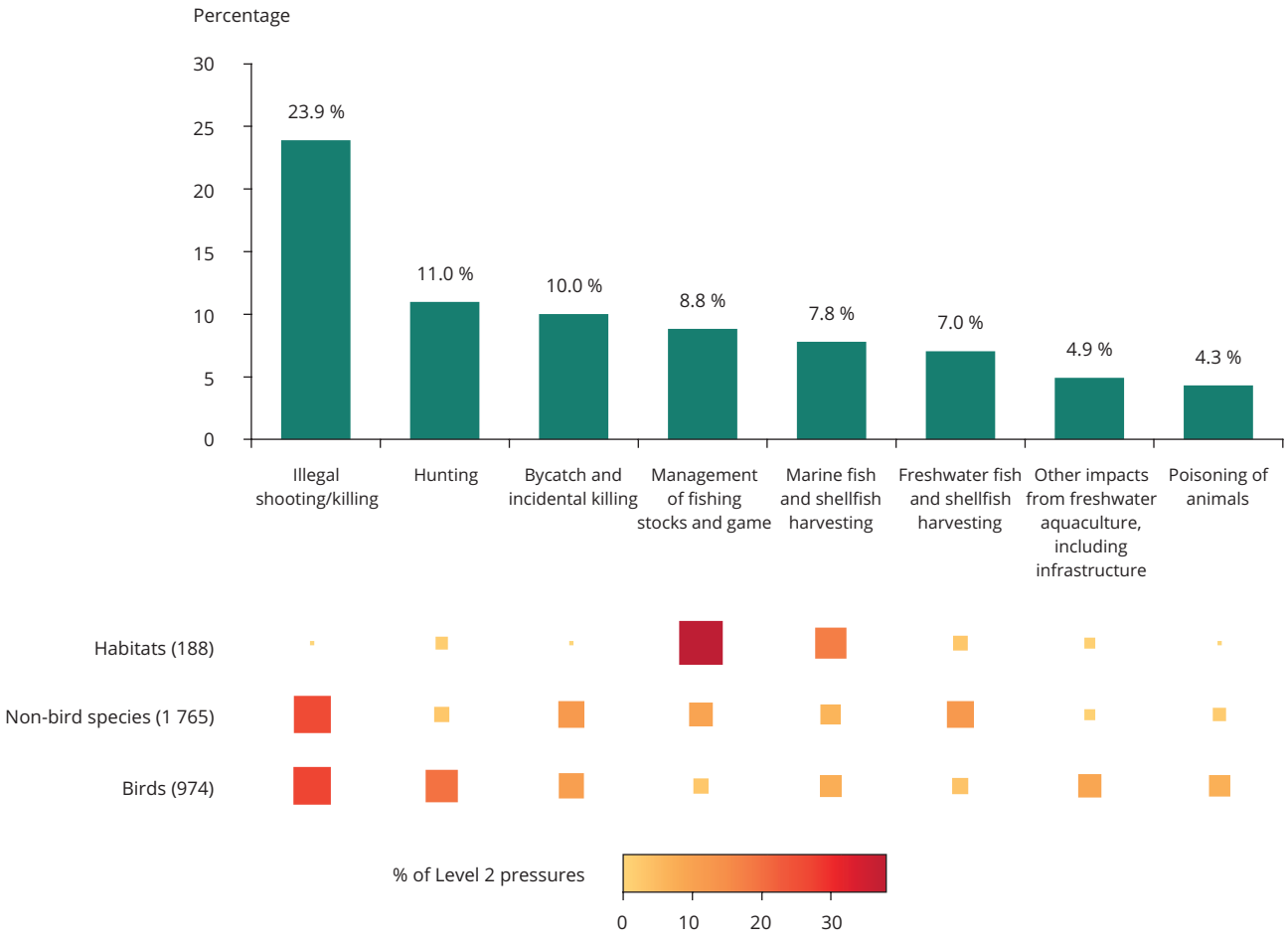
Not surprisingly, forestry is the dominant group of pressures reported for most of the Annex I forest types: it amounts to 50 % of all pressures for mixed forests, broadleaved deciduous and coniferous forests. For broadleaved evergreen forests, however, forestry accounts for only 20 % of the pressures, which is equal to the degree of impact arising from agricultural activities.

Forest habitats are especially affected by the removal of dead and dying trees as well as by broader land use changes, such as c**onversion to monocultures or other forest types**. Other habitat groups, e.g. grassland and heath habitats, are more significantly affected by ongoing **afforestation dynamics** in the EU, which decrease the area of open landscape structures.

4.1.4 Exploitation of species

The exploitation of species is the most frequent pressure group for wintering and passage birds (see Figure 4.2). Impacts on bird species largely relate to **illegal shooting or killing** (27 %) **and hunting** (19 %) (Figure 4.6). Recent research in 26 European countries has estimated an annual hunting bag of at least 52 million birds, excluding a significant number of killings in areas just beyond the study area and in European countries for which no data were available

Figure 4.6 Distribution of the eight most relevant level 2 pressures caused by exploitation of species for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

(Hirschfeld et al., 2019). Hunting bag information — although mandatory in Article 12 reporting for those Annex II birds that are hunted nationally — still shows significant gaps: in over 78 % of reports no information on hunting bags was provided. The only countries with more than half of their entries filled in were Malta, France and Poland; the former two are also the countries with the highest share of hunting reported. Three countries (Ireland, the Netherlands and the United Kingdom) did not provide any hunting bag data, and, according to the data reported, no bird species is nationally hunted in the Netherlands. However, hunting pressure is related not only to direct increased mortality of the target species but also disturbance and reducing the amount of prey available.

Non-bird species are also affected by exploitation, with an above average impact on fish, mammals and reptiles. Fish are among the most affected by **marine and freshwater harvesting** (Figure 4.6). The impacts on mammals can be divided into two main groups: large terrestrial mammals that are mostly exposed to illegal killing and marine mammals that are mainly affected by **bycatch and marine harvesting activities**. Terrestrial mammals that are particularly affected include the Grey Wolf (*Canis lupus*), Eurasian Lynx (*Lynx lynx*) and Eurasian Otter (*Lutra lutra*), whereas marine mammals include the Short-beaked Common Dolphin (*Delphinus delphis*) and Harbour Porpoise (*Phocoena phocoena*), among others. Bycatch and marine harvesting is also a significant pressure on island breeding seabirds (see Box 4.1) and sea ducks (Mergini) and has a significant impact on their breeding success.

The exploitation of species can affect the intactness of their habitats. This is especially relevant for coastal and marine habitats because fish and shellfish harvesting (e.g. by bottom trawling) cause physical loss of and disturbance to seafloor habitats and reduce prey populations, which again disturb marine species.

4.1.5 Invasive alien species

Invasive alien species (IASs) are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, causing serious negative effects in their new environment. IASs represent a major and increasing threat to native European flora and fauna and cause billions of euros worth of damages every year to the European economy. The present IAS pressure category also includes issues arising from interactions with problematic native species, disease or pathogens.

Box 4.1 Closer look: Balearic Shearwater

Photo: Balearic shearwater © Cabrera Natura

The Balearic Shearwater (*Puffinus mauretanicus*) is an Annex I Spanish-breeding endemic seabird whose entire population is located within the Natura 2000 network. While the species is challenging to monitor (information is based on the extrapolation of data from single colonies using indirect methods that could undervalue the existing breeding population), it has been assessed as critically endangered since 2004.

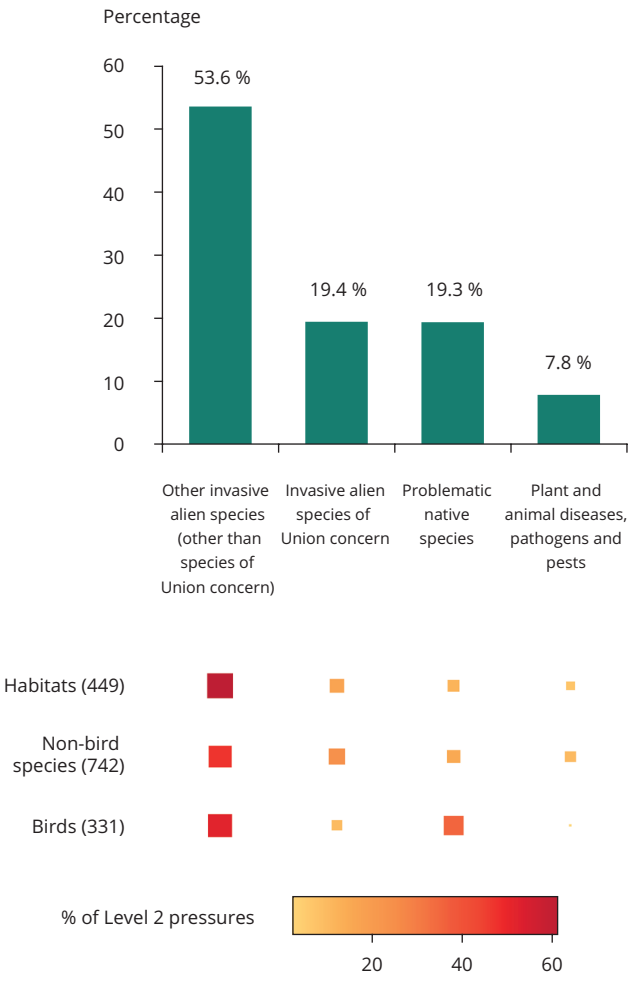
As with many seabirds, this species continues to be significantly threatened by bycatch and incidental killing (due to fishing and hunting activities), as well as invasive alien species (other than species of Union concern). In particular, these birds are threatened by predation at their breeding colonies by introduced mammals (such as feral cats and genets and, to a lesser extent, rats) as well as at-sea mortality as a result of interactions with commercial and artisanal fisheries. Further threats reported by EU Member States include mixed source marine water pollution, marine fish and shellfish harvesting (causing a reduction in both species and prey populations and general disturbance), and residential or recreational activities and structures generating various kinds of pollution. Finally, the species is also subject to a lesser extent to roads and related infrastructure, pollution from industrial and commercial activities, and modification of hydrological flows. The population is consequently decreasing in the short and long terms.

To improve the status of the Balearic Shearwater, there is an urgent need for habitat restoration, improvement and management. This needs to be accompanied by better monitoring of the impact of the aforementioned pressures as well as reductions in the impact of mixed source pollution and the threats posed by bycatch, unsustainable fishing and invasive alien species.

In 2015, EU Regulation 1143/2014 on invasive alien species (IAS Regulation; EU, 2014) entered into force and identified **invasive alien species of Union concern** (Figure 4.7). These species cause damage such as predation of adults and chicks/eggs by — inter alia — the Coypu (*Myocastor coypus*) or the Raccoon (*Procyon lotor*), browsing of understory habitats by Reeves' Muntjac (*Muntiacus reevesi*), and competition for food from Red Swamp Crayfish (*Procambarus clarkii*). Within the first reporting period of the IAS Regulation, Member States provided specific information on 48 IASs of Union concern ([27]). According to Member States' reporting, IASs of Union concern represent around 20 % of pressure reported for invasive species, while much greater impact is reported from **IAS other than species of Union concern** ([28]). These include, among others, the loss of (native) prey species owing to competition from the Pacific Oyster (*Crassostrea gigas*), decline in the quality of native vegetation owing to the spread of invasive plant species, and the overgrowth of alluvial and lowland humid habitats with invasive plants (e.g. Japanese Knotweed (*Fallopia japonica*) or Himalayan Balsam (*Impatiens glandulifera*)). A prominent example of an invasive predator is the American Mink (*Neovison vison*), which in Europe has decimated seabird colonies and reduced some waterfowl populations, such as those of the Coot (*Fulica atra)*, Moorhen (*Gallinula chloropus*) and other Rallidae (Ferreras and Macdonald, 1999; CABI, 2020). This carnivore not only poses a threat to many internationally important populations of ground-nesting birds but also severely affects local populations of amphibians, reptiles and small mammals, such as the European Water Vole (*Arvicola amphibious*) in the United Kingdom (CABI, 2020). IASs are generally reported as highly relevant for habitats, particularly for dune habitats and sclerophyllous scrub ([29]). A decline in the quality of native vegetation in the sclerophyllous scrub habitat is, among other causes, due to the spread of the False Indigo-bush (*Amorpha fruticosa*). This fast-growing, deciduous shrub forms a dense thicket that outcompetes the native flora and changes successional patterns (CABI, 2020). The pressures caused by IASs are not distributed homogeneously across the EU. Dune habitats, for example, are particularly affected by IASs in the Atlantic and Pannonian regions and sclerophyllous scrub in the Macaronesian region. In some parts of Europe, floodplains and riparian areas in particular are subject to invasion by IASs.

In these areas, invasive plant species (e.g. Giant Goldenrod (*Solidago gigantea*), Japanese Knotweed and Himalayan Balsam) are spreading along water courses. While forests are generally not as badly affected by IASs as other habitat types, broadleaved evergreen forests are the exception. For them, IASs other than of Union concern is the single most

Figure 4.7 Distribution of level 2 pressures caused by invasive alien species for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

([27]) In August 2019, an extension brought the list to 66 species (36 plants, 30 animals).

([28]) This group includes species introduced in the modern period that are established in the wild outside their natural range and excluded from the IAS Regulation.

([29]) The reporting of invasive alien species is still very uneven across Member States and the nature directives; some Member States reported invasive alien species as a problem in many instances and some did not report any problems at all.

reported pressure, amounting to 17 % of all reported pressures. IASs of Union concern are most often reported as pressures for coastal habitats, followed by forest and freshwater habitats.

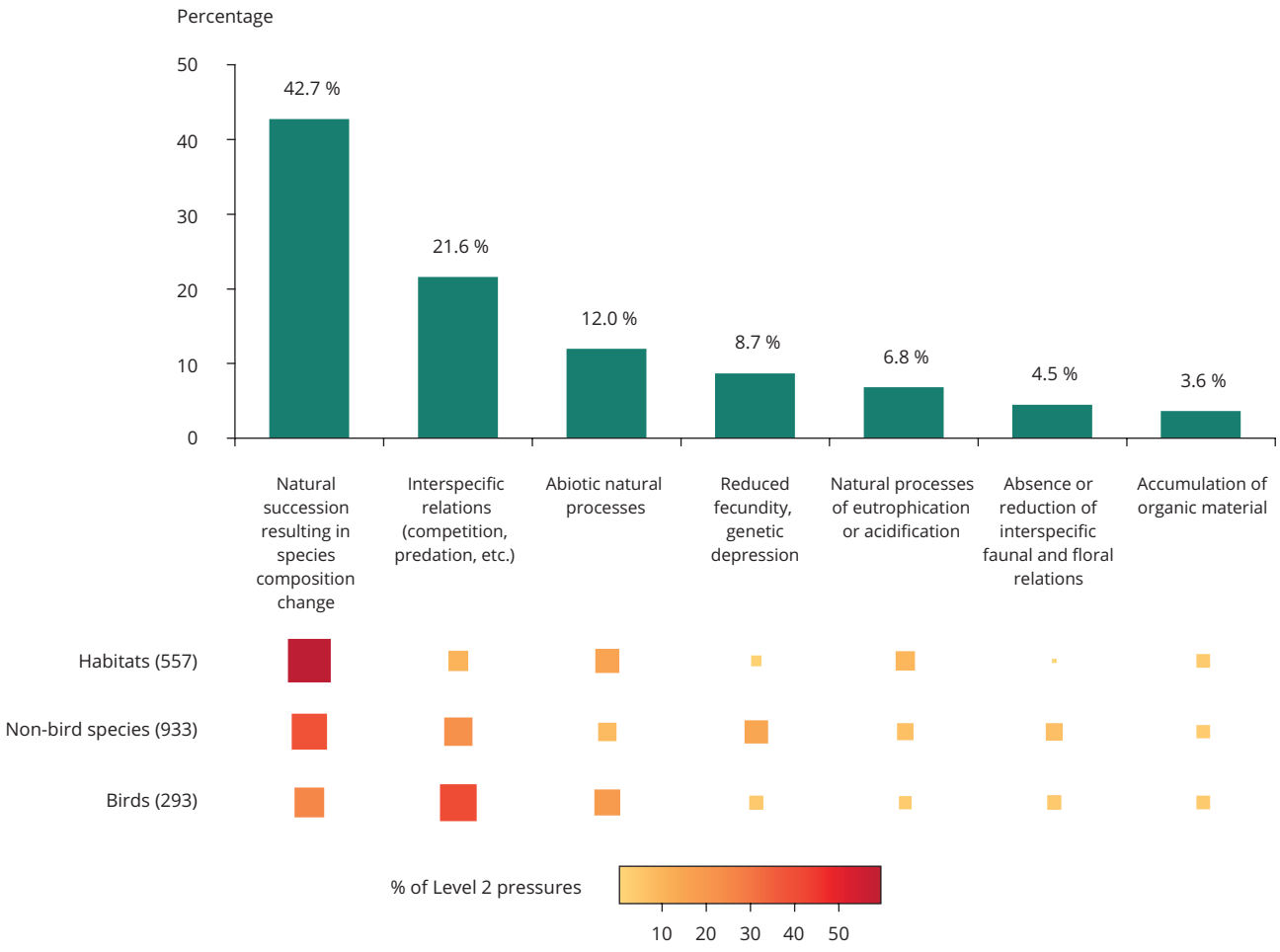
Amphibians, fish, vascular plants and birds — especially breeding seabirds such as shearwaters or storm-petrels — are the species that are most affected by IASs (see Box 4.1). Amphibians are also affected by animal diseases to an exceptionally high extent. As an example, a recent study on the amphibian fungus *Batrachochytrium salamandrivorans* concluded that the disease is more widely distributed than previously thought and can cause localised extinction of amphibian species (Spitzen-van der Sluijs et al., 2016).

Compared with the last reporting period (2007-2012), the impact of IASs increased in importance for both habitats and species. IASs are also considered to be a growing threat in the future.

4.1.6 Natural processes

Natural processes refer to, for example, vegetation succession and biocenotic evolution, abiotic natural processes and interspecific faunal relations. These processes are ongoing and are critical to sustain natural life. Habitats and species are subject to such natural processes over long time-frames as they evolve together, with strong impacts on species diversity and habitat composition. However, only when an ecosystem's natural balance is distorted as a result of accelerating climate change or direct human intervention (e.g. by eliminating disturbance regimes like natural floods, the presence of wild herbivores or large carnivores, or by confining dynamic early succession habitats to static fragments in an otherwise unavailable agricultural and forest landscape) can they become considerable pressures. The most relevant natural process-related pressure is **natural succession** (Figure 4.8), resulting in changes in species

Figure 4.8 Distribution of level 2 pressures caused by natural processes for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

composition. However, this pressure has often been mistakenly reported by Member States as indicating a lack of appropriate management of certain habitats (e.g. abandonment of grazing, lack of hay cutting).

Bogs, mires and fens are among the habitats most vulnerable to natural succession, usually indirectly caused by human intervention (e.g. lowering water tables by drainage). Other habitats affected by natural processes are dunes and grasslands. Birds, however, according to Member States' reports, are mostly exposed to **interspecific relations** largely associated with competition, predation and parasitism. Certain groups of birds, such as waders, gulls, shearwaters and storm-petrels, are particularly affected by interspecific relations. These include, among others, predation by other species and competition for nesting sites or food (see Box 2.2).

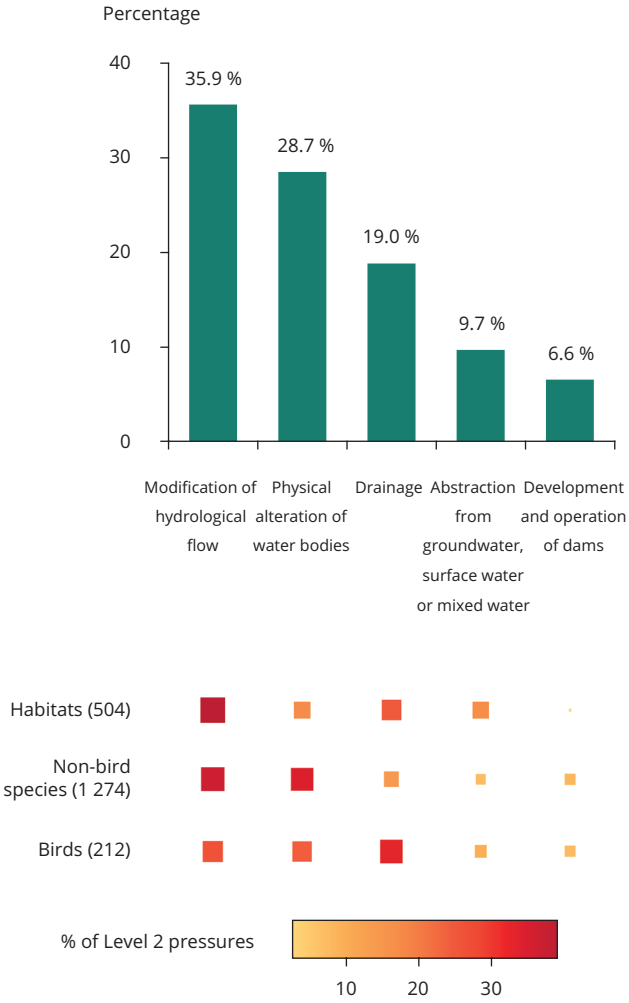
Of the Article 17 species, vascular plants most frequently face pressures from natural processes. The Lady's Slipper Orchid (*Cypripedium calceolus*), Fen Orchid (*Liparis loeselii*) or the Water Shamrock (*Marsilea quadrifolia*), for example, experience interspecific relations as their predominant overall pressure. In the case of the Fen Orchid, the plant depends on the natural processes of land upheaval around the Baltic Sea: old sites become overgrown when they rise too high above sea level.

4.1.7 Modification of water regimes

Pressures concerning modifications to the water regime are highly fragmented among the different pressure groups, overall accounting for 11 % of all reported pressures. This specific pressure group only accounts for pressures that are not directly related to any other pressure group. For example, drainage activities that are part of agricultural activities are included in the agricultural pressure group, and hydropower installations are included in the energy pressure groups, making up 14 % and 13 % of water-related pressures. Following this logic, the present pressure group covers only 58 % of all reported pressures related to human-induced changes in water regimes, i.e. only those that are not covered by others.

Unsurprisingly, pressures related to this group are particularly relevant for freshwater habitats and fish. **Modifications of the hydrological flow** (Figure 4.9) are reported to be the pressure with the most significant impacts on European freshwaters. This hydrological pressure is mostly related to running water and includes, for example, modification of flooding regimes or cutting of aquatic and bank

Figure 4.9 Distribution of level 2 pressures caused by modification of water regimes for habitats and species, shown as the percentage of pressures within this level 1 group



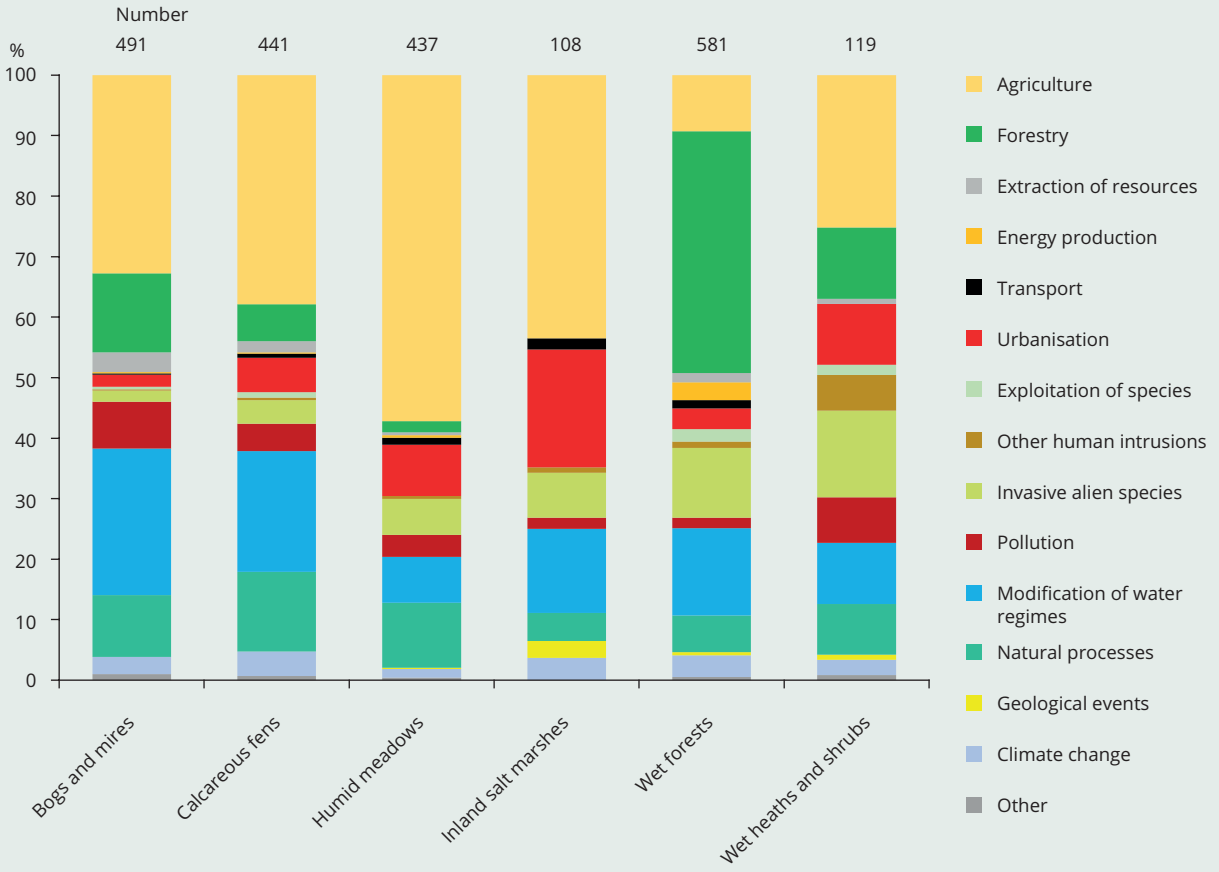
Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments

Box 4.2 Closer look: Pressures on wetland habitats

For this analysis, Annex I habitats were classified into six groups: bogs and mires, calcareous fens, humid meadows, inland salt marshes, wet heaths and shrubs, and wet forests. From Figure 4.10 it can be seen that pressures related to agriculture are the most frequently reported group of pressures in all habitat types except wet forests. For humid meadows they represent 67 % of all pressures reported. Pressures related to forestry are the main pressure group for wet forests. Modification of water regimes (for purposes other than agriculture or forestry) is important especially for bogs and mires and calcareous fens and less important for inland marshes and wet forests. Urbanisation is the second most important pressure category for inland marshes. Invasive alien species were reported as a pressure especially for wet forests and wet heaths and shrubs, less so for inland marshes and humid meadows and rarely for calcareous fens and bogs and mires. Pollution is not a dominant pressure: it represents **up to 5 % of pressures reported for bogs and mires and wet heaths and shrubs**.

Figure 4.10 Main pressures for wetland habitats



Source: Article 12 and Article 17 Member States' reports and assessments.

At the level of individual pressures, the following pressures are most important for wetland habitats: ·

- **Abandonment of grassland management** (but not significant for wet forests and wet heaths and shrubs), **natural succession** resulting in species composition change (not important for inland salt marshes and wet forests), and **intensive grazing or overgrazing by livestock** (not important for wet forests) are overall the most important pressures.
- **Drainage** belongs to the group of top pressures for calcareous fens and for bogs and mires.
- The most important pressure on wet forests is **other invasive alien species** followed by **conversion to other types of forests** including monocultures and **modification of hydrological flow**.
- The top pressure for inland salt marshes is the **conversion from one type of agricultural land use to another**.

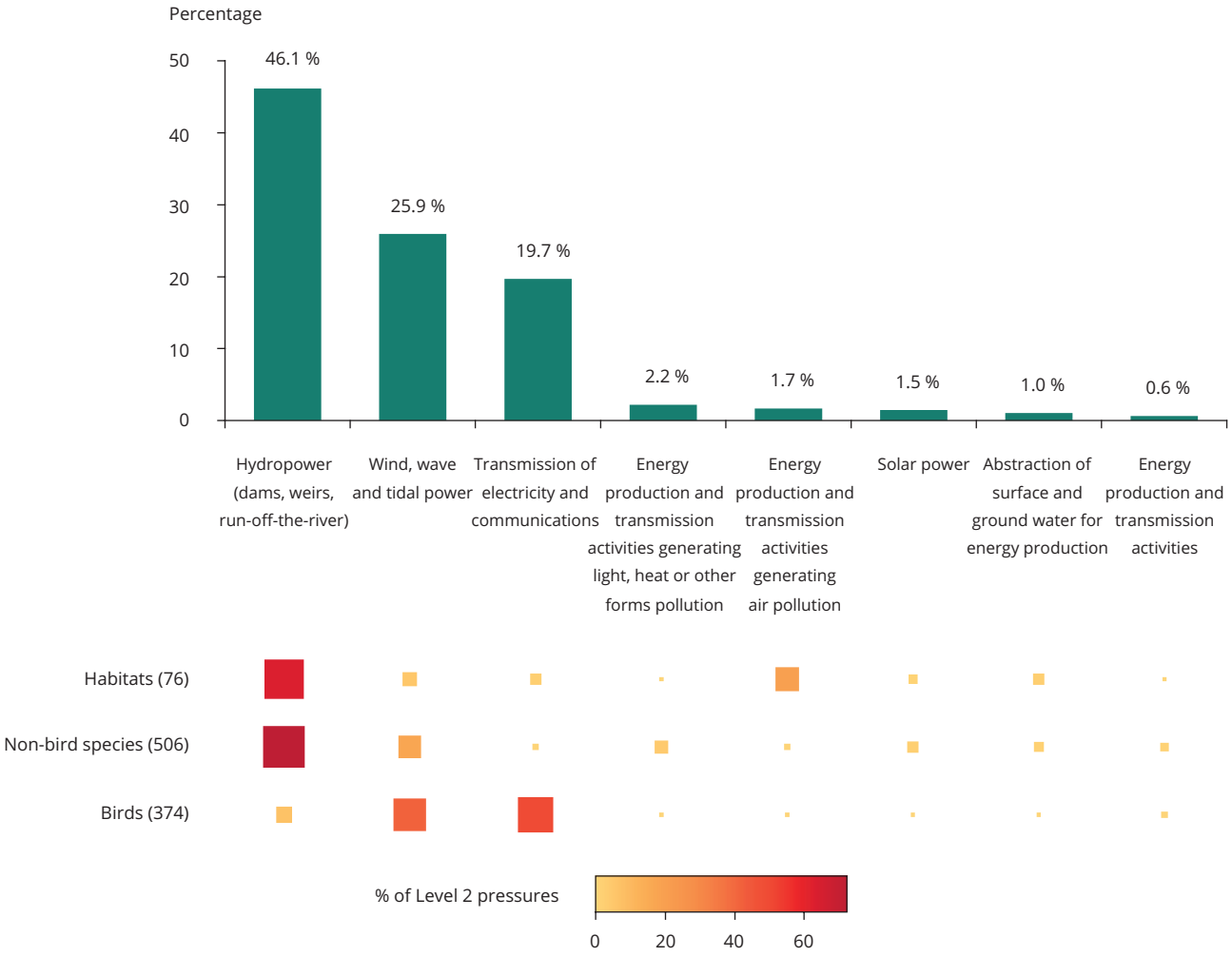
vegetation to improve water flow. Next, **physical alterations of water bodies** is one of the main pressures on freshwater fish. Physical alterations encompass, inter alia, the removal of sediments, building of dams and weirs, canalisation and water deviation.

Aside from freshwater habitats, severe pressures related to human-induced changes in water regimes also impact bogs, mires and fens and the species associated with them (e.g. Aquatic Warbler). **Drainage** activities reported under this category that are not attributed to a specific sectoral driver (e.g. agriculture) account for 10 % of the overall pressures reported for bog habitats. Consequently, these activities also affect rare and specialised species that are a part of bogs, such as the Moor Frog (*Rana arvalis*) or Peat Moss (*Sphagnum spp*.). Hydrological changes caused by drainage also affect birds such as herons and storks that often prey on species dependent on such habitats. Other birds such as waders use wet grasslands for nesting (see Box 2.3). As a result, any changes in water levels may pose a significant threat to their breeding success.

4.1.8 Energy production

In 2018, the EU produced around 42 % of its own energy. Renewable energy (34 % of total EU energy production) was the largest source contributing to energy production in the EU at that time, followed by nuclear energy (31 %) and solid fuels (22 %) (Eurostat, 2020b). Renewable energy sources include solar (thermal and photovoltaic) energy, hydropower (including tide, wave and ocean energy), wind, geothermal and all forms of biomass energy. Although these renewable energy sources are highly important

Figure 4.11 Distribution of level 2 pressures caused by energy production for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

to mitigate climate change and thereby reduce negative impacts on biodiversity, their construction and operation nevertheless have an impact on habitats and species. In contrast to the pressures caused by renewable energy sources, the impacts of fossil fuel energy (oil, coal and gas) production are more dispersed: water-related impacts (e.g. lowering the water table) or the impacts of extraction activities and the operation of power plants are rather reported under level 1 pressure groups such as 'Extraction of resources' or 'Mixed source pollution'.

As noted in the previous section, the pressures related to human-induced hydrological impacts are dispersed among the different level 1 pressure groups. Therefore, this group reflects only 45 % of all energy-related pressures; most of the other pressures are classified as human-induced changes in the water regime (largely dams). Of all the energy-related pressures, **hydropower installations** represent the single most important impact for (migratory and freshwater) fish (Figure 4.11). This includes not only dams or weirs as physical structures but also the changes they cause in the hydrological functioning of rivers, river morphology (large stretches canalised) and the chemical and thermal properties of water. Aside from freshwater habitats that are exposed to hydropower installations (such as Alpine rivers and their ligneous vegetation with *Salix elaeagnos*, 3240), other habitats seem much less affected by energy production.

Pressures from **wind, wave and tidal power** are the dominant energy-related pressures for species. Wind power may have a significant impact, as was reported for bats such as the Lesser Noctule (*Nyctalus leisleri*), Nathusius's Pipistrelle (*Pipistrellus nathusii*), and the Paricoloured Bat (*Vespertilio murinus*) as well as birds such as the Razorbill (*Alca torda*), the Greater White-fronted Goose (*Anser albifrons albifrons*) or the Golden Eagle (*Aquila chrysaetos*). This is mainly due to direct collision and fatal barotraumas from the rotating blades of turbines. However, species can also be affected by displacement through habitat reduction and substantial habitat loss or damage, barrier effects that alter migration flyways or local flight paths, and other indirect effects, such as reductions in prey species (Arnett et al., 2008; Rollins et al., 2012; Gove et al., 2013; Garthe et al., 2017). The impacts of wind farms on birds are highly dependent on, for instance, species ecology and flight height. As an example, little direct impact has been identified for the gannet population, but large raptors and other large soaring species have a higher risk of collision (Furness et al., 2013; Gove et al., 2013; Warwick-Evans et al., 2017). Oceanic wave and tidal resources, while still few in operation, may result in the displacement of marine birds from important feeding grounds either through direct disturbance of the birds themselves or through disruption to their prey as developments expand in the coming decades (BirdLife International, 2012). In addition, **offshore wind farms** and other types of energy production severely affect marine mammals because of the noise pollution caused during the construction process; affected species include the Harbour Porpoise (*Phocoena phocoena*) and the Grey Seal (*Halichoarus grypus*) (BfN, 2020).

EU energy production from renewable energy sources is expected to increase significantly over the coming decades, as it is a major pillar of fully decarbonising the EU economy by 2050. For 2030, the EU currently aims to increase the share of renewable energy in total final energy consumption to 32 % by 2030, an increase of 60 % compared with 2015 (EC, 2018). In its proposal for a new European Green Deal, the European Commission has proposed to increase the EU greenhouse gas reduction target for 2030 from currently -40 % compared with 1990 to a target in the range between -50 % and -55 % (EC, 2019a). If such an increase is adopted by the EU, renewable energy targets for 2030 would also have to increase. Therefore, it is fundamental that climate mitigation and biodiversity policies and measures are developed and implemented in a coherent and coordinated manner to avoid, or minimise, further impacts.

4.1.9 Climate change

Climate change is already happening, with noticeable impacts such as rising temperatures (in air, sea and freshwater), more frequent periods of drought and wildfires, shifting rainfall patterns, melting glaciers, less snow and a rising global mean sea level. These effects have both direct and indirect impacts on species and habitats. Direct impacts include changes in phenology, species abundance and distribution, community composition, habitat structure and ecosystem processes, and the desynchronisation of ecological relationships (EEA, 2017; IPBES, 2019). Other impacts include northwards and uphill range shifts, as well as local and regional extinctions of species (Keller et al., 2020).

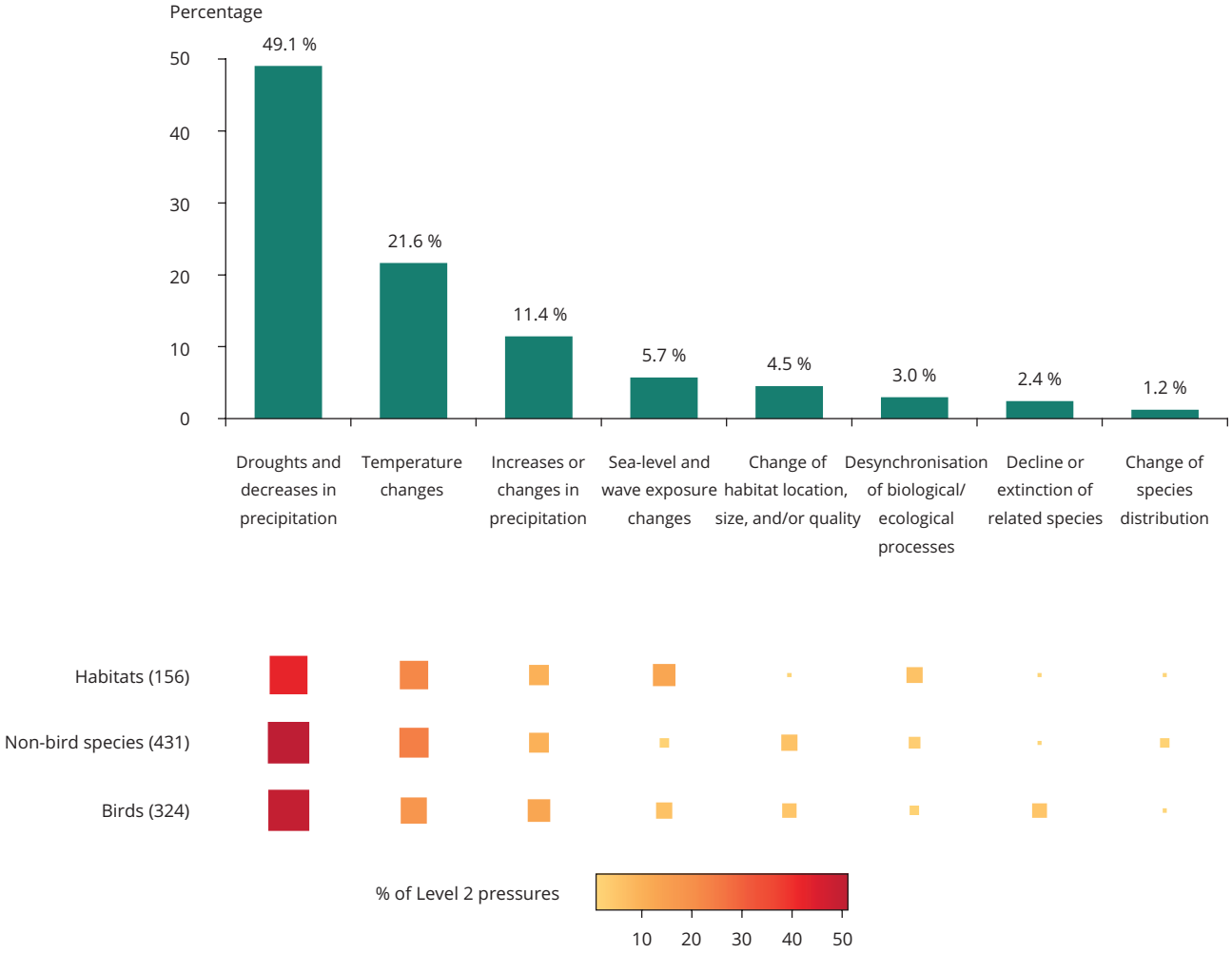
In the current reporting period, the most relevant pressure related to climate change was **droughts and decreases in precipitation** (see Figure 4.12). This pressure accounts for 5 % of all reported pressures affecting amphibians (e.g. the Yellow-bellied Toad (*Bombina variegata*)). Amphibians are particularly sensitive to **temperature** and **changes in precipitation** because of their central

position in food webs, their strong dependence on both aquatic and terrestrial systems, and their moist permeable skin acting as a sensitive respiratory organ (Olson and Saenz, 2013). Molluscs and some mammals, e.g. bats such as Botta's Serotine (*Eptesicus anatolicus*), are affected by rising temperatures, as this hampers their reproduction and foraging. Drought and decreased precipitation make up 2 % of the reported pressures for birds associated with reedbeds and reedy ponds, such as the Common Little Bittern (*Ixobrychus minutus*).

Several habitats also face severe pressures from decreases in precipitation, such as bogs, mires and fens. Coastal habitats, such as those in the Atlantic and Boreal regions, mainly face the pressure of **changes in sea level and wave exposure**. Although other climate-related pressures may not have been reported as high-level pressures in many instances, the **decline or extinction of related species** (e.g. prey species) or the **change in habitat locations** (e.g. for coastal and pelagic seabirds) already indicate a significant impact on the reproduction and survival rates of species and bird populations.

Although climate change is not reported as a particularly relevant pressure for the period from 2013 to 2018, research on future scenarios predicts that climate change will have a dramatic effect on European plants and animals in the years to come and lead to an acceleration in biodiversity loss in many areas (EC, 2020f). Climate change is also likely to exacerbate the problem of invasive species in Europe (especially in the northern parts), and some locations will become more favourable for previously harmless alien species.

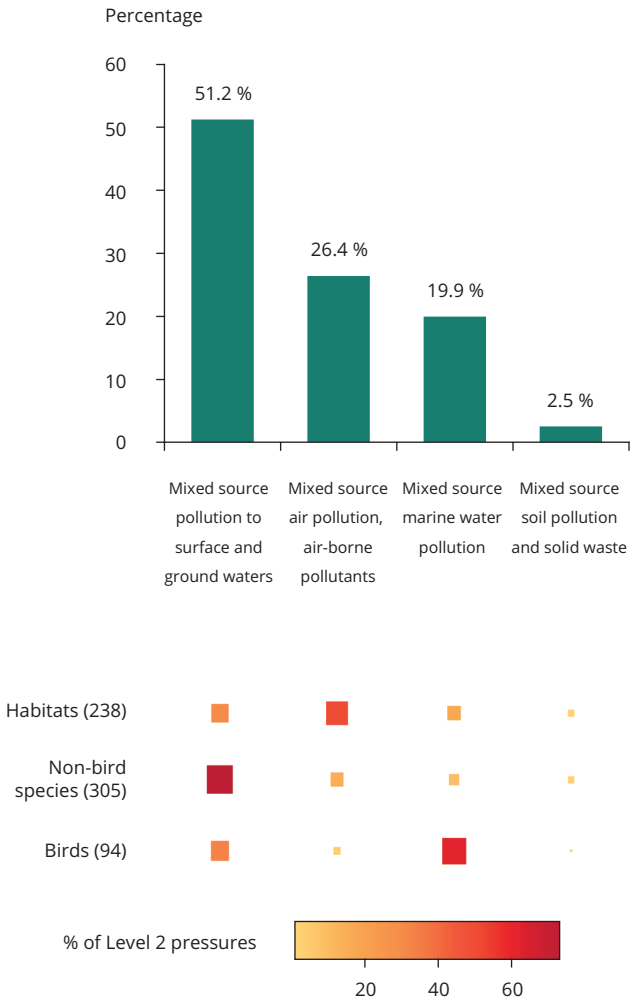
Figure 4.12 Distribution of level 2 pressures caused by climate change for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports is given in parentheses.

Source: Article 12 and Article 17 Member States' reports and assessments.

Figure 4.13 Distribution of level 2 pressures caused by pollution for habitats and species, shown as the percentage of pressures within this level 1 group



Notes: The size of the squares and their colour reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages. Total number of reports given in parenthesis.

Source: Article 12 and Article 17 Member States' reports and assessments.

Reflecting these predicted changes, climate change is seen as an emerging threat. This is also mirrored in Member States' reports under the nature directives. In this context, threats are defined as projected pressures within 12 years of the end of the current reporting period. For climate change, the reporting suggests a steep rise (80 %) in related pressures, further amplifying the present impacts of droughts and decreases in precipitation as well as changes in temperature. In addition, changes in habitat location, size and/or quality is a rising threat with particular relevance for species, most notably in the Continental and Alpine regions. According to Member States' reporting , water-dependent species and habitats will be specifically affected, such as waterbirds (e.g. geese, diving ducks (*Aythya spp.*), herons), freshwater species such as fish (e.g. Grayling (*Thymallus thymallus*) and Atlantic Salmon (*Salmo salar*)), amphibians, butterflies, crayfish and the Pearl Mussel (*Margaritifera margaritifera*) and diverse habitats such as forests (e.g. several temperate beech and oak forests and riparian mixed forests), coastal and marine habitats (e.g. coastal lagoons, mudflats, reefs), glaciers, and alkaline fens, petrifying springs and quaking bogs.

4.1.10 Pollution

The number of pollution records from the level 1 group 'Pollution' was relatively few (see Figure 4.2). However, this group includes only pollution from mixed sources that could not be attributed to a specific origin or activity (see Figure 4.13).

Considering the pollution entries reported across different level 1 groups reveals the true importance of this pressure. These pressures account for 7 % of the over 31 000 individual pressure records. The top three level 1 groups under which pollution pressures were reported are 'Agriculture' with almost half of the records (48 %), 'Mixed source pollution' (28 %) and 'Urbanisation' (21 %). This clearly shows the importance of agricultural activities as a key source of pollution (air, water and soil) negatively affecting the status of and trends in many habitats and species. Because of the taxonomy of pressures used in the reporting, atmospheric emissions and air pollution did not stand out and were underestimated; however, they have a significant impact in terrestrial habitats especially reactive to nitrogen deposition. Across Europe it is predicted that, with current policy in 2020, over 70 % of the area of EU ecosystems will receive

more atmospheric nitrogen than they can take and continue to function naturally (Hettelingh et al., 2017).

As a policy response to the critical issue of pollution, both the EU Biodiversity Strategy for 2030 and the Farm to Fork strategy aim to significantly reduce the input of chemical pesticides (50 % reduction) and to promote less intensive farming practices, including a significant reduction in fertiliser use (at least 20 %).

Key messages

- Agricultural activities represent the most common pressure group across habitats and species: abandonment of extensive management and intensification are the most frequent pressures.
- Agriculture is also the main sector contributing to air, water and soil pollution (almost half of all pollution reports), with significant impacts on standing waters, rivers and marine habitats and their species.
- Marine and coastal habitats are particularly affected by pressures related to sports, tourism and leisure activities.
- Species exploitation is the largest overall pressure for wintering and passage birds, relating to illegal shooting or killing and hunting, as well as incidental killing; non-bird species are also affected, with fish, mammals and reptiles being affected more than average.
- Invasive alien species affect habitats more than species, but they do affect amphibians, fish, vascular plants and breeding seabirds.
- Modifications of the hydrological flow are the most significant water regime modification pressure for European freshwaters and bogs, mires and fens, while physical alterations of water bodies are the dominant pressure for freshwater fish.
- Of energy-related pressures, hydropower installations are the most damaging for (freshwater) fish; most birds are especially vulnerable to electricity and communication transmission infrastructure.
- The most relevant pressure related to climate change is droughts and decreases in precipitation, accounting for 5 % of all reported pressures affecting amphibians; climate change is growing in importance and Member States reported significant increases in threats.

DASHBOARD
with detailed information by Member State:
Pressures Article 12

DASHBOARD
with detailed information by Member State:
Pressures Article 17

4.2 Conservation measures

4.2.1 Application of measures

The nature directives emphasise the need for conservation measures to maintain or restore the natural habitats and populations of wild fauna and flora. Establishing conservation measures in Natura 2000 sites is a mandatory responsibility of the competent authorities in each Member State ([30]) and is the focus of this chapter. If it is necessary to set up a formal framework for implementing practical conservation actions (conservation measures) — which represent the core of this section — Member States are asked to (1) develop appropriate management plans specifically designed for their sites or integrate them into other development plans, or (2) take appropriate statutory, administrative or contractual measures corresponding to the ecological requirements of the Annex I habitats and Annex II species present on the sites. For Annex I birds and other migratory birds for which the Natura 2000 sites are classified, Member States have to avoid pollution and deterioration of habitats or any disturbances affecting them.

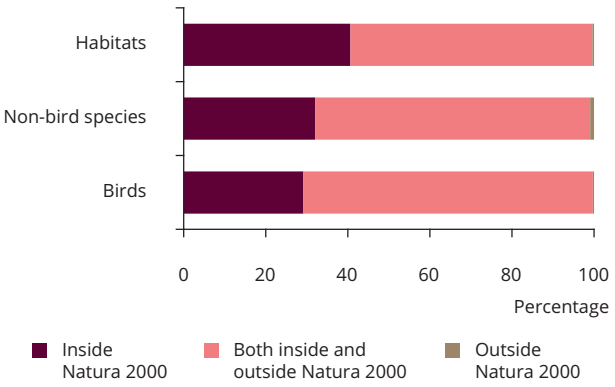
Although the directives require conservation actions to be established within the Natura 2000 sites, conservation measures are also applied by Member States outside the network to contribute to achieving good conservation status of habitats and species in need of management. However, as Figure 4.14 shows, only a small number of measures are only taken outside Natura 2000 sites. Instead, most conservation measures are applied both inside and outside the Natura 2000 network.

Within the nature directives' 2013-2018 reporting period, Member States provided an overview of conservation measures, indicating whether or not the majority of the measures needed were taken. For each habitat and species, this consisted of an overarching evaluation of the status of the main conservation issues targeted by the measures in place and of the expected overall response time of all the measures taken. This broad evaluation did not look specifically at the status, purpose or response time of each individual measure in place but was a global assessment of a habitat or species. This enables the link to be established between the status of measures and the reported conservation status or trends. In addition, Member States provided a detailed list of measures taken, which serves to highlight what has been done to counteract pressures and threats and to conduct an overall evaluation of the state of conservation measures.

Habitats

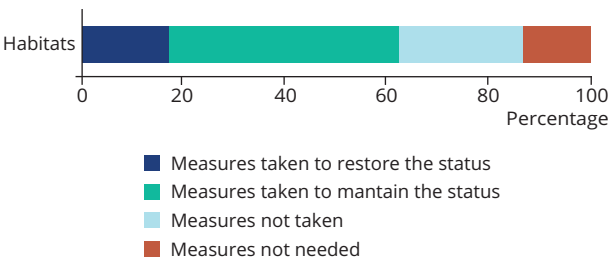
- Across terrestrial and marine habitats, the majority of conservation measures are already taken for around 60 % of Member States' habitats (Figure 4.15). Another 10 % of habitats were reported as not requiring any conservation measures.
- Forests, followed by grasslands, freshwater and coastal habitats more frequently have all measures needed in place in comparison to other habitat groups. Eight Member States (Bulgaria, Denmark, Estonia, Italy, Luxembourg, Latvia, Slovakia and the United Kingdom) report that, for more than 90 % of their habitats, conservation measures have been identified and taken.

Figure 4.14 Main location of measures for habitats and species



Source: Article 12 and Article 17 Member States' reports and assessments.

Figure 4.15 Implementation status of habitat conservation measures



Source: Article 12 and Article 17 Member States' reports and assessments.

([30]) Reporting on conservation measures does not cover all species listed in the nature directives; this information is available only for Annex II species from the Habitats Directive, Annex I birds and birds for which Natura 2000 sites are classified under the Birds Directive.

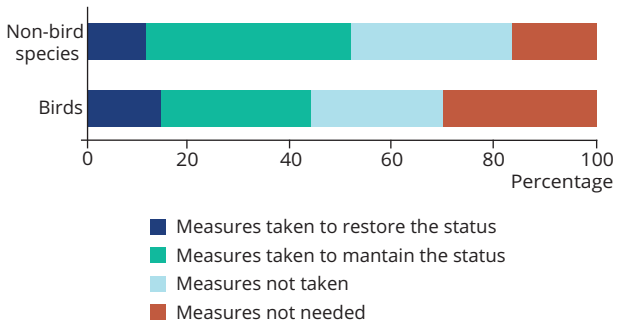
- Habitats for which the necessary measures have been identified but most of them not yet taken comprise an additional approximately 22 % of reports. These largely stem from coastal, freshwater and dune habitats and the largest share is in the Marine Mediterranean region, followed by the Mediterranean and Boreal regions.

- For those habitats where particular conservation actions were reportedly not needed, the highest proportion is in Cyprus followed by Greece and Romania.

Member States have different underlying reasons for applying conservation measures, including **restoring** the current status — increasing the habitat area, restoring its structures and functions — or just **maintaining** the current status. For the large majority of habitat reports, 'measures taken' aim to maintain the current status, followed by restoring structure and functions (72 % and 23 % respectively); only around 4 % of the reports have measures aiming to increase the habitat area.

In relation to measures taken and their main purpose, the habitats reports are also classified according to the time-frame of the expected response of a habitat to measures applied. The majority of habitats will respond to the measures in the mid-term (68 %) and the rest either in the short term (14 %) or the long term (18 %). These categories were all present in each of the habitat groups but varied in their frequencies. Short-term responses to measures are expected in particular for dune habitats and heath and scrub, mid-term responses are generally high across all habitat groups, with freshwater habitats having the highest share. Long-term responses are expected for forests in particular.

Figure 4.16 Implementation status of species conservation measures



Source: Article 12 and Article 17 Member States' reports and assessments.

Species

For approximately half of the birds and non-bird species, measures were 'identified and taken' and one third have 'identified but not yet taken' the necessary measures (see Figure 4.16). The share of these categories is similar across marine and terrestrial species.

Conservation measures relating to **non-bird species** revealed several noteworthy findings across the different categories:

- Measures 'identified and taken' have the highest reported shares in Belgium, Bulgaria, Luxembourg, Slovakia and the United Kingdom at around 90 %; the majority of necessary measures were taken for vascular plants, arthropods, mammals and fish, with around 80 % aiming to maintain the current status.

- Species with measures 'identified but not yet taken' make up the largest share of the Macaronesian region species; the highest total counts were reported by Croatia, Spain and Portugal.

- 'Measures not needed' comprise around 70 % of the Marine Black Sea reported measures for species; the largest share of cases was reported by Cyprus.

Almost 80 % of the measures taken for non-bird species aim to maintain their current status. Restoration measures, on the other hand, play a less prominent role. The majority of measures are estimated to have short-term effects (60 %). The highest share of those with long-term responses are reported for fish, mammals, molluscs and non-vascular plants.

Regarding **birds**, 'measures not needed' account for around 30 % of all cases. The remaining species are largely reported as having the measures 'identified and taken' (40 %) or 'identified but not yet taken' (30 %):

- Cases with measures 'identified and taken measures' were largely reported from Bulgaria and Poland (more than 160 measures each) as well as Spain, Germany, Hungary and the United Kingdom (more than 100 measures each) and comprise very high shares of the measures reported from Hungary, Malta and the United Kingdom (approximately 90 %).

- Cases with measures 'identified but not yet taken' were largely reported from Croatia.
- Only a few bird species have measures that are 'needed but cannot be identified', comprising a large share of Greece's reported measures. The share of response times of these measures is around 60 % mid-term, 25 % short-term and 15 % long-term.

Among breeding, wintering and passage birds, the highest total number of measures was reported for breeding birds. The distribution across categories is similar for all three groups and is, in decreasing order: maintain current status, increase area, restore structure, expand range. Malta reported almost 100 % of the measures to increase area as taken, while Estonia reported more than 70 % of the measures to enhance the current status by restoring structure and functions as taken.

Key messages

- For most of the habitats and species, measures have been applied both inside and outside the Natura 2000 network, with a smaller share taken only within the network. Measures that have been taken only outside the Natura 2000 sites are limited.
- For 60 % of habitats, measures were 'identified and taken'; these mostly aim to maintain the habitat's status (e.g. for forests, grasslands, freshwater and coastal habitats).
- For non-bird species, around 50 % of the reports indicate that measures have been taken; these largely target vascular plants, arthropods, mammals and fish, with the majority of measures aiming to maintain their status.
- For birds, approximately 40 % of the reports indicate that measures have been taken, with the highest total share reported for breeding birds.
- Overall, the majority of habitats and bird or non- bird species have measures that have been taken to maintain the current status.
- Reports indicate that, for the majority of habitats and species, measures are needed and these had been taken; however, conservation status and trends have not significantly improved and deterioration is ongoing. This may indicate that measures not yet taken are key to delivering conservation objectives and also that measures not fully implemented either need to be scaled up or were not effective.

DASHBOARD
with detailed information by Member State:
Measures Article 12

DASHBOARD
with detailed information by Member State:
Measures Article 17

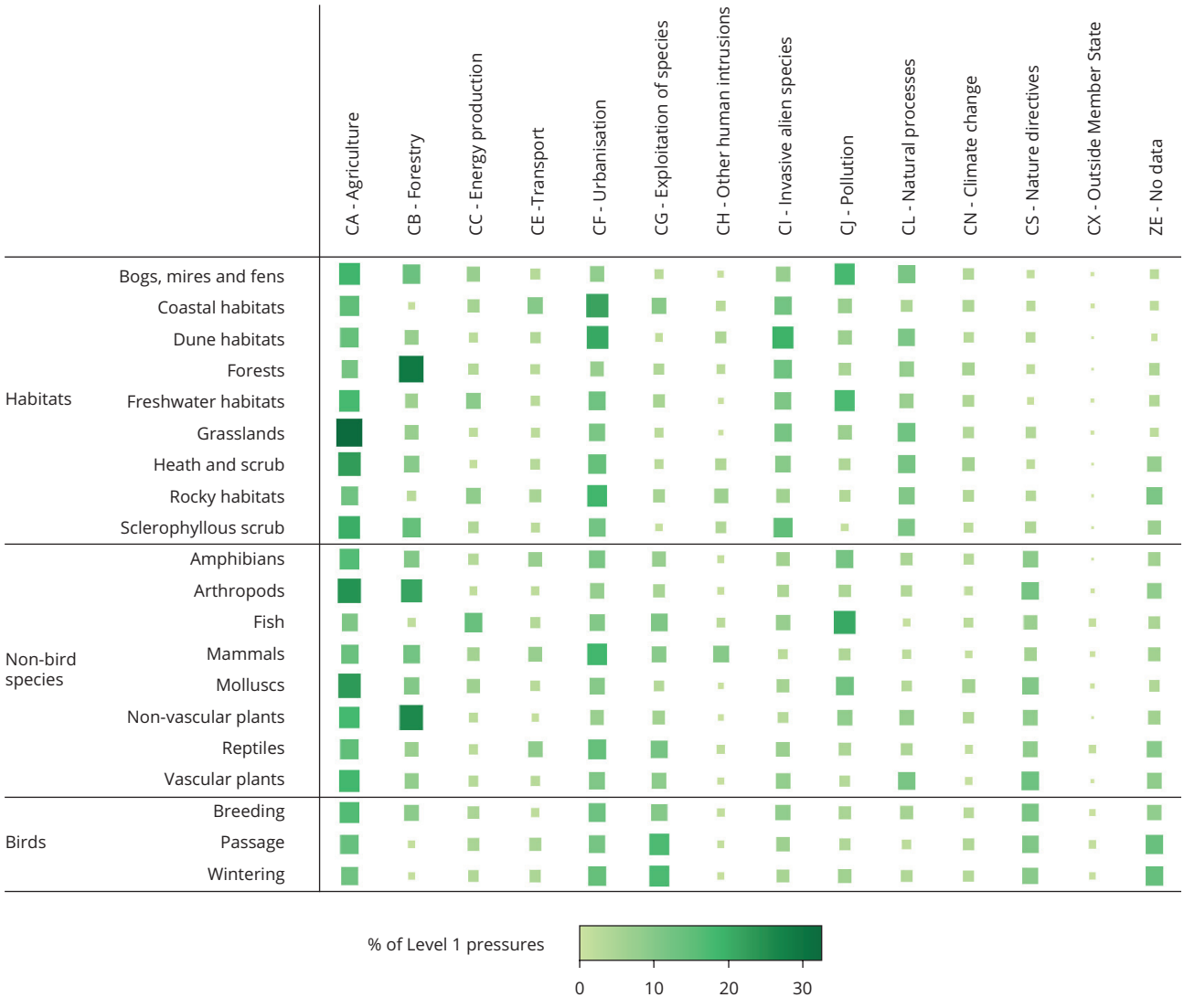
4.2.2. Measures and pressures

The following section looks at the measures reported that aim to reduce the pressures reported in Section 4.1 to minimise potential impacts from future threats. Corresponding to the pressures, measures are reported for different level 1 groups that (mainly) mirror the level 1 pressure groups.

As shown in Figure 4.17, conservation measures targeting agricultural practices are by far the most frequent among the measures implemented, corresponding to the negative impacts of agricultural activities, or the decline of extensive management of grasslands and some heathlands. However, measures are more evenly distributed across the categories than pressures targeting a wide range of different sectors.

As for the reporting of pressures, practical conservation measures are further detailed in a second level. The following section therefore reflects measures that are applied to target the pressures listed in Section 4.1.

Figure 4.17 Distribution of level 1 measure categories among habitats and species



Notes: The size of the squares and their shade reflect the percentage of pressures for each group: bigger darker squares indicate higher percentages.

Source: Article 12 and Article 17 Member States' reports and assessments.

Agriculture

With more than 17 % of all measures, agriculture-related activities were the most frequently reported group. Most of the conservation measures applied for habitats concern **adapting mowing and grazing activities, maintaining existing extensive agricultural practices** and **reinstating appropriate practices to address abandonment**. Semi-natural grasslands and especially hay meadows, such as *Molinia* meadows (6410) or lowland hay meadows (6510), are the habitats that are most frequently addressed by such measures.

For freshwater habitats, the majority of measures aim to **reduce diffuse pollution to surface waters and groundwaters**, e.g. through decreased discharge, connection to sewers and improvements in waste water treatment. Bogs, mires and fens, however, are mainly addressed by **management of drainage and irrigation operations** to improve habitat condition, together with **reinstating or adapting extensive management practices**. In addition, airborne pollution caused by agriculture was targeted by a number of measures, e.g. by integrated nitrogen management approaches, low-emission application techniques or replacing chemical fertilisers with organic equivalents.

For most species' groups, **reinstating, adapting and maintaining extensive management activities** were also the conservation measures most frequently reported, especially for insects, vascular plants and birds. However, with 6 % of all reported measures taken for mammals, **managing the use of natural fertilisers and chemicals** is the predominant measure to address the related pressures reported mostly for bats and small mammals.

Among a wide variety of measures applied, Member States should also provide specific information on measures aiming to **restore or re-create the landscape features of agricultural landscapes** or habitats. This type of measure is implemented relatively rarely for most of the habitat or species groups, but these proactive conservation actions are rather frequent for agricultural and dune habitats, reptiles, amphibians and mammals.

Urbanisation

Overall, **reducing the impact from outdoor sports, leisure and recreational activities** is the most frequent measure related to this category targeting habitats and species. Such reductions particularly target marine and coastal habitats, dune habitats and rocky habitats

Box 4.3 Closer look: Pastures as ecological corridors for mammals

Photo: Corsican Red deer © NEEMO

The Corsican Red Deer (*Cervus elaphus corsicanus* Erxeleben*)* is a subspecies of the European red deer and is endemic to Sardinia and Corsica. The species is mainly threatened by extensive logging, hunting, forest fires, the diffusion of farming and the spread of livestock. These factors have led to habitat fragmentation and severe population decline across the deer's territory. The LIFE project One Deer Two Islands (LIFE11 NAT/IT/000210) aimed to improve the conservation status of the Corsican red deer in Sardinia and Corsica by reducing conflict with human activities and promoting awareness of the species' ecological and economic value. Eighty deer captured in Sardinia in the source area of the Costa Verde Oasis (Arbus) at the Monte Arcuentu and Rio Piscinas Site of Community Interest were reintroduced into the former Sardinian province of Ogliastra to repopulate a territory that in the past housed a large number of red deer. Ecological corridors have been set up by creating 80 ha of pastures and herbaceous meadows to feed the deer in south-east Sardinia. The pasture and meadows keep deer away from crops that are intended for domestic livestock and encourage them to migrate to less populated areas. As the project only ended in 2019, the impact cannot yet be measured. Considering the endemism characterising the species, it is highly probable that the project has contributed to the recent positive trend and a good conservation status.

(predominantly in the Alpine region) and species such as mammals (e.g. Greater Mouse-eared Bat (*Myotis myotis*)), birds (e.g. Golden Eagle (*Aquila chrysaetos*)) and vascular plants. One of the main focuses of these measures is to develop sustainable tourism.

Measures related to **managing the conversion of land for construction and development of infrastructure** are frequently applied to grasslands and related species such as insects, birds and reptiles.

Proactive measures such as **restoring the areas impacted by urbanisation or leisure use** are predominantly implemented for marine and coastal habitats. For dunes, these measures may include controlling visitor numbers and raising awareness of their value.

Forestry

Overall, the most common forestry measures relate to **adapting and changing forest management and exploitation practices** (25 % of all forestry measures taken). Not surprisingly, this type of measure particularly targets forest habitats. In practice, these measures can involve, for example, adapting and changing management practices to secure or develop old stocks of trees, retaining dead and dying trees and stumps, preserving habitat continuity or preventing forest wildfires. One of the prominent approaches to increasing the multifunctionality of forests is the 'close-to-nature-management' that promotes alternatives to even-aged monocultures.

Preventing the conversion of (semi-) natural habitats into forests and (semi-) natural forests into intensive forest plantation is of particular relevance for many habitat groups and some specific non-bird species, each of which have close to 20 % of all forestry-related pressures falling within this category. Examples include grasslands, heath and scrub, dune habitats and bogs, mires and fens, as well as species such as insects and vascular plants.

The species targeted by forestry measures are largely mammals, insects and vascular plants as well as forest-dependent birds such as the Hazel Grouse (*Bonasa bonasia*) or the Black Stork (*Ciconia nigra*).

Exploitation of species

Measures in this group are most frequently implemented for fish and birds as it includes, 16 % and 14 %, respectively, of all measures taken for fish

Box 4.4 Closer look: Tackling invasive alien species in England

Photo: Japanese Knotweed © MdE

The LIFE project Rapid Life (LIFE16 NAT/UK/000582) aims to deliver a package of measures to reduce the impact and spread of invasive alien species (IASs) in freshwater aquatic, riparian and coastal environments across England. It addresses different pillars of the EU IAS Regulation, such as prevention, early detection and response to and management of widely spread IAS species at the regional level. The project produced IAS management toolkits and protocols for the prevention, detection and control of IASs. Moreover, the project successfully implemented and demonstrated novel methodologies for the detection and monitoring of IASs, such as the use of e-DNA to detect signal crayfish, and innovative technologies for the removal and/or eradication of IASs, such as the use of novel biocontrol methods to eradicate invasive weeds (Himalayan Balsam and Japanese Knotweed) and the use of male sterilisation to control signal crayfish. Regarding the actual management and control of IAS dispersal, RAPID LIFE implemented demonstration projects at catchment and local scales. At catchment scale 12 000 m^2 and 8 000 m^2 of Himalayan Balsam was removed manually by volunteers, while, at the small scale, biocontrol methods were used to clear 100 m^2 of Himalayan Balsam and 300 m^2 of Japanese Knotweed. Biocontrol methods were used to combat Himalayan Balsam at nine sites and Japanese Knotweed at 13 sites. The project also successfully combatted Signal Crayfish at three sites and released White-clawed Crayfish reared in captivity to restore the population balance.

and birds. For birds, 40 % of these measures include the **management of hunting, recreational fishing and recreational or commercial harvesting or collection of plants,** which is also the most frequent measure taken for fish. Other species that are targeted by measures relating to their exploitation are mammals and reptiles, especially through **the control/eradication of illegal killing, fishing and harvesting** — mostly achieved by increased enforcement. This measure is also frequently applied in the conservation of fish and birds.

Invasive alien species

Around 9 % of all measures reported were implemented to **reduce the impacts of invasive alien or problematic native species**. Habitats, especially coastal habitats, dunes, forests, grasslands and freshwater habitats, and equally non-bird species, are mainly targeted by measures related to controlling and eradicating invasive alien species, whereas measures for birds mostly involve managing problematic native species. Practical implementations include the elimination of key invasive species such as Himalayan Balsam (*Impatiens glandulifera*) or Japanese Knotweed (*Fallopia japonica*) or the control and containment of invasive animal species.

Natural processes

Natural process-related measures largely target habitats through their **management to slow, stop or reverse natural processes.** Such measures are typically applied to bogs, mires and fens as well as to forests and grasslands.

Mixed source pollution and the modification of water regimes

This group of measures, targeting in particular the aquatic environment and wetlands, contains the measures overall most frequently applied for the conservation of fish populations**.** Here, the main focus lies on **reducing the impact of multipurpose hydrological changes**, which is the single most often applied measure, of all measures, dedicated to conserving fish. Direct measures may include the removal of sediments, canalisation, water deviation or modification of the flooding regime. These measures are also frequently applied for the conservation of birds, for example wading birds such as the Eurasian Bittern (*Botaurus stellaris*)**.**

Moreover, measures from this group are equally important for freshwater habitats and bogs, mires and fens that are extensively targeted by **reducing the impact of multipurpose hydrological changes** and **mixed source pollution** as well as by **restoration measures.** This includes renaturalising rivers from plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) (see Box 4.5) or oligotrophic to mesotrophic standing waters with *Littorelletea uniflorae* and/or *Isoëto-Nanojuncetea* vegetation (3130). Measures related to mixed source pollution address emissions to air of ammonia as well as greenhouse gas and water-borne pollution by local action and regional policy implementation.

Energy production and resource extraction

For species, the most frequent measures addressing energy- and extraction-related pressures are **reducing the impact from hydropower operation and infrastructure.** This includes**,** inter alia, building and managing fish passages or regulating water flows, which is particularly relevant for fish such as the Asp (*Aspius aspius*). On the other hand, **adapting and managing renewable energy installation, facilities and operation** is most relevant for birds and aquatic mammals such as the Harbour Porpoise (*Phocoena phocoena*) or the European Otter (*Lutra lutra*) as well as bat species. Birds such as the White Stork (*Ciconia ciconia*) are further targeted by measures aiming to **reduce the impact of service corridors and networks**, such as by modifying power lines to prevent birds being electrocuted or developing green or blue infrastructure to improve connectivity.

Measures that focus on **adapting and managing the extraction of non-energy resources** are especially applied to coastal habitats**.** These measures target,

Box 4.5 Closer look: Increasing river connectivity in Estonia

Since 2012, Estonia has reported genuine stability in the unfavourable-inadequate conservation status of water courses from plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260). This is in part thanks to the contribution of two consecutive LIFE projects HAPPYFISH (LIFE07 NAT/EE/000120) and LIFE HAPPYRIVER (LIFE12 NAT/EE/000871), which both restored habitats affected by hydrological changes by physically removing sediments in the water and managing riparian vegetation. HAPPYFISH was awarded Best of Nature in 2013.

for example, the extraction of minerals such as sand, gravel, loam, clay, peat and salt.

Climate change

Conservation measures targeting the effects of climate change involve either mitigation or adaptation activities. Of the reported measures that have been taken in this group, the majority addressing mitigation are reported for birds. However, measures focusing on adaptation are largely reported for habitats, including forests, freshwater and coastal habitats as well as bogs, mires and fens, e.g. by adapting fire management or by adaptive management and restoration to strengthen their resilience and enhancing their heterogeneity and protection against natural hazards (through genetic diversity or adapted tree composition). In the Netherlands, for instance, the Greater White-fronted Goose (*Anser albifrons*), the Great Bittern (*Botaurus stellaris*) and the near-threatened Corncrake (*Crex crex*) are targeted with so-called 'climate buffers' as part of a landscape management approach, including restoring overflow areas and reed marshes in the alluvial plain and broadening tributary river mouths to slow outflow into the river (BirdLife International, 2009).

Key messages

- 17 % of all measures target agricultural activities, most prominently by reinstating, adapting and maintaining extensive management activities such as mowing and grazing.
- Measures for marine and coastal habitats, dune habitats and rocky habitats most frequently relate to reducing the impact from outdoor sports, leisure and recreational activities.
- Most common forestry measures relate to adapting and changing forest management and exploitation practices, which also relates to climate change adaptation.
- The management of hunting and recreational fishing and the control/eradication of illegal killing and fishing mainly target birds and fish. Overall, the most frequent measure targeting the conservation of fish, however, is reducing the impact of multipurpose hydrological changes.

4.2.3 Effects of measures

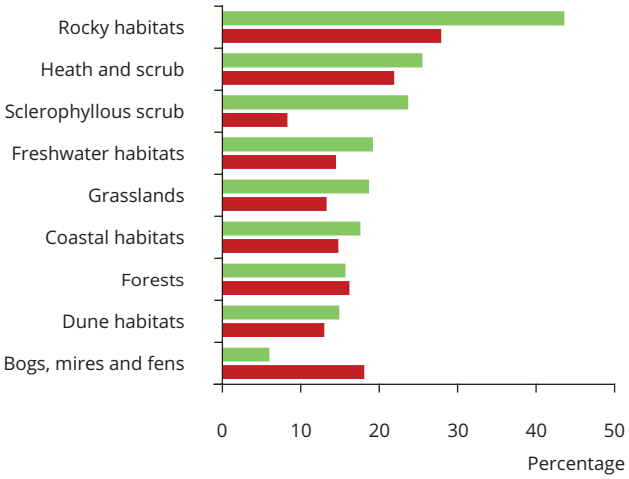
Linking status and trends to measures

A link between the measures taken and good conservation status is apparent for nearly all **habitat groups**, with a statistically significant positive correlation for rocky habitats and sclerophyllous scrub (see Figure 4.18). These two groups include many natural habitats in which the main conservation challenge is to regulate or avoid human activities and also habitats requiring agricultural use. Conservation measures applied to these habitats include regulating and maintaining extensive agricultural use, regulating leisure activities, regulating extraction activities, reducing the impact of the transport infrastructure, and habitat restoration. Raised bogs, mires and fens, however, show the opposite tendency. Only about 5 % of bogs in which measures have been taken are reported to have a good conservation status; this is significantly lower than for bogs where no measures have been taken. In general, as seen in Section 4.1, the majority of conservation measures taken during the reporting period will only achieve the expected result in the near future. This may be one of the reasons for the missing correlation between measures and status for these habitat groups, but it is also an indication that further restoration effort is needed (see Section 4.3). Similarly, the majority of habitats show improving and stable trends as a result of the measures taken.

Transboundary pressures, such as air pollution, affect habitats particularly sensitive to nitrogen deposition; however, this kind of pressure cannot be addressed at local level and may explain the poor response of those habitats to restoration measures.

(Non-bird) species also reflect this correlation, having a higher likelihood of having a good conservation status when conservation measures are implemented, often just by maintaining their good status from the

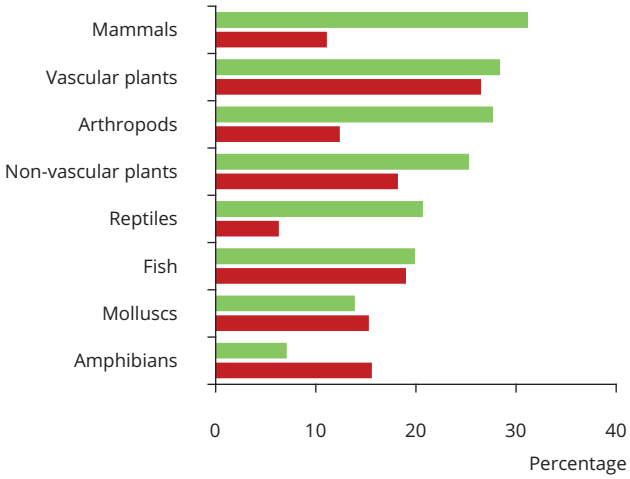
Figure 4.18 **Percentage of good conservation status if measures are taken or not taken for Annex I habitats**



Proportion of good conservation status/increasing trend when measures taken

Proportion of good conservation status/increasing trend when measures not taken

Figure 4.19 **Percentage of good conservation status if measures are taken or not taken for Annex II species**



Proportion of good conservation status/increasing trend when measures taken

Proportion of good conservation status/increasing trend when measures not taken

Source: Article 17 Member States' reports and assessments.

past. Approximately 30 % of species with a good status have benefited from such measures, while only 20 % of species for which no measures were implemented (although they are needed) have a good status (see Figure 4.19). Similarly, over one third of species that did not have conservation measures in place have a bad conservation status, compared with only one quarter of those species for which measures were applied. The strongest correlation between implementing conservation measures and status is observed for mammals, arthropods, reptiles and non-vascular plants as well as, to a lesser degree, fish. The proportion of deteriorating trends in conservation status is significantly higher for almost all species groups if measures are not taken, with the exception of amphibians and molluscs.

For **birds**, Annex I taxa and special protection area trigger species are more likely to have increasing population trends when conservation measures are implemented; this is true for all bird groups, including breeding, wintering and passage birds (see Figure 4.20).

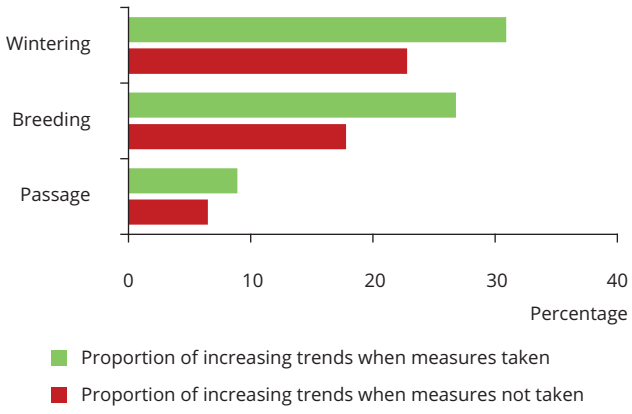
Linking improvements to measures

Looking only at the link between measures and the status of Habitats Directive species and habitats does not show the full picture, especially as the changes (represented as a change between either conservation status categories or conservation status trends) that may result from implementing conservation measures are not taken into account. In addition, many habitats and species populations are targeted by measures as a result of their bad conservation status. Finally, measures sometimes need longer time-frames to take effect. This is the case with, for example, degraded bogs, mires and fens where — depending on the hydro-ecological situation before restoration and the methods applied — it may take several decades before the desired peat-forming vegetation is sustainably restored. The following section therefore looks at these changes, building on the approaches taken to identify improvements for habitats and non-bird species (Section 3.4) and for birds (Section 2.4).

Applying conservation measures increases the likelihood of having a positive trend in conservation status (improved status as well as improving trend; both are grouped under the 'improvement' category in this analysis). However, improving cases for habitats are rather rare, as shown in Section 3.4.2. In cases where measures are needed but not taken, the conservation status and/or trend is more likely to be bad or further deteriorating (Figure 4.21).

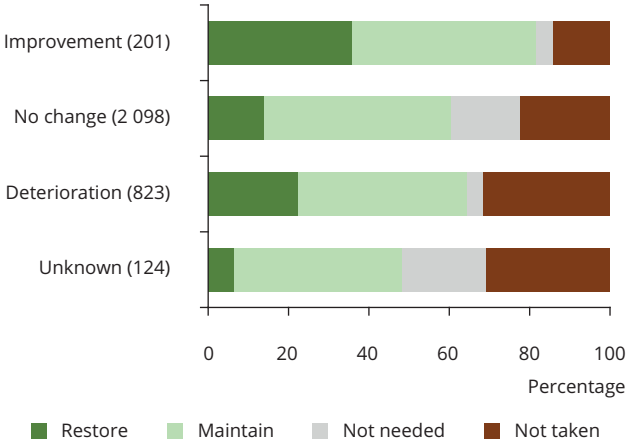
For all improving habitat assessments, more than 80 % of the improvements can be linked to the measures taken. However, habitats showing a deteriorating status despite the application of measures may indicate that

Figure 4.20 **Percentage of increasing population trends if measures are taken or not taken for Annex I and special protection area trigger bird species**



Source: Article 12 Member States' reports and assessments.

Figure 4.21 **Measures reported and changes in conservation status of habitats**



Source: Article 17 Member States' reports and assessments.

the measures taken have not been effective or require more time for their impact to be seen.

It can be expected that, for at least some habitat types that were previously degraded or depleted, the positive trends will be more frequently associated with restoration measures (if the response time is long enough) than with measures aiming to maintain the current state.

This correlation between restoration measures and positive trends is evident in the data reported for certain habitat groups and locally, for example:

- bogs, mires and fens (mainly in Belgium and the United Kingdom), e.g. through buying out an industrial peat extraction site for restoration in the case of the United Kingdom;
- coastal habitats, e.g. sandbank (1110) restoration in Denmark and the Netherlands;
- freshwater habitats by restoring water courses from plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) in Estonia or Germany (see also Box 4.6);
- heaths, e.g. through restoration activities in Latvia (4010);
- grasslands, e.g. through proactive management in Belgium and the Netherlands;
- forests, mainly various beech forests in Austria, Belgium and the United Kingdom.

There are limited cases of **Annex II** species having had improvements to their conservation status reported (see Section 3.4.3). Similar to the findings for habitats, the data show that applying measures correlates with a higher likelihood of having good or improving conservation status. Around 80 % of the improvements identified can be linked to the measures taken (see Figure 4.22). In cases where measures are 'needed but not taken', conservation statuses are more likely to be poor, bad or further deteriorating.

Of the various species groups, mammals and fish have shown the most frequent improvements in conservation status as a result of measures taken. A link between restoration measures (mainly promoting the population growth or restoring the species' habitats) and positive trends in global conservation status assessments has been recorded for some species or species groups, for example:

- large carnivores such as the Brown Bear (*Ursus arctos*), Grey Wolf (*Canis lupus*), Iberian and Eurasian Lynx (*Iberian lynx* and *Lynx lynx*) in several Member States with depleted populations;

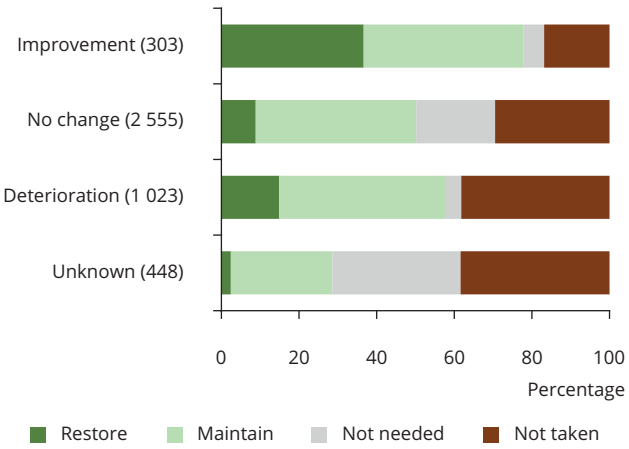
Box 4.6 Management measures to improve the hydrological regime in restored freshwater habitats in Germany (3260)

Photo: *Ranunculus fluitans* © Rutger Barendse

The watercourse habitat from plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in Germany was widely assessed as being in bad condition. Measures to improve the status of the watercourses and their species included improving and restoring the water quality and the hydrological egime and establishing protected areas. The measures taken to improve the status of the habitat had wider positive effects and enabled the populations of the associated species to increase across Germany. In addition to reducing habitat-related pressures on the species, measures were taken to regulate fishing practices. The management recommendations were drawn up by the Federal Agency for Nature Conservation for specific endangered species. Various LIFE projects contributed to this success, e.g. Bachtäler Arnsberger Wald/Rehabilitation of streams in the Arnsberger Wald (LIFE07 NAT/D/000214) and Rur und Kall/Fluvial habitats (LIFE10 NAT/DE/000008).

Source: Tucker et al. (2019).

Figure 4.22 Measures reported and changes in conservation status of Annex II species



Source: Article 17 Member States' reports and assessments.

- several bat species, mainly in Belgium and France;
- among plants, such as the Fen Orchid (*Liparis loeselii*) in Austria, Belgium and the United Kingdom;
- insects, e.g. saproxylic beetles in Italy;
- migratory fish, including anadromous fish and lampreys such as the Atlantic Salmon (*Salmo salar*).

Fish and mammals also respond to both restoration and maintaining measures, whereas the improvements among arthropods, molluscs and vascular plant groups are more frequently associated with measures aiming to maintain the current state. For amphibians, non-vascular plants and reptiles, the opposite is true, and improvements are more frequently connected to restoration measures.

The share of targeted measures applied for **birds** is around 50 % (20 % to restore and 31 % to maintain), which is significantly lower than that for habitats and non-bird species. Overall, the link between the trend category and the implementation of measures is less evident. However, as is the case for Annex II species, most of the measures are expected to have an impact in the mid-term (i.e. by 2030) rather than in the short term.

Box 4.7 Closer look: Recovery of the Aquatic Warble

Photo: Aquatic warbler © Dušan Boucný, IUCN

The Aquatic Warbler (*Acrocephalus paludicola*) is an Annex I species for which an improved conservation status was reported, moving from vulnerable in 2015 to near threatened in the most recent reports. Once widespread, the aquatic warbler almost entirely disappeared from western Europe as fen, mire and wet meadow habitats were lost to agriculture. Since 2011, however, the population has started to stabilise. These status improvements can be traced back to targeted conservation actions, including LIFE projects (e.g. the Aquatic Warbler project — Conserving *Acrocephalus paludicola* in Poland and Germany, LIFE05 NAT/PL/0001016, and LIFE Aquatic warbler and biomass, LIFE09 NAT/PL/000260), an international species action plan (2008), the international memorandum of understanding on the species under the Bonn Convention for Migratory Species in 2003, and protection under the Natura 2000 network. While most countries with low Aquatic Warbler numbers reported decreasing trends, Poland reported an increase in their population following intensive conservation actions. In the case of the Polish LIFE project, the area of habitat suitable for the aquatic warbler in eastern Poland was increased and ongoing management of major parts of the project sites was secured through income generated from biomass. This suggests that the species is highly dependent on conservation management.

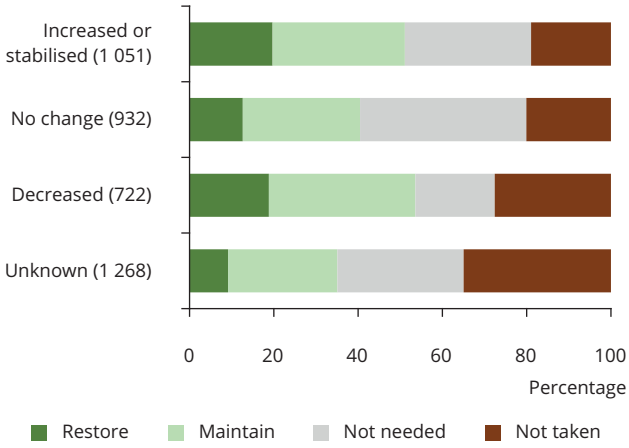
Source: Polish Society for the Protection of Birds (2020).

Although the link between increased trends and measures is not always clear, decreasing trends are more likely when measures have not been taken (see Figure 4.23). In terms of increasing population trends, there is a link at Member State level for some species groups:

- For raptors and owls, for example, more than half of the taxa with an increasing population trend at Member State level (winter and breeding) have had measures taken.
- for seabirds from the petrel, storm-petrel and shearwater families (Procellariiformes), a large part of the increasing trend is associated with the measures taken.

Further differences are evident based on the type of measure taken, i.e. restoration or **maintenance** measures. Some groups benefited noticeably more from a given type more than others. **Maintenance** measures benefited, for example, ducks, geese and swans (Anseriformes), stork-like birds (Ciconiiformes), loons (Gaviiformes), passerines (Passeriformes) and grebes (Podicipediformes) more than restoration measures. Hoopoes and hornbills (Bucerotiformes), bustards (Otidiformes) and the colourful Coraciiformes families, on the other hand, benefited more from restoration measures.

Figure 4.23 Measures reported and changes in bird population trends (Annex I and special protection area trigger species)



Source: Article 12 Member States' reports and assessments.

Key messages

- For most habitats and species, there is a positive link between the measures taken and good conservation status (except for raised bogs, mires and fens, vascular plants, amphibians, molluscs, and passage birds).
- Applying proactive restoration measures (e.g. to restore structure and functions) and measures to maintain the current status drives improvements in status.
- Restoration measures strongly benefited bogs, mires and fens, heath and scrub, freshwater habitats, grasslands and forests (mostly locally) as well as amphibians, reptiles and birds of the hoopoe and bustard groups.
- Fish and mammals benefited equally from both restoration and maintenance measures.
- Maintenance measures are key for arthropods, molluscs and vascular plants and strongly benefited ducks, geese and swans, storks and flamingos, loons and passerines.

4.3 Restoration needs of habitats

The conservation status of a habitat depends on its natural range, area, structure and functions, and future prospects (see more detail on parameters in Box 3.1). While restoration efforts need to address all of these parameters, this section focuses only on Annex I habitat types and the restoration efforts that are needed to re-establish their natural range, increase their surface area and improve their structure and functions (including within the Natura 2000 network). In the context of this report, restoration has a dual meaning and refers to:

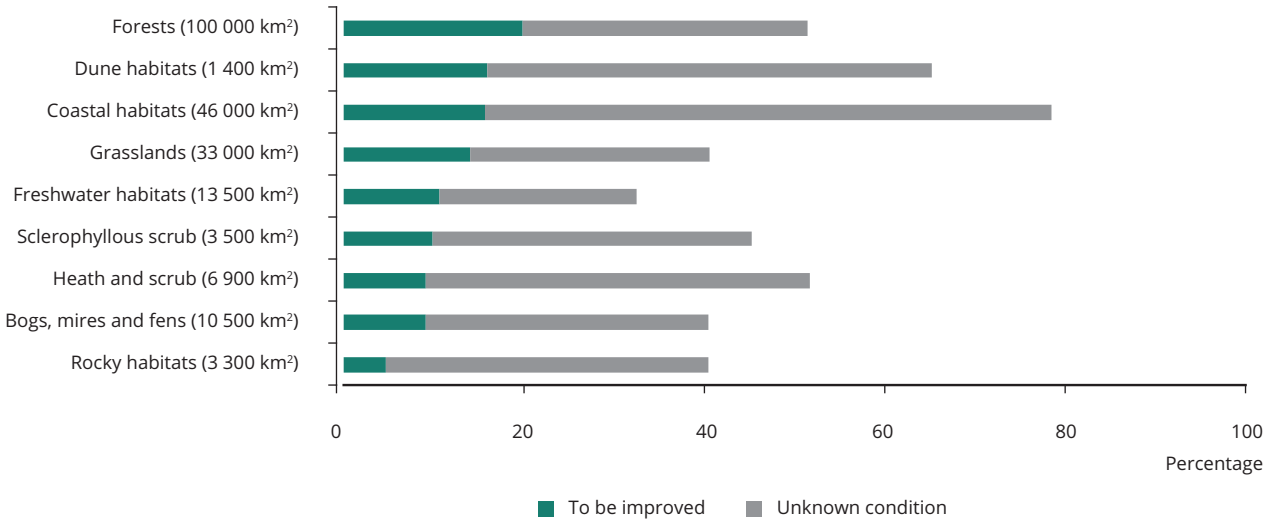
- **improving** the condition (used to assess structure and functions) of existing habitats through targeted management measures (e.g. for overgrazed grassland with surplus nitrogen in the soil and reduced floristic composition);
- ensuring sufficient availability of habitat area through habitat **(re-)creation** (i.e. creating additional areas of a given habitat, e.g. wetland habitat from a drained agricultural field).

This section estimates the minimum area that needs to be restored to achieve favourable conservation status for the habitats listed in Annex I of the Habitats Directive. It should be kept in mind that restoration alone is, however, not sufficient and that future prospects (i.e. pressures and measures) also need to be favourable to achieve the desired effects.

4.3.1 Overall need for restoring EU habitats

The analysis shows that at least 11 000 km^2 of Annex I habitats **need to be (re-)created** and added to the habitat area that already exists to ensure the long-term functioning of each habitat. This figure was estimated based on the minimum possible area required to achieve the status of a favourable reference area reported by each Member State (for more details, see Röschel et al., 2020), and it is likely that more will be needed to achieve good status for all habitats. It should be noted that the favourable reference area (and the condition of habitats used for the estimation of improvement needed below) is largely missing from several Member States — particularly for marine habitats — which might lead to a considerable **underestimation** of the actual area needing to be restored (see Figure 4.24). The habitat groups identified as having the largest areas to be (re-)created are forests (4 600 km^2), grasslands (1 900 km^2), bogs, mires and fens (1 700 km^2), and coastal habitats (1 400 km^2). EU-wide, this corresponds to 1-1.5 % of the total existing area of these habitat groups.

Figure 4.24 Percentage of Annex I habitat areas to be improved per habitat group



Note: Proportion of the total area reported by Member States that needs to be improved and proportion of unknown or not reported condition for each habitat group. The United Kingdom and habitat 8310 were excluded from the calculations.

Source: Article 17 Member States' reports and assessments.

The current area of habitats that **need to be improved** (i.e. areas reported as being in 'not good' condition) is estimated to be between 167 000 km² and 263 000 km², or 4-6 % of the EU territory. It should be noted that the quality of available data ([31]) on habitat condition on which this analysis is based is a limiting factor. Largely because of insufficient monitoring data, the condition of many habitats used in this calculation could only be determined for part of the habitat area (e.g. the condition of 63 % of coastal habitats and 50 % of dune habitats remains unknown). This means that the actual habitat areas in need of restoration are **likely to be much bigger** than those that have been estimated.

The average areas to be improved for each habitat type are as follows:

- Forests have the largest area in need of restoration targeted at improving their condition (approximately 100 000 km²); this equates to near 20 % of the total area of Habitats Directive forests needing to be improved.
- Coastal habitats need 16 % of their total area to be restored (approximately 46 000 km²).
- Grasslands need around 13.5 % of their total area to be restored (approximately 33 000 km²).
- Freshwater habitats need approximately 10.5 % of their total area to be restored (approximately 13 500 km²).
- Bogs, mires and fens need around 9 % of their total area to be restored (approximately 10 900 km²), including bog woodland, natural eutrophic and dystrophic lakes, oligotrophic waters, transition mires and quaking bogs.

The areas in need of restoration (improvement of their condition) listed above are shown in Figure 4.24 as a proportion of the total habitat area reported by Member States. In addition to maintaining areas that are already in good condition, restoration efforts also require increased investment from existing funding streams accompanied by appropriate policies to facilitate and prioritise the required restoration actions. This is confirmed by the EU Biodiversity Strategy for 2030 — Bringing nature back to our lives (EC, 2020d) — adopted by the European Commission, which puts restoring nature at its core.

As mentioned above, the incompleteness of the data reported confirms the need to further support, develop and implement appropriate monitoring schemes in Member States.

([31]) The calculations exclude the United Kingdom, given the relevance of these estimations for the post-2020 biodiversity strategy. Habitat 8310 (Caves not open to the public) was also excluded, taking into account its linear and underground characteristics.

Box 4.8 Closer look: Active restoration of habitats

Boost for alvar grasslands in Estonia

Nordic alvar and Precambrian calcareous flatrocks (priority habitat type 6280*) are found around the Baltic Sea. The habitat is mainly under pressure because traditional low-intensity grazing has been abandoned. In Estonia, the project LIFE to Alvars (LIFE13 NAT/EE/000082) and State Forest Management Centre land management agreements have achieved substantial improvements in the country's alvar grasslands by implementing restoration measures. Key success factors were the fast, efficient large-scale mechanical restoration technique, improved communication between the local people and the state organisation (which facilitated restoration and grazing arrangements), availability of targeted agri-environment support, and the project team's efforts to enable local livestock owners to sign restoration agreements and agri-environment contracts. The habitat improvement was enabled by developing integrated coastal zone management and also by the local population's enhanced awareness of sustainable development and the benefits of nature conservation in this biosphere reserve.

Photo: Fixed dunes in Sweden © NEEMO

Restoring fixed dunes in Sweden

Fixed — or grey — dunes (priority habitat type 2130*) comprise a secondary succession stage of dune formation. They are characterised by a perennial open vegetation of grasses, herbs, mosses and lichens, attracting specialised fauna, mostly invertebrates. Although they are present along most of Europe's coasts, three quarters are found in the Atlantic region. In all regions fixed dunes have a bad conservation status with mostly negative trends. The habitat is mainly threatened by encroachment of tall herbs and grasses, shrubs and trees, mostly as a consequence of planting trees for coastal defence or land abandonment. In the Continental region of Sweden there is a positive trend in the surface area of fixed dunes Here, the project SandLife (LIFE11 NAT/SE/000849) addressed the problems of historical overstabilisation of coastal and inland dunes and was instrumental in stopping the further decline of the fixed dune habitat. The project coordinated actions across 23 Natura 2000 sites in the south of the country and cleared 550 ha of scrub and trees, opened up 200 ha of dunes by disturbing the soil with tractor-mounted harrows and ploughs, and dug up 40 ha of the invasive Japanese Rose (*Rosa rugosa*).

Photo: Peatland restoration in Belgium © NEEMO

Peatland restoration in Belgium

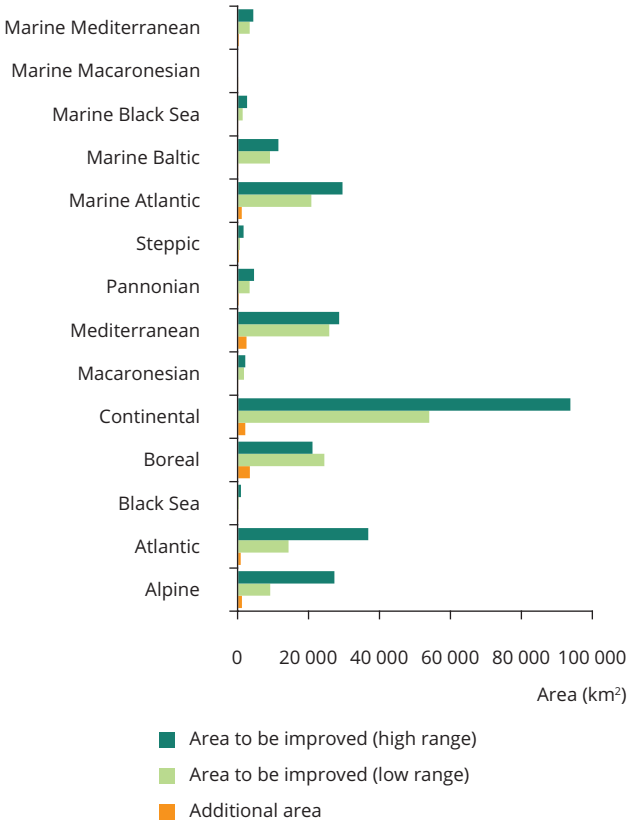
The majority of the total habitat area of bogs and mires and grasslands has been lost over the last century as a result of human interventions, such as agricultural intensification, draining peatlands and land take/urbanisation. To overcome these pressures and restore peatlands, a series of six LIFE Nature mire restoration projects were successfully implemented in the Belgian Ardennes between 2003 and 2019, and more than 80 % of peatlands in Wallonia and about 40 % of all peatlands nationally were mapped. As a result, a total area of over 2 500 ha of peatlands show improved peat soil hydrology. The area on which restoration measures (mainly deforestation) have been completed corresponds approximately to the total area of degraded raised bogs still capable of natural regeneration (7120) in continental Belgium. In regenerating bog habitats it can take up to several decades before the desired peat-forming vegetation is sustainably restored. However, it can be assumed that the large scope of the series of LIFE projects in the Ardennes plateau and the advanced stage of development of pioneer mire vegetation will soon lead to an improvement in the conservation status of the targeted mire habitats on a national scale.

4.3.2 *Restoration estimations per biogeographical and marine region*

The biogeographical regions with the largest areas of habitats needing to be actively (re-)created are the Boreal, Mediterranean, Continental and Alpine (see Figure 4.25). The relatively small area needing to be (re-)created in the Atlantic region may indicate the physical and ecological impossibility of (re-)creating additional habitat areas because of current conditions, such as the high degree of urbanisation and intensive agricultural land use. However, the figures need to be read in relation to the total areas of Annex I habitat in the regions, where the total area in the Atlantic region (without the United Kingdom) is between 50 km^2 and 71 000 km^2, while for the Continental region it is between 250 km^2 and 280 000 km^2.

In terms of improving the condition of existing habitat areas, the biogeographical regions with the largest estimated needs are the Continental, Mediterranean, Atlantic, Marine Atlantic and Boreal regions. In the Continental region, the vast majority of habitat areas in 'not good' condition are beech and oak forests, lowland and hay meadow grasslands and freshwater habitats, in particular natural eutrophic lakes and lowland rivers. The main areas in the Mediterranean and Boreal regions to be improved are degraded forests, grasslands, scrub and heath (Mediterranean) and bogs and mires and freshwater habitats (Boreal). Degraded sandbanks, large shallow inlets and bays, and reefs require significant restoration in the Marine Atlantic region. More than half of the area to be restored in the Atlantic region is forests (mostly beech), as well as temperate heath, bogs and mires.

Figure 4.25 Estimation of Annex I habitat areas to be improved and area to be created per region



Note: 'Low' and 'high' range refer to the minimum and maximum areas in 'not good' condition as reported by Member States; 'additional' means the minimum areas to be re-created. The United Kingdom and habitat 8310 (caves) were excluded from the calculations.

Source: Article 17 Member States' reports and assessments.

Table 4.1 Estimation of carbon-rich Annex I habitat areas to be improved and area to be created per habitat group

Ecosystem	Low range (km^2)	High range (km^2)	Additional (km^2)
Coastal habitats	4 695	6 670	400
Heath and scrub	4 055	9 770	313
Grasslands	15 112	50 581	1 852
Bogs, mires and fens	9 331	11 567	1 690
Forests	84 455	109 978	4 648

Note: 'Low' and 'high' range refer to the minimum and maximum areas in 'not good' condition as reported by Member States; 'additional' means the minimum areas to be re-created. The United Kingdom and habitat 8310 (caves) were excluded from the calculations.

Source: Article 17 Member States' reports and assessments.

4.3.3 Restoration and climate change mitigation

Natural solutions are essential to confront the climate change and biodiversity crises. Here, many Annex I habitats that are particularly carbon rich offer the potential to store and sequestrate carbon and thereby contribute to mitigating climate change in addition to their biodiversity value. However, this capacity depends on their physical scale of coverage, condition and conservation status. Historically, land use decisions have been the primary driver of carbon stock changes across ecosystems, serving to decrease carbon stocks through land conversion (such as converting forest to cropland) or increase capacity through restorative measures (Goldstein et al., 2020).

Habitats considered 'carbon rich' were selected from the Habitats Directive to identify their contribution towards climate change mitigation targets. These include all Annex I forests, bogs, mires and fens, grasslands and temperate heath and scrub, as well as several coastal and halophytic habitats (mostly coastal marshes and mudflats ([32])) and *Posidonia* beds (see Table 4.1). These habitats represent 148 out of 233 habitats in Annex I, covering an area of approximately 950 000 km^2 or around two thirds of the total habitat area reported across Member States. Here, carbon is stored in the above and below ground biomass and (mainly) in the soil, with variations across sites and habitat types.

By maintaining and restoring such carbon-rich habitats or promoting active accretion of sediments in intertidal systems, climate change can be mitigated by directly reducing greenhouse gas emissions, safeguarding carbon stores and — in some cases — re-starting sequestration functions (Alonso et al., 2012). Policies and conservation measures must therefore prioritise improving the degraded ecological conditions of carbon-rich nature areas across Europe. Taking this into account, it is estimated that between 13 % and 19 % of the carbon-rich surface areas need to be improved (118 000-189 000 km^2). In addition, it is estimated that a minimum of 9 000 km^2 of these habitats would need to be (re-)created to achieve good status in terms of distribution (range) and surface area.

In some cases, anticipated restoration measures may create trade-offs between increasing carbon sequestration and protecting biodiversity (e.g. the removal of trees to restore lowland heathland) (Alonso et al., 2012). All available information is thus necessary to underpin decision-making, including a comprehensive mapping of carbon- and nature-rich areas, the effects of management, habitat condition and factors such as soil and sediment characteristics (Alonso et al., 2012).

Key messages

- At least 11 000 km^2 of Annex I habitats need to be (re-)created, in addition to the area that currently exists, to ensure the long-term viability of each habitat type; this figure, however, is greatly underestimated because of the lack of reported data.
- The current area of habitats needing to be improved is estimated to be approximately 215 000 km^2 (or 5 %) of the EU-27 (EU-28 minus UK) territory; this is also underestimated given the incompleteness of the reported data.
- The biogeographical regions with the largest areas of habitats estimated to be actively needing to be (re-)created are the Boreal, Mediterranean, Continental and Alpine regions.
- Approximately 16 % of the carbon-rich surface areas of Annex I habitats need to be improved (154 000 km^2). Restoring and maintaining carbon-rich habitats can make a significant contribution to climate change mitigation.

DASHBOARD
with detailed information by Member State:
condition of habitats

([32]) Habitat codes 1120, 1130, 1140, 1310, 1320, 1330, 1410, 1420, 1430, 1510 and 1630.

Photo: © Barnyz, Flickr

Figure 5.1 Natura 2000 and conservation status

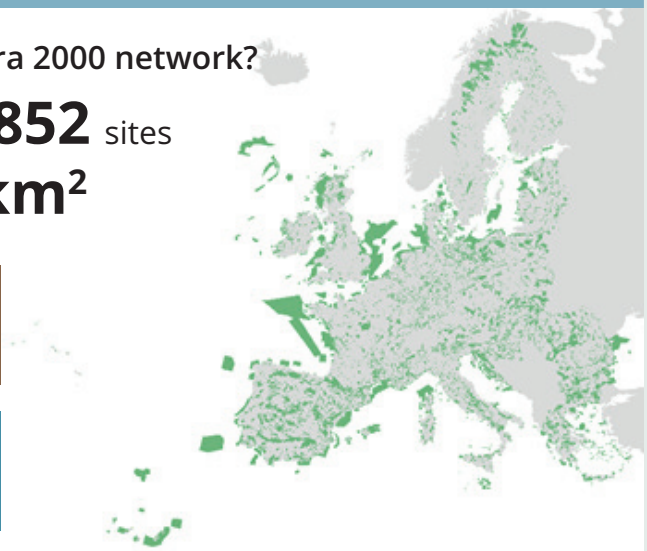
Natura 2000

Member States provide information* on the total number and area of sites classified under the Birds Directive (Special Protection Areas, SPAs) and proposed and designated under the Habitas Directive (Sites of Community Importance, SCIs, and Special Areas of Conservation, SACs) for both land and sea.

*Official statistics on Natura 2000 are provided on the dedicated EEA Natura 2000 Barometer.

What are the main facts on the EU Natura 2000 network?

The Natura 2000 network includes **27 852** sites with an area of **1 358 125 km²**



Largest terrestrial area is Vindelfjällen in Sweden with **5 547 km²**; the **smallest** are the bat quarters in Walpersberg (Germany) with only **100 m²**

Largest marine area is the SPA in the French Mers Celtiques with **17 861 km²**; the **smallest** is Leixão da Gaivota (Portugal) with **1 600 m²**

What are the main results of the nature reporting?

Natura 2000 coverage

With a mean of 70 %, non-bird species have the highest **coverage**, especially **vascular plants and reptiles**.

Fish species are the least well covered (40 %).

For terrestrial habitats, **sclerophyllous scrubs and heaths** are best covered by Natura 2000 sites; **forests** on the other hand have the least coverage with 56 %.

Passage birds have the highest coverage among birds.

Effectiveness of Natura 2000 network

Measuring the effectiveness of Natura 2000 and its measures **remains limited** because of the lack of appropriate monitoring.

Habitats and species with a high coverage frequently show a significantly higher proportion of improvement and less deterioration than habitats with less coverage.

For **birds,** the correlation is less evident.

Land cover changes

Land cover changes are less within Natura 2000 than outside, but habitats are still being lost.

Dominant land cover changes within the Natura 2000 network occurred for **grasslands.**

Within the network, **arable land and permanent crops** have increased.

Full potential of Natura 2000 not yet achieved

Further action is needed to increase its effectiveness such as fostering coherence within and across Member States, improving the policy planning and implementation process and strengthening management and monitoring on the individual sites.

5 Status of the Natura 2000 network

Natura 2000 represents the largest coordinated network of nature conservation areas in the world, covering almost one fifth of the EU's terrestrial land area and approximately 10 % of Europe's seas. This network forms the backbone of EU nature conservation, contributing to maintaining or improving the conservation status of targeted habitats and species. While the terrestrial component of Natura 2000 is considered close to being complete, further marine sites are necessary.

The Natura 2000 network currently comprises almost 28 000 sites, classified either as 'special protection areas' under the Birds Directive or designated as 'Special Areas of Conservation' (and 'Sites of Community Importance') under the Habitats Directive. Special Protection Areas (SPAs) ensure that the 'most suitable territories' for bird species are designated. For sites to be designated under the Habitats Directive, Member States propose Sites of Community Importance (SCIs). The responsible Member States then have 6 years to designate the site as a special area of conservation (SAC), thereby formally enacting the requirement to apply necessary conservation measures.

Many sites are both (fully or partially) SPAs and SACs and are often also protected by other national or international designations (e.g. national parks, World Heritage or Ramsar sites). Sites are, however, not necessarily strict nature reserves and actually often include other uses, such as farmland or exploited forests. While much of the land included in the network is privately owned and managed, the use and management of all SACs and SPAs must comply with the ecological requirements of the species and habitats in question.

This chapter provides more detailed information on the current status ([33]) of the Natura 2000 network and gives an outlook on the actions needed to further strengthen the network. The current coverage of ecosystems, species and habitats and their trends and conservation status are outlined. Finally, we provide insights on the umbrella effect of the network and its effects on non-target species. The chapter is illustrated with case studies on the ecological coherence and drivers of the successful implementation and management of Natura 2000 sites.

The data for the present analysis includes Member States' reports as well as the Natura 2000 database and Corine Land Cover data.

Photo: © Nuno Alves, Environment & Me /EEA

([33]) Using in particular data from the Natura 2000 Barometer (end of 2019).

5.1 Facts and figures

Member States provide information on the total number and area of sites designated under the Birds Directive (SPAs) and proposed and designated under the Habitats Directive (SCIs and SACs) as well as on the terrestrial area of sites and the proportion of the marine area of each site. The official data from the Natura 2000 network, however, are published by the EEA on the Natura 2000 Barometer ([34]). For the general introductory figures on the current status of the Natura 2000 network, current Barometer data (end 2019) are presented.

As at end 2019, the Natura 2000 network includes 27 852 sites with an area of 1 358 125 km^2. The terrestrial component of the network comprises nearly 784 994 km^2, representing 17.9 % of the EU's land territory. With this extent, the EU has achieved Aichi biodiversity target 11 ([35]) through its Natura 2000 network alone since 2012. The remaining 573 131 km^2 include the marine area covered by Natura 2000 sites, amounting to 9.7 % of EU waters (Figure 5.2).

Maps 5.1 and 5.2 show the current number and area of terrestrial Natura 2000 sites per Member State in 2019. These presentations indicate the total area distribution and discloses country-specific geography by the over- or under-representation of their actual extents.

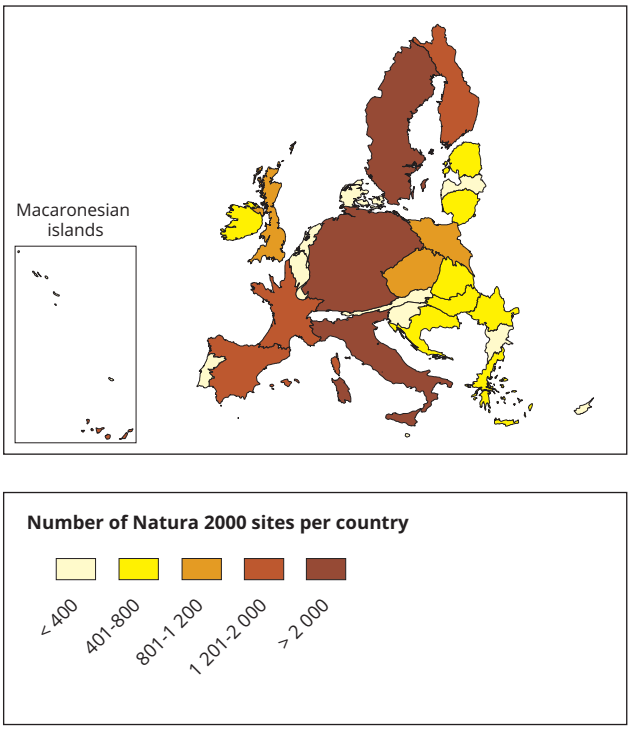
The highest terrestrial overall coverage of Natura 2000 sites is reported by Slovenia (38 %), Croatia (37 %), Bulgaria (36 %) and Slovakia (30 %). The lowest terrestrial coverage is reported by Denmark (8 %), the United

Figure 5.2 Natura 2000 area coverage

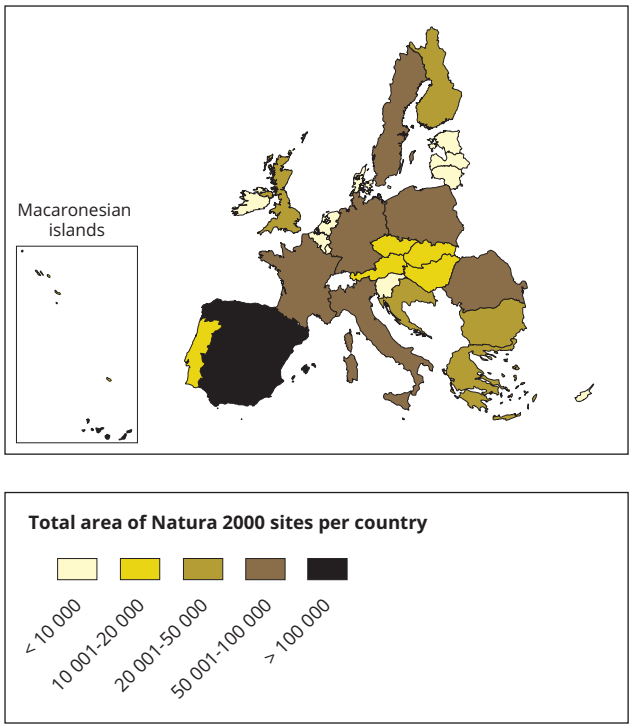
Note: Status end 2019.

Source: Natura 2000 database (2019).

Map 5.1 Number of Natura 2000 sites



Map 5.2 Total area of Natura 2000 sites



Note: These maps are cartograms that distort the geometry of regions to convey specific information by resizing them. The bototm right boxes show the Macaronesian islands (Azores, Madeira and Canary Islands). They include only terrestrial Natura 2000 sites for the EU-28 (SPAs, SACs, SCIs and proposed SCIs).

Source: Natura 2000 database (2019).

([34]) https://www.eea.europa.eu/data-and-maps/dashboards/natura-2000-barometer

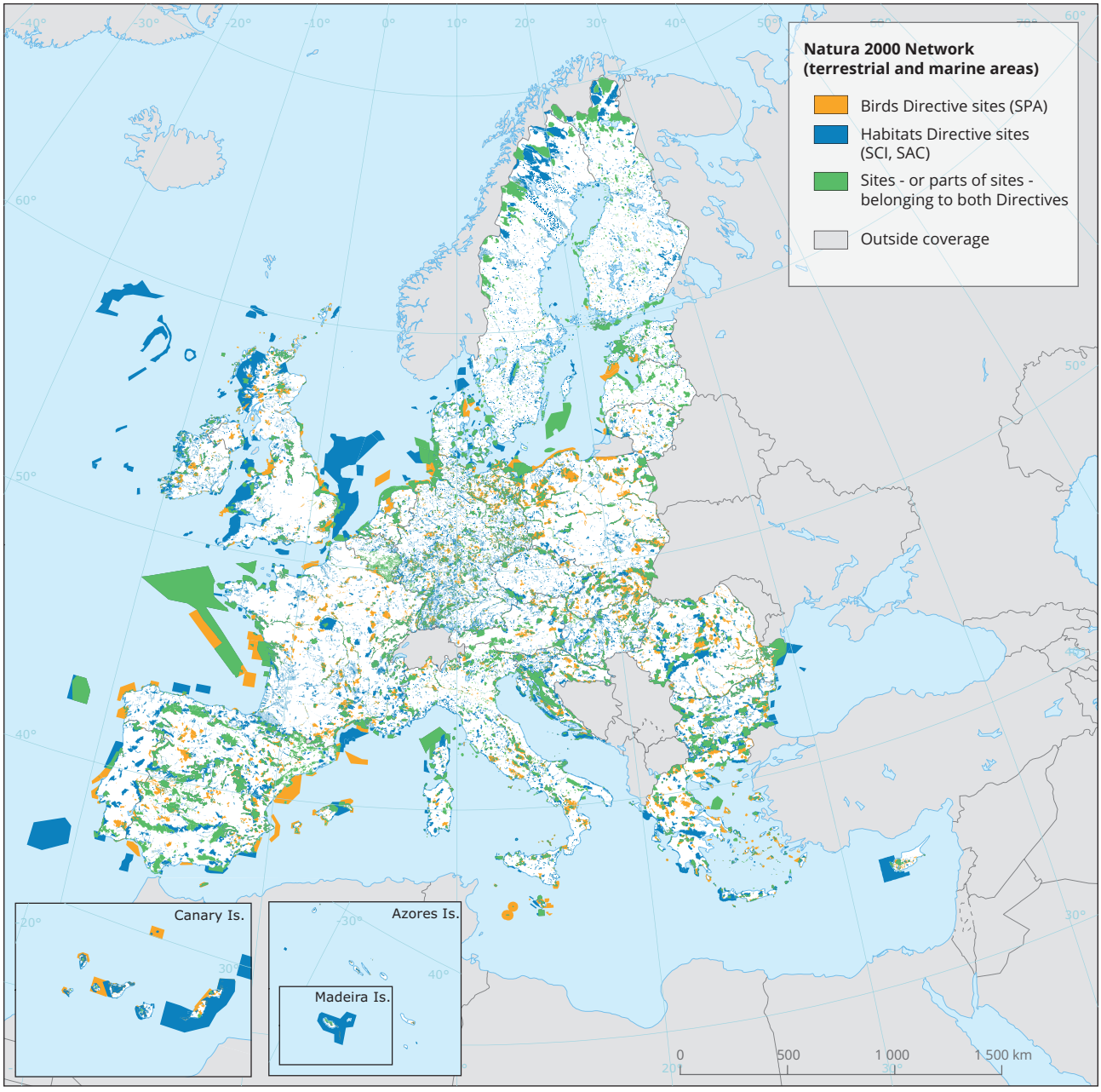
([35]) Aichi biodiversity target 11 of the Convention on Biological Diversity's strategic plan 2011-2020 requires the conservation of at least 17 % of terrestrial and inland water and 10 % of coastal and marine areas.

Kingdom (9 %) and Latvia (12 %). Germany has the largest number of Natura 2000 sites (5 200) while Spain has the largest area (222 515 km²), followed by France (203 564 km²). With regard to the marine distribution of sites, France has the biggest Natura 2000 area with 132 689 km² (Map 5.3).

The Natura 2000 network has grown rapidly since the early 1990s, rising from 50 000 km² in 1993 (equivalent to the combined area of Luxembourg and Slovakia) to 950 000 km² in 2010; the network reached over 1.35 million km² in 2019, which is equivalent to the combined area of France, Sweden and Romania (see Figure 5.3). The recent growth can mainly be attributed to the extension of the marine Natura 2000 network, which has doubled in area since the previous reporting period (2007-2012).

Member States need to ensure that sufficient protection and appropriate measures are implemented

Map 5.3 Natura 2000 network (terrestrial and marine areas)

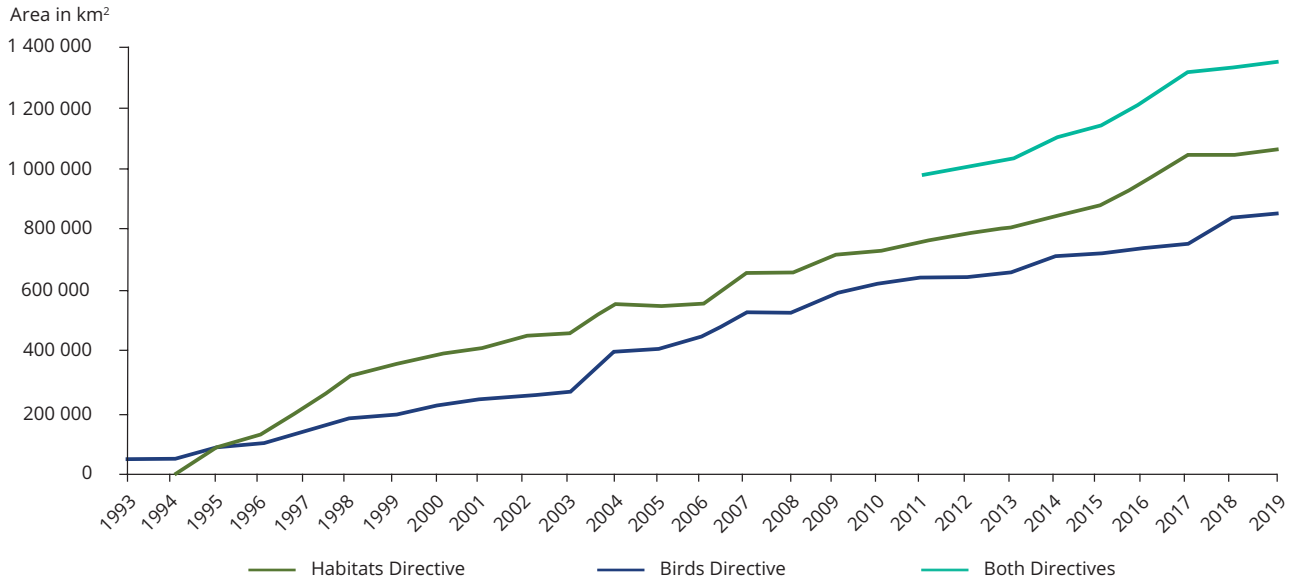


Reference data: ©ESRI

Note: The map shows SPAs, SACs, SCIs and proposed SCIs (pSCIs).

Source: EEA (2020c).

Figure 5.3 Cumulative surface area of the Natura 2000 network from 1993 to 2019



Note: Many Natura 2000 sites are, partially or totally, both SPAs and SCIs; in calculating the area, the overlaps have been eliminated. Because of limitations in geographical information systems technology in the past, the area taking into account overlaps has only been available since 2011.

Source: Natura 2000 databases. Data are for the EU-28 and include SPAs, SACs, SCIs and proposed SCIs.

in Natura 2000 sites for habitats and species of Community interest and that they form a functional network. Member States adopt different strategies to achieve this goal: some select large areas (mostly in more natural and extensive landscapes, and in this case a Natura 2000 site also includes many non-targeted habitats and even human settlements) and some select small areas targeting only one habitat or the habitat of a species covered by the nature directives.

The range in size of Natura 2000 network sites is quite remarkable: some sites are less than 1 ha in size, e.g. the *Eiskeller in Klötze* (Germany) with just 100 m², while others cover vast areas spanning several thousands of square kilometres (see the lists of the smallest and largest sites). Some SPAs, for example, are classified to protect selected sea cliff habitats, which may be used by many thousands of breeding seabirds. Such sites are nevertheless likely to have a relatively low spatial area due to their vertical nature.

Within 6 years of their designation as SCIs, Member States need to designate these sites as SACs. In the reporting under the Habitats Directive, Member States give updates on the current state of SAC designations. According to this reporting, the number of SAC sites has more than doubled, with 7 262 new designations and around 303 800 km² added since the end of the last period (2012). The designation status between Member States varies greatly. Whereas some countries report that their SAC designation process is complete, e.g. Austria, Belgium, Denmark, Estonia, Luxembourg and Slovenia, or nearly complete, other countries have only designated less than 20 % of their SAC areas, e.g. Bulgaria, Malta, Latvia, Poland, Portugal and Romania. Looking at the individual progress reported by Member States, some countries increased their SAC area significantly. Spain, for example, reported a more than 10-fold increase and France an increase close to 200 %, while the increase in designation in Portugal was only marginal within this reporting period (3.8 %).

With the designation of SACs, Member States also need to adopt conservation measures that involve, if need be, appropriate management plans and/or other measures that correspond to the ecological requirements of the natural habitat types and the species of Community interest. An analysis of Article 17 reporting shows a cumulative SAC area of 358 000 km² in the current reporting period ([36]) (131 500 km² reported in 2012), which equals over 15 500 Natura 2000 sites with management plans. Because of a change in methodology, a direct comparison between the two reporting periods is of limited value.

([36]) Data limitations arise from missing Article 17 data from France and from the fact that the management plans are not mandatory measures and Member States are free to use other measures under Article 6.1 that are not included in this analysis.

Box 5.1 Europe's marine realm under protection

Photo: North Sea © Congerdesign, Pixabay

The marine Natura 2000 network is making steady advances towards reaching the global biodiversity conservation goal of protecting 10 % of the world's oceans by 2020. Over 3 150 sites have been designated across the 23 coastal EU Member States, with exceptional progress being made in recent years, as the marine network area doubled since the last reporting period. The network encompasses over 570 000 km² of coastal and marine areas, which represents around 9.7 % of the total marine area of the EU, and protects 66 marine bird species, seven marine mammal species, two sea turtle species, 19 anadromous fish species ([a]) and nine marine habitat types (EC, 2019b). While Europe is advanced when it comes to designating marine protected areas, the vast majority of marine habitats and species targeted need to be better protected by the network to achieve good conservation status. Developing management plans and implementing tailored management practices remain key challenges to effectively protect Europe's seas. Another challenge is the lack of data on species and habitats when it comes to marine protection; significant data gaps remain and thus assessment of conservation status and the effectiveness of measures proves difficult. There is still work to be done to complete the network, especially in terms of offshore waters and certain regional seas, as well as advanced monitoring practices and management measures to ensure that the protected area is not only growing in area and number of sites but also improving its actual capacity to deliver effective conservation of habitats and species. Seabird species are protected by sites classified as Special Protection Areas under the Birds Directive, but site designation is moving too slowly to safeguard species properly against significant disturbance.

Note: ([a]) Anadromous fish species hatch in freshwater, thereafter migrate to salt water for most of their life, and then returns to freshwater to spawn.

Sources: EC (2019b, 2020e).

Table 5.1 Largest and smallest Natura 2000 sites

TERRESTRIAL	MARINE
Five largest sites	**Five largest sites**
Vindelfjällen, Sweden, SPA/SAC, 5 547 km²	Mers Celtiques — Talus du golfe de Gascogne, France, SPA, 71 861 km²
Delta Dunării și Complexul Razim — Sinoie, SPA, Romania, 5 083 km²	Mers Celtiques — Talus du golfe de Gascogne, France, SCI, 62 320 km²
Delta Dunării, Romania, SCI, 4 536 km²	Southern North Sea, United Kingdom, SCI, 36 951 km2
Kaldoaivin Erämaa, Finland, SPA/SAC, 3 514 km²	Banco Gorringe, Portugal, SCI, 22 928 km²
Sologne, France, SAC, 3 462 km²	Espacio marino del oriente y sur de Lanzarote-Fuerteventura, Spain, SCI, 14 328 km²
Smallest site	**Smallest site**
Fledermausquartiere im Walpersberg bei Großeutersdorf, Germany, SAC, 100 m²	Leixão da Gaivota, Portugal, SPA, 1 600 m²

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Natura 2000 VIEWER

DASHBOARD
with detailed information by Member State:
Natura 2000 barometer

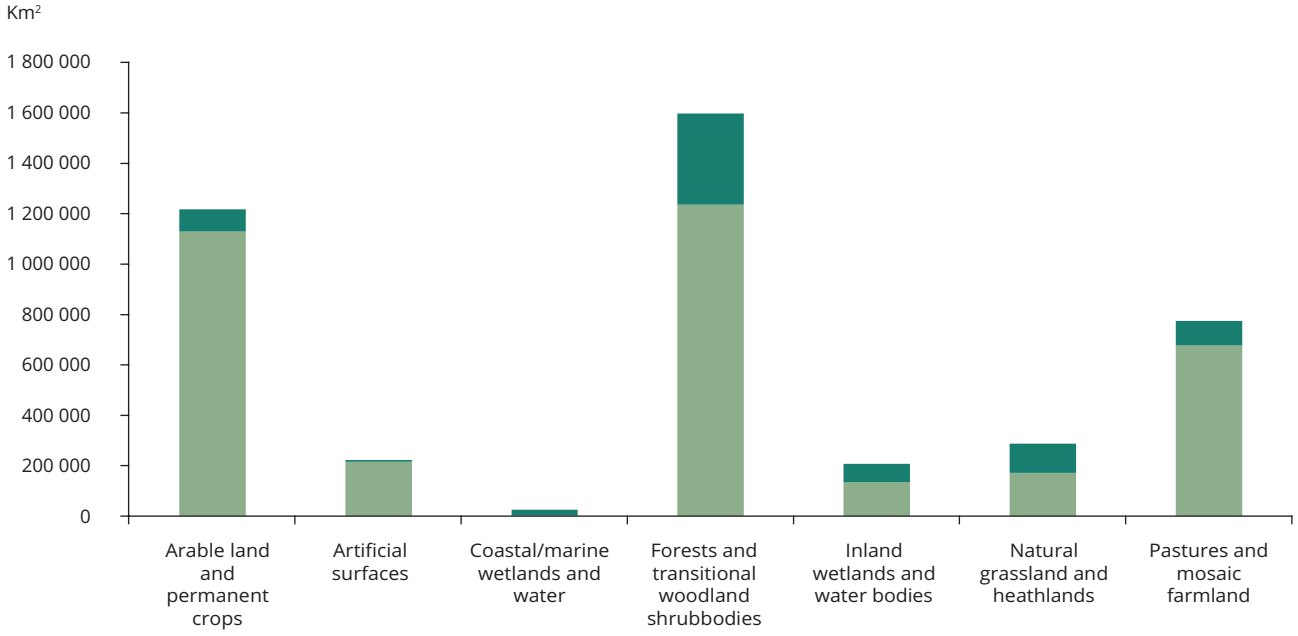
5.2 Land use in Natura 2000 sites

The following analysis is based on a comparison of the area of the Natura 2000 network (Natura 2000 database 2018) with the Corine Land Cover (CLC) inventory from the Copernicus Land Monitoring Service. The terrestrial part of the Natura 2000 network is largely covered by forests and transitional woodland shrub as well as natural grasslands and heathlands (see Figure 5.4), making up over 60 % of the network. Moreover, about 41 % of all wetlands and water bodies (terrestrial and coastal combined) are included in the network.

The land cover composition of the Natura 2000 network area differs from that of the area outside the network. Coastal and marine wetlands and water bodies make up the smallest area in the EU, and they encompass many species and habitats that are particularly vulnerable to human activities such as drainage, which is part of agricultural activities, or hydropower installations. Other major land cover classes with better coverage by the Natura 2000 network include natural grasslands and heathlands (41 %) and inland wetlands and water bodies (35 %).

Changes in land use between 2012 and 2018 differ inside and outside the Natura 2000 network, with less change overall within the network than outside (see Figure 5.4). The biggest changes **outside** the network relate to artificial surfaces, which increased by 2 571 km^2, and pastures and mosaic farmland, which decreased by 2 054 km^2; this represents a huge loss of this land cover class that includes many natural and semi-natural habitats. The dominant changes **within** the network, which are of a much smaller order than changes outside the network, occurred in grassland ecosystems, which decreased by 291 km^2, and forests, which decreased by 214 km^2. The one exception is coastal and marine wetlands, which both grew by 8 km^2 between 2012 and 2018 inside and outside the network.

Figure 5.4 Land cover and land cover changes inside and outside the Natura 2000 network (in km^2)



Inside Natura 2000 (km^2)	202	69	8	-214	-72	-291	-127
Outside Natura 2000 (km^2)	-128	2.571	8	-1.021	218	-684	-2.054

Sources: EEA (2020b); Corine Land Cover data for 2012 and 2018.

Within the network, arable land and permanent crops have increased, while grasslands and forests have decreased. Table 5.2 shows a matrix of land cover changes between 2012 and 2018. Pastures and mosaic farmland (with approximately 18 %) and inland wetlands and water bodies (with approximately 10 %) have been extensively transformed into arable land and permanent crops both inside and outside the network. Recent research has shown, however, that high nature value (HNV) farmland inside Natura 2000 sites is less likely to be converted into artificial surfaces than such farmland outside the network and is more likely to maintain its pattern of mosaic farming (Anderson and Mammides, 2020). The dominant change across land cover classes was conversion into arable land and permanent crops, while natural grasslands and heathlands (with approximately 7 %) have changed mainly into forest ecosystems.

Some of these changes can be linked to fires, which have significant effects on forest ecosystems and on natural grasslands and heathlands. The available data on wildfires show a high variability between years and regions in the EU but indicate an increasing risk, particularly in the Mediterranean countries. While a number of factors play a role in the frequency and level of impact of wildfires, climate change is critical and is projected to pose increasing risks in the years to come with potentially devastating effects on ecosystem functioning and biodiversity (de Rigo et al., 2017). In November 2017, the annual cumulative burnt area of Portugal, Spain and Italy alone exceeded 0.8 million hectares (de Rigo et al. 2017), the largest impact of forest fires in Europe. The FireLife project in Hungary demonstrates how fires can be prevented in some regions through targeted communication campaigns and by promoting biomass management among forest workers (see Box 5.2).

Table 5.2 Land cover changes/flows inside the Natura 2000 network (2012-2018)

Change matrix inside Natura 2000 (% of total changes)		2012						
		Arable land and permanent crops	Artificial surfaces	Coastal/ marine wetlands and water bodies	Forests and transitional woodland shrub	Inland wetlands and water bodies	Natural grasslands and heathlands	Pastures and mosaic farmland
2018	Arable land and permanent crops		0.28	0.17	5.60	10.23	5.11	18.38
	Artificial surfaces	3.11		0.05	2.62	0.30	1.21	3.02
	Coastal/marine wetlands and water bodies	0.47	0.18		0.09	0.15	0.01	0.02
	Forests and transitional woodland shrub	3.89	0.72			0.37	7.09	5.07
	Inland wetlands and water bodies	3.05	1.22		1.59		0.95	2.54
	Natural grasslands and heathlands	0.88	0.25		4.08	0.06		0.54
	Pastures and mosaic farmland	7.84	0.73	0.20	4.27	0.77	2.88	

Sources: Corine Land Cover data for 2012 and 2018.

Box 5.2 Forest fires in Hungary — nature at risk

Photo: May 2012, after a 6-day forest fire in Bugac, Hungary © FIRELIFE

Over the last few decades, forest fires in Hungary have increased greatly. Fires have started because of climate extremes, a decrease in precipitation, an increase in mean annual temperature and a series of winters without snowfall. As a result, the period of fire risk has extended. Not only has the frequency of fires increased but also their intensity and the speed at which they spread. This was especially true during the extremely hot summers of recent years. These intense forest fires burn larger areas, as they are more difficult to extinguish. Fires are having an increasingly negative impact on vegetation, as well as on the structure of the forest.

The FIRELIFE project (LIFE13 INF/HU/000827) contributed to forest fire prevention in Hungary by carrying out a targeted communication campaign and by promoting biomass management among forest workers. Raising awareness of this climate change impact is crucial to increasing resilience. In 2012, the year before the launch of the project, 2 500 forest fires affected around 14 000 ha of forest in the country. Forest fires are mostly initiated by people, so the project was set up to show that effective communication of prevention measures can reduce the number and impact of fires. Highlighting appropriate regulation and targeted subsidies can also improve biomass and land use conditions to slow down and limit the spread of fires. As a result of the project's work, the number of forest fires had fallen to one third of the 2012 figure by the time it finished early in 2020.

Sources: EC (2019c); FIRELIFE (2020).

Key messages

- Forests and grasslands make up over 60 % of the terrestrial area of the Natura 2000 network.
- The biggest changes outside the network include an increase in artificial surfaces of about 2 600 km² and a decline in pastures and mosaic farmland of more than 2 000 km².
- While grasslands and forests have decreased within the network, these decreases have been smaller than the decrease in the same habitats outside the network.
- The dominant change across land cover classes within the Natura 2000 network was conversion of pastures and mosaic farmland into arable land and permanent crops.

DASHBOARD
Copernicus Land Monitoring Service Corine
Land Cover: land cover and change statistics

5.3 Coverage of species and habitats by Natura 2000

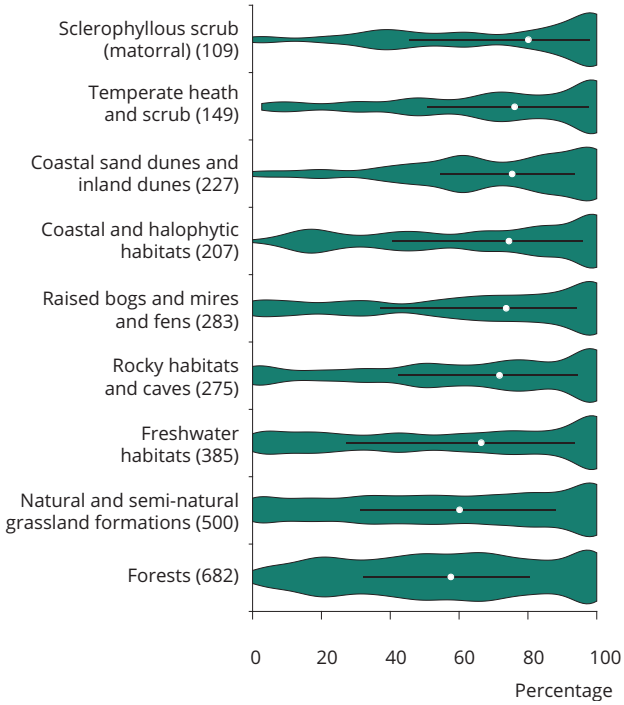
The habitats and species protected under the Birds and Habitats Directives are covered by the Natura 2000 network to varying degrees. Protected areas in general tend to be less effective in protecting wide-ranging and relatively common habitats and species and species that are highly mobile or have dispersed distributions. These are therefore covered to a smaller extent by the Natura 2000 network than rare and place-bound habitats and species. Variability in coverage also relates to the different approaches taken by Member States to designating and managing Natura 2000 areas and to targeting different species and habitats groups. When reporting, Member States were asked to indicate the habitat area or species populations covered by the Natura 2000 network. The completeness of these data varies among Member States and habitats/species groups.

To evaluate the importance of the Natura 2000 network in terms of coverage of habitats or species, Member States provide an estimation of the global habitat area or population size occurring within the network. In this section, the degree of coverage is illustrated by **violin plots**. The graphics in Figures 5.5 and 5.6 show a continuous distribution between 0 % and 100 %. The thickness of the tube corresponds to the number of assessments reported for the degree of coverage. The white point is the median indicating the 'middle' value in the list of numbers and the black line indicates the area containing 50 % of the data points (25th to 75th quantile).

Although coverage varies among different habitat groups (and single habitats), the overall mean coverage of habitats is relatively high (64 %). Habitats in general have slightly lower coverage by the Natura 2000 network than species (70 %). For sclerophyllous scrub habitats, the median and mean values are the highest of all the habitat groups. Forest Annex I habitats are the least covered at a median of 56 %. For forest habitats, there are many cases with medium coverage and only a smaller proportion with very high coverage.

It is worth noting that more freshwater habitats and grasslands have lower network coverage than is the case for the other habitat types. Freshwater and grassland habitat groups contain several relatively common and widespread habitats, which typically occur in intensively used landscapes with a lower density of protected areas. However, they are important for several species covered by both directives and should be more strongly promoted

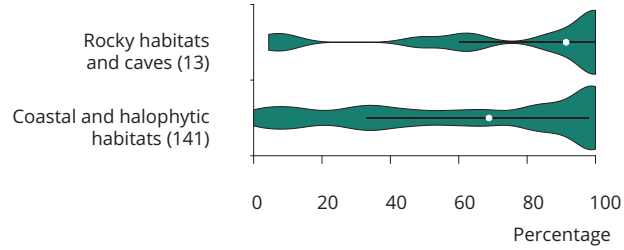
Figure 5.5 Percentage coverage by the Natura 2000 network of Annex I terrestrial habitats



Note: The number of reports are indicated in parentheses. The total number of reports is 2 970.

Source: Article 17 Member States' reports and assessments.

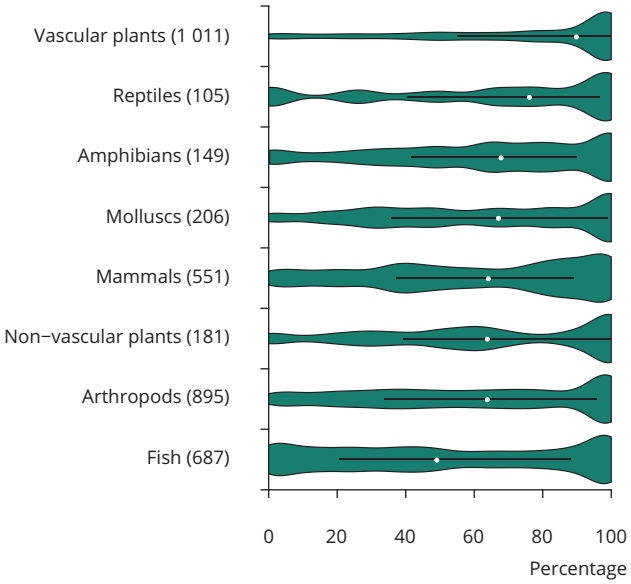
Figure 5.6 Percentage coverage by the Natura 2000 network of Annex I marine habitats



Note: The number of reports are indicated in parentheses. The total number of reports is 2 970.

Source: Article 17 Member States' reports and assessments.

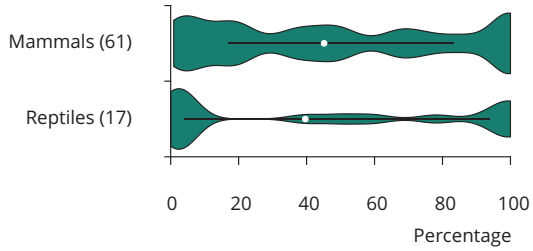
Figure 5.7 **Percentage coverage by the Natura 2000 network of Annex II terrestrial species**



Note: The number of reports are indicated in parentheses. The total number of reports is 3 214.

Source: Article 17 Member States' reports and assessments.

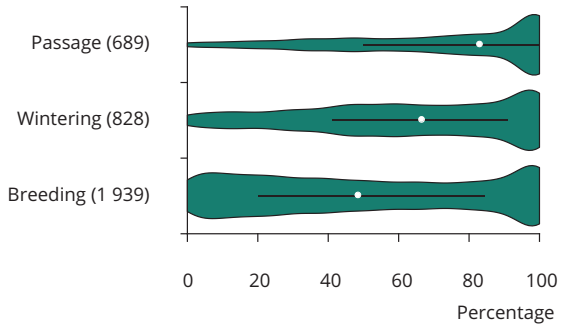
Figure 5.8 **Percentage coverage by Natura 2000 of Annex II marine species**



Note: The number of reports are indicated in parentheses. The total number of reports is 3 214.

Source: Article 17 Member States' reports and assessments.

Figure 5.9 **Percentage coverage of birds by SPAs at the EU level in the period 2013-2018**



Note: The number of reports are indicated in parentheses. The total number of reports is 2 825.

Source: Article 12 Member States' reports and assessments.

as key features to improve the ecological coherence of Natura 2000. Examples of these habitats include lowland hay meadows (6510), natural lakes (3150) and the comparatively less common and widespread plain to mountain rivers (3260, see Boxes 4.5 and 4.6). Sea caves (8330) receive mostly very high medium coverage; marine coastal habitats are slightly less well covered by the Natura 2000 network relative to terrestrial coastal habitats (see Figure 5.6).

Natura 2000 sites cover the core habitats of 1 035 Annex II taxa (see Figure 5.7). The best covered groups are vascular plants with a median of 90 %. A much lower coverage is reported for other species groups, especially fish with a median of only 49 %. Lower coverage for some species groups is perhaps due to their high mobility, with the network sometimes only including key areas of their habitat (e.g. for spawning) instead of all stretches of their migratory routes. Some species enjoy regionally full coverage under the Natura 2000 network, such as several vascular plants (especially endemic species occurring in few localities) or mammals such as Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) in the Mediterranean region of France. This is also one of the species that underwent a genuine improvement within this reporting period (see Section 3.4.3). Marine species have very low coverage by the Natura 2000 network relative to most terrestrial species, with a median for marine mammals of 43 % coverage and for marine turtles of around 4 % (see Figure 5.8). This is understandable given the high mobility of these species and the fact that Natura 2000 sites mostly include breeding sites for these species. The specific challenge for these species lies in identifying and designating resting and foraging areas and their migration routes, which has not progressed far given the lack of studies and difficulty in outlining areas where they are significantly present.

The number of assessments for which Natura 2000 site coverage is unknown is much higher for species than for habitats. An unknown coverage is reported for over half of reptile, amphibian and mammal species, which denotes a lack of appropriate inventories and monitoring.

Member States designate SPAs for Annex I bird species, as well as for regularly occurring migratory species not listed in Annex I, known as 'SPA trigger species'. Coverage for birds is especially lacking for marine birds: on average, SPAs cover 16 % of the breeding distribution of seabird species and only 1.4 % of their non-breeding distribution (Ramírez et al., 2017). Coverage is best for passage birds with a median of 83 % (see Figure 5.9). However, the majority of the broad-front migrant species are not covered by the SPA network. This is likely to be explained by the location of important coastal and inland wetlands

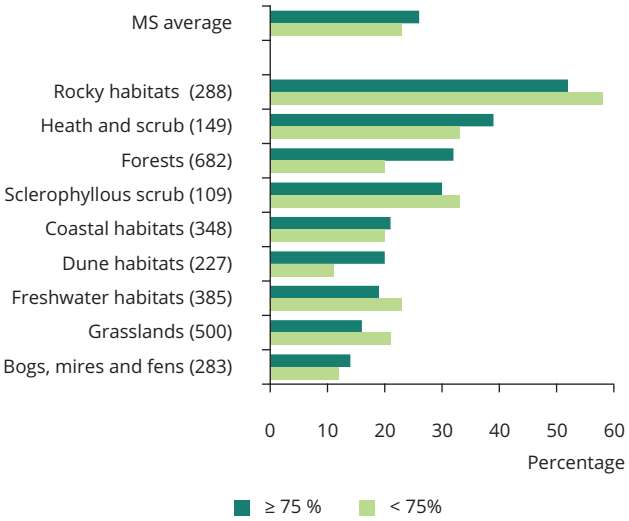
and other roosting sites where many passage birds congregate within the Natura 2000 network. Breeding birds have a median coverage of only 48 %. This can possibly be attributed to the fact that their breeding distributions are much larger and nesting sites of several species are much more dispersed. Thus, it would be difficult to include the entire breeding area of a species within the Natura 2000 network.

Key messages

- Scrub, dunes, bogs and rocky habitats are better covered by the Natura 2000 network than forests or grasslands.
- Natura 2000 network coverage is generally higher for non-bird species than for habitats.
- Vascular plants are the best covered species group, while fish species are the least well covered.
- Terrestrial reptiles are well covered by the network on average, but the network falls short in protecting many reptile species.
- Coverage for birds is generally lower than for non-bird species, especially for breeding birds and marine birds, but there are many data gaps.

Photo: Bogs, Estonia © Carlos Romao

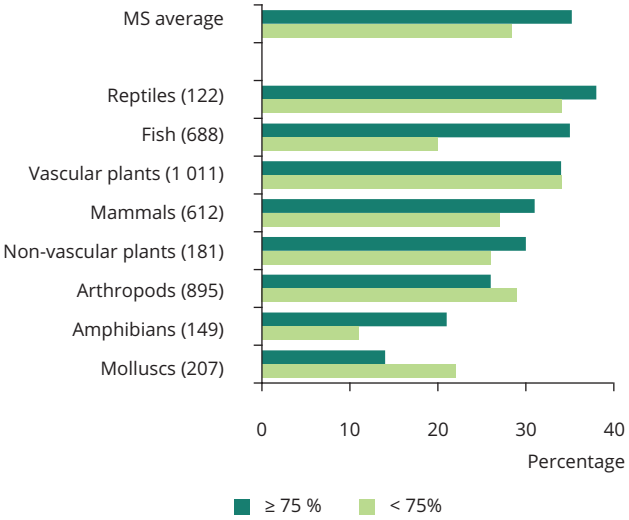
Figure 5.10 **Percentage of Annex I habitats with ≥ 75 % and < 75 % of their area covered by Natura 2000 with good conservation status**



Note: The number of assessments per group is indicated in parentheses. The total number of assessments is 2 970.

Source: Article 17 Member States' reports and assessments.

Figure 5.11 **Percentage of Annex II non-bird species with ≥ 75 % and < 75 % of their area covered by Natura 2000 with good conservation status**



Note: The number of assessments per group is indicated in parentheses. The total number of assessments is 3 527.

Source: Article 17 Member States' reports and assessments.

5.4 Effectiveness of the Natura 2000 network

The Natura 2000 network was established with the purpose of creating a coherent European ecological network of SACs. According to Article 3.1 of the Habitats Directive, the network 'shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range'. The data currently reported do not allow a direct comparison of the conservation status of species and habitats inside and outside the Natura 2000 network to measure its effectiveness. Therefore, this section looks into other potential parameters, such as the link between level of coverage of species (Annex II of the Habitats Directive) and Annex I habitats and the proportion of favourable status assessments, and, more importantly, at the reported changes in status but also improvements in trends between the current (2013-2018) and last (2007-2012) reporting period. For this, the habitats and species assessments have been divided into three groups based on percentages covered by Natura 2000: < 35 %, 35-75 %, > 75 %. These classes were chosen using a statistical technique (*k*-method) that is designed to divide data into homogeneous groups. The first analysis focuses on the comparison of high coverage for different groups, whereas the analysis of improvement looks at the differences between the different degrees of coverage. For the assessment of bird population trends, a comparison was made between SPA species and non-SPA species. The analyses are based on Member States' data and assessments.

Across Europe, **habitats** with a high coverage by the network have a significantly higher proportion of good assessments than habitats with a lower coverage. Higher Natura 2000 coverage is correlated with positive impacts on conservation status for most of the habitat groups, such as heath and scrub, forests, bogs, mires and fens, and coastal and dune habitats (Figure 5.10). Other habitat groups, such as freshwater, grasslands, sclerophyllous scrub and rocky habitats, show the opposite correlation: more of those with less than 75 % coverage are reported to have good conservation status than habitats with a higher level of coverage.

Non-bird species with high Natura 2000 coverage were assessed as having good conservation status significantly more often than those with lower coverage. Of the species with over 75 % coverage by Natura 2000 sites, 35 % were assessed as having good conservation status (Figure 5.11). In comparison, only 28 % of the species covered to a lesser extent by the

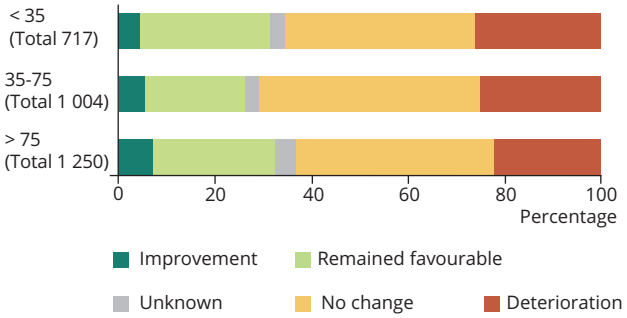
network were assessed as having a good conservation status. At the species group level, a clear pattern for good assessments emerges when seen in relation to the Natura 2000 coverage (i.e. over 75 % coverage). The data for reptiles, amphibians, fish, mammals and non-vascular plants support this conclusion, with greater spatial coverage significantly correlated with a higher proportion of good conservation status compared with groups with less Natura 2000 coverage. However, the data for arthropods, molluscs, other invertebrates and vascular plants do not support this correlation.

Interpretation of these results remains difficult because the status of these species before the establishment of the network is not known. Therefore, as was done for the measures in Section 4.2.3, the following analysis uses **improvements** within this period to further investigate the effectiveness of Natura 2000. These improvements were identified by comparing status and trends between the current and last reporting period (for more detail, see Sections 2.4 and 3.4). For Natura 2000, the focus is on Annex I habitats, Annex II species (Habitats Directive) and Annex I and SPA trigger species (Birds Directive).

The results show that **habitats** with more than 75 % coverage by Natura 2000 sites have a higher proportion of improvement (approximately 7 %) than those with less than 35 % coverage (5 %) (see Figure 5.12). At the same time, a higher coverage also resulted in less deterioration. However, the improvements remain rather small; most of the assessments did not change and predominantly have unfavourable status.

Bogs, mires and fens as well as dunes and forest habitats show the same results at the habitat group level, with higher coverage resulting in more improvement. With a reported improvement of over 8 %, the habitat group of bogs, mires and fens benefited particularly from higher levels of Natura 2000 coverage compared with low coverage (improvement of 1 %). At the biogeographical level, the Alpine region exhibits quite low degrees of improvement — despite high coverage — although the share of assessments reporting good status already is the highest among all regions (over 40 %). The habitats reported on under Article 17 that experienced the most significant improvements overall are widely protected by the Natura 2000 network, such as the dry Atlantic coastal heaths with *Erica vagans* (4040) and coastal dunes with *Juniperus* species (2250). Overall, the Natura 2000 network's effectiveness in improving habitats is highly variable and difficult to generalise, as additional indicators, such as the date of accession to the EU, would need be considered (EEA, 2020a).

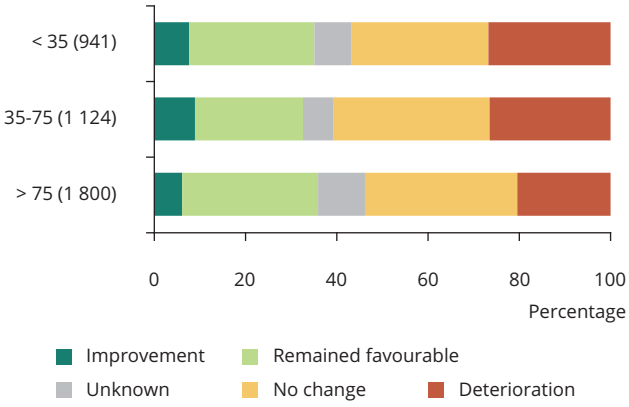
Figure 5.12 Changes in conservation status and trends for Annex I habitats within different Natura 2000 coverage classes



Note: 'Improvement' corresponds to unfavourable assessments that improved or became good, 'Remained favourable' to assessments that kept their good status, 'No change' to unfavourable assessments that did not improve or deteriorate, 'Deterioration' to unfavourable assessments that further deteriorated or changed from favourable to unfavourable, and 'Unknown' to assessments with unknown status. The number of assessments per group is indicated in parentheses. The total number of assessments is 2 970.

Source: Article 17 Member States' reports and assessments.

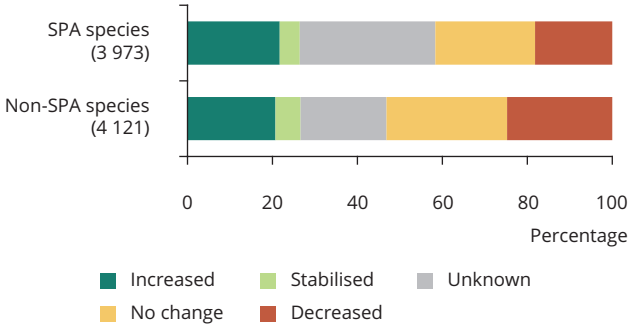
Figure 5.13 **Changes in conservation status and trends for Annex II non-bird species within different Natura 2000 coverage classes**



Note: 'Improvement' corresponds to unfavourable assessments that improved or became good, 'Remained favourable' to assessments that kept their good status, 'No change' to unfavourable assessments that did not improve or deteriorate, 'Deterioration' to unfavourable assessments that further deteriorated or changed from favourable to unfavourable, and 'Unknown' to assessments with unknown status. The number of assessments per group is indicated in parentheses. The total number of assessments is 3 865.

Source: Article 17 Member States' reports and assessments.

Figure 5.14 **Changes in population trends for Annex I and SPA trigger bird taxa compared with those for species not triggering the SPA classification**



Note: The analysis shows the short term-population trends. The 'stable' trend category is split in two distinct categories: 'Stabilised', corresponding to populations with stable or fluctuating short-term but decreasing long-term trends, and 'No change', which includes populations with stable or fluctuating short-term trends but which are not decreasing in the long term. Category 'Increased' corresponds to increasing trends, 'Decreased' to decreasing trends and 'Unknown' to unknown population trends. The graph combines information for breeding, wintering and passage birds. The number of assessments per group is indicated in parentheses. The total number of assessments is 8 094.

Source: Article 12 Member States' reports and assessments.

For **non-bird species,** the results are not as clear as for habitats. Across European species, those with a Natura 2000 coverage of between 35 % and 75 % show the highest degree of improvement (approximately 9 %) compared with the other coverage classes (see Figure 5.13). However, the figure also shows that the share of already good assessments is lowest in this class, resulting in the smallest proportion of combined good status and improvement compared with the other groups. The species with more than 75 % coverage have the lowest proportion of deteriorating changes and also the most unknown assessments.

For **birds**, the non-SPA taxa are more frequently reported with ongoing decreasing trends or no change (Figure 5.14). However, the comparison is impaired by a significantly higher proportion of unknown trends within the SPA taxa.

One reason for the more inconclusive results for species could be that site protection is not always the best means of achieving a better conservation status for species with bigger home ranges or dispersed distribution or that generally have more complex requirements than habitats. Zehetmaira et al. (2015) conducted their study on Natura 2000 beech forests as a protective habitat for forest-dwelling bats and found that the current management of Natura 2000 beech forests is almost identical to that of non-Natura 2000 commercial forests. Management, beyond the act of designating protected areas, is thus crucial to effective species protection under Natura 2000 (see Section 4.2). The effectiveness of Natura 2000 sites is not only subject to designation, as different factors can slow down or halt positive effects (EEA, 2020a). At a Natura 2000 site aiming to conserve cetaceans and turtles in Andalusia and Murcia, for example, a lack of political will and support was found to undermine the conservation efforts of the stakeholders involved in the site (Tucker et al., 2019).

Overall, it remains difficult to draw definitive conclusions about the effectiveness of the Natura 2000 network. This is especially because of the monitoring approach taken by several Member States, whereby the conservation status of habitats and species is mainly monitored and assessed in Natura 2000. Thus, there is a lack of data enabling comparison between the conservation status of and trends in species and habitats inside and outside the Natura 2000 network. While a holistic approach, using ecological data and data on pressures and threats, offers a more comprehensive evaluation of conservation status, an aggregation of data submitted

by Member States can mean that many positive developments at the local, regional or national scale are lost (Sotirov, 2017). A representative study of 9 602 Natura 2000 sites for birds indicated that the abundance of non-target species increased as the proportion of landscape covered by Natura 2000 increased (Pellissier et al., 2019). In addition, Koschova et al. (2018) looked at 252 European breeding bird species, of which 79 are listed under Annex I of the Birds Directive, and found significant positive effects in Member States on their trends, which was not the case in non-Member States. Yet the network's effectiveness for birds could be enhanced by taking account of richness patterns when designing SPAs for birds (Davis et al., 2020). Overall, there is not sufficient qualitative information on the design and implementation of the conservation objectives and measures within and outside the Natura 2000 network, which is crucial to achieving effective protection and monitoring.

Key messages

- The effectiveness of the Natura 2000 network is determined by the sites' coverage, management and ability to reduce pressures.
- Species and habitats are more likely to have a good conservation status if they are well covered by the Natura 2000 network.
- Habitats with a level of high coverage (> 75 %) by Natura 2000 sites show a significantly higher proportion of improvement and less deterioration than habitats with lower levels of coverage.
- Measuring the effectiveness of Natura 2000 network and its measures remains restricted by the limited implementation of comprehensive and appropriate monitoring inside and outside the network.
- Despite signs of the network's positive contribution, its potential has not been fully unlocked and the implementation gap is still significant.

Photo: © Bence Mate, REDISCOVER Nature/EEA

5.5 Actions needed to strengthen the Natura 2000 network

Although the Natura 2000 network has been positively correlated with improvements in the status of the habitats and species it protects, there is significant room to move beyond surface area targets for protected areas and to concentrate on increasing their effectiveness. A comprehensive literature review by Davis et al. (2020) conducted in tandem with the *State of nature in the EU* report identified **four key overarching influencing factors** affecting the ecological effectiveness of the Natura 2000 network: (1) selection of Natura 2000 sites at Member State level; (2) management and monitoring of Natura 2000 sites; (3) the policy planning and implementation process; and (4) global and local challenges. These factors are briefly outlined below, drawing on the Member States' reports and EEA (2020a), and complemented with recommendations for future action.

5.5.1 Selection of Natura 2000 sites at Member State level

The selection of Natura 2000 sites can directly affect the effectiveness of the network as a whole. Inefficient site selection has been linked to politically motivated selection and giving low priority to conservation objectives compared with economic objectives. Unclear conservation objectives for the network also reduce its effectiveness, necessitating increased coherency between **conservation objectives and conservation measures**, not least by ensuring spatially coherent objective setting at the national scale accompanied by appropriate monitoring schemes with measurable indicators. Additional factors include a bias towards areas more removed from human activity, a delayed focus on marine protected areas and the inefficient protection of soil diversity. Incoherent planning and site selection approaches between and within Member States has led to insufficient functional connectivity and spatial connectedness between neighbouring countries and habitats and gaps in coherence within Member States. This highlights the need to increase connections between **protected areas and the level of protection** beyond the site. The current **'functional' area network** should be expanded as part of Natura 2000 and beyond to ensure coherence, connectivity, resilience, species/habitat benefits and the delivery of ecosystem services (including carbon storage as a contribution to climate change mitigation). In the long term, this may include attaching stricter protections to Natura 2000 designations or more rigorously integrating environmental impact assessments.

5.5.2 Management and monitoring of Natura 2000 sites

Insufficient development and implementation of management plans for species and habitats, designed to increase the ecological effectiveness and cost-effectiveness of conservation measures, have had a negative impact on the achievement of conservation goals. Effective management and monitoring is further challenged by inadequate personnel, administrative and financial resources and by including diverse land categories with different ownership statuses, types of land use and human activity levels, and varying amounts of data availability. There is thus a significant need to increase the effectiveness of **management and monitoring practices**, in part via increased stakeholder participation. **Guidelines and models for effective public participation** should be developed and implemented, including encouraging volunteer-driven citizen science and outlining how to incorporate the data generated in existing monitoring systems ([37]). Guaranteeing that responsible authorities fully implement **Natura 2000 legal requirements** would ensure that important criteria for what is considered effective management, especially in terms of management planning, are met. Authorities should further **prioritise an ecological focus** in implementation and monitoring, and increase efforts to **harmonise monitoring** inside and outside the Natura 2000 network across Member States. Conservation and restoration objectives for Natura 2000 sites should be improved by defining **specific, measurable, comprehensive and realistic objectives** that can be monitored and evaluated and that also take into account the co-benefits of ecosystem services (e.g. carbon storage) delivered by certain habitats. Specific guidance from the European Commission would be useful to support Member States to clarify and implement their monitoring obligations, both in relation to species and habitats and in relation to Natura 2000 areas. Dedicated funding for monitoring (e.g. from the LIFE+ programme) might be necessary to achieve a step change in this respect. Incoherent management approaches between marine and terrestrial Natura 2000 sites and lack of coordination with other protected area networks were raised as another barrier to effectiveness.

([37]) See, for example, the standards of the IUCN Green List of Protected and Conserved Areas: https://www.iucn.org/regions/europe/our-work/natura-2000-europes-protected-areas-network/iucn-green-list

Box 5.3 Closer look: Good practice examples of monitoring, knowledge and policy

Improved governance and capacity building

Examples of enhanced capacity building can be found in all Member States since the beginning of the LIFE programme. Large carnivore conservation in Romania is among the beneficiaries of capacity building, underpinned by three LIFE projects. These projects supported the establishment of an independent network of experts and managers, who were able to advise the Romanian Ministry of Environment on large carnivore issues (Vrancea, LIFE02 NAT/RO/008576, Carnivores Vrancea II, LIFE05 NAT/RO/000170, and URSUSLIFE, LIFE08 NAT/RO/000500). The first project started with a team of three people, which grew to over 25 people working on large carnivore conservation issues in 2013 within URSUSLIFE or other parallel projects. The expert network created and reinforced over the years has proven itself especially useful for implementing monitoring activities. Since the initial three projects were concluded, two other LIFE projects have taken over: LIFE FOR BEAR (LIFE13 NAT/RO/001154) and WOLFLIFE (LIFE13 NAT/RO/000205). Based on the initial LIFE projects, the operators have the necessary expertise and capacity to lead large nature conservation projects. For instance, WOLFLIFE is coordinated by the Vrancea County Environmental Protection Inspectorate, which led the LIFE02 project with the Asociatia Pentru Conservarea Diversitatii Biologice (APCDB) as an associated beneficiary. The APCDB was a local non-governmental organisation at the time of the first project in 2002. In 2013, it was still managed by the same core team of experts, who had managed six other projects on large carnivore conservation, funded by different sources (from National Geographic to EEA grants — more than EUR 2 million investment in total), drawing on the initial capacity-building impact of the LIFE programme. In Romania, the wolf has a favourable conservation status, which has remained stable over the years.

Photo: Citizen science © Dimitris Poursanidis, Environment & Me / EEA

Volunteer-driven citizen science and knowledge exchange

During the project LIFE Euro Bird Portal (LIFE15 PRE/ES/000002), the partners of the European Bird Census Council developed a web portal showing the distribution of 105 bird species across Europe. The Euro Bird Portal (EBP) is able to produce weekly animated maps that display data from January 2010 up to the current week at a resolution of 30 km × 30 km ([a]). The bird observation data are collected on a daily basis from 28 European countries and submitted automatically to a central repository that was created during the LIFE project. The main outcome is the production of daily maps and graphs showing near to real-time information. Altogether, over 40 million map combinations are possible. The EBP viewer and the central database now cover all EU countries (except Malta) as well as Turkey, Norway and Switzerland and have been updated with more than 320 million new inputs since the LIFE project started. This enormous effort is possible because of the participation of more than 120 000 bird watchers across the EU and highlights an efficient and far-reaching collaboration between 82 European entities. It is the largest citizen science initiative at EU level and is the only big data project in Europe dealing with biodiversity data. It shows how the work of many entities, scientists and bird watchers can be gathered and combined to deliver relevant outcomes at the European level. The final project outputs are highly relevant for research, nature conservation and education as well as policy enforcement and development. The EBP offers enormous possibilities for the future, although it will largely depend on external funding. Future collaborations with relevant organisation and institutions at EU level will be crucial to make the best use of the data produced.

Note: ([a]) https://eurobirdportal.org/ebp/en

5.5.3 Policy planning and implementation process

The ability of policymakers and planners to inform and evaluate effective planning is often jeopardised by a lack of knowledge of the ecological requirements and pressures affecting habitats and species, the lack of standardised monitoring across Natura 2000 sites, the absence of smart objectives and measures, and poor financial planning and lack of resources. A lack of reliable data or insufficient communication of existing data to policymakers and planners create bottlenecks in the use of information from gap analyses and monitoring of ecological processes, which should be used as the basis for decision-making. The resulting low awareness of the diverse benefits produced by the Natura 2000 network is often compounded by a long-standing conflict between economic or political interests and conservation goals. There is thus an urgent need to increase coherence between **biodiversity policy** and other policy areas, such as in the fields of agriculture and economic and rural development, and create a more integrated approach to address potential conflicts and trade-offs between various interests while fostering synergies. Concrete recommendations include strengthening requirements for **environmental impact assessment** for EU policies and increasing the focus of responsible authorities on **potential synergies**, such as green infrastructure and ecosystem-based disaster protection, climate mitigation and adaptation. Greater **political support** to enforce commitments made under other environmental or land use policies (e.g. Water Framework Directive and the greening measures of the common agricultural policy) would also make a considerable difference in reducing high-impact pressures and threats such as nitrogen pollution and hydrological change. The targets set in the new EU Biodiversity Strategy for 2030 respond to most of these challenges but require much stronger implementation than those in the EU Biodiversity Strategy to 2020 and significant efforts to take a cross-sectoral approach (see also Chapter 7).

5.5.4 Global and local challenges

Research on the effect of climate change on the Natura 2000 network identify it as a serious challenge in terms of both habitat and species protection. Although the impact on network connectivity is predicted to be rather small, it is anticipated that species and habitat shifts in range and population declines due to climate impacts will reduce the network's effectiveness. A particular concern is that protected sites may become unsuitable for targeted species. Adopting a long-term perspective, it is thus critical to increase the **adaptive capacity** of and **functional connectivity** between protected sites. This entails creating functional connections enabling species to migrate over long distances in pursuit of habitats that have shifted as a consequence of climate change. Management decisions should consider an **expansion of the network** to increase coverage and include more sites to help species and habitats adapt to climate change, increase the network's contribution to **carbon storage** and provide a range of other ecosystem services and benefits. Finally, more consideration should be given to **non-conservation activities** within the network and activities outside protected areas**.** Furthermore, although site-level management is sufficient in many countries, conservation objectives are sometimes not being met due to pressures from outside the sites (e.g. nitrogen pollution or changes in hydrological regimes). The effective implementation of other directives is therefore critical, as well as an increased policy focus on establishing effective **buffer zones and semi-natural habitats** outside protected areas and ensuring adequate levels of protection inside sites. Moreover, national and local measures need to be directed not only at habitat management but also at reducing cross-cutting pressures and threats such as air and water pollution. This requires investment in integrated approaches ([38]) and sharing learning and experiences between Member States.

([38]) Examples of such approaches include the catchment sensitive farming air quality strategy in the United Kingdom and the integrated approach to nitrogen (PAS) in the Netherlands.

5.5.5 Addressing knowledge and communication gaps

Across all of these key areas, there is the cross-cutting recommendation to address **knowledge and communication gaps** in science, policy, and practice. This entails putting more emphasis on the effective dissemination of the data reported by Member States to encourage their broader uptake and application. Research can help to fill gaps in the data reported and provide valuable insights and detailed case studies on selected species and habitats. On this basis, **sound scientific knowledge** should play a greater role in decisions about planning, site selection, management and policy, and insights from implementation should be more fundamentally integrated into science. Furthermore, there is a need to facilitate **targeted knowledge sharing** on the effectiveness of management practices and the exchange of best practice at site level.

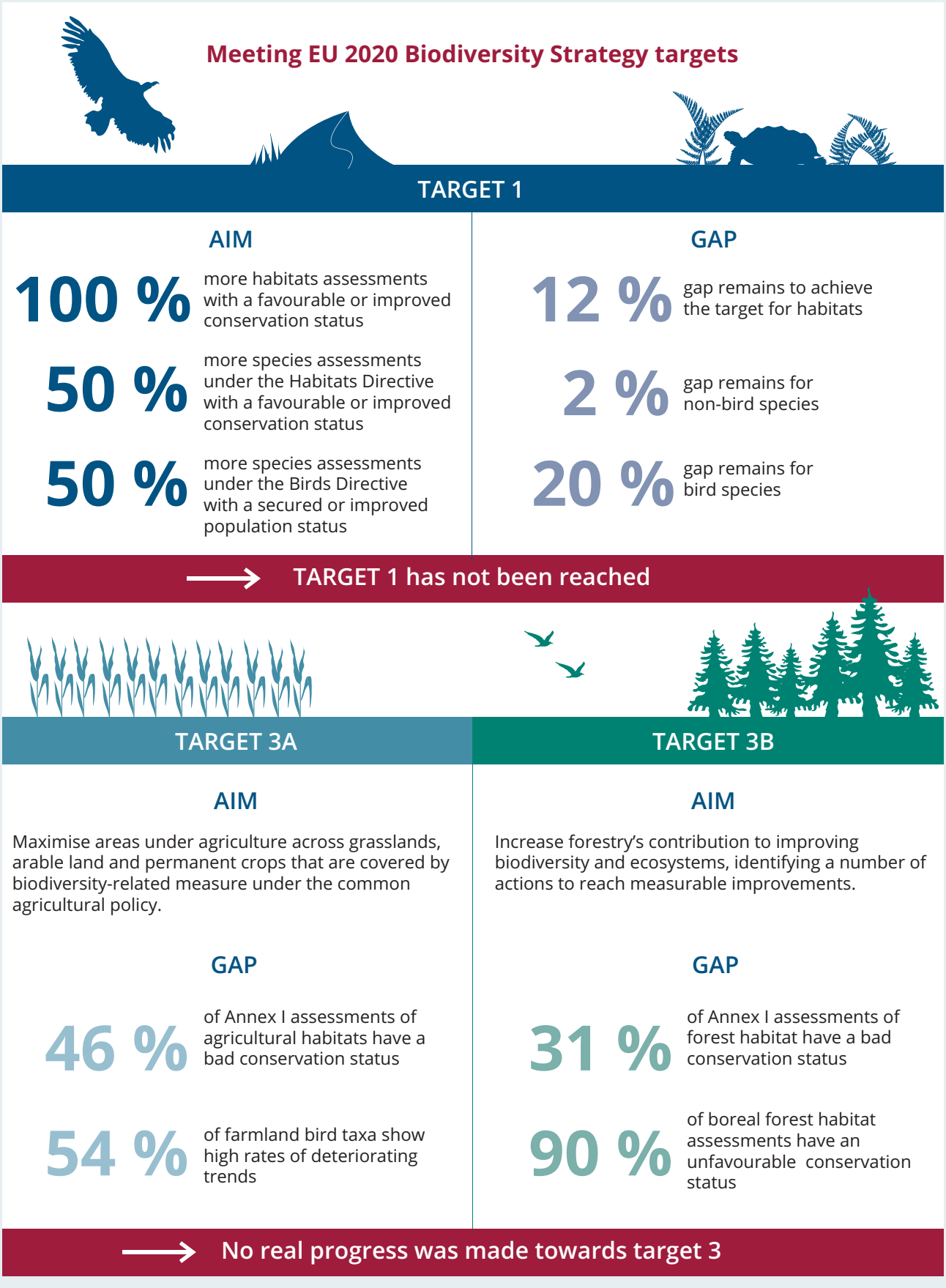
Key messages

The key actions needed to strengthen the Natura 2000 network entail:

- Increasing the adaptive capacity of and functional connectivity between protected sites and the level of protection beyond the site;
- Increasing the effectiveness of management and monitoring practices;
- Addressing knowledge and communication gaps in science, policy and practice; and
- Streamlining biodiversity protection across key sectoral policies.

Photo: Plitvice Lakes National Park © Carlos Romao

Figure 6.1 Summary of progress towards EU 2020 biodiversity strategy targets



6 Meeting EU 2020 Biodiversity Strategy targets

In an effort to halt the loss of biodiversity and the degradation of ecosystems in the EU, the European Commission adopted a biodiversity strategy in 2011 that covered the period up to 2020. The strategy includes six targets to be reached by 2020, two of which explicitly mention species and habitat conservation status. Target 1 strives to achieve a proper implementation of the nature directives, not least through improvements in the status of all species and habitats covered. Target 3 aims to optimise agriculture and forestry's benefits for biodiversity.

This chapter outlines the progress made towards targets 1 and 3 of the EU Biodiversity Strategy to 2020. Target 1 focuses on the amount of secure/favourable or improving assessments for birds (Birds Directive) and habitats and species of Community interest (Habitats Directive). Target 3 provides more detailed information for agriculture and forest ecosystems, outlining the current status, contributing factors and necessary actions to reverse undesirable trends. These analyses stem from the biogeographical assessments of habitat types and species listed in the Habitats Directive and the population status assessments of bird species from the Birds Directive, using methodologies approved by the Member States and the European Commission ([39]).

6.1 Measuring progress towards target 1

Target 1 of the EU Biodiversity Strategy to 2020 aims to achieve a full implementation of the Habitats and Birds Directives for European habitats and species, maintaining them at and restoring them to favourable conservation status by 2020. Specifically, it aims to reach:

- 100 % more habitat assessments showing a favourable or improved ([40]) conservation status;
- 50 % more species assessments under the Habitats Directive showing a favourable or improved conservation status; and
- 50 % more species assessments under the Birds Directive showing a secure or improved population status.

Figure 6.2 Progress towards target 1 (percentage of assessments)

Note: Each bar represents the percentage of assessments showing a favourable/secure or improving status.

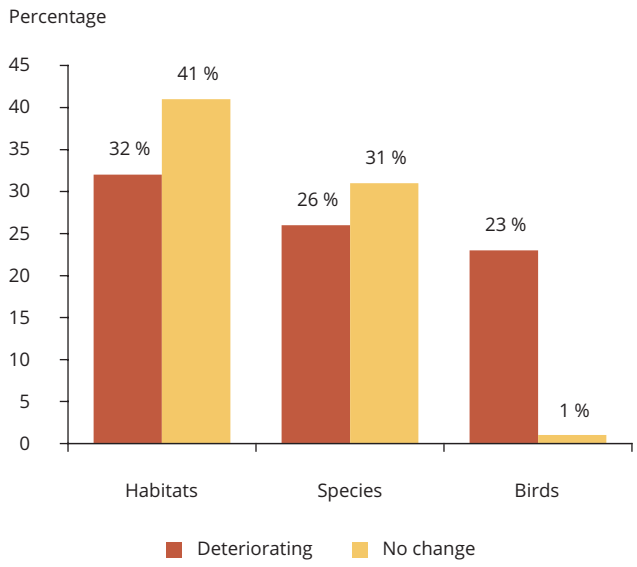
Source: Article 12 EU assessments and Article 17 Member States' reports and EU assessments.

The overall progress made across species and habitats towards target 1 is relatively small compared with the 2010 baselines, i.e. **the target was not met for any of the groups** (see Figure 6.2). More specifically, the 2020 target of reaching favourable and improving assessments for 34 % of habitat assessments was not met (12 % short of the target). In comparison, non-bird species assessed as favourable or improving have increased almost in line with their 2020 target, falling only 2 % short of the 35 % target when considered collectively. The picture for birds is more diverse, with an increase in the number of secure and improving taxa between 2010 and 2015, followed by a decrease between 2015 and 2020 (-3 %). Overall, a gap of over 20 % remains to achieve target 1. Although the decline could be due in part to better and more comprehensive data and to a slight change in the assessment methodology, e.g. more sensitive thresholds for stable,

([39]) Doc NADEG 18-05-06 (Measuring progress under Target 1 of the EU 2020 biodiversity strategy): https://circabc.europa.eu/w/browse/72cd273c-a270-4b8c-8604-fcb57549839c.

([40]) The term 'improved' includes improvement in both status and trend.

Figure 6.3 Trends in unfavourable assessments not contributing to target 1 (%)



Note: For habitats and non-bird species, 'Deteriorating' includes unfavourable assessments (poor and bad status) that show a negative trend between 2010 and 2020) and 'No change' indicates unfavourable assessments that have not improved or deteriorated; for bird species, 'Deteriorating' corresponds to long-term trends where short-term trends are not stable or increasing and 'No change' includes stable/fluctuating trends.

Source: Article 12 EU assessments and Article 17 Member States' reports and EU assessments.

decreasing and increasing trends, there is evidence that many species have undergone genuine deterioration of their population trends in both the short and long terms. For non-bird species, it should be noted that there was a decrease in the number of unknown assessments, which may have contributed to more favourable and improved assessments.

Over 41 % of habitat assessments remained stable (i.e. no improvement or deterioration in their unfavourable status) and 32 % deteriorated between 2010 and 2020. For species, 31 % of the assessments did not change and 26 % deteriorated. Still, over 73 % of the habitat and 57 % of the species assessments remain unfavourable (see Figure 6.3). For birds, 23 % of the assessments indicate a deterioration (declining short-term trend) and 1 % have a stable or fluctuating short-term trend and a long-term trend that is not declining.

Target 1 has not been achieved in large part because of a failure to sufficiently address the main drivers of biodiversity loss, including intensive agricultural practices, land abandonment, urban sprawl, grey infrastructure development, pollution and human activities at sea (see details in Chapter 4 on pressures and threats). Stronger mainstreaming of biodiversity — making it part of everyday practice — with other sectors and coordination of policies is needed, including agriculture, marine, forestry, energy and water legislation (EFH, 2019). The nature directives' effectiveness has also been impeded by delays in establishing the Natura 2000 network and in implementing necessary management actions (e.g. conservation measures, species protection, restoration, monitoring, financing) (EC, 2016; EFH, 2019). According to the fitness check (EC, 2016), further challenges include limited and poorly targeted funding (including the continuation of perverse subsidies), knowledge gaps, insufficient stakeholder engagement and human resource constraints.

Key messages

- Target 1 of the EU Biodiversity Strategy to 2020 has not been reached.
- A 12 % gap remains to achieve the target for habitats, a 20 % gap remains for bird species and only a 2 % gap remains for non-bird species.
- High shares of assessments are further deteriorating: 32 % for habitats, 31 % for non-bird species and 23 % for bird species.

6.2 Measuring progress towards target 3

Target 3 of the EU Biodiversity Strategy focuses on two of the most significant economic activities having an impact on biodiversity, i.e. agriculture (target 3a) and forestry (target 3b). Combined, these sectors comprise more than two thirds of the entire EU terrestrial area. For more information on the specific pressures, see Chapter 4: Pressures and responses.

6.2.1 Agriculture

Target 3a of the EU Biodiversity Strategy to 2020 focuses on agriculture, which is one of the main sectors generating pressures on European habitats. The target aims to 'maximise areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity-related measures under the Common Agricultural Policy', targeting agricultural habitats that make up 28 % of the 1.3 million km² terrestrial area reported for Annex I habitats. The assessments at the EU level (based on Member States' reporting on 233 habitats) highlight that:

- The conservation status of Annex I agricultural habitats is still assessed as bad (45 %) and poor (38 %); other Annex I habitats, for comparison, are assessed as 31 % bad and 45 % poor.
- Only 8 % of agricultural habitats are assessed as improving, whereas 45 % are assessed as deteriorating.

The negative effects of the pressures linked to agriculture become even more evident when comparing habitats that are partially (over 212 300 km²) or fully (over 169 200 km²) dependent on agricultural activities.

67 % of agricultural habitats that are fully dependent on adequate agricultural management and 37 % of those that are partially dependent were assessed as 'bad' (see Figure 6.4). Similarly, deteriorating trends are found far more frequently in habitats that are fully dependent on agricultural management measures than in those that are only partially dependent. Improving trends are infrequent, reported in only 6 % of fully dependent and 9 % of partially dependent agricultural habitats. This compares with 32 % of other non-agricultural habitats deteriorating and over 9 % improving (see Figure 6.5). Finally, the condition of agricultural habitats that are fully dependent on management had fewer 'good' and more 'not good' cases than those that are partially dependent on management. Overall, the percentage of good cases for the agricultural habitats was lower than that of other habitats (12 % versus 16 %); the not good cases were similar for both agricultural and other habitats.

Grasslands make up 16 % of the total area of Annex I habitats, with over 265 700 km² and 52 Annex I habitats. A large share of grasslands are also categorised as agricultural habitats. Almost half of the grasslands assessed have a bad conservation status and over a third were assessed as poor. Only 7 % of grasslands assessed showed an improving trend, while nearly 51 % of grassland trends were classified as deteriorating.

Figure 6.4 **Conservation status of agricultural habitats (partially and fully dependent on agricultural management)**

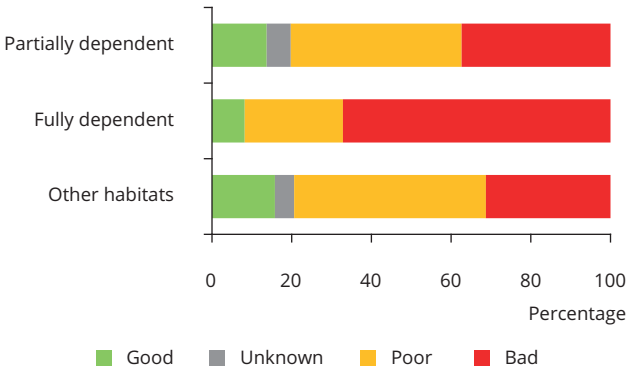
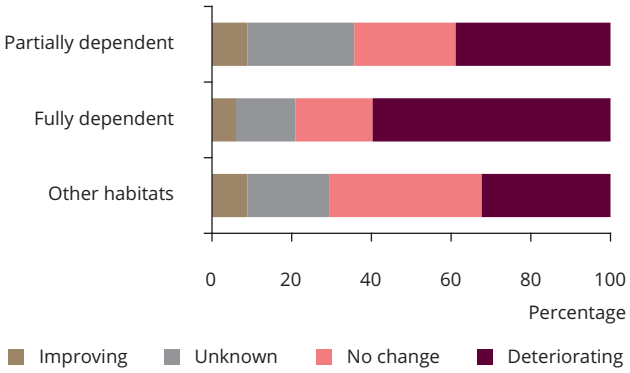
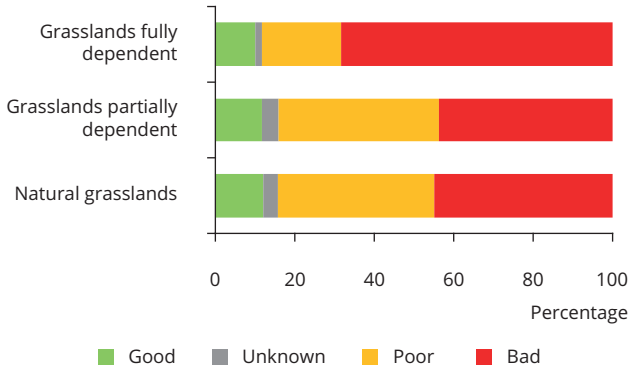


Figure 6.5 **Trend in conservation status of agricultural habitats**



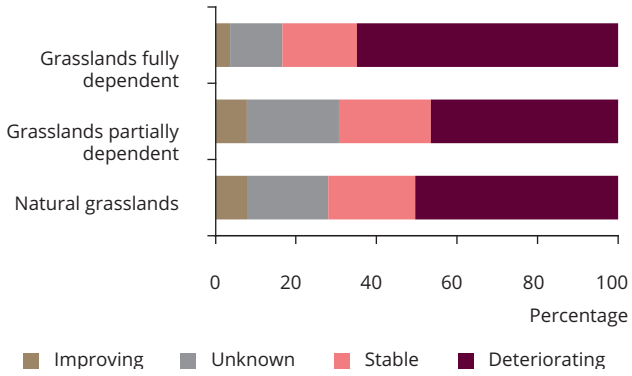
Source: Article 17 Member States' reports and EU assessments.

Figure 6.6 **Conservation status of grasslands by type**



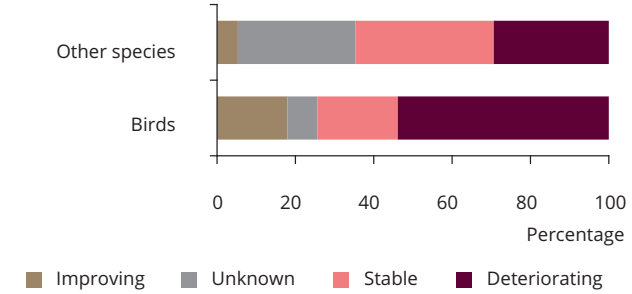
Source: Article 17 Member States' reports and assessments.

Figure 6.7 **Trend in conservation status of grasslands by type**



Source: Article 17 Member States' reports and assessments.

Figure 6.8 **Trends in status of birds and non-bird species in agricultural habitats and grasslands**



Source: Article 12 and Article 17 EU-level assessments.

Grasslands that are fully dependent on the implementation of management measures (over 116 600 km²) are more frequently reported as having a bad conservation status (68 %) than grasslands that are partially dependent on their management (over 166 400 km²) and natural grasslands (over 166 100 km²), with 44 % and 45 %, respectively. The differences between the conservation status assessments of natural grasslands and those grasslands that are partially dependent on agricultural activities are minimal (see Figure 6.6). Similar results were observed for trends in conservation status. Grasslands that are fully dependent on management are less frequently reported as improving (4 %) than natural grasslands and grasslands that are partially dependent on management (both with 8 % improving). However, the percentage of unknown assessments was far higher for natural grasslands and grasslands that are partially dependent on management (see Figure 6.7). For grassland species, the results are mix (see Figure 6.8). Approximately 18 % of agricultural bird species are improving, but almost 54 % are deteriorating. In contrast, only 5 % of non-bird grassland species show improvements, but also have a lower share deteriorating (29 %).

Grasslands are also key habitats for many pollinators. As shown above, neither their status nor their trends are improving. The importance of grassland and other habitats for pollinators is detailed in Box 6.2.

Box 6.1 **Habitats depending on agricultural management for their viability**

- Agricultural habitats fully dependent on agricultural management refers to semi-natural habitats established under regular (usually low-intensity) agricultural management. The species composition is a product of the site conditions and the type and intensity of management. Stopping management practices or changing the management intensity will result in (usually irreversible) changes in the habitat structure and species composition and trigger a change to another habitat type.
- Agricultural habitats partially dependent on agricultural management refer to habitats that profit from agricultural management measures because they either maintain the habitat type or enlarge/maintain the habitat distribution, often by preventing or reducing secondary succession to another habitat type.

Source: Adapted from Halada et al. (2011).

Box 6.2 Closer look: Grasslands and pollinators

The European Commission recognises the importance of certain habitats for pollinators within the EU pollinator initiative (EC, 2018). The initiative aims to address the decline of pollinators in the EU and contribute to global conservation efforts and sets out measures under three priorities:

1. improving knowledge of the decline in pollinators, its causes and consequences;
2. tackling the causes of the decline; and
3. raising awareness, engaging society-at-large and promoting collaboration.

Recent work by the EEA and European Topic Centre on Biological Diversity consortium identified Annex I habitats that are particularly important for pollinators (Kudrnovsky et al., 2020). As a first step, plant species classified as important for pollinators were assigned to their respective habitats. Based on the number of animal-pollinated plant species, the importance of each Annex I habitat was derived. With a mean of 111 plant species classified as being important for pollinators, grasslands are the most important habitat group for pollinators. The second most important habitat group is sclerophyllous scrub with a mean of 77 species. The three most relevant habitats following these groups are heath and scrub, bogs, mires and fens and forests. Single habitats with more than 400 plant species assigned to them include semi-natural dry grasslands (see also the European Commission's habitats action plan for dry calcareous grasslands (6210); EC, 2019d) or alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0).

Furthermore, the analysis focuses on the five most important habitat types for pollinators in each group. When comparing the top five habitat types with the whole group, it can be seen that these habitats mostly have a poorer conservation status than the average of the whole group (Figure 6.9; see Figure 4.2 for the five most relevant habitat groups). This is especially true for the two most important habitat groups for pollinators, grasslands and sclerophyllous scrub, but also applies to bogs, mires and fens as well as forests. The same applies for the conservation status trend, which is worse for the top five habitat types within grasslands, sclerophyllous scrub and forests (Figure 6.10). For the purpose of comparison, the overall results for conservation status and trends per group can be found in Sections 3.2.1 and 3.3.1.

Figure 6.9 Proportion of conservation status in the five most relevant habitat groups

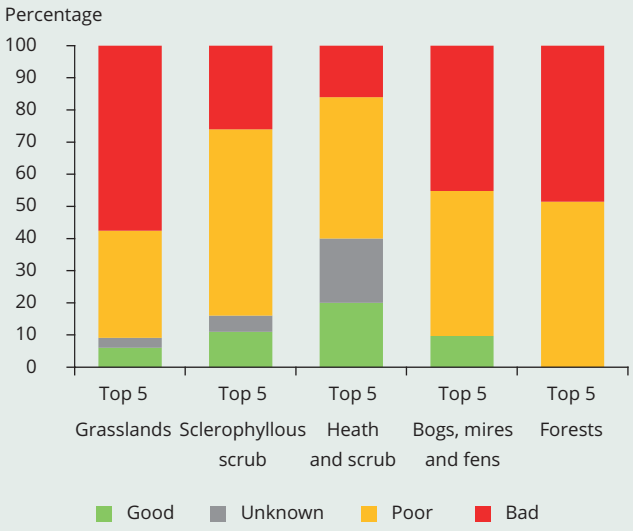
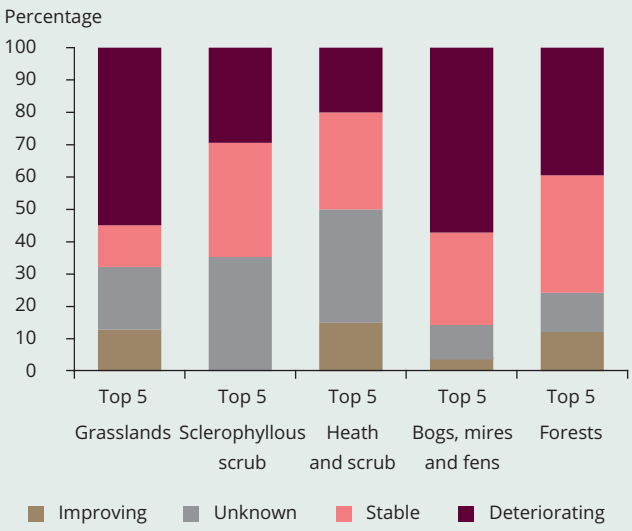


Figure 6.10 Proportion of conservation status trends in the five most relevant habitat groups



Source: Article 17 Member States' reports and assessments.

The main reasons for the poor status of grasslands important for pollinators are grassland abandonment, natural succession, intensive grazing and the application of fertilisers. Furthermore, alluvial forests that are rich in species important for pollinators (e.g. based on their many early spring species in the herb layer which are pollinated) often have bad conservation status. There are various reasons for this; the main impact for pollinators is, however, changes in hydrology and the connected conversion of those forests into other habitats.

Species linked to agricultural habitats show similar results to grassland species regarding their assessments of conservation status and trends (see Figure 6.8). Almost one third of species were assessed as having good conservation status, while around 15 % had bad status (e.g. the Tartarian Breadplant and *Tripolium sorrentinoi*, many butterflies and amphibians) and 44 % had poor conservation status. Only around 5 % of the species linked to agricultural or grassland habitats showed improving trends (see Figure 6.9), such as a few bat species (*Miniopterus schreibersii*, *Myotis* spp.), plants such as the Marsh Angelica, the endangered *Carduus myriacanthus,* the vulnerable *Carlina onopordifolia* and the Eurasian Toothed Grasshopper. Trends for non-bird species showed that around one quarter of species are deteriorating and one third are stable. Trends in conservation status are unknown for almost one third of non-bird species, hindering firm conclusions being drawn. Status assessments of bird species show an exceptionally high rate of not secure populations at 75 % for species present on farmland (e.g. larks, shrikes and buntings). Short-term population trends for farmland birds reveal that 54 % are deteriorating, 21 % are stable and 18 % are improving; these trends echo those of the common farmland bird index and the grassland butterflies index (see Box 6.3).

Compared to the mid-term results in 2015, assessments of agricultural habitats show an overall deterioration in conservation status: good status decreased from 14 % to 12 % and bad status increased from 39 % to 45 %. Assessments with improving conservation status trends tripled from over 3 % to 10 %, while simultaneously those with deteriorating trends display a 34 % to 39 % increase. Agricultural species (other than birds) show similar, but slightly better results: good status assessments are more frequent than in 2015 (from 27 % to 30 %), but poor and bad assessments also increased, particularly the later ones from 14 % to 16 %. Improving trends increased slightly (from 4 % to over 5 %), as did the deteriorating trends from 25 % to over 29 %.

As shown by the results presented, farmland biodiversity continues to decline. While targeted agri-environmental and climate measures funded through the common agricultural policy can have positive impacts on sustainable farming systems and the conservation of semi-natural farmland habitats and species, their impacts are limited at European scale because of insufficient application and coverage (14.6 % of utilised agricultural area in 2017) (Pe'er et al., 2017; EC, 2019e). This favouring of low-impact measures rather than greening and cross-compliance options by Member States inhibits the potential to deliver biodiversity benefits (ECA, 2020). Another weakness is the inadequate designation of environmentally sensitive permanent grasslands, leaving the majority of grasslands vulnerable to ploughing and further jeopardising biodiversity (Pe'er et al., 2017; EC, 2019e). Moreover, there are no reliable indicators for measuring the results and impacts of direct payment schemes and rural development programmes in relation to biodiversity (ECA, 2020). An in-depth analysis on ongoing agricultural pressures is provided in Section 4.1.1.

6.2.2 Forests

Target 3b of the EU Biodiversity Strategy 2020 aims to increase the contribution of forestry to maintaining and enhancing forest biodiversity, identifying a number of actions to achieve measurable improvements. Forest habitats make up almost one third of the area of Annex I habitats with over 500 000 km^2, approximately 60 % of which are temperate forests and 25 % are boreal and Mediterranean (overlap between the groups is possible). Assessments revealed that:

- Close to one third of the European forest assessments showed bad conservation status (31 %).
- Over half of the assessments showed poor conservation status (54 %).
- Approximately 14 % of the assessments showed good conservation status.
- On average all other Annex I habitats were assessed as 38 % bad, 41 % poor and 15 % good.

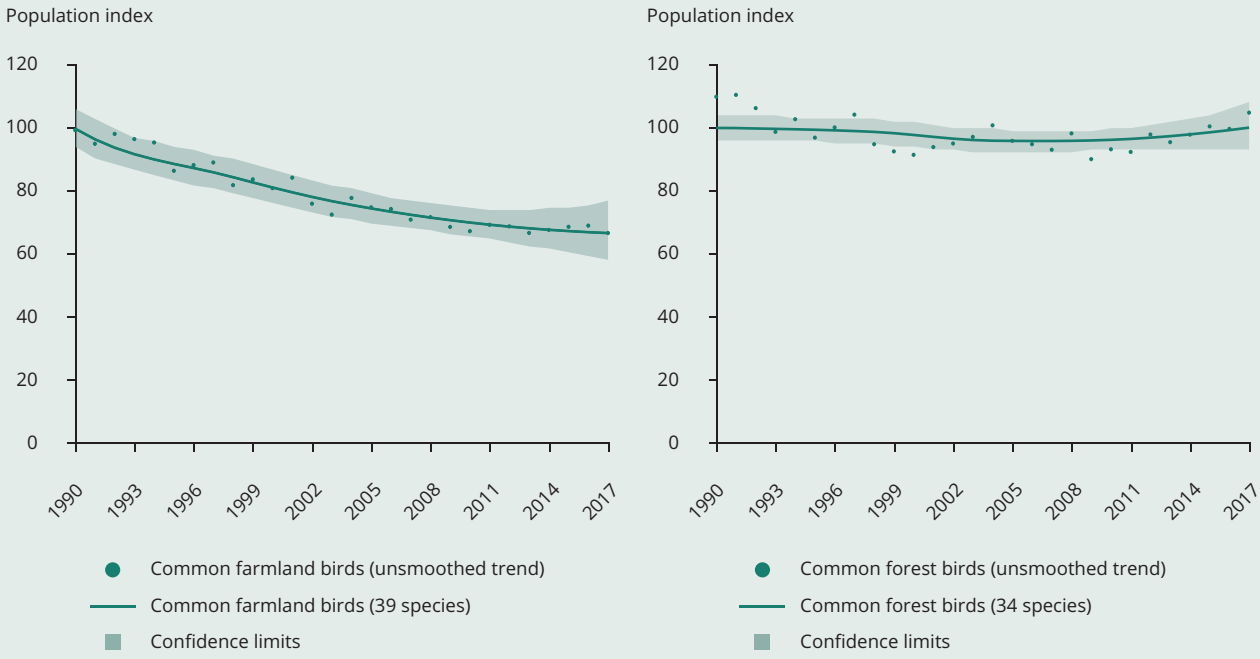
Box 6.3 Abundance and distribution of common bird and butterfly species

Birds and butterflies are sensitive to environmental change and their population sizes can reflect changes in ecosystems as well as in other animal and plant populations. Trends in bird and butterfly populations can thus be excellent barometers of the health of the environment. The status of birds and butterflies has been the subject of long-term monitoring in Europe, much of it via voluntary efforts. Both species groups have a strong resonance with the interested public and are good examples of how the power of citizen science can be harnessed by effective targeting.

The long-term trends (over 25 years) revealed by monitoring schemes for common birds — in particular farmland birds — show significant declines, with no signs of recovery (Figure 6.11). Between 1990 and 2016, there was a decrease of 9 % in the index of common birds across the 26 EU Member States with bird population monitoring schemes. The common forest bird index decreased by 3 % in the EU. The decline in common farmland bird numbers was much more pronounced, 32 % at the EU level.

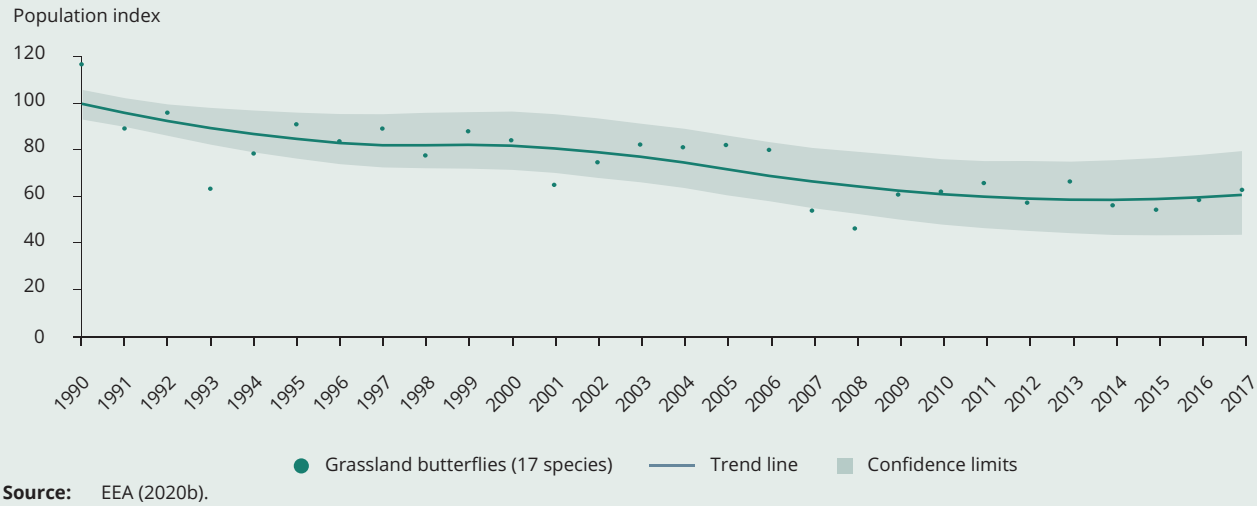
The index of grassland butterflies has declined significantly in the 15 EU countries where butterfly monitoring schemes exist. In 2017, the index was 39 % below its 1990 values (Figure 6.12).

Figure 6.11 EU common birds population index from 1990 to 2016



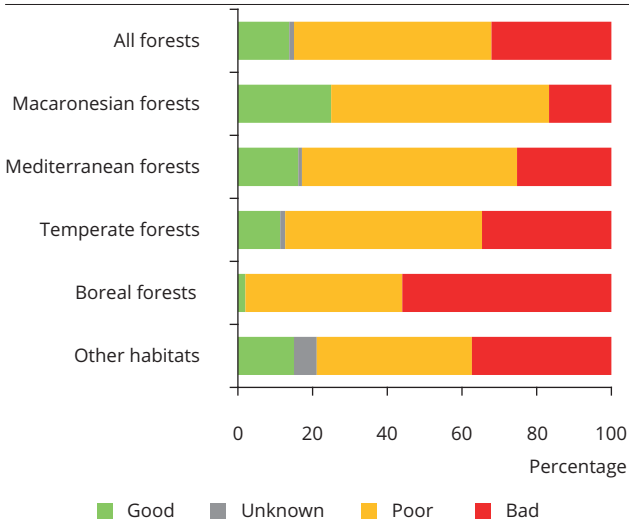
Source: EEA (2020b).

Figure 6.12 Population index of grassland butterflies 1990-2017



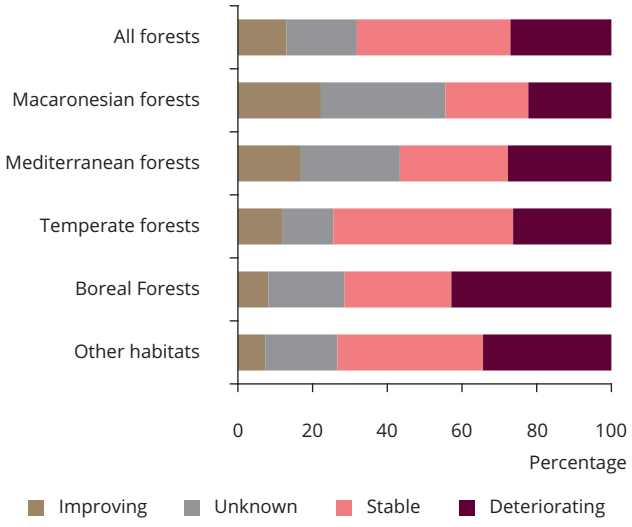
Source: EEA (2020b).

Figure 6.13 Conservation status of forests by region



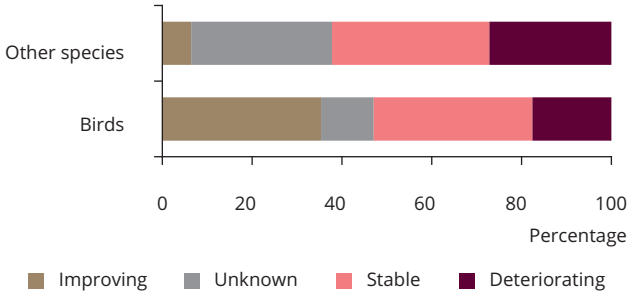
Source: Article 17 Member States' reports and EU assessments.

Figure 6.14 Trend in conservation status of forests by region



Source: Article 17 Member States' reports and EU assessments.

Figure 6.15 Trends in status of forest non-bird and bird species



Source: Article 12 and Article 17 Member States' reports and EU assessments.

While these numbers do not show much progress, the trends in conservation status are more favourable with over 54 % of all forest habitats assessed showing stable or improving trends. However, about one third of the forest assessments are deteriorating (27 %) and 19 % are unknown. In comparison, 41 % of Annex I habitats other than forests were assessed as deteriorating and 37 % as either stable or improving.

Boreal forests had the highest amount of bad assessments (56 %) (see Figure 6.13) and the highest percentage of habitats with deteriorating trends in conservation status (43 %) (see Figure 6.14). Other forest groups had noticeably better results.

Close to one third of forest bird species were assessed as having an improving trend (34 %), while 37 % have a stable trend and 17 % a deteriorating trend (see Figure 6.15). For forest non-bird species, almost one third of assessments have an unknown conservation trend (31 %), 27 % have a deteriorating trend and only 6 % are improving. Bird species in forest habitats were assessed as having a substantial percentage of not secure populations (79 %), with only 5 % assessed as secure. This indicates an even higher negative population status than farmland bird species. In terms of trends, however, forest bird species show more promise than farmland species. Over one third of forest species are increasing in the short term (34 %) and 37 % are stable, while only 17 % were assessed as decreasing (compared with 54 % of farmland birds assessed as decreasing; see Box 6.3).

Compared to the mid-term results in 2015, assessments of forest habitats show a deterioration in conservation status: good status decreased from 16 % to 14 % and assessments revealing a bad status increased from 27 % to 31 %. Meanwhile, assessments with improving conservation status trends increased by four, from over 3 % to 13 %, and those with deteriorating trends decreased from 29 % to 24 %. The percentage of assessments of forest species (other than birds) in good status is higher than in 2015 (from 27 % to 30 %), but poor and bad assessments also increased in total from 56 % to 59 %. Improving trends also increased slightly (from 4 % to 6 %), as did the deteriorating trends from 21 % to over 27 %.

In conclusion, the conservation status of forest habitats and species covered by EU nature legislation shows no significant signs of improvement. This is in part because of the large variance in thresholds across Member States regarding the eligibility of forest management plans or equivalent instruments for funding (ranging from requiring plans for all forests to only requiring plans for forests larger than 100 ha) (Langhout, 2019). Yet, further forestry management plans are being developed and could serve as a step forward in ongoing conservation efforts. An in-depth analysis on ongoing forestry pressures is provided in Section 4.1.3.

Key messages

- No real progress was made towards reaching target 3 for agriculture (target 3a) or for forestry (target 3b).
- More than 46 % of Annex I assessments of agricultural habitats and 31 % of assessments of forest habitats show a bad conservation status.
- The status and trends for habitats that are fully dependent on agricultural management are worse than for habitats that are partly dependent and, for example, natural grasslands.
- Over 90 % of boreal forest habitat assessments show an unfavourable conservation status and worse trends than temperate and Mediterranean forests.
- Agricultural/farmland species have worse trends than forest species, with farmland bird taxa and forest bird taxa showing high rates of deteriorating trends (54 % and 17 %, respectively).
- The poor status of and trends in agricultural habitats and species is not surprising, taking into account the pressures they undergo (see Section 4.1).

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7 Conclusion and outlook

Despite significant efforts across Member States, biodiversity continues to decline and faces deteriorating trends in the greater part of Europe. The majority of protected habitats and species have a poor or bad status as a result of ongoing pressures from changes in land and sea use, overexploitation (e.g. relating to agriculture, fisheries and hunting) and unsustainable management practices (e.g. agricultural or forestry management). These drivers are compounded by the modification of water regimes, pollution, invasive alien species and the effects of climate change.

Yet there are also positive developments being reported, and a number of species and habitats have shown improved status and trends. Forests, mammals and birds (e.g. several birds of prey) are among the top beneficiaries of the conservation measures applied. The Natura 2000 network, which is a cornerstone of the nature directives, often provides an important framework for implementing such measures, and positive effects have been reported both within the network and globally (with slightly higher positive impacts inside the network than globally). This correlation between effective management measures and the successful protection of species and habitats highlights the need for wider application of measures to increase the scope of the impact.

These improvements were, however, insufficient to achieve the aims of the EU Biodiversity Strategy to 2020. None of the groups studied met their targets, and habitats and birds lag particularly far behind. These groups saw less than half of the improvements needed to achieve their targets.

The new EU Biodiversity Strategy for 2030 aims to address these gaps and ensure that ecosystems are healthy, resilient to climate change, rich in biodiversity and deliver the range of services essential for citizens' prosperity and well-being. Ambitious targets address the main drivers of biodiversity loss and aim to reduce key pressures on nature and ecosystem services in the EU. The strategy focuses on restoring ecosystems rather than on merely averting degradation and biodiversity loss and responds to key gaps and pressures identified in the state of nature assessments, for example:

- **Agricultural pressures**: increase organic farming to more than 25 %; reduce the overall use of and risk from pesticides by 50 % by 2030; provide space for wild animals, plants, pollinators and natural pest regulators; and recover at least 10 % of agricultural area as high-diversity landscape features.
- **Need for increased restoration**: an ambitious EU nature restoration plan will be developed by 2021 to improve protection of intact habitats and restore degraded areas, e.g. by more effectively protecting marine habitats and restoring at least 25 000 km of rivers to free-flowing rivers by 2030.
- **Exploitation of forest resources and extensive management**: propose a dedicated EU forest strategy in 2021, including a roadmap for planting 3 billion trees by 2030 and the strict protection of all remaining EU primary and old-growth forests.
- **Insufficiency of the current Natura 2000 network**: protect at least 30 % of the land and 30 % of the sea in the EU (including Natura 2000 and nationally designated areas), whereby one third of protected areas will be strictly protected; effectively manage and monitor all protected areas, defining clear conservation objectives and measures; and improve habitat connectivity for a coherent and resilient Trans-European Nature†Network.

Through these ambitious objectives, the new strategy offers a great opportunity to halt or reverse biodiversity decline. Nevertheless, several pressures outlined in the state of nature assessments are not directly addressed by quantitative goals (e.g. urbanisation and tourism development-related pressures, leading to fragmentation and coastal degradation as well as legal hunting, which particularly affects birds).

Additional effort is also needed within the nature directives to improve monitoring capacities within

Member States so that they can support the targets outlined. Although the state of nature assessments show improved data availability, many data gaps ('unknowns') persist, especially for marine species. Furthermore, new indicators and data are necessary to be able to duly evaluate the role of the Natura 2000 network in achieving the objectives of the nature directives and the targets of the EU Biodiversity Strategy for 2030. Emerging challenges such as climate change have also been raised by Member States as a growing threat to habitats and species (not least because of the increased spread of invasive alien species). Expected changes in abundancy and distribution (e.g. a potential northwards migration) should thus also be addressed in future reporting under the nature directives and taken into account within the context of the new strategy.

Finally, for the EU Biodiversity Strategy for 2030 to be effective, implementation of measures has to be significantly increased compared with the EU Biodiversity Strategy to 2020. Tremendous efforts are needed to put the cross-sectoral approach into practice, such as adapting the common agricultural fisheries policies to be tools for protecting biodiversity. Additional requirements for effectiveness include setting standards (e.g. for the ecological quality of new designated areas and restoration areas) and ensuring sufficient financial and human resources to put in place a robust governance and policy framework for nature conservation, achieve the 2030 targets, and support the post-2020 global biodiversity framework of the United Nations Convention on Biological Diversity.

Photo: © Pawel Zygmunt, NATURE@work /EEA

Abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
CAP	Common agricultural policy
CLC	Corine Land Cover
EEA	European Environment Agency
EIP-Agri	European Innovation Partnership 'Agricultural productivity and sustainability'
EBP	Euro Bird Portal
ETC/BD	European Topic Centre on Biological Diversity
EU	European Union
EU-28	The 28 Member States of the EU (1 July 2013 to 31 January 2020)
EU-27	EU-28 minus UK (after 31 January 2020)
EUNIS	European University Information Systems organisation
HNV	High nature value
IAS	Invasive alien species
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
IUCN	International Union for Conservation of Nature
MS	Member State
MSAP	Multi-species action plan
PECPMS	Pan-European Common Bird Monitoring Scheme
SAC	Special Area of Conservation
SAP	Species action plan
SDGs	Sustainable Development Goals
SCI	Site of Community Importance
SPA	Special Protection Area

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