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State of Nature in the EU - Methodological paper

Methodologies under

the Nature Directives reporting 2013-2018

and analysis for the State of Nature 2000

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1 Introduction

This report is complementary to the third edition of the State of Nature report, which describes the state of nature in the EU based on reports from Member States under the Birds (2009/147/EC) and the Habitats (92/43/EEC) Directives for the period 2013-2018. The first edition was developed based on 2007 Member State reporting (2001-2006) and was published in 2009[1]. The second edition (reporting 2007-2012) was published in 2015[2].

This report details the methodologies applied in the current State of Nature report, complementing the reporting guidelines for the Member States (see **Reference Portals** for Article 12[3] and Article 17[4]); it focuses on assessments made at EU level beyond Member State reports. It is a stand-alone document that explains the methodological processes that lead to the assessments and results presented in the current State of Nature Report.

As part of the new reporting period, the terminology for describing the conservation status of protected habitats and species was harmonised for Article 12 (Birds Directive) and Article 17 (Habitats Directive) as shown in the table below.

EU Status	Good	Poor	Bad	Unknown
categories of EU **population status of birds**	Secure	Near Threatened (close to being in high risk of extinction in the near future according to IUCN Red List criteria), Declining or Depleted	Threatened (according to IUCN Red List criteria)	Unknown
categories of EU biogeographical **conservation status for habitats and species** of Community interest	Favourable	Unfavourable inadequate	Unfavourable bad	Unknown

This document summarises methodological applications practiced to derive results presented in the "State of nature in the EU: Results from reporting under the nature directives 2013-2018" report. To facilitate traceability of findings, each chapter is complimentary to the same section in the State of Nature report.

[1] https://www.eionet.europa.eu/etcs/etc-bd/activities/reporting/article-17/outcomes-2001-2006

[2] https://www.eionet.europa.eu/etcs/etc-bd/activities/reporting/article-17/outcomes-2007-2012

[3] http://cdr.eionet.europa.eu/help/birds_art12

[4] http://cdr.eionet.europa.eu/help/habitats_art17

2 Status and trends of birds

Article 12 requires Member States to report on their progress in implementing Council Directive 2009/147/EC of April 1979, amended in 2009, on the conservation of wild birds (Birds Directive) to the European Commission every six years. The six-year reporting cycle was established in agreement with Member States in 2008-2012 before recently being legislatively established as well. In mid-2019, Member States submitted their second report under Article 12 of the Birds Directive by application of the format established in 2011 and updated in 2016. The reports are required for all regularly occurring breeding species, and also for wintering and passage Annex I taxa and non-Annex I taxa triggering SPA designations (and in addition for Annex II species not occurring as breeders) (DG Environment, 2017). The reported data includes, among others, **population size**, **trends** and **distribution**, along with information on the **main pressures and threats**, **conservation measures** and coverage by the **Special Protection Area (SPA) network.** A mix of taxonomic levels (species and sub-species levels) was used for most the statistics presented in Chapter 2 of the State of Nature in the EU report. Therefore, in the context of this present chapter and Chapter 2 of the State of Nature in the EU report, the word 'species' is used in the strict sense of bird populations considered at taxonomical species-level only. Conversely, the word 'taxa' (which is usually used as a general term to talk about a taxonomic group of any level) refers in this context (unless stated otherwise) to the selection of species, as well as sub-species and biogeographic populations, which were assessed for this report.

2.1 Facts and figures

Analysis was undertaken to show the shares of the reports submitted by Member States for birds listed in the Annexes I and II of the Birds Directive, covered by Article 12 reporting as well as those for non-annex taxa.

2.2 Population size and trends

Data across Member States were combined to produce overall EU population sizes and trends for each taxon. Different Member States used different methodologies for estimating population sizes and trends, and potentially adopted differing interpretations of some aspects of the guidance on reporting (e.g. in some cases Member States deviate from the agreed definition of stable or uncertain trends), which needs to be taken into consideration when reviewing overall figures.

EU population size

The reported population size data across all Member States (minimum and maximum or best values) were summed to calculate the overall EU minimum and maximum population size of each bird taxon. To allow total EU species population sizes to be calculated, all Member States were requested to report their national data using a common population unit. Population units for most breeding birds were breeding pairs (except a minority of taxa with unusual or complex breeding biology or cryptic behaviour, for which other units, such as calling or lekking males, were used); for wintering birds, units were individuals. These population units were agreed during the consultation for the Member State species checklists. In cases where population size data were reported in population size units different to those specified for Article 12 reporting, the reported values were converted to the appropriate units based on expert opinion and with reference to any relevant national sources. In cases when population size was indicated as a minimum or maximum value only, with no additional information to verify that this was the only value intended to be provided (e.g. type of estimate indicated as minimum), this was considered an omission and the value provided was used as a best single value.

When only best single value was indicated, this was used as both minimum and maximum when calculating the overall EU population size.

With the agreement of the European Commission, population data from national NGOs or other alternative sources were used in some particular cases (e.g. where important omissions from Member States' reports were identified, or more recent good quality data were not taken into consideration). These surrogate data were used to ensure the bird species assessments, which are based around a rigorous scientific exercise, are able to deliver a clear and up-to-date status of each species in the EU[5].

EU population trends

Population trend data from all Member States were combined and weighted by each Member State's contribution according to the size of its population. Weightings were based on the geometric mean of the Member State's minimum and maximum population size (or the population size best single value where such was provided), compared to the best single value or geometric mean of the equivalent totals for the overall EU population. This analysis was carried out using a dedicated tool developed by the IUCN to estimate overall trends based on data from multiple (national) subpopulations (IUCN, 2019).

Trend information reported as unknown (where there are insufficient or no data available to be possible to estimate a trend direction or calculate magnitudes) and missing information (e.g. trend magnitude not reported) was problematic for the analysis and evaluation of the EU trends and status. Where trend directions were reported as unknown for more than half the total EU population (based on geometric means or best single values), the overall EU trend was classified as unknown, as the true actual trend of the unknown populations could plausibly have driven the overall EU trend in the opposite direction to that of the reported populations. Where over half of the total population trend of a species was reported as uncertain (where the magnitudes reported span 0, but it is difficult to ascertain the direction of the trend – e.g. minimum -38 and maximum +19), or where trend directions were reported as unknown for less than half of EU populations, but allocating a trend category with confidence was not possible due to conflicting trend information or lack of trend magnitudes, the overall EU trend was classified as uncertain. Where relevant, the robustness of trend categories in terms of the effects of missing data were tested using plausible 'good' and 'bad' scenarios, based on other sources of information, such as any other trend information reported by the Member State, other published sources, and/or recent national Red Lists, and in some cases on expert opinion.

The interpretation of trend direction categories by Member States varied throughout the countries. The correct ways to define these categories are given in the supporting document available on the Article 12 **reference portal**[6]. If trend direction categories deviated from the magnitudes given, then these were adjusted according to the magnitude data, and the change recorded in the species' audit trail, which can be found on the Article 12 reporting **webtool**[7].

Both EU trend direction and magnitude were calculated and used for the EU level assessments. The trend directions for each species are provided on the Article 12 reporting web tool, together with the population size estimates.

Bird taxa population size and trend data for which Member States reported at a sub-specific, sub-population or biogeographical population level were aggregated to obtain species level data, as this is

[5] If relevant, the use of any surrogate data is documented in the audit trail for distinct species assessments which can be reached via the Article 12 reporting webtool
https://nature-art12.eionet.europa.eu/article12/summary

[6] The N2K Group (2019) Reporting trend magnitudes for different categories of short- and long-term trend. Available at http://cdr.eionet.europa.eu/help/birds_art12/Reporting%202019/Guidance%20on%20reporting%20trend%20magnitudes%2020180703.docx

[7] https://nature-art12.eionet.europa.eu/article12/

the taxa level needed to undertake regional Red List assessments. In addition, separate EU size and trend data at the subspecies level were produced for sub-species listed in the Annexes of the Directive and their aggregated counterparts, or for sub-species/biogeographical populations with international Action Plans and their aggregated counterparts.

The trend analysis in the State of Nature chapter is based on the EU population trend data for taxa (including subspecies or population level assessment instead of species level assessment where relevant, see above). Two taxa which are regionally / globally extinct before the current short-term trend period are excluded from the analysis of short-term trend, while they are included in the analysis on long-term trends.

Population status of species

For a majority of species, the EU population status assessments were based on data from the breeding season, but for a minority of species, winter data were (also) used. The EU population status of species that do not breed (regularly) within the EU were based solely on winter data, where the data reported was representative enough of the total EU wintering population (22 taxa including both species and subspecies level assessments), while for species that occur in both seasons, the assessment process was carried out independently on data for both breeding and wintering populations. During winter, individuals can be much more mobile, which could potentially complicate the aggregation of the Member States data. However, most of the species for which winter data were requested are covered by coordinated international schemes, such as the African-Eurasian Waterbird Census (coordinated by Wetlands International), that take this into account. Furthermore, for some species in winter, underlying population trends can be obscured by demographic factors, often related to inter-annual variations in weather conditions. In some years, for example, birds that usually winter in the EU may be forced to move elsewhere to escape harsh winter conditions; in others, birds that usually winter outside the EU may show marked influxes into the region.

Consequently, EU population status assessments were carried out principally on the basis of breeding data, provided that the breeding data were more representative and reliable, and that the resulting status category was the same as or higher than (i.e. more threatened) that obtained using winter data. The assessed EU population status was based on wintering data for three species which also breed in the EU (*Calidris maritima*, *Calidris minuta*, and *Clangula hyemalis*).

The EU population status was assessed using an agreed standardised methodology (DG Environment 2014). The methodology aims to maintain as much comparability as possible with that used to calculate the baseline for Target 1(ii) for birds under the EU Biodiversity Strategy for 2020 (BirdLife International, 2004), and to maximise the use of the data reported by the Member States under Article 12. The first step in the EU population status assessment process is assessing whether taxa are regionally threatened or near threatened, i.e. if they meet or are close to meeting the IUCN Red List criteria at the EU28 level (IUCN, 2012; IUCN 2019a). This process feeds directly into the Pan-European Red List of Birds that is being prepared in parallel, as a core deliverable of the European Commission–funded contract led by BirdLife International to support Article 12 reporting (BirdLife, 2019).

Two previous complete assessments of the population status of birds at EU level were published in 2004 (EU25) and 2015 (EU27), respectively (BirdLife, 2004; EEA, 2015)). The assessments are based on the IUCN Red List methodology, but adapted as regards the IUCN 'Least Concern' category, which is sub-divided into 'Declining', 'Depleted' and 'Secure'. For consistency with these earlier assessments, the 2020 assessment has applied the same set of quantitative criteria to classify species into a small number of categories, according to their EU population status (Table 2.1).

Four of the species for which Member States have provided the population and trend data were not assessed, three non-native species and one species occurring sporadically within the EU.

Step 1: Combining national data-sets and producing descriptive statistics

The EU-level analysis of the Article 12 involves combining the national data sets provided by each country to produce one EU-level data set, which summarises the size and trend of each species' population and breeding range size at EU level. This is described in detail in the first part of this section.

Step 2: Applying the IUCN Red List criteria to the EU data-set

The IUCN Red List of Threatened Species™ categories and criteria (IUCN, 2012) are well known and widely respected, with clear guidelines (IUCN, 2017). They identify the immediate risk of extinction of species which is just one of many ways of informing conservation priorities. This concept is very relevant to the Birds Directive (e.g. Article 4) and has been used to help prioritise species (e.g. for Species Action Plans, LIFE funding, etc.). Including a regional Red List application in the system used to assess the EU population status of species is thus highly relevant (IUCN, 2012a).

However, Article 2 of the Birds Directive demands much more than avoiding extinction:

> *"Member States shall take the requisite measures to maintain the population of the species referred to in Article 1* [i.e. all naturally occurring wild birds in the EU] *at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level."*

This is why the application of the IUCN Red List criteria is not enough. Many European bird species have declined significantly since the 1970s, and many are still declining today (PECBMS, 2018), albeit at rates slower than those triggering IUCN Red List thresholds. Such declines are exactly the type of deterioration that the Birds Directive intends to prevent (Article 2), so whilst the species involved may not (yet) be threatened according to IUCN Red List guidelines, they definitely cannot be considered Secure/in good status either.

Table 2.1 Criteria to allocate bird species to population status categories in the EU level assessment in 2020.

Broad category	EU population status category (and acronym)	Brief description of criteria 2020
THREATENED / BAD	Regionally Extinct (RE)	As per IUCN (i.e. no reasonable doubt that last individual in EU28 has died)
	Critically Endangered (CR)	Meets IUCN Red List criteria for CR at EU28 scale
	Endangered (EN)	Meets IUCN Red List criteria for EN at EU28 scale
	Vulnerable (VU)	Meets IUCN Red List criteria for VU at EU28 scale
NOT SECURE / POOR	Near Threatened (NT)	Close to meeting IUCN Red List criteria for VU at EU28 scale
	Declining	EU28 population or range declined by ≥20% since 1980 with continuing decline since 2007
	Depleted	EU28 population or range declined by ≥20% since 1980 but no longer declining since 2007

Broad category	EU population status category (and acronym)	Brief description of criteria 2020
SECURE / GOOD	Secure	Does not currently meet any of the criteria above in EU28
UNKNOWN		Inadequate information available to assess EU28 status

Note: For the sake of common presentation with results under the Habitats Directive in the State of Nature report, broad categories & colour codes may be used.

Step 3: Applying additional criteria to the EU data-set

Recognising the need to differentiate between those species that are neither Threatened or Near Threatened according to IUCN Red List guidance (see Table 2.1 above), nor yet Secure/in good status, two additional criteria (which were first developed and used in earlier pan-European assessments (Tucker & Heath, 1994; BirdLife, 2004a) were refined and used in the 2004 and 2015 EU assessments to identify a broader list of species of conservation concern with relevance to the Birds Directive:

Declining: Many European bird populations have declined substantially since the 1970s, albeit often too slowly to meet IUCN Red List thresholds. It is important to highlight these species, so that action can be taken to arrest their declines before they become Threatened (from which it is much harder and costlier to recover). Range contractions are often less marked, but are also of conservation significance, given the importance of maintaining the area of species' distributions, as well as their populations. In 2020, as in 2015, species will be evaluated as Declining if their long-term EU-level trend (c. 1980-2018) indicates an overall decline/contraction of ≥20 % and their short-term EU-level trend (2007-2018) indicates an ongoing decline (assuming they do not meet any higher criteria).

Depleted: This category was introduced in 2004 to highlight species whose earlier declines (between 1970 and 1990) had ceased or slowed (between 1990 and 2000), but whose populations remained below the level envisaged under Article 2 of the Birds Directive. It thereby highlights species that have already undergone a decline of the type that the Birds Directive intends to prevent, and which have not yet recovered, even though they are no longer declining. In 2020, as in 2015, species will be evaluated as Depleted if their long-term EU-level trend (c. 1980-2018) indicates an overall decline/contraction of ≥20 % since 1980 but their short-term EU-level trend (2007-2018) indicates that they are now stable or even starting to recover (assuming they do not meet any higher criteria).

The 1980 baseline does not adequately capture the pre-1980 declines of many species, whose deterioration stimulated the development of the Directive. Given the difficulty of establishing an ecological baseline for many species in most countries, and the lack of monitoring data from before the 1970s however, using 1980 is a pragmatic solution and corresponds with the entry into force of the Birds Directive.

In general, the EU population status analysis in the State of Nature report is based on the EU data for species, as this level is needed to undertake regional Red List assessments, which is the basis for determining the 2010 baseline for measuring the improvements in status of birds. For the analysis of the EU status across the Annexes of the Directive or for the analysis of the status of species with species action plans, the subspecies covered by each instrument and their counterparts are used instead of species level assessments. The total number of taxa included in these analyses (505) is the total number of taxa assessed (at both species and sub-species level if are relevant), excluding not evaluated and extinct taxa.

2.3 Improvement of trends

Improvements are considered to be any improvements that are real changes in nature rather than changes resulting from better data or knowledge, taxonomic change or the use of different monitoring methods between reporting periods.

Within the Article 12 reporting, Member States provide information on birds' populations and breeding distribution and their trends. Unlike for Article 17 reporting, the status of bird populations is only assessed at the EU level under Article 12. Bird taxa identified as having shown an improving population trend in this chapter are based on the Article 12 Member State reports. Identical methods have been applied for identifying taxa with non-secure improved status under the progress towards the EU 2020 Target 1 evaluation. Bird reports were thus selected that:

1. Showed an increasing population trend in the last 12 years (2007-2018), regardless of the 38 years (1980-2018) long-term trend, or
2. Showed stable or fluctuating short-term trend in the last 12 years, and a decreasing long-term trend

This specific group of species will be referred to as '**improving bird taxa'** in the following Table 2.2. Improvements are those with assessment combinations shaded in green (see the matrix below). The information on 'SPA trigger species' is taken from the Article 12 reporting.

Table 2.2 Criteria matrix used to identify 'improving bird taxa' on the basis of the Article 12 MS reports

		Short-term population trend (2007-2018)					
		Inc	Sta	Flu	Dec	Unc	Unk
Long-term population trend (1980-2018)	Inc						
	Sta						
	Flu						
	Dec						
	Unc						
	Unk, N/A						

Note: Trend: Dec = Decreasing (-) -; Flu= Fluctuating; Inc = Increasing (+) +; Sta = Stable (0) =; Unc = Uncertain (u) u; Unk = Unknown (x) x; N/A = no data Selection fields are highlighted in green.

Source: Article 12 reports and assessments

The improving bird taxa correspond to the increase and stabilised categories in the analysis of the effectiveness of conservation measures (chapter 4.2).

Taxa covered by the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA[8]) were used to identify water birds. Marine birds were identified following the EU Marine Strategy Framework Directive technical guidance for reporting (EC, 2008). Common farmland and forest birds were identified on the basis of data from PECBMS[9]. The lists of birds under these categories, with more detailed information on the methodology, will be made available online.[10]

[8] https://www.unep-aewa.org/

[9] EBCC/RSPB/BirdLife/CSO (2020), https://pecbms.info/trends-and-indicators/

[10] Reference Portal Article 12: http://cdr.eionet.europa.eu/help/birds_art12

3 Status and trends of habitats and species

Article 17 of the Habitats Directive requires that Member States regularly prepare and submit reports on progress made in implementing the directive, using a format agreed by the Habitats Committee for this reporting cycle which was published in 2016 (EC, 2016). These include habitats which are threatened to disappear in the EU, have a small natural range, or serve as exemplary illustrations of Europe's nine terrestrial biogeographical regions (i.e. Alpine, Atlantic, Black Sea, Boreal, Continental, Macaronesian, Mediterranean, Pannonian, Steppic) and five marine regions (Marine Atlantic, Marine Baltic, Marine Black Sea, Marine Macaronesian, Marine Mediterranean). Concerned species and habitats span the entire territory of the MS, often extending beyond the Natura 2000 network. For the period from 2013 to 2018, explanatory notes and guidelines were edited by the EEA and its ETC/BD and published by the European Commission (DG Environment, 2017a). Article 17 reporting by the MS and EU serve to gather information and assess the **conservation status** of these species and habitats within each biogeographical and marine region and MS, as well as general information on the Directive's implementation (such as the **number of sites** and their **area**, **proportion of sites** with management plans and **measures undertaken**). Reported data is used to derive conservation status and trends, recognise relevant pressures and threats, identify conservation measures and assess data quality.

3.1 Facts and Figures

The introductory facts and figures present the split of the habitats and species listed in the Annexes I, II, IV and V of the Habitats Directive.

Grouping of habitats was done according to the grouping in Annex I, which is expressed in the habitat codes first number of the four-digit code. Grouping of species was done according to the taxonomical groups which are given in Annex II, IV and V.

These groupings are also integrated in the check lists, which are produced by the ETC/BD and uploaded on the Art. 17 reference portal[11].

The area of the habitat types was calculated from *Master_tables_20200224.accdb* table *mastertab_habitats_regions*, column *coverage_etc*[12].

To represent a contribution of the Directive to protection of the European and EU biodiversity, a comparison of the Annex biodiversity with the EU biodiversity of species and habitats was done. For species, Red List publications, included in Table 3.1 below, were a source for the information. In these, many species are reported for Europe/the EU in the different species groups.

- Mammals: Temple, H.J., and Terry, A., 2007, *The Status and Distribution of European Mammals*. Luxembourg, Publications Office for Official Publications of the European Commission.
- Reptiles: Cox, N., and Temple, H.J., 2009, *European Red List of Reptiles*. Luxembourg, Office for Official Publications of the European Commission.
- Amphibians: Temple, H.J., and Cox, N.A., 2009, *European Red List of Amphibians*. Luxembourg, Office for Official Publications of the European Commission.
- Freshwater Fishes: Freyhof, J., and Brooks, E., 2011, *European Red List of Freshwater Fishes*. Luxembourg, Publications Office of the European Union.

[11] Reference Portal Article 17: http://cdr.eionet.europa.eu/help/habitats_art17

[12] The database with Member State data and EU assessments are made available on the EU's open data portal https://data.europa.eu/euodp/en/home

- Butterflies: Van Swaay, C., et al., 2010, *European Red List of Butterflies*. Luxembourg, Publications Office of the EU.
- Dragon flies: Kalkman, V.J., et al., 2010, *European Red List of Dragonflies*. Luxembourg, Publications Office of the European Union.
- Grasshoppers: Hochkirch, A., et al., 2016, *European Red List of Grasshoppers, Crickets and Bush-crickets*. Luxembourg, Publications Office of the European Union.
- Crayfish: Kouba, A., Petrusek, A., and Kozak, P., 2014, *Continental-wide distribution of crayfish species in Europe: update and maps*. Knowledge and Management of Aquatic Ecosystems. 413: 31pp.
- Freshwater Molluscs: Cuttelod, A., et al., 2011, *European Red List of Non-marine Molluscs*. Luxembourg, Publications Office of the European Union.
- Terrestrial Mollsucs: Neubert, E., et al., 2019, *European Red List of Terrestrial Molluscs: Snails, Slugs, and Semi-Slugs*. IUCN, Cambridge, UK and Brussels, Belgium.
- Beetles: Cálix, M., et al., 2018, *European Red List of Saproxylic Beetles*. IUCN, Brussels, Belgium.
- Vascular Plants: Bilz, M., et al., 2011, *European Red List of Vascular Plants*. Luxembourg, Publications Office of the European Union.
- Bryophytes: Hodgetts, N., et al., 2019, *A miniature world in decline: European Red List of Mosses, Liverworts and Hornworts*. IUCN, Brussels, Belgium.

For Arthropods species, the information from the Red Lists of Butterflies (Europe: 482, EU: 451 species), Dragonflies (Europe: 138, EU 135), Grasshoppers (Europe 1082, EU 995), Beetles (Europe 29000 species) and Crayfish (Europe 5, EU 4)) were compared with the numbers from Annex II/IV. The number for Vascular Plants is mentioned in the EU Red List for Vascular Plants (Bilz et al. 2011).

Table 3.1 Proportion of EU/European species protected under the Habitats directive per taxonomical category

Taxonomic group	No. of species* (Europe)	No. of species (EU)*	No. of species (HD Annexes)	Relative coverage by Annexes Europe	Relative overage by Annexes EU
Mammals	219	179 (EU 25)	141	64%	79%
Amphibians	85	84 (EU 27)	72	85,%	867%
Terrestrial and freshwater Reptiles	151	141 (EU 27)	105	70,%	75%
Freshwater fish and lampreys	531	381 (EU 27)	208	39,%	54%
Non-marine molluscs	3325	2934 (EU 27)	48	1,%	2%
Arthropods[13]	30707	30585 (EU 27/28)	129	0,4%	0,4%
Vascular plants	25000	25000	650	3%	3%
Bryophytes	1796	1728 (EU 28)	36	2%	2%

***** Total number of species mentioned in the corresponding European Red List

For habitat types, the list of EUNIS habitat types level 3 was used as a reference for the habitat diversity of the EU using the EUNIS habitat classification 2007 revised 2012 and amended 2019[14]. We used the crosswalk between EUNIS habitat classification 2007 and Habitats Directive Annex I habitat types

[13] Dragonflies, Butterflies, Crayfish, Beetles, Grasshoppers, Crickets and Bush-crickets

[14] https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification

2008[15] to investigate the extent to which Europe's habitat diversity is covered by Annex I. There is not always a one to one relationship between EUNIS level 3 habitats and Annex I habitat types. The subsequent correspondence is identified:

- = same
- < narrower
- > wider
- ? not determined
- - no correspondence

We treated any correspondence between EUNIS level 3 and Annex I habitat type as a coverage and no correspondence as non-coverage. The result is shown in the subsequent Table 3.2.

Table 3.2 Proportion of the habitats from the EUNIS habitats classification which (partially) overlaps with the habitats protected under the Habitats directive

EUNIS Habitats	Number of Level 3 habitats in EUNIS classification	Overlapping with Annex I habitat(s)	Without overlap with non-Annex I habitat(s)
A Marine Habitats	56	41	15
B Coastal habitats	19	13	6
C Inland surface waters	21	12	9
D Mires, bogs and fens	15	10	5
E Grasslands and land dominated by forbs, mosses or lichens	42	20	22
F Heathland, scrub and tundra	41	18	23
G Woodland, forest and other wooded land	60	29	31
H Inland unvegetated or sparsely vegetated habitats	30	15	15
I Regularly or recently cultivated agricultural, horticultural and domestic habitats	8	0	8
J Constructed, industrial and other artificial habitats	34	0	34
X Habitat complexes	36	5	31
Total	**362**	**163**	**199**
Total_%		**45.03%**	**54.97%**

The facts and figures also contain information on global areas of Annex I habitats. The habitat area can be reported by Member States[16] as a minimum-maximum interval or a best single value. In the calculation, best value or, if not available, an average between the reported minimum and maximum values (if maximum was not available but only the minimum, the reported minimum was used in calculations, missing minimum values were replaced with 0 and the average was calculated consequently), were used to obtain a single value for habitat area. These single values were then used to produce the statistics. Same principles were used for calculation of the statistics in the chapter 5.2.

[15] https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification/documentation/link-between-eunis-2007-and.xls

[16] The reported area for habitats 6510 and 3270 in Continental region of FR were substituted.

Maps of spatial diversity of habitats and species display the number of reported habitats or species occurring within each 10 km x 10 km grid cell. This map is a representation of diversity of protected habitats and specie across EU highlighting regions with the highest or lowest concentration of Habitats Directive habitats and species.

3.2 Conservation status

The Habitats Directive reporting requires Member State information on the conservation status of habitats and species listed in the Annexes to the Directive. Conservation status is the overall assessment of the status of a habitat type or a species at the scale of a Member State's biogeographical or marine region.

Favourable conservation status

The assessment of a habitat type or species is related to the concept of Favourable (good) conservation status. Conservation status of a species/habitat reflects the sum of the influences action on the species/habitat that may affect the long-term distribution, abundance and quality. Favourable conservation status is the overall objective to be reached for all habitat types and species of Community interest (i.e. the habitats and species listed in Annexes I, II, IV and V of the Directive) and it is defined in Article 1 of the Habitats Directive (see below). It can be simply described as **a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to continue to do so in the future**. The conservation status objective of the Directive is defined in positive terms, oriented towards a favourable situation, which needs to be defined, reached and maintained. It is therefore aimed at achieving far more than trying to avoid extinctions.

The conservation status of a species in the Habitats Directive (Article 1(i)) will be taken as 'favourable' when:

- *population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

The conservation status of a habitat in the Habitats Directive (Article 1(e)) will be taken as 'favourable' when:

- *its natural range and areas it covers within that range are stable or increasing; and*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and*
- *the conservation status of its typical species is good as defined in (i).*

The agreed method for the evaluation of conservation status assesses separately each of the parameters of conservation status (Table 3.3), with the aid of an evaluation matrix, which is a part of the report format approved by the Member States, and then combines these assessments to give an overall assessment of conservation status.

Table 3.3 Parameters for the conservation status assessment of species and habitat types

Parameters for the conservation status assessment of species	Parameters for the conservation status assessment of habitat types
Range	Range
Population	Area
Habitat for the species	Structure and functions
Future prospects	Future prospects

The overall conservation status is assessed in four categories: favourable, unfavourable-inadequate, unfavourable-bad and unknown (see evaluation matrices in Annex 2). To facilitate reading of graphs and simplify writing, the following terms are used as synonyms: good, poor, bad and unknown.

Detailed guidelines with criteria and thresholds to assess conservation status of the individual parameters and the overall conservation status are given in the explanatory notes and guidelines for the Member States' Article 17 reporting (DG Environment, 2017a).

EU level assessment

In addition to the conservation status provided by Members States (for each species and habitat by biogeographical/marine region), an assessment of conservation status is also made at the EU biogeographical level. The EU assessment for habitats and species was carried out by the EEA and its ETC/BD combining Member States' data. For parameters such as range, area and population, it is possible, at least in theory, to sum the Member State values and use the conservation status evaluation matrices in Annex 2. However, this is not possible for qualitative parameters such as future prospects or in cases where data are missing or manifestly erroneous. Here, Member States' reports are brought together using an agreed, standardised methodology outlining the different parameters and data sources.

Where a habitat or species only occurs in one country within a region (e.g. habitat type ´32A0 Tufa cascades' only occurs in Croatia), the EU assessment for the region is the same as the Member State assessment (method 0MS). Similarly, when each of the Member States in which a species or habitat is present has reported the same evaluation for each parameter, this value is also assigned to the EU regional assessment (method 0EQ) (e.g. the sedge *Carex holostoma* in the Boreal region, assessed as 'favourable'). This is the case for approximately half of the habitats and species.

Where it was not possible to use the countries' background data directly (method 1), the overall assessment of the conservation status for each biogeographic or marine region is achieved by weighting the different parameters to reflect the status and proportion of the habitat type or species present in each Member State and biogeographical/marine region, while taking into account the data provided by Member States (method 2). Where possible, the four parameters are evaluated individually, and then combined to provide a regional assessment using the same method used by the countries, based on the assessment matrix in the report format (EC, 2016a). Table 3.4 below indicates the preferred weight for each parameter.

Where a weighting is required, the final classification for each region is based on thresholds applied in the same way for all the parameters assessed, and in a set order (see Table 3.5). Although these thresholds are arbitrary, trials showed that changing them made little difference to overall conclusions.

The trend of the overall conservation status allows more subtle changes (improvement or deterioration) of the unfavourable categories to be identified. The reported trend of the overall

conservation status by the Member States can be weighted using the same methods as used for the assessments of the biogeographic regions.

Table 3.4 Weighting of parameters for assessment of overall conservation status

Order of preference	Habitats	Non-bird species
1st	Surface area (from tabular data)	Population (from tabular data)
2nd	Area (from spatial data, 10 km x 10 km grids)	Area (from spatial data, 10 km x 10 km grids)
3rd	Range (from tabular data)	Range (from tabular data)

Table 3.5 Criteria for classification of conservation status of habitats and non-bird species

If…	… the habitat/non-bird species is considered…
The proportion of a habitat/non-bird species reported as 'bad' is greater than or equal to 25%	**Unfavourable-bad (Bad)**
The proportion of a habitat/non-bird species reported as 'good' is greater than or equal to 75%	**Favourable (Good)**
The proportion of a habitat/non-bird species reported as 'unknown' is greater than or equal to 25%	**Unknown**
Any other combination applies	**Unfavourable-inadequate (Poor)**

On the basis of Member States' assessments for each habitat and species present in each biogeographical/marine region, separate EU regional assessments are conducted for the biogeographical regions and marine regions as a whole. They were carried out by the EEA and ETC-BD experts between October 2019 and February 2020, followed by a public consultation in February and March 2020 using a web tool, allowing for comments from a wide range of stakeholders. About 24 visitors from 18 network locations across the EU were registered, and nearly 390 comments were received. Of these comments, 60 % were considered relevant and were integrated into the online database/information. A variety of comments on the process (e.g. lack of consultation at national level) were also received, either via the web tool or by email/letter.

Aggregation methods for EU assessment

After considering several possibilities and having discussed this topic with the Habitats Directive Scientific Working Group in 2007-2008, three methods to assess conservation status of habitats and species at regional level (biogeographical and marine) were developed for the 2001-2006 report for use where a habitat/species occurs in two or more MSs in a region with varying assessments; they are all based on data and conclusions from the original MSs reports. The same methods were used for the 2013-2018 report. The choice of the assessment method (apart from method 0) will depend on data availability.

Assessments may be carried out using (in order of preference):

Method 0EQ: In some cases, all the MSs within a region may have reported the same conclusion for a parameter. Here, this conclusion will also be the EU conclusion for the parameter and this should be recorded as method '**0EQ**'.

Method 1: Aggregating data from MS reports for each parameter and using the evaluation matrices from the report format (EC, 2016a); this is the preferred method for the parameters range, population

(of a species) and area (of a habitat) and structure and functions but often not possible due to data constraints.

Method 2: by calculating the weighted average of the conservation status of individual parameters. This is the second preference. Weighting options and thresholds used by the three methods provided above (Tables 3.4 and 3.5)

Once the status of each of the 4 parameters has been assessed using methods 0EQ, 1 or 2, the overall status is calculated by using the rules given in the last line of the evaluation matrices

It is probable that in some cases no regional assessment will be possible; these should be noted as 'unknown'.

Table 3.6 Conservation status

Parameter	Conservation Status			
	Favourable-good ('green')	Unfavourable-poor ('amber')	Unfavourable-bad ('red')	Unknown (insufficient information to make an assessment
Overall assessment of CS	All 'green' OR three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with 'green' or all 'unknown

Method 3: by calculating the weighted average of MS overall conservation status assessments. This method should only be used when neither methods 1 or 2 are possible.

As indicated above, for habitats/species only present in one MS, the MS assessment is the EU assessment – **Method 0MS**.

Table 3.7 below summarises which methods can be used for each parameter or overall assessment of Conservation Status. The priorities (preferred versus alternative method) are set for each parameter separately and it is possible that Method 1 is used for one parameter, e.g. range, while only Method 2 is possible for other parameters, e.g. habitat area or population.

Table 3.7 Possible methods for each parameter or for overall Conservation Status

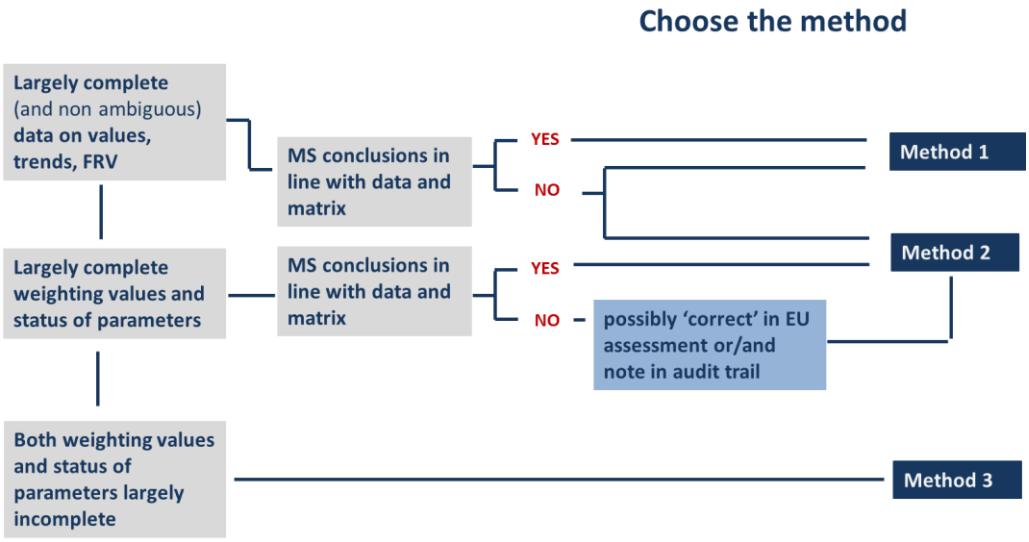
Parameter	Habitats	Species
Range	**preferred: Method 1** alternative: Method 2	**preferred: Method 1** alternative: Method 2
Area covered by habitat (habitats only)	**preferred: Method 1** alternative: Method 2	
Population of species (species only)		**preferred: Method 1** alternative: Method 2
Structure & functions (habitats only)	**preferred: Method 1** alternative: Method 2	
Habitat for the species (species only)		**Method 2**
Future prospects	**Method 2**	**Method 2**
Overall Conservation Status	**preferred: MTX** alternative: 3	**preferred: MTX** alternative: 3

Note: methods 0EQ and 0MS are not listed as they do not require aggregation of MS data. Only Method 2 is proposed for habitats. For the species, cases where direct calculation is possible will be extremely rare (all Member States report identical values for both sufficiency of occupied habitat and short-term trend).

Choice of the aggregation method

The choice of the assessment method (apart from method 0) will depend on data availability. Figure 3.1 provides steps for selecting the broad assessment method.

Figure 3.1 Steps for selecting the broad assessment method.



Presentation of results

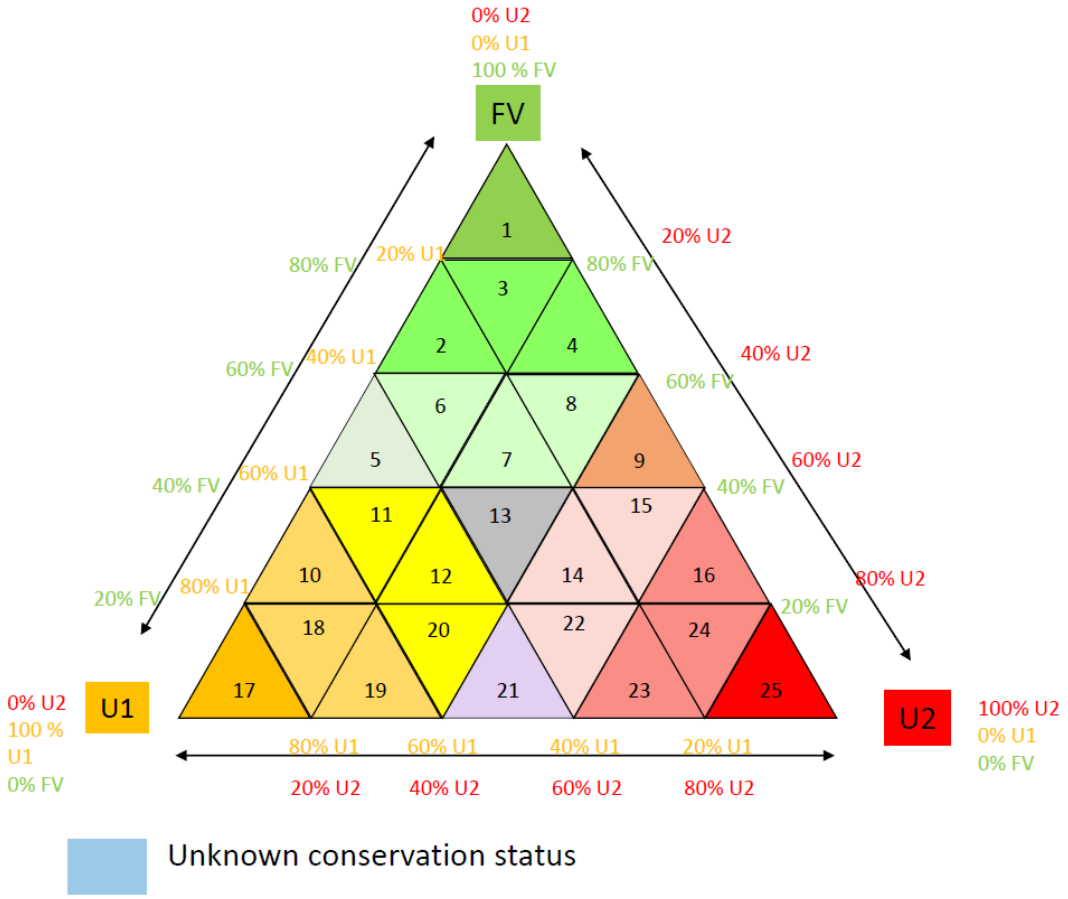
The conservation status analyses do not include the assessments done at either Member State or EU biogeographical level for marginal habitats and species, and occasional and newly arriving species. At the EU biogeographical level, this concerns habitats and species which are either marginal, or occasional or newly arriving at all Member States from which they are reported within a region. Many marine species fall under this category. This principle is applied in all analysis in Chapter 3 and in the remaining chapters of the State of Nature in the EU report. More details are provided in the technical documentation of the Article 17 reporting dataset available, via the EEA's datacentre[17].

Spatial distribution of conservation status presented at Member State level were done as follows. The percentage of reports with favourable (FV), unfavourable inadequate (U1) and unfavourable bad (U2) for each 10x10 km grid cell have been calculated. A grid cell with 100 % favourable status is coloured, as shown in the top level triangle in the legend. The other colours show different kinds of combinations such as 10 % favourable inadequate, 50 % inadequate and 40 % bad status. Reports with unknown status have not been considered for the colour triangle, thus grid cells with 100 % unknown trends appear in blue.

In cases where only very few habitats/species occur in a grid cell, a status category might occur to 100 %, (e.g. 100 % bad). In the vast majority of the cases there is a mixture of status categories in one grid cell.

[17] https://www.eea.europa.eu/themes/biodiversity/dc

Figure 3.2 Derived legend for conservation status map

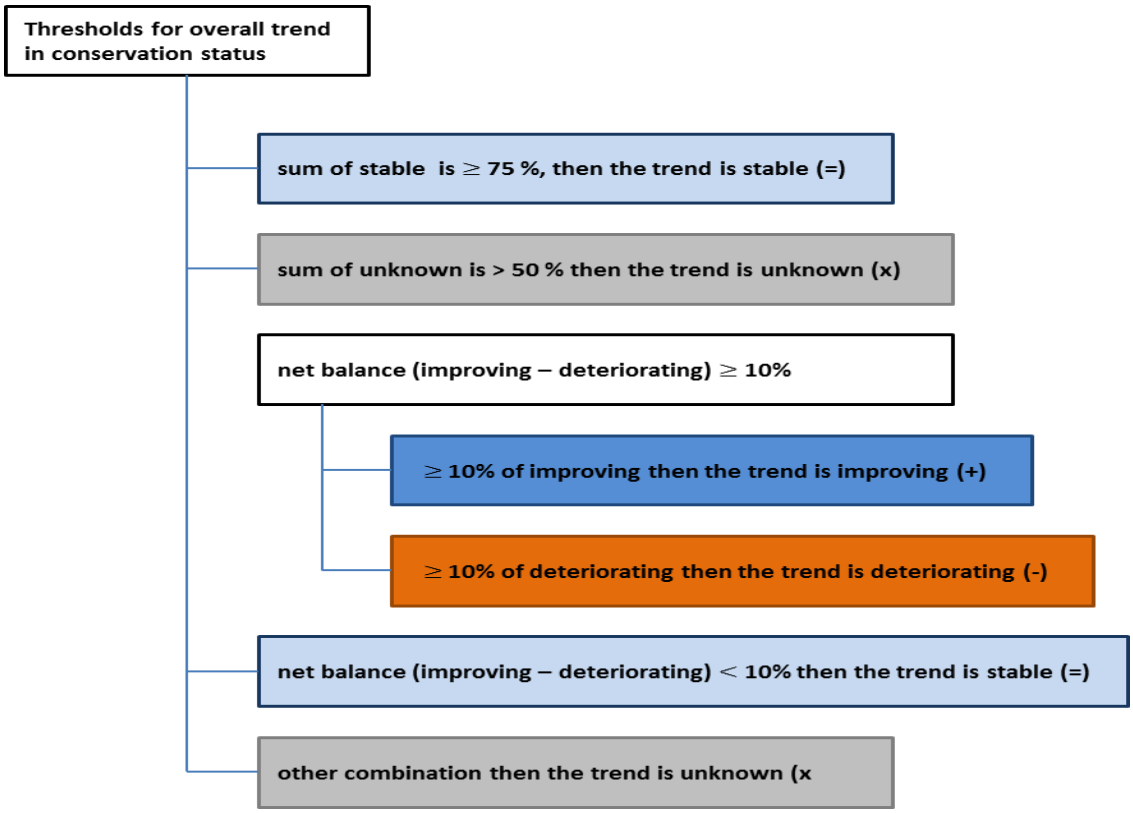


3.3 Trends in conservation status

Given the definition of 'favourable conservation status' in the Habitats Directive, changes in the overall conservation status, for example from unfavourable to favourable or, from unfavourable bad to inadequate - require relatively major changes in the individual conservation status parameters to be noted. The use of trends of the overall conservation status allows more subtle changes (improvement or deterioration) of the unfavourable categories to be identified. This information is also used to measure progress to Target 1 of the EU Biodiversity Strategy for which it is necessary to identify which assessments can be considered as 'Favourable' or 'improving'.

The EU biogeographical trends are estimated as a part of the EU assessment of status detailed above. The trend should be estimated for habitats and species in good, poor and bad status; this information is not relevant for unknown status. For assessing the EU conservation status trend the MS trends are weighted using the same methods as used for the assessment of parameters (see Section 3.2). Once the proportion at EU biogeographical scale for each trend category (improving, deteriorating, stable, unknown) is estimated the resulting EU trend is assessed applying the following thresholds presented in Figure 3.4.

Figure 3.3 Assessment of trends in conservation status



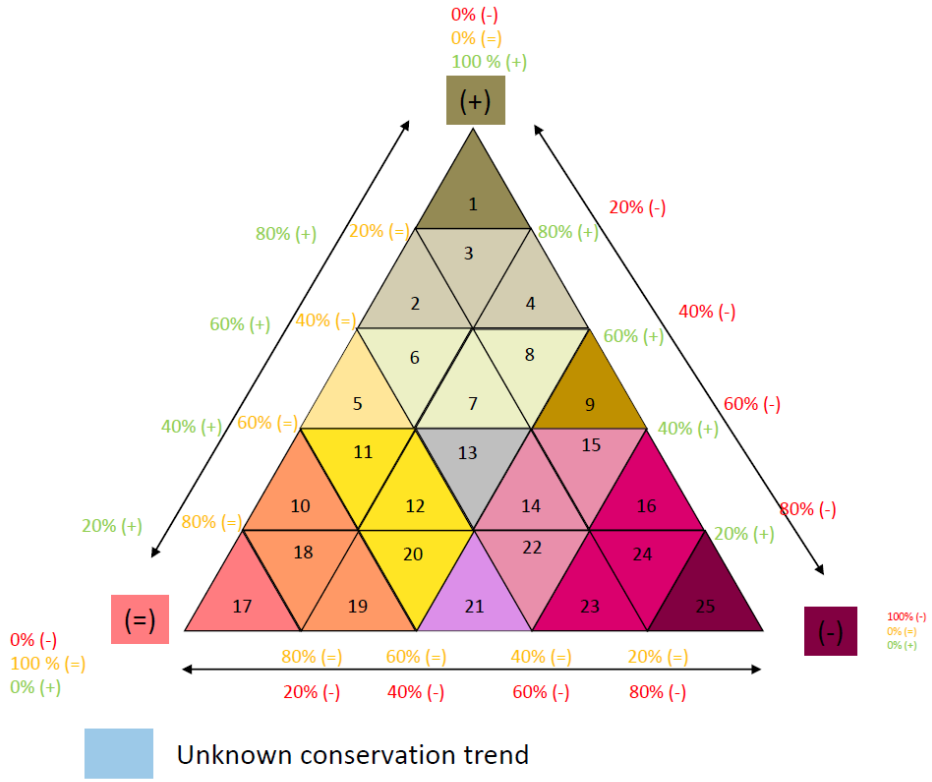
Presentation of results

Analogous to the maps from Section 3.2 that show the spatial distribution of the conservation status, these maps are also provided for the conservation status trend (further information see Section 3.2). The colour coding for the trends are shown in Figure 3.3.

The percentage of reports with improving (+), stable (=) and deteriorating (-) trends for each 10x10 km grid cell have been calculated. A grid cell with 100 % improving trends is coloured as shown in the top level triangle in the legend. The other colours show different kinds of combinations, such as 10 % improving, 50 % stable and 40 % deteriorating trends. Reports with unknown trends have not been considered for the colour triangle, thus grids cells with 100 % unknown trends appear in blue.

In cases where only very few habitats/species occur in a grid cell, a trend category might occur to 100 %, (e.g. 100% deteriorating). In the vast majority of the cases there is a mixture of trend categories in one grid cell.

Figure 3.4 Derived legend for conservation status trend map



3.4 Improvement of 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 deterioration for species and habitats. In order to avoid neglect on those cases related to conservation efforts being made, a methodology[18] was developed in which **improvement** is understood in the case of:

- improved status category since 2013 (e.g. U2 to U1, U1 to FV, U2 to FV) which are reported by the Member States as 'genuine' status change in conservation status (see Table 3.8);
- improving conservation status trends for habitats / species with unfavourable status in the current period regardless of what the trend was in the previous period; and
- stabilised trend in assessments of unfavourable status in 2018 that had declining trends in 2013 (which are reported by the Member States 'genuine' change).

Table 3. 8 below illustrates this categorisation. The "improved status" category includes all cases with assessment combinations shaded in dark green *and* where the Member States has classified the 2013-2018 change as genuine in conservation status.

[18] This methodology corresponds to the approach deployed for the national summaries.

Table 3.8 **Criteria matrix used to identify improvement of status and trends in habitats and species according to Article 17 reports ("improved status" dark green, "improving conservation status trend" light green, "stabilised trend" yellow)**

		Previous assessment (2007-2012)							
		FV	U1+	U1=	U1-	U2+	U2=	U2-	XX
Assessment (20013-2018)	FV		■	■	■	■	■	■	
	U1+		■□	■□	■□	■	■	■	
	U1=				■	■	■	■	
	U1-					■	■	■	
	U2+					■□	■□	■□	
	U2=							■	
	U2-								
	XX								

Note: Conservation Status: FV = favourable; U1 = unfavourable – inadequate; U2 = unfavourable – bad; XX = unknown; Trend: '+' improving, '=' no change; '-' deteriorating; 'xx' unknown; Status change in conservation status: ■ = 'genuine', □ = other than genuine change;.

Source: Article 17 reports and assessments

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

Use of the reported information on main reason for change

The information on reason for change in conservation status and trend reported by Member States was harmonised prior to use in this analysis. First, the previous status and trends were assigned to each habitat and species reported using the information reported for the 2007-2012 reporting period. For species with taxonomical changes (e.g. a species split into several new species), no previous status and trends were assigned. If the previous status or trend and the current status or trend were the same, this was considered as 'no change' even though a main reason might have been reported from Member State. In case no reason for change was reported, or this was not in line with the assigned previous status (i.e. no change reported while the status or trend differ), this is coded as 'No Info' (no information). Habitat and species where no previous status was assigned (e.g. when they were not reported in 2007-2012 or there was a taxonomical split) this is accounted as Not Applicable.

4 Pressures and responses

4.1 Key pressures for species and habitats

Pressures and threats provide information on the main drivers influencing conservation status of species and habitats. They can help to identify actions required for restoration and they are essential to communicate the results of the status assessment to various stakeholders.

Under Article 12 reporting, pressures and threats were required only for certain bird species, i.e. for regularly occurring Annex I species and any other migratory species triggering SPA designations nationally (as indicated in the species checklist). Member States were encouraged to provide this information for Annex II species and, if available, also for remaining species. They were reported separately for breeding, winter and passage seasons.

In the reporting guidelines, pressures are defined as having acted within the current reporting period and they have threats or future/foreseeable impacts (within the next two reporting periods) that are likely to affect the long-term viability of the habitat and its typical species. The list of pressures and threats used for the assessment, as well as further information on the list and practical guidance on how these were used of the Member States reporting, can be found on the Article 12 or Article 17 Reference Portals. For the 2013–2018 reporting pressures are classified into 15 Level 1 categories corresponding to the main sectoral driver (see Table 4.1)

Table 4.1 Labels and short titles for the main Level 1 categories

Code	Label	Short title
A	Agriculture	Agriculture
B	Forestry	Forestry
C	Extraction of resources (minerals, peat, non-renewable energy resources)	Extraction of resources
D	Energy production processes and related infrastructure development	Energy production
E	Development and operation of transport systems	Transport
F	Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas	Urbanisation
G	Extraction and cultivation of biological living resources (other than agriculture and forestry)	Exploitation of species
H	Military action, public safety measures, and other human intrusions	Other human intrusions
I	Alien and problematic species	Invasive alien species
J	Mixed source pollution	Pollution
K	Human-induced changes in water regimes	Modification of water regimes
L	Natural processes (excluding catastrophes and processes induced by human activity or climate change)	Natural processes
M	Geological events, natural catastrophes	Geological events
N	Climate change	Climate change
X	Unknown pressures, no pressures and pressures from outside the Member State	Other

In addition to the type of pressure and threat for each species, Member States also ranked the relative importance of the pressure or threat as falling under one of two categories, as shown in Table 4.2.

Table 4.2 Categories for ranking pressures and threats

Code	Meaning	Comment
H	High importance/impact	Important direct or immediate influence and/or acting over large areas (a pressure is the major cause or one of the major causes, if acting in combination with other pressures, of significant decline of surface area of habitat, range or area of habitat with good conditions; or pressure acting over large areas preventing the habitat from being restored to Favourable conservation status at the biogeographical scale).
M	Medium importance/impact	Medium direct or immediate influence, mainly indirect influence and/or acting over moderate part of the area/acting only regionally (other pressure not directly or immediately causing significant declines).

In addition to the overarching Level 1 categories, an underlying Level 2 identifies 203 individual pressures/threats (mostly listed as 'activities'). Within the State of Nature Report, only pressures of high importance/impact were assessed. The full results for threats and the pressures of high/medium importance are available on the online dashboard.

Specific notes related to the analysis in section 4.1 of the report:

- The analysis of the main drivers in the State of Nature report shows the frequency of reported pressures, which are aggregated at Level 1. Consequently, if several pressures under one major category have been reported in a Member State's report for a habitat or species, the respective major category is counted only once.

  Example: for Arnica montana in the Atlantic region a Member States reports pressure caused by 'Abandonment of grassland (A06), intensive grazing (A09) and application of fertilisers (A20). These is accounted as one pressure "agriculture".

  The frequency of reported pressures per habitat or species groups shows the percentage ratio between number of records of aggregated Level 1 pressures for e.g. agriculture and the total number of Level 1 pressure records for habitat/species group.

- Only high ranked pressures are considered.
- A Level 2 analysis was conducted using all pressures reported for one Level 1 category, presenting the total shares of the individual Level 2 impacts within the respective category.

Additionally, the analysis of pressures on wetland habitats presented in Box 4.2 was generated using ecological grouping. These groupings were developed with the aim to get a more detailed look into particular ecological groups of habitats and specie to derive more information on group specific pressures. Anecdotal results based on the grouping were included throughout Section 4.1. Such analyses using these ecological groupings can further be related to assessments under other legal reporting processes. The ecological groupings are also used for the analysis on meeting the EU 2020 Biodiversity Strategy target 3a (Section 6.2 of the report) and described in more detail in the respective Section 6.2 of this document.

4.2 Conservation measures

Conservation measures are concrete actions aiming at maintaining or restoring the natural and semi natural habitats protected by the Habitats Directive and the habitats or populations of Habitats Directive species or birds. Under Article 12 reporting, as for pressure and threats the conservation

measures were required only for Annex I species and any other migratory species triggering SPA designations nationally. However, Member States were encouraged to provide this information for Annex II species and, if available, also for remaining species.

Nature reporting provides the general information on implementation of measures but also a list of particular measures taken for each habitats or species. The general information on measures, which is provided globally for each habitat or species in each region or for each bird species in a corresponding season provides an overview of the conservation measures: whether measures have been taken for a habitat or species within a region, their location (i.e. are the measures for a particular habitat/species rather taken inside or outside the Natura 2000 network), which conservation problem the measures address (e.g. restoring the habitat or enhancing the population) and in which time frame the positive impacts can be expected.

The particular conservation measures taken for each habitat or species were reported using the codified list of measures. The list of conservation measures mirrors the list of pressures and threats and the conservation measures are principally understood as an action to mitigate the impact of past and present pressures. The list of conservation measures used for the assessment, as well as further information on the list and practical guidance on how to use it for reporting, can be found on the Article 12 or Article 17 Reference Portals.

Measures information from Member States[19] is used for all EU analyses; this information is not aggregated at the EU level. As regards analysing the link between the measures and status or reported improvement or deterioration of status, this is based on Member State information for status and trend.

The information on conservation measures (both general information and the detailed list of measures) was only mandatory for Annex II Habitats Directive species and for certain bird species, i.e. for regularly occurring Annex I species and any other migratory species triggering SPA classification. If the information on measures was provided for other groups of species (e.g. Habitats Directive Annex IV species or V or non-Annex I and non-SPA trigger birds), this was not taken into calculations.

Specific notes related to the analysis in section 4.2 of the report:

- Analysis of main location of measures excludes cases where this information was not reported (either was not relevant as measures were not taken, or missing).
- The analysis of the main measures taken by the Member States shows the frequency of reported measures, which are aggregated at Level 1, similar to the pressure analysis in chapter 4.1. This means that if a Member State reports several measures under one major category for a habitat or species, the respective major category is counted only once. The frequency of reported measures per habitat or species groups shows the percentage ratio between number of records of aggregated level 1 measures for e.g. agriculture and the total number of level 1 measures records for habitat/species group.

  A Level 2 analysis was conducted using all pressures reported for one Level 1 category, showing the total shares of the individual Level 2 impacts within the respective category.
- The analysis of the impact of measures on conservation status excludes reports where Member States indicated that measures are not needed.

[19] For the analysis presenting the relative importance of broad measures categories the measures reported by countries are aggregated into broad categories (e.g. 'CA – Agriculture'). If for a habitat or species at least one measure form a respective broad category was reported, this habitat or species was counted. Habitats or species for which several measures belonging to the same category were reported was only counted once.

- The analysis of correlation between the measures and the improvement or deterioration of the status uses the same definition of improvement as the analysis in chapter 3.4. The categories used in this analysis are defined as follows:
    - **Improvement.** *Improved status*: unfavourable status in 2013, with a genuine better status in 2019; improving conservation status trend, no matter if the change of trend is genuine or non-genuine. *Stabilised trend*: stable trend in 2019, deteriorating in 2013 and genuine change in trend between 2013 and 2019.
    - **Deterioration.** *Deteriorated status*: change of status towards worse category between 2013 and 2019, which is indicated as genuine. *Deteriorating conservation status trend*: no matter if the change of trend is genuine or non-genuine.
    - **No change.** *Favourable with no change***:** favourable status in 2019, when it is not indicated as a genuine change between 2013 and 2019. *Unfavourable with no change*: any unfavourable status in 2019, when it is not indicated as a genuine change between 2013 and 2019.
    - **Unknown:** unknown status in 2019.
- The analysis of correlation between the measures and the improvement or deterioration of the population trends uses the same definition of improvement as the analysis in Chapter 2.4. The categories used in this analysis are defined as follows:
    - **Increased or stabilised:** increasing short term population trend; stable or fluctuating short-term and decreasing long-term population trend
    - **Decreased:** decreasing short -term population trend
    - **No change:** stable or fluctuating short -term population trend
    - **Unknown**: unknown short -term population trend

4.3 Restoration needs for habitats

This section summarises estimations of surface areas that would need to be restored in order to achieve favourable conservation status for Annex I habitats of the Habitats Directive. These estimates may be particularly relevant for the framing and implementation of the EU Biodiversity Strategy for 2030 and action plan. Consequently, data from the United Kingdom was excluded from the calculations. In addition, habitat 8310 (Caves not open to the public) was excluded from all the area calculations given its linear character and underground occurrence.

For the purpose of this work, restoration includes two components:

1. The additional area of habitats that need to be recreated (e.g. wetland habitat from a drained agricultural field); this linked to the concept of 'Favourable Reference Area' (FRA), which determines the conservation status of the parameter 'Area covered by the habitat'[20]. FRA is *'the surface area in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the habitat type; this should include necessary areas for restoration or development for those habitat types for which the present coverage is not sufficient to ensure long-term viability'*[21]

[20] Conservation Status, as defined by the Habitats Directive, includes four parameters: - Range / Area covered by the habitat (Area in short) / Structure and Functions / Future Prospects A habitat type has a *favourable Conservation Status* only when all four parameters are *favourable*; this is the 'one out, all out' principle.

[21] Article 17 reporting guidelines: https://cdr.eionet.europa.eu/help/habitats_art17

2. The area of existing habitats that is degraded and needs to be improved (e.g. an overgrazed grassland with too much nitrogen in the soil and a reduced floristic composition); this is linked to the conservation status of parameter 'Structure and functions', which depends on the amount of the habitat in 'good condition.

The calculations were made from the data reported by Member States in 2019 (for the period 2013-2018) under Article 17 of the Directive.

Estimating the additional areas to be (re)created

Data on Favourable Reference Area (FRA) for each habitat was used to estimate the additional area of habitats to be recreated; this is the difference between the estimated FRA and the actual reported area.

The following approach was taken to estimate FRAs:

- Only habitats with regular presence (PRE) were considered
- Habitat reports with 'unknown' operator in FRA were excluded
- For the habitat reported area, the 'best estimate', or the average min/max in its absence, was used
- Few records with operator 'less than' or 'N/A' replaced by other operator according to the conservation status of the 'surface area' parameter: e.g. 'less than' and FV replaced by 'approximately equal to', 'less than' and U1 replaced by 'more than'
- The total FRA for each habitat resulted from the sum of:
    - All FRA areas reported as a value or with the operator 'approximately equal (to the reported area);
    - All FRA areas reported with operator 'more than' estimated as 1.05 times the reported area of the habitat (more 5 %);
    - All FRA areas reported with operator 'much more than' estimated as 1.10 times the reported area of the habitat (more 10 %).

The additional area to be recreated was calculated by subtracting the 'current reported area' from the estimated FRA area.

Estimating the habitat area to be improved/restored

The habitat area to be improved resulted from the sum of the reported areas in a 'not-good condition' using the average between the minimum and maximum values (or best estimate when available).

Since most reports did not provide data on condition for 100 % of the reported habitat area, the 'unknown condition' area was estimated by including both the areas of the 'unknown condition' and the areas for which no condition was reported.

The data used for this analysis stem from the reported data on habitat condition (structure and function parameter) that were collected for the first time in the reporting cycle 2013-2018.

It should be noted that the quality of available data[22] on habitat condition, on which this analysis is based, is a limiting factor. Largely due to insufficient monitoring data, the condition of many habitats used in this calculation could only be determined for a 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 which have been estimated.

[22] The calculations exclude the United Kingdom given the relevance of these estimations for the EU Biodiversity Strategy for 2030. Habitat 8310 (Caves not open to the public) was also excluded due to its liner and underground characteristics.

5 Status of the Natura 2000 network

5.1 Facts and Figures

The cartogram maps show the Member States resized relative to the area of, e.g. Natura 2000 sites. The transformation was accomplished via the "cartogram_cont" function from the cartogram library of the statistical software R (R Core Team, 2019). The method uses a rubber sheet distortion algorithm to resize the countries (Dougenik et al., 1985) and construct continuous area cartograms. The algorithm iteratively distorts the original shape of the countries to the desired size while preserving the topology of the original map. Relative position, shape and visual recognition of the countries are preserved as much as possible.

The map shows the distribution of Habitats Directive sites (pSCIs, SCIs and SACs) and Birds Directive sites (SPA) based on the Natura 2000 spatial data set. Overlapping sites are coloured separately; these overlapping sites are in most of the cases the so called 'type C' sites, which are designated under both Directives. In some cases, these overlapping sites belong to one of the Directives.

5.2 Coverage of ecosystems by terrestrial and marine Natura 2000 sites

The source of the land cover status and change statistics inside and outside of Natura 2000 sites was taken from the EEA Joint Environmental Data Infrastructure (JEDI). JEDI is the EEA's system infrastructure for building data cubes specially made for land and ecosystem accounting. Different spatial datasets can be imported to the database based on a regular grid where every cells is a unique identifier. Through this common identifier, JEDI can relate and calculate areas based on the same cell identifier. The number of recorded data sets (Corine Land Cover (CLC), Natura 2000, Biogeographical regions, etc.) is growing continuously.[23]

The JEDI tool allows the user to select the requested dataset. After the selection, data cubes and tableau projects are built which can then be used for the statistical analysis (EEA, 2020). The CLC2012 and 2018, as well as the Natura 2000 (2018) data used in this chapter, were taken from the Natura 2000 cube and viewer.[24]

The online tableau dashboards provide information about the land cover and land cover changes inside and outside the Natura 2000 network.

5.3 Coverage of species and habitats by Natura 2000

Member States report the area for habitats and population of species within the Natura 2000 network. Relating these numbers to the total area and population of a country, respectively, results in the percentages covered by Natura 2000 per country. The habitat area or population size can be reported[25] as a minimum-maximum interval or a best single value. In the calculation, best value or, if not available, an average between the reported minimum and maximum (if maximum value was not available but only minimum, the reported minimum was used in calculations, missing minimum values were replaced with 0 and the average was calculated consequently), were used to obtain a single value for habitat area/population size both globally and within the network. These single values were compared to obtain a percentage coverage by Natura 2000 sites.

[23] Explore the Interactive Contextual Data Inventory

[24] Natura 2000 data viewer: https://www.eea.europa.eu/data-and-maps/dashboards/natura-2000-data-viewer

[25] The reported area for habitats 6510 and 3270 in Continental region of France were substituted.

The coverage values are shown via violin plot and are produced with the vioplot function of the vioplot library in the statistical software R (R Core Team, 2019). These are quite similar to a box plot but they additionally show the probability density of the data at different values via a rotated kernel density plot on each side. Less technically, it shows how frequent certain values, in this case N2000 coverages, are. In other words, 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 visualises the area containing 50 % of the data points ("25 % to 75 % quantile").

The statistics on coverage by Natura 2000 sites are presented separately for marine and terrestrial habitats and species. Marine habitats and species are in general those for which the reporting in marine regions is requested. Anadromous fish or freshwater fish with distinct marine populations are considered terrestrial even though reported in marine regions. Contrary to this, *Acipenser sturio* is treated as a marine species. The list of marine habitats and species is provided as a part of the EU reporting dataset.

5.4 Effectiveness of Natura 2000 network

The coverage by Natura 2000 sites described in chapter 5.3 was used to divide the habitats and species into classes: 0-35 %, 35-75 % and 75-100 %. These classes were chosen using a statistical technique (*k*-method) that is designed to divide data into homogeneous groups. They were established based on the data from the 2007-2012 (2008-2012) reporting period and additionally used in the current analysis. The analysis in this excludes habitats and species for which the coverage by Natura 2000 sites could not be determined (habitat area or population size, either global figure or within the Natura 2000, was missing or calculated coverage was bigger than 100 %).

The effectiveness of the Natura 2000 network was first analysed using the comparison of proportion of habitats and species in good status with Natura 2000 site coverage of <75 % and > 75 %.

In the analysis of changes of conservation status in Natura 2000 coverage classes, the subsequent categories have been used:

- **Improvement.** *Improved status:* unfavourable status in 2013 with a genuine better status in 2019; improving conservation status trend, no matter if the change of trend is genuine or non-genuine. *Stabilised trend*: stable trend in 2019, deteriorating in 2013 and genuine change in trend between 2013 and 2019.
- **Deterioration.** *Deteriorated status*: change of status towards worse category between 2013 and 2019, which is indicated as genuine; deteriorating conservation status trend, no matter if the change of trend is genuine or non-genuine. *Favourable with no change:* any favourable status, when it is not indicated as a genuine change between 2013 and 2019.
- **No change.** Any unfavourable status, when it is not indicated as a genuine change between 2013 and 2019.
- **Unknown.**

6 Meeting EU 2020 Biodiversity Strategy targets

In an effort to halt the loss of biodiversity and the degradation of ecosystem services in the EU, the European Commission adopted a Biodiversity Strategy in 2011. The Strategy includes six targets to be reached by 2020, two of which explicitly mention species and habitat conservation status. Target 1 strives to reach a proper implementation of the Nature Directives, not least through improvements in the status of all covered species and habitats. Target 3 aims to optimise agriculture and forestry's benefits for biodiversity.

6.1 Measuring progress towards Target 1

Target 1 concerns nature conservation and restoration and is based on improving the conservation status of species covered by the Habitats Directive and species covered by the Birds Directive.

To quantitatively measure this target, a methodology was developed by the Expert Group on Reporting under the Nature Directives and further validated by the Group of Experts on the Birds and the Habitats Directive. It is based on a changes matrix which displays the different possible combinations of changes in EU conservation status assessments (for Article 17) between two reporting periods (i.e. 2001 through 2006 – used as the baseline for 2010 -, and 2013 through 2018), or changes in bird population status (for Article 12) since 2004 - used as the baseline for 2010 - when the report "Birds in the European Union" (BirdLife, 2004) was published.

Box 6.1 Target 1 of the EU 2020 Biodiversity Strategy

To halt the deterioration in the status of all species and habitats covered by EU nature legislation and achieve a significant and measurable improvement in their status so that, by 2020, compared to current assessments:

(i) 100% more habitat assessments and 50% more species assessments under the Habitats Directive show (a favourable or) an improved conservation status; and

(ii) 50% more species assessments under the Birds Directive show a secure or improved status

6.1.1 Habitats Directive

The baseline (2001–2006) is 17 % of favourable assessments for species and 17 % for habitat types (EC, 2011); therefore, achieving the target means that at least 25 % of the assessments for species are favourable or have an improved conservation status, and that at least 34 % of the assessments for habitat types are favourable or have an improved conservation status in 2020.

The most recent 'State of nature in the EU' report includes a chapter on measuring progress towards Target 1 using assessments from the 2013–2018 reports.

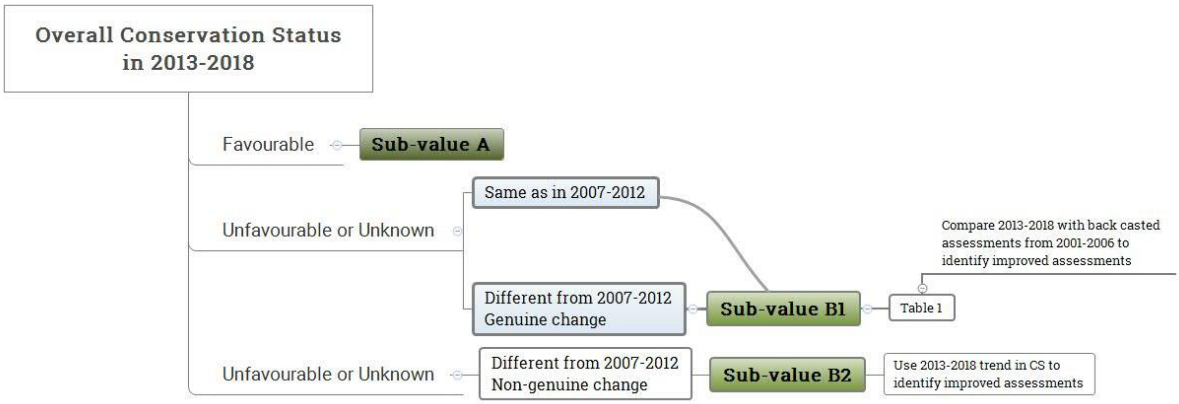
Calculating progress towards Target 1 (Habitats Directive) in 2020

For the Habitats Directive component of Target 1, measuring progress between the baseline period (2001–2006) and the 2020 target (corresponding to 2013–2018) will include three components:

- Percentage of features with a Favourable conservation status (FV) in 2013-2018 (**sub-value A**)
- Percentage of improved assessments from Table 6.1 (see below) for conservation status assessments that did not change or that genuinely changed between 2007-2012 and 2013-2018; i.e. compare the EU (biogeographical) conservation status assessments from 2013–2018 with those from 2001–2006 back-casted with the information on 'nature of change' from 2007–2012 (see box below) (**sub-value B1**)
- Percentage of improved assessments i.e. with a positive (+) trend in the conservation status of 2013-2018, for conservation status assessments that did not genuinely changed between 2007-2012 and 2013-2018; i.e. use the conservation status trends of 2013-2018 (**sub-value B2**)

This approach is illustrated by Figure 6.1 below.

Figure 6.1 Flowchart summarising how to measure 'favourable' and 'improved' assessments to measure progress towards Target 1 under the Habitats Directive



A + B1 + B2 will give us the percentage of assessments with a favourable or improved conservation status in period 2013-2018 (closest to 2020) when compared to period 2006-2012 (closest to 2010).

The majority of changes in conservation status reported by the MSs for the period 2007–2012, for both habitats and species were due to better data or changes in the methodology used, with many habitats and species previously reported as 'Unknown' being reported as one of the three conservation status classes. This in turn means that many of the EU assessments for biogeographical and marine regions also changed between 2001-2006 and 2007-2012 periods due to non-genuine reasons. The 'back-casted' status for 2001-2006 period should be used to evaluate the progress towards the Target 1.

Box 6.2 Explanation of 2001-2006 conservation status with back-casting used for Target 1 assessment

As the nature of change was noted by the assessor for each EU regional assessment in 2007-2012 period, it is possible to identify which assessments from 2001-2006 period have changed due to different methods and improved data (non-genuine changes) and to 'back cast' the 2001-2006 conservation status using the 2007-2013 data. For example, habitats and species assessed as 'Unknown' in 2001–2006 would have the same conservation status as in 2007–2012. Similarly, if reason for change for 2007-2012 was 'non genuine' change the habitat or species would have the 2007-2012 status.

6.1.2 Birds Directive

The baseline for birds is 52%, based on the number of species considered to be secure in the only EU-level assessment conducted before 2010 (in 2004, at EU25 level) (BirdLife, 2004). If the target was simply to increase this figure by 50 %, then it would mean that 78 % of species (rounded up to 80 % in some EC documents) would need to be in secure status by 2020 (EC, 2011). However, the target includes species whose status is either *secure* or *improved*. It is therefore necessary to use the data reported under Art. 12 to: (a) determine which species are *secure*; and (b) define the conditions under which non-secure species will be classified as *improved*. This is very important, as many species are a long way from being secure, but some are recovering, some remain depleted and others are still declining.

Calculating progress towards Target 1 (Birds Directive) in 2020

The method and parameters used to assess the conservation status of habitats and taxa under Article 17 of the Habitats Directive do not apply to birds. However, retaining the logic of the proposal above for the Habitats Directive, and striving for consistency, the formula to be used for measuring progress between the baseline assessment (2004) and the closest assessment to 2020 (2013–2018) is as follows:

- Percentage of bird species with Secure assessments in 2020 (based on reports from 2013-2018)
  (**sub-value A**)
- Percentage of improved non-secure assessments from Table 6.2 below; the improved assessments are identified according to a combination of the population short-term (2007-2018) and long-term (1980-2018) trends
  (sub-value B)

NB: The criteria and method proposed for 2020 is the same that was used in 2015; the only changes concern the periods used for estimating the short-term and long-term of the EU population trends.

Table 6.2 Classifying changes in trend direction of non-secure bird species at EU level as improvements

Long-term trend (1980–2018)	Short-term trend (2007–2018)			
	Increasing	Stable/Fluctuating	Decreasing	Unknown
Increasing	Yes	No	No	No
Stable/Fluctuating	Yes	No	No	No
Decreasing	Yes	Yes	No	No
Unknown	Yes	No	No	No

Due to the way in which Target 1 is formulated, *improvements* are only relevant to species classified as non-secure (i.e. Threatened or Not Secure). If a species has stopped declining but remains depleted (and is thus non-secure), it contributes towards the 2020 target, because the loss of this particular aspect of biodiversity has been halted (i.e. improvement). Conversely, if a species is still declining, albeit it at a slower rate than previously, it does not contribute towards the 2020 target, because it represents ongoing biodiversity loss (i.e. deterioration).

6.2 Measuring progress to Target 3

Target 3 of the EU Biodiversity Strategy to 2020 is to 'improve integration in key sectors, specifically through targets and action to enhance the positive contribution of the agriculture, forest and fisheries

sectors to biodiversity conservation and sustainable use'. The assessment of progress towards this target calls for the development of statistics showing, inter alia, the conservation status of species and habitats of European concern linked to agro-ecosystems and forest ecosystems. Target 3 includes two sub-targets; both make reference to conservation status of habitats and species. The State of Nature assessment contributes to measurements of progress towards this target by looking at conservation status and changes of conservation status of agricultural and forest habitats and species, in addition to population status and its changes for birds.

The most recent 'State of nature in the EU' report includes a chapter on measuring progress towards Target 3 using assessments from the 2013–2018 reports. The analyses show the status and trends (at the EU level) of agricultural and forest habitats and species.

Box 6.3 Target 3 of the EU 2020 Biodiversity Strategy

To increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity:

(3A) Agriculture: By 2020, maximise areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity-related measures under the CAP so as to ensure the conservation of biodiversity and to bring about a measurable improvement in the conservation status of species and habitats that depend on or are affected by agriculture and in the provision of ecosystem services as compared to the EU2010 Baseline, thus contributing to enhance sustainable management.

(3B) Forests: By 2020, Forest Management Plans or equivalent instruments, in line with Sustainable Forest Management (SFM), are in place for all forests that are publicly owned and for forest holdings above a certain size (to be defined by the Member States or regions and communicated in their Rural Development Programmes) that receive funding under the EU Rural Development Policy so as to bring about a measurable improvement in the conservation status of species and habitats that depend on or are affected by forestry and in the provision of related ecosystem services as compared to the EU 2010 Baseline.

6.2.1 Agricultural ecosystems

Target 3A explicitly refers to species and habitats that depend on or are affected by agriculture, hence, we prepared classification of habitats depending fully or partly on agricultural management. The agricultural management represent to those ecosystems disturbance of a certain type and intensity and therefore habitats and species need to be adapted to these disturbances. Some habitat types were adapted to them in such degree that their absence leads to changes in habitat structure and result in transition to another habitat type. Such habitats are classified as habitats fully depending on agricultural management. Other habitats can persist without agricultural management, but the management measures are favourable to them – mostly by enlarging habitat area or by blocking succession and thus maintenance of habitat type also in places where without agricultural management will disappear. We built the current classification on previous work (Halada et al., 2011), reflected addition of habitat type 6540 Sub-Mediterranean grasslands of the *Molinio-Hordeion secalini* to Habitat Directive Annex I by accession of Croatia to EU and expert comments to individual habitat types.

The agricultural habitats are represented in the Habitats Directive Annex I mostly by grasslands. Therefore, we found it useful to separate natural grasslands from those in need of management (i.e. grazing, cutting). We thus distinguished three groups: natural grasslands, grasslands depending partially and grasslands depending fully on agricultural management. The work described above was used for this classification. We provide below a description of individual categories.

Habitats depending on agricultural management for their survival (based on Halada et al., 2011)**:**

- **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 type and intensity of human 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.

Grassland habitats

- **Natural grasslands.** Grassland habitats of natural origin usually not managed or not depending on (agricultural) management.
- **Grasslands partially depending on management.** Grassland habitat of natural origin 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.
- **Semi-natural or successional grasslands fully dependent on management.** Semi-natural grasslands are grasslands developed by long-term interaction of man and nature, in which from natural communities evolved habitats adapted to certain frequency and intensity of human management. Grasslands established on arable land or grasslands intensively used in the past are included.

Species of agricultural ecosystems

In addition to habitats, we identified non-bird species that are linked to agricultural ecosystems and species linked to grasslands. In both classification we expressed the degree of species linkage to these ecosystems in three categories:

- Preferred: species occurs mostly in this ecosystem type.
- Suitable: species optimum is in another ecosystem type, but regularly occurs also in the assessed ecosystem type. This category is used also for species with broad ecological valence occurring in different ecosystem types without clear preference of one of them.
- Occasional: species linked to another ecosystem type and occurring in assessed ecosystem type occasionally or marginally.

Bird species of agricultural ecosystems are represented by bird species composing the European Common Farmland Birds Indicator[26].

6.2.2 Forest ecosystems

Forests host a dominant part of Europe´s terrestrial biodiversity and contribute significantly to climate change mitigation. In addition to a supply of wood, forests also provide multiple ecosystem functions and services that are vital to society and human well-being. These include provision of freshwater and clean air, regulation of climate and nutrient cycling, and contribution to human health and recreation

[26] https://pecbms.info/trends-and-indicators/indicators/

(Thompson et al., 2014). The EU Biodiversity Strategy to 2020 target 3 - to increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity – reflects the importance of these functions of forests. Therefore, we prepared a classification of habitats and species of forest ecosystems.

Forest habitats

The first step was to define which habitats of the Habitats Directive Annex I can be considered as forest habitats. We included habitats that are listed in the Annex I of the Habitats Directive under Forests (habitat code starting with 9) and seven additional habitats that meet the main criterion used for identification of forest habitats for High Nature Value Forest Areas (i.e. habitats with a tree cover greater than 10%). Then, two types of forest habitats classification were prepared. To address the utilisation of forests, we assessed potential of forests for exploitation in three categories: forests with limited potential for exploitation, forest with good potential for timber production and forest with good potential for non-timber production. We also supposed that the forest use and pressures to forests differ in individual parts of Europe, therefore we classified forest habitats based on their occurrence in four parts or Europe: boreal zone, temperate zone, Mediterranean and sub-Mediterranean zone, and Macaronesian region. Categories used for both classifications are described below.

Production function of forests

- **Forests with limited potential for exploitation.** This group includes forests with mostly non-production function e.g. forest types on stands with high erosion risk, high altitude forests, forest types on unproductive stands, natural non-exploited forests or extensively exploited Mediterranean forests.
- **Forests with good potential for exploitation – timber production.** This group contains forest types on productive stands that are mostly used for timber production.
- **Forests with good potential for exploitation – non-timber production.** This group contains forest types that are used for non-timber products, e.g. for fruits (chestnut forests), bark (cork oak forests), resin (*Tetraclinis articulata* forests), etc.

Regional classification of forests

- **Boreal forests.** Forests of northern boreal zone adapted to harsh climatic conditions.
- **Forests of temperate zone.** Forests of nemoral zone of Europe adapted to moderate temperature climate.
- **Mediterranean and sub-Mediterranean forests** (including supra-Mediterranean). Forests of Mediterranean and sub-Mediterranean zones of Europe. High-mountain (oro-Mediterranean) habitats are also included.
- **Macaronesian forests.** Forests of Macaronesian biogeographical region; forest types of Azores, Madeira, and Canary islands.

Forest species: Non-bird forest species

The non-bird species linked by to forest ecosystems were selected using three categories defined above (preferred, suitable, occasional). In addition, we identified forest species into two categories: species living on live, standing trees and species living on dead wood. The reason for this classification is that these species are related to forests that are valuable and are either not managed or receive special management. Species living on live, standing trees are usually typical for old forests with tree

holes, species living on dead wood are typical to virgin forest with all stages of tree life cycle, non-managed forest or forest managed with specific aim to keep dead wood.

Forest species living on wood

- **Species living on live, standing trees.** From plants are here included especially mosses, from animals species living under bark or in wood holes.
- **Species living on dead wood.** Species living on fallen trunks and dead wood in different stages of decomposition.

Bird species of forest ecosystems are represented by bird species composing the European Common Forest Birds Indicator.

7 Data quality and limitations

Both the Habitats and Birds Directives require appropriate monitoring systems to be in place to provide the relevant information for producing national reports. Ideally, the data would have been collected from robust and comprehensive surveys and using methods comparable across all Member States.

For Habitats Directive habitats and species, actually only around 20 % of numerical estimates or trends originate from complete or robust surveys while more than 20 % of the information reported by Member States is based on expert judgement, and for some 10 % the available knowledge is insufficient (see Table 7.1). These values vary among parameters. For example, maps or habitat area/population size within the Natura 2000 network are based on complete or robust surveys in more than 30% of cases, while trends in habitat areas with good condition, population trends or trends of habitat for species are assessed based on a complete survey only in some 15 % of the cases. The robust trend information is, however, essential for assessing the status of habitat area and population size at Member State level as change of the yearly trend magnitude from < 1 % to >1 % triggers shifts from 'inadequate' to 'bad' status categories for these parameters. Although trend magnitudes are not a mandatory component of the Habitat Directive reports, they inform the assessment of the status at the level of Member States as explained above. The trend magnitudes were, however, provided in less than 1 % of cases. A relatively low proportion of data stems from complete or robust surveys for the dynamic measures (trends), which reveals greater monitoring needs across the protected habitat and species.

Table 7.1 Methods used for numerical parameters and trends

	Habitats	Non-bird species	Birds
Complete survey or a statistically robust estimate	23%	20%	37%
Mainly extrapolation from a limited amount of data	44%	42%	32%
Mainly expert opinion with very limited data	22%	24%	16%
Insufficient or no data available	10%	13%	14%
Methods not provided	0%	1%	1%

Quality and availability of information from Member States inevitably impacts the quality of the EU assessment of status and trends. The direct calculation of EU status used for habitat parameters range, area, structure and functions, species parameters range and population (method) are only possible if the majority of underlying data feeding into calculation is available and of sufficient quality. Table 7.2 provides an overview of missing or unknown information.

For EU assessments, Method 1 was used in 63 % of possible cases (excluding the habitat and species only in one Member State or where the status from all Member States is the same) for habitat range, in 33 % of cases for species range, 14 % for population size, 42 % for habitat area and 20 % for structure and functions. Globally, the weighting was used for at least one of those parameters for 80 % of habitat and 75 % of species assessments. Whilst weighting is a prevailing method for EU assessments, it also depends on data quality and availability. In theory, the weighting of the Member State assessments by habitat area or population size is preferred as these two measures give the most accurate weight for the habitat or species in a Member State.

The prevailing use of extrapolation from limited data and expert opinion for these two parameters (for habitat area these methods are used in 68% of Member State reports and for population size in 74%) can lead to differences in precision of Member States' estimates to a degree that Member State information is not fit for the EU assessment and EU analysis. Even though the information is provided the reported minimum and maximum intervals are very broad or the figures unexpectedly high/low; in these circumstances the weighting by population or habitat area is not used by the assessor but rather weighting by distribution area, the method which works with the precision of 100km^2.

Table 7.2 Missing or unknown information from Member States for items used for EU assessment of status

Missing or unknown information				Use in EU assessment	
Habitat parameters		**Species parameters**		**weighting**	**calculation**
Distribution map	*0%*	Distribution map	*5%*	✓	
Range surface area	*0%*	Range surface area	*1%*	✓	✓
Range trend	*9%*	Range trend	*13%*		✓
Reference range	*10%*	Reference range	*20%*		✓
Area of habitat	*4%*	Population size	*6%*	✓	✓
Area trend	*15%*	Population trend	*34%*		✓
Reference area	*11%*	Reference population	*19%*		✓
Habitat conditions	*6%*	Occupied habitat	*21%*		✓
Trend in area with good condition	*34%*	Habitat trend	*28%*		✓

Although 37 % of numerical estimates or trends for birds come from a complete or robust survey, expert opinion was used in 16 % of cases and for an additional 14% of cases the data are insufficient. The status assessment is based principally on data for species population size and for trends mostly on the short-term population trend. The long-term trend is, however, essential in order to distinguish 'declining and depleted' species from 'secure' ones, and is used as the principal criterion for long-lived species. The majority of EU assessments uses the breeding data (even though the winter data are also available). Complete or robust surveys are more frequently available for wintering populations (56 % of population size estimates and short-term trends originate from complete or robust survey for winter reports, while only 36 % and 40 % respectively for breeding populations).

The EU figures for population size and trends should ideally be calculated by combining figures provided by each Member State; this calls for information provided by Member States to not have significant gaps. Although population size is missing in less than 1 % of the Member State reports for breeding season and less than 3 % for winter season, reported information on trends is in many cases incomplete (missing trend magnitudes, unknown trend direction) (see Table 7.3)

Table 7.3 Missing or unknown information from Member States for items used for EU assessment of status

Parameters	
Population (breeding) - Size	0.3 %
Population (breeding) - Trend (short-term)	20 %
Population (breeding) - Trend (long-term)	29 %
Population (wintering) - Size	3 %
Population (wintering) - Trend (short-term)	29 %
Population (wintering) - Trend (long-term)	38 %

Furthermore, the data from Romania for the period 2012-2018 is completely missing.

When needed, for example in case of Romania, the surrogate data were used in the EU status assessments (mainly for population size or trends). This is noted in the audit trail to EU assessment and accessible vie the Article 12 web tool.

8 References

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Annex 1: Pressures and threats

Table Annex 1.1 Pressure and threat categories used for Article 12 & 17 reporting, level 1 in full and examples of levels 2

Level 1		Level 2	
A	Agriculture	A01	Conversion into agricultural land
B	Forestry	A02	Conversion from one type of agricultural land use to another
C	Extraction of resources (minerals, peat, non-renewable energy resources)	A03	Conversion from mixed farming and agroforestry systems to specialised production
D	Energy production processes and related infrastructure development	A04	Changes in terrain and surface of agricultural areas
E	Development and operation of transport systems	A05	Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, etc.)
F	Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas	A06	Abandonment of grassland management (e.g. cessation of grazing or mowing)
G	Extraction and cultivation of biological living resources (other than agriculture and forestry)	A07	Abandonment of management/use of other agricultural and agroforestry systems (all except grassland)
H	Military action, public safety measures, and other human intrusions	A08	Mowing or cutting of grasslands
I	Alien and problematic species	A09	Intensive grazing or overgrazing by livestock
J	Mixed source pollution	A10	Extensive grazing or undergrazing by livestock
K	Human-induced changes in water regimes	A..	……
L	Natural processes (excluding catastrophes and processes induced by human activity or climate change)		
M	Geological events, natural catastrophes		
N	Climate change		
X	Unknown pressures, no pressures and pressures from outside the Member State		

Source: http://cdr.eionet.europa.eu/help/habitats_art17 (List of pressures and threats)

Annex 2: The evaluation matrices

Annex 2.1 - Assessing conservation status of a species

Table Annex 2.1 General evaluation matrix (per biogeographical/marine region within a MS)

Parameter	Conservation Status			
	Good ('green')	**Poor ('amber')**	**Bad ('red')**	***Unknown (insufficient information to make an assessment)***
Range (within the biogeographical region concerned)	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference range'	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS OR more than 10% below favourable reference range	*No or insufficient reliable information available*
Population	Population(s) not lower than 'favourable reference population' AND reproduction, mortality and age structure not deviating from normal (if data available)	Any other combination	Large decline: Equivalent to a loss of more than 1% per year (indicative value MS may deviate from if duly justified) within period specified by MS AND below 'favourable reference population' OR More than 25% below favourable reference population OR Reproduction, mortality and age structure strongly deviating from normal (if data available)	*No or insufficient reliable information available*
Habitat for the species	Area of habitat is sufficiently large (and stable or increasing) AND habitat quality is suitable for the long-term survival of the species	Any other combination	Area of habitat is clearly not sufficiently large to ensure the long-term survival of the species OR Habitat quality is bad, clearly not allowing long-term survival of the species	*No or insufficient reliable information available*
Future prospects (as regards to population, range and habitat availability)	Main pressures and threats to the species not significant; species will remain viable on the long-term	Any other combination	Severe influence of pressures and threats to the species; very bad prospects for its future, long-term viability at risk.	*No or insufficient reliable information available*
Overall assessment of CS	All 'green' OR three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with green or all "unknown"

Annex 2.2 - Assessing conservation status of a habitats type

Table Annex 2.2 General evaluation matrix (per biogeographical/marine region within a MS)

Parameter	Conservation Status			
	Good ('green')	**Poor ('amber')**	**Bad ('red')**	***Unknown (insufficient information to make an assessment)***
Range (within the biogeographical/marine region concerned)	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference range'	Any other combination	Large decrease: Equivalent to a loss of more than 1% per year within period specified by MS OR More than 10% below 'favourable reference range'	*No or insufficient reliable information available*
Area covered by habitat type within range[27]	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference area' AND without significant changes in distribution pattern within range (if data available)	Any other combination	Large decrease in surface area: Equivalent to a loss of more than 1% per year (indicative value MS may deviate from if duly justified) within period specified by MS OR With major losses in distribution pattern within range OR More than 10% below 'favourable reference area'	*No or insufficient reliable information available*
Specific structure and functions (including typical species[28]**)**	Structures and functions (including typical species) in good condition and no significant deteriorations / pressures	Any other combination	More than 25% of the area is unfavourable as regards its specific structures and functions (including typical species)[29]	*No or insufficient reliable information available*
Future prospects (as regards range, area covered and specific structures and functions)	The habitats prospects for its future are excellent / good, no significant impact from threats expected; long-term viability assured	Any other combination	The habitats prospects are bad, severe impact from threats expected; long-term viability not assured.	*No or insufficient reliable information available*
Overall assessment of CS	All 'green' OR three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with green or all 'unknown'

[27] There may be situations where the habitat area has decreased as a result of management measures to restore another Annex I habitat or habitat of an Annex II species. The habitat could still be considered to be at 'Favourable Conservation Status' but in such cases give details in the Complementary Information section ('Other relevant information') of Annex D

[28] See definition of typical species in the Explanatory Notes and Guidelines

[29] E.g. by discontinuation of former management, or is under pressure from significant adverse influences, e.g. critical loads of pollution exceeded

Annex 3: Conservation measures

Table Annex 3.1: Overview of conservation measures (Art.12 and Art.17)

Level 1		Level 2	
CA	Measures related to agriculture and agriculture-related habitats	CA01	Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land
CB	Measures related to forestry and forest-related habitats	CA02	Restore small landscape features on agricultural land
CC	Measures related to resources extraction and energy production	CA03	Maintain existing extensive agricultural practices and agricultural landscape features
CE	Measures related to development and operation of transport systems	CA04	Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures
CF	Measures related to residential, commercial, industrial and recreational infrastructures, operations and activities	CA05	Adapt mowing, grazing and other equivalent agricultural activities
CG	Measures related to the effects of extraction and cultivation of biological living resources	CA06	Stop mowing, grazing and other equivalent agricultural activities
CH	Measures related to military installations and activities and other specific human activities	CA07	Recreate Annex I agricultural habitats
CI	Measures related to alien and problematic native species	CA08	Adapt soil management practices in agriculture
CJ	Measures related to mixed source pollution and human-induced changes in hydraulic conditions for several uses	CA09	Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production
CL	Measures related to natural processes, geological events and natural catastrophes	CA10	Reduce/eliminate point pollution to surface or ground waters from agricultural activities
CN	Measures related to climate change	CA..	……
CX	Measures outside the Member State		
CS	Measures related to management of species from the nature directives and other native species		

Source: http://cdr.eionet.europa.eu/help/habitats_art17 (List of conservation measures)