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AND NATURAL HABITATS

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REPORTING GUIDELINES: CONCEPTS AND DEFINITIONS
REPORTING ON THE IMPLEMENTATION OF MANAGEMENT, MONITORING AND REPORTING MEASURES

Reporting period 2019–2024

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INTRODUCTION

Reporting under Resolution No. 8 (2012) uses a format agreed with countries' representatives as part of the *Ad hoc* Working Group on Reporting. The **reporting format aims at standardising and harmonising the content of the reports across countries** to allow the aggregation of national data and produce Pan-European report(s). After each reporting period, a revision of the formats and associated guidelines is undertaken by the Council of Europe and the European Environment Agency in collaboration with Contracting Parties to facilitate a harmonised understanding among countries, using scientific and pragmatic approaches.

The format was initially approved by the Standing Committee in 2017 for the first reporting under Resolution No. 8 (2012) for the period 2013-2018. For the current 2019-2024 reporting period, the main changes concerned enhancing and refining the information provided by countries to suit the requirements of the Kunming-Montreal Global Biodiversity Framework and the Bern Convention Vision, e.g. reformulation of information submitted on favourable reference values and changes to the population units used for some species groups.

Box 1: How to use these guidelines

These guidelines are aimed primarily at those responsible for compiling national reports Resolution No. 8 (2012) for the period 2019 – 2024 but may also be of interest to others who wish to use or better understand the results.

The technical specifications for the data to be reported will be given in specific delivery manuals and code lists with codes for standardised entry of information in the reporting formats available on the Reporting Reference Portal. The delivery manuals and code lists will complement the Guidelines on Explanatory Notes.

The Reporting Reference Portal will contain documents and other material related to the information provided in the reporting format considered for the reporting under Resolution No. 8 (2012).

It includes:

- the reporting format for the period 2019 – 2024;
- the Guidelines on Explanatory Notes in support to the reporting format and the Guidelines on Concepts and Definitions;
- reference material, e.g. checklists for species and habitats, maps of biogeographical regions, agreed population units, lists of pressures and threats, list of conservation measures, and European Grids (10 x 10 km ETRS) used for mapping the distribution and range;
- additional examples illustrating Guidelines on Explanatory Notes (e.g. favorable reference values);
- guidance documents and IT applications (e.g. range tool) for preparing and delivering the reporting dataset.

This document provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'. It clarifies concepts and gives definitions (such as Structure and functions, Favourable reference values) and assessment methods (e.g. for Future prospects). Best practice examples in relation to reporting on favourable reference values and pressures and threats reporting are provided on the Reference portal. This guidance is largely based on the guidance from the 2013–2018 reporting period[6], but several sections have been revised.

Content of the report under Resolution No. 8 (2012)

The reports provide information on the conservation status of habitats and species listed in Resolution No. 4 (1996) and Resolution No. 6 (1998) of the Bern Convention. **The conservation status is the overall assessment of the status of a habitat type or a species at the scale of a country or biogeographical region**.

Favourable conservation status (FCS)

The assessment of the conservation status of a habitat type or a species is related to the concept of Favourable conservation status (FCS), which is the overall objective to be reached for all habitat types and species and it can be simply described as **a situation where a habitat type or a species is prospering (in both quality and extent/population) and with good prospects to continue to do so in the future**. This conservation status objective 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 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 will be taken as 'favourable' when:

- *its natural range and the 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 favourable.*

The agreed method for the evaluation of the conservation status assesses separately each of the parameters of the conservation status (Table 1), with the aid of an evaluation matrix (see Parts C and E of the reporting format), and then combines these assessments to give an overall assessment of the conservation status.

Table 1: 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 (including typical species)
Future prospects	Future prospects

The reports give an overview of the state of Europe’s biodiversity and form an important component to evaluate European and national policies, in particular, in measuring progress towards the 2030 goals set under the Bern Convention Vision and Strategic Plan for the period to 2030.

1 SPECIES GUIDANCE

1.1 Species to be reported

1.1.1 All species

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Taxonomical changes and names to be used for reporting

Several species listed in Resolution No. 6 (1998) have been revised from a taxonomical point of view because they are now considered to be two or more species. Conversely, other species listed are now included under other newly defined species, often changing their specific or even subspecific status. A common taxonomic understanding of the taxa by all countries concerned is essential for merging the countries' reports in order to produce a European-level assessment of their conservation status. The basic rule in aligning the species to be reported with the current taxonomy is to report at the species level in line with current understanding of the taxonomy, bearing in mind how a species was understood by the legislator at the time when Resolution No. 6 (1998) was drafted.

As a general principle, in situations where a species listed in Resolution No. 6 (1998) was split into several other species, wherever feasible (i.e. the species can be determined in the field), the Country should try to produce one report under Resolution No. 8 (2012) for each currently recognised species.

However, when the complexity of the situation and the impossibility to recognise the species in the field made not possible to produce separate reports for each species, then, a joint report covering more than one currently recognised species should be provided. This includes the following situations:

- scientific uncertainty on validity of newly described taxa; or
- diverging opinions on species taxonomy; or
- lack of clarity concerning the species taxonomy; or
- problems with determination of newly described species which cannot be resolved in due time.

Some species included in Resolution No. 6 (1998) are now part of other species, often losing their specific or even subspecific status. These few species do not represent a valid taxonomical entity, and the names listed in Resolution No. 6 (1998) refer to a particular population of a currently recognised species. In these cases, countries should still provide a report under Resolution No. 8 (2012) corresponding to the species name in Resolution No. 6 (1998) as it was interpreted at the time. For example, according to current knowledge, the species listed in Resolution No. 6 (1998) *Euphorbia lambii*, native to La Gomera in the Canary Islands, and *E. bourgeana* both represent a single species for which the name *E. bourgeana* is used. However, the reporting obligation only covers the La Gomera population previously referred to as *E. lambii*.

In some very rare cases, two species listed in Resolution No. 6 (1998) have been merged into one currently recognised species. For example, *Margaritifera durrovensis* is now considered part of *M. margaritifera*, or *Limonium multiflorum* and *L. dodartii* ssp. *lusitanicum (the latter is no longer valid).* In these cases, a joint report should be provided under the currently valid species name (as provided in the species checklist). If the conservation status and threats to these two populations (previously recognised as different species) differ, their status and threats can still be reported separately either in an additional optional report[1] or information can be provided in the relevant 'Additional information' fields.

Table 2 provides an overview of species listed in Resolution No. 6 (1998) which have been merged into one currently recognised species.

Table 2: Species listed in Resolution No. 6 (1998) which were merged into one currently recognised species

Taxonomical group	Name in Resolution No. 6 (1998)	Currently recognised species	Note
Plants	*Limonium multiflorum* *Limonium dodartii* ssp. *lusitanicum*	*Limonium multiflorum*	Joint report for both species under the name *Limonium multiflorum.*
Molluscs	*Discoglossus jeanneae* *Discoglossus galganoi*	*Discoglossus galganoi*	Joint report for both species under the name *Discoglossus galganoi.*
Molluscs	*Margaritifera margaritifera* *Margaritifera durrovensis (Margaritifera margaritifera)*	*Margaritifera margaritífera*	Joint report for both species under the name *Margaritifera margaritifera.*

Some species included in Resolution No. 6 (1998) have been split into two or more reporting species. When scientific literature is compelling and widely accepted and the distinction is clear, the new species has been included in the checklist of the reporting under Resolution No. 8 (2012). For instance, *Mauremys cas*pica occurs in the Caucasus and Eastern Europe, while *Mauremy rivulata* has a more Mediterranean distribution. Both species were considered under *Mauremy caspica* when Resolution No. 6 (1998) was drafted, but now they are included separately in the checklist of the reporting under Resolution No. 8 (2012). Another example is the split of *Osmoderma eremita* (see table 3 below).

For some species the taxonomy remains unclear or was ambiguous at the time Resolution No. 6 (1998) was published. For these species, the link between the currently recognised valid name(s) and the names listed in Resolution No. 6 (1998) is not clear. For example, based on available sources it is not possible to clearly conclude whether *Barbus plebejus* should cover Balkan species of the *B. cyclolepis* complex, since several contradictory descriptions of the earlier species were available when Resolution No. 6 (1998) was drafted.

Reporting under the terms 'complex' and 'all others' is a technical solution for reporting on groups of species that could not be distinguished in the field. This joint reporting is still retained for most complex groups of species; nevertheless, countries are encouraged to report at species level when the taxonomical determination and distinction of the species at site level is clear.

[1] In some situations, countries may complete additional reporting formats for habitats (subtypes) or species (e.g. distinct species of genus *Eudontomyzon* spp. *or Alosa* spp.*)* not listed in the checklist of the reporting under Resolution No. 8 (2012)

Table 3: Reporting ‘complexes’ and ‘all others’ for the 2019 – 2024 reporting period.

2013 – 2018 reporting	2019 – 2024 reporting
Cobitis taenia complex	*Cobitis taenia* complex (sensu lato)
Cottus gobio all others	*Cottus gobio* all others (sensu lato)
Barbus meridonalis all others	*Barbus* *balcanicus* *Barbus petenyi* *Barbus carpathicus* *Or* *Barbus meridionalis* all others (*B. meridionalis* sensu lato)
Osmoderma eremita complex	*Osmoderma eremita* *Osmoderma barnabita*

Other species listed in Resolution No. 6 (1998) are currently considered taxonomical errors, e.g. *Marsilea azorica* was considered a conservation priority species in the Azores, Macaronesia, and Europe (Martín Esquivel et al., 2008). In a recent publication, Schaefer et al. (2011) provide scientific evidence revealing that *Marsilea azorica* is a misidentified alien species from Australia (*M. hirsuta)*. The invasive character of *M. hirsuta* was not known when the Azores population was described as a species.

This should not be confused with situations where species listed in Resolution No. 6 (1998) were previously recognised as distinct species but are now included under other native taxa.

As there is no up-to-date taxonomical reference covering all species groups in Europe, the list of species in the checklist is based on the best available scientific information from global and regional taxonomical references as well as on proposals by countries. However, due to the complexity of some groups, reporting under complexes such as ‘spp.’, ‘all others’ or ‘complex’ is still allowed. The list of species to be reported by Contracting Parties is included in the checklist of the reporting under Resolution No. 8 (2012) available on the Reporting Reference Portal.

Occurrence categories used in the species checklist

The following categories and codes are used for the 2019–2024 reporting:

- **Present regularly (PRE)**

This category applies to species which occur regularly in the region.

- **Occasional (OCC)**

Occasional species are species:

- which do not have a stable and/or regular occurrence in the biogeographical/marine region; and
- for which the number of records is insignificant.

Reproduction within a biogeographical region is not recorded or is very sporadic. Even if it is not appropriate or possible to assess their conservation status at the country’s biogeographical level at this stage, these species should be reported in order to be duly reflected in the Pan-European biogeographical assessment.

For example: *Rhinolophus ferrumequinum* in the Republic of Moldova.

Using the ‘occasional’ category should reflect the history of the species, and its use should be restricted to cases where species have a natural irregular occurrence and also occur in insignificant numbers. The 'occasional' category should not be used for:

- species which were regularly occurring in the past but whose numbers have significantly declined, or a reproducing population became extinct due to human pressures, so that at present only occasional or vagrant individuals occur within a biogeographical region. In this case the category 'present' should be used;
- poorly known species with occasional records in the region, but which most likely have a stable or regular occurrence. These should be listed under the category 'present regularly';
- species which occur as vagrant but with important abundance (e.g. marine mammals or turtles in many regions). These species should be listed under the category 'present regularly'.

- **Newly arriving species (ARR)**

Newly arriving species are species that do not represent a permanent component of the fauna or flora of a biogeographical/marine region, but which have started to be recorded recently, within the last 12 years, due to the dynamics of their natural range.

Even if it is not appropriate or possible to assess their conservation status at the Country's biogeographical level at this stage, these species should be reported in order to be duly reflected in the biogeographical assessment. For assessing conservation status at European biogeographical level, it is important to identify the dynamic processes of range, mainly if they appear as a result of climate change, land-use or other changes, and reflect them in the assessment.

This category should not be used for species that already have a stable population within the biogeographical region.

If a newly arriving species is not listed in the current checklist of the reporting under Resolution No. 8 (2012) for the country, due to an oversight when the list was prepared, the country should still report it.

- **Marginal (MAR)**

The category 'marginal occurrence' should be used in situations where:

- the species occurs principally in one region (or country) with a population extending to a neighbouring region (or country),
- the abundance of the species is insignificant and the occurrence represents a limit of a natural range of a species in a given area.

In contrast with occasional species, the occurrence of a marginal species within a region (or country) is regular. Marginal populations are closely connected to the main population occurring in the neighbouring region or country (for example, the immigration of individuals) so their favourable status can be achieved only in relation to the main population. It is not expected that the conservation status of the marginal species will be assessed. However, if the conservation status is evaluated the assessment should consider their marginal position and link to a principal population, for example when estimating the favourable reference population.

The use of the 'marginal' category should reflect the history of the species and should be restricted to situations where the species occurs naturally as 'marginal'. The 'marginal' category should not be used for species that were regularly occurring in the past but whose numbers have significantly declined or a reproducing population has become extinct due to human pressures, so that nowadays only individuals, originating from a neighbouring population persist. In this case the category 'present' should be used.

For example: the Swiss population of *Parachondrostoma toxosma* is in the margin of distribution of the species (which occurs mainly in France), it is present only in one locality in the Doubs mountains. The population is declining due to the concurrence with the non-native species *Chondrostoma nasus*. In this case, the species has been considered as PRE since we believe the non-significant occurrence of the species might be linked to non-natural parameters (pressures).

- **Species extinct after entry into force of the Bern Convention (EXa)**

This category applies to species for which the last record in a biogeographical or marine region (even if it was a single individual) was noted after the date when Bern Convention came into force in the country; these species previously had a permanent/regular occurrence in the region.

In some situations, the species has not been recorded for several years, but there is insufficient evidence to conclude that it is extinct. These species should be classified as 'present'.

- **Species extinct prior to entry into force of the Bern Convention (EXp)**

This category includes species for which the last record of the species in a biogeographical or marine region (even if it was a single individual) was before the date when the Convention came into force in the Contracting Party but after 1950.

This category also includes species which became extinct in the past (including before 1950) but for which there is a restoration project, or species of a particular conservation interest with recent signs of recolonisation, but for which successful recolonisation or reintroduction cannot yet be concluded.

- **Scientific reserve (SCR)**

The occurrence of the species is uncertain. This category applies when there are only occasional historical records and it is not possible to judge if it occurs in the region regularly in significant numbers (this should only be the case for species which are extremely difficult to survey). Scientific reserve should also be used where there is a recent record of a species in the biogeographical region but its validity remains unresolved.

This category should not be used:

- for species which were known to occur in a region and for which there were no records of their presence during the current reporting period. These species are to be classified as 'present';
- where the occurrence of a species is unresolved due to the absence of inventories. Such species should be treated as 'present' and the report should reflect the fact that there are no data available.

Reintroduction of species

Reporting on the reintroduction of species follows the same principles as in the published IUCN 2013 guidance where reintroduction is defined as 'the intentional movement and release of an organism inside its indigenous range from which it has disappeared' (IUCN 2013).

Box 2: Reintroduction of species

The definition of reintroduction in the IUCN guidelines 2013 is 'the intentional movement and release of an organism inside its indigenous range from which it has disappeared'. In that context, the aim of reintroduction is to 're-establish a viable population of the focal species within its indigenous range'.

1.1.2 Marine species

This chapter provides complementary information to the Guidelines on ‘Explanatory notes in support to the Reporting Format’.

Marine regions

The map of biogeographical regions was prepared from terrestrial data and is therefore not appropriate for reporting on non-coastal marine habitat types and species.

For marine species countries should report conservation status using the following marine regions:

- Marine Arctic
- Marine Atlantic;
- Marine Baltic;
- Marine Black Sea;
- Marine Caspian
- Marine Mediterranean;
- Marine Macaronesian

Species to be reported in marine regions

Marine species (Table 4) should only be reported under Resolution No. 6 (1998) for the appropriate marine region(s) even though some of them also occur, at times, on land. For example, the species *Halichoerus grypus* (grey seal) should only be reported for marine regions, even though it occurs on beaches and rocks. The assessment should also take into account the use of the areas within the ‘terrestrial’ biogeographical region. For example, an assessment of *Halichoerus grypus* will include the beaches, rocks, etc. as well as the seal’s use of marine habitats.

Table 4: Marine species to be reported under marine regions

Mammals
All species of *Phocidae* except *Phoca hispida saimensis* (Boreal)
All species of *Cetacea*
Reptiles
All species of *Cheloniidae* and *Dermochelyidae*
Molluscs
Gibbula nivosa
Patella ferruginea

Species to be reported in terrestrial biogeographical regions

Species which are predominately terrestrial but which can occur in the sea, such as *Lutra lutra* (otter) should only be reported under the appropriate terrestrial biogeographical region.

Anadromous fish and lampreys and fish forming separate sea-spawning populations

Most of the fish and lampreys listed in the Resolution No. 6 (1998) occurring in the sea are anadromous (or have anadromous populations), i.e. they migrate between rivers (where they spawn) and the sea. See the list below[2]:

Acipenser nudiventris

Acipenser naccarii

Acipenser sturio

Alosa spp.

Lampetra fluviatilis

Petromyzon marinus

Coregonus oxyrhynchus

Bearing in mind the lack of knowledge about the marine stages of the life cycle of most anadromous fish and lampreys and the fact that the same populations occur in marine areas and rivers (so the status in the adjacent biogeographical and marine region is closely linked), the status of anadromous fish and lampreys should only be assessed in terrestrial biogeographical regions. Information on 'habitat quality and availability' and 'pressures and threats' specific to the marine environment should be included in the terrestrial report.

The only exception to these rules is *Acipenser sturio*, for which countries have to provide separate reports for the marine and terrestrial regions. The only extant spawning population of *Acipenser sturio* occurs in the Garonne in France (Gesner et al., 2010-1), although there are some indications of its presence in the river Evros in Greece (Koutrakis et al., 2011). This critically endangered species spends a significant part of its life in marine areas.

1.1.3 Transboundary populations

In some cases, species may have a population which is shared between two or more countries, such as the Tatra chamois (*Rupicapra rupicapra tatrica*) in Poland and Slovakia or the Persian leopard (*Phantera pardus*) in the Caucasus. In such instances, countries are encouraged to undertake a common assessment and to agree on data and assessments, but each Contracting Party reports the results for its territory, i.e. its respective proportion of the regional population and range and corresponding trends (although disintegrating the regional values into countries proportions will probably result in relatively crude estimates, these are important to understand the impact of pressures and conservation measures, which are likely to be different in each country as well as the role of the Emerald Network), information related to habitat for the species, and the Emerald Network, respective pressures and threats and conservation measures. The regional (transboundary) values for range and population size can be provided in field 'Additional information'.

If a joint regional assessment of the conservation status was made, the results of this assessment can be provided instead of the country's level assessment. This should be noted under field 13.2 'Transboundary assessment'. Joint assessments between two or more countries should be done primarily in cases where there is a certain level of cooperation and common understanding of the management needs and approaches for that species (e.g. large carnivore populations). There may also be cases where it is biologically relevant to consider populations in other neighbouring EU countries. This should be clearly described under field 13.2 'Transboundary assessment'.

For some marine species, population estimates have been made by sea area and not by country; for

[2] *Salmo salar,* an anadromous fish, is not listed as it is only protected in freshwaters. Further guidance on anadromous fish does not apply to this species. Unlike other anadromous fish, 'habitat quality and availability' should not consider the quality in marine areas and the listing of marine pressures and threats is not expected

example, the SCANS surveys of small cetaceans in the European Atlantic and North Sea[3]. In such cases, it may be appropriate for all countries involved to produce a regional assessment of status for range and population (but each country should report the respective proportion of the population size and range area, as stated above). In addition, a coordinated assessment of pressures and threats, conservation measures and future prospects, should be undertaken if appropriate. For this type of (optional) assessment it is important that field 13.2 'Transboundary assessment' includes information on how the assessment was carried out.

1.1.4 Sources of information for species assessments

Countries shall undertake surveys and inventories, and these should be the basis of the assessments under Resolution No. 8 (2012). Field 2.3, on Part A of the Resolution No. 8 (2012) reporting format, requires countries to submit information on monitoring schemes.

The EuropaBON[4] project aims to establish a centre to coordinate monitoring activities across Europe. Although still in progress at the time of compiling this manual, information on monitoring schemes for the main species is available for some European countries.

Guidance has been published by the European Commission for large carnivores[5]. Although produced from a management perspective this may be a source of information for this species group (Boitani et al., 2015). For reporting under Resolution No. 8 (2012), in cases of conflicting advice, the guidance given in these guidelines takes priority.

1.1.5 Reporting where distinction between two species is problematic

In general, for cases where distinction between two or more close species is problematic and only field estimates covering both species are available, the country can submit a joint general report (see above point Taxonomical change and names to be used for reporting).

Or two reports with the same values can be provided for both problematic species. This option should preferably be avoided if this will lead to a significant overestimation e.g. population size or range of one or both species. If joint values/assessments are provided, an appropriate explanation (including the species names of species concerned) should be provided in the field 'Additional information for each section where the joint value or assessment is provided. Ideally, this explanation should contain any information that can clarify the relative proportion of e.g. population size between two species. The method used should reflect the fact that actual figures reported are an approximation and should be 'b) based mainly on extrapolation from a limited amount of data' or 'c) based mainly on expert opinion with very limited data' respectively. If none of this is possible the information will be reported as 'unknown'.

1.2 Trends

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

The conservation status assessment stresses the importance of trend information: trends are decisive for the assessment of conservation status since usually only stable or increasing trends can result in an overall Favourable conservation status (FCS) conclusion. Therefore, more attention should be paid to the methodology of monitoring schemes to improve the quality of trend information.

[3] Hammond et al., 2013
[4] https://europabon.org/ , https://monitoring.europabon.org/monitoring/biodiversity_data/list/
[5] http://ec.europa.eu/environment/nature/conservation/species/carnivores/index_en.htm

Trends are an essential part of the assessment of all conservation status parameters except Future prospects. A comparison between the overall population trend in the biogeographical or marine region and trends within Emerald Network sites is essential for assessing the impact of the Emerald Network on conservation status.

Emerald Network (Proposed, Candidate and Adopted sites) coverage for species listed in Resolution No. 6 (1998).

Trends are usually derived from modelling or existing monitoring schemes, which are based on sampling, as complete surveys are exceptional and usually only undertaken for very rare species. Sampling methods should be statistically robust wherever possible. **In the absence of dedicated monitoring schemes, trends are usually a result of expert opinion and in that case should be reported only as directions (increasing/decreasing/stable), without absolute values**. Unknown trends should be reported as ‘unknown’. If the available data are not sufficient to determine trend direction, this can be reported as ‘uncertain’ (lack of a clear signal).

Trend is a (measure of a) directional change of a parameter over time. Trends (especially of population) should ideally be the result of a statistical regression of a time series. Fluctuation (or oscillation) is not a directional change of a parameter, and therefore fluctuation is not a trend. However, fluctuations can occur within a long- term trend and can affect the measurement of short- term trends, because it is difficult to assess whether there is a real trend in the short-term, or whether there is simply a fluctuation or population cycling effect.

Fluctuation is an intrinsic character of all natural systems and can be observed for all directions of the trend (increasing, decreasing, and stable). However, it is only detectable in regularly surveyed populations. Fluctuations are only likely to be detected when the parameter is measured several times within a given timeframe. Ideally, they will be based on more frequent sampling. In reality, this is unlikely to happen in short timeframes (such as 12-year intervals), and setting short- term trends in a long- term context will help to identify where fluctuations are occurring.

Fluctuations in Range or area of Habitat for the species are rarely detectable over a 12- year period and any fluctuation of these values is mostly long term. In summary: Range and Habitat for the species are unlikely to fluctuate in a 12-year period. However, measurement of these parameters can be inexact and longer- term information may be required to detect any real changes, given the range of data availability, sample sizes and possible survey methods.

The criteria used to decide whether a trend should be categorised as ‘stable’, ‘increasing’, or ‘decreasing’ varies depending on the type of trend information available.

If trend data are robust and they allow statistically significant modelling, but the trend (magnitude) is very small (i.e. the confidence limits do not overlap zero and are narrow enough to allow for a high degree of confidence), even small trends should be reported as directional trends (‘decreasing’ or ‘increasing’). If the conservation status assessment deviates from the matrix rules (the status cannot be favourable if the trend is decreasing) due to negligible trend magnitude this should be explained in the field ‘13.1 Justification of % thresholds for trends’ under ‘Complementary information’.

On the other hand, if the data quality is not good enough and it is not possible to model a statistically significant directional trend (confidence limits do overlap zero), the trend should be considered as stable. Any further details can be provided in the corresponding field ‘Additional information’.

Short- and long-term trends

The reporting under Resolution No. 8 (2012) considers a period of six years, but estimates of trend are more likely to be statistically robust over longer time periods. It is therefore recommended to estimate short-term trends over two reporting cycles, i.e. 12 years (or a period as close to this as possible), as this should give a more reliable and comparable estimate of the trend; see Table 5). Long-term trends, which are likely to be more statistically robust, can also be reported (in a series of optional fields). The recommended period for assessing longer-term trends is four reporting cycles (24 years). This definition of a long-term period used for reporting of the long-term trends should not be confused with the legal requirement of a ‘long-term’ maintenance of a habitat.

The short-term trend information should be used in the evaluation matrix to undertake the conservation status assessment. In particular, the short-term trend magnitude is important for distinguishing the conservation status categories for unfavourable i.e. U1 unfavourable-inadequate and U2 unfavourable-bad. For the range and population parameters a loss of >1% per year trend magnitude (over the short-term trend period) signifies an unfavourable-bad conservation status.

Table 5: Period for assessing trends

Trend	Period to assess trend
Short-term	Two reporting cycles (12 years; or a period as close as possible)
Long-term	Four reporting cycles (24 years; or a period as close as possible)

The trend magnitude reported should be the change over the relevant period (e.g. 12 years for short-term trend). Where magnitude is derived from data covering a different time interval, estimate the change for the reporting period by simple proportion. For example, a change of 150 km^2 over 15 years would be equivalent to 10 km^2 per year or 120 km^2 over the 12-year interval for short-term trend magnitude. If the change appeared at a specific time (for example, as a result of a catastrophe), a precise time period or year should be reported, and an explanation should be provided in ‘Additional information’ field.

1.3 Favourable reference values

This chapter provides complementary information to the Guidelines on ‘Explanatory notes in support to the Reporting Format’.

What are favourable reference values?

The concept of favourable reference values (FRVs) is derived from the definition of Favourable conservation status that relates to the ‘long-term distribution and abundance’ of the populations of species, and for habitats to the ‘long-term natural distribution, structure and functions as well as the long-term survival of its typical species’ in their natural range. This requires that the species is maintaining itself on a long-term basis as a viable component of its natural habitats. Similarly, for habitats, it is required that the specific structure and functions necessary for its long-term maintenance exist and will continue to exist and that its typical species are in favourable status, i.e. are maintaining themselves on a long-term basis. If Contracting Parties do not maintain or restore such a situation, the objective of the Convention is not met.

Favourable reference values – ‘range’ for species and habitats, ‘population’ for species, and ‘area’ for habitats – are critical in the evaluation of conservation status. The evaluation matrices (Parts C and E of the reporting format) require countries to identify favourable reference values for range (FRR) and area (FRA) for habitats and for range (FRR) and population (FRP) for the species. The conservation status assessment then looks at the difference between current values and reference values. Basically, the range, area, and population must be sufficiently large in relation to favourable reference values (as defined in the evaluation matrix) to conclude, alongside other criteria (e.g. trends), whether the parameter is ‘favourable’ or ‘unfavourable’.

The concept of favourable reference values describes the favourable reference range, population and habitat area as follows:

Range within which all significant ecological variations of the habitat/species are included for a given biogeographical region and which is sufficiently large to allow the long-term survival of the habitat/species; favourable reference value must be at least the range (in size and configuration) when the Resolution No. 8 (2012) came into force; if the range was insufficient to support a favourable status the reference for favourable range should take account of that and should be larger (in such a case information on historic distribution may be found useful when defining the favourable reference range); 'best expert judgement' may be used to define it in absence of other data.

Population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species; favourable reference value must be at least the size of the population when the Resolution No. 8 (2012) came into force; information on historic distribution/population may be found useful when defining the favourable reference population; 'best expert judgement' may be used to define it in absence of other data.

Total surface area of habitat 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; favourable reference value must be at least the surface area when the Resolution No. 8 (2012) came into force; information on historic distribution may be found *useful when defining the favourable reference area; 'best expert judgement' may be used to define it in absence of other data.*

Setting the favourable reference values (FRVs) for species

Overview of general principles for setting reference value

Before setting the favourable reference values, it is advisable to collect all the relevant information about the species in order to understand their ecological and historical context. Therefore, ideally, data and information on the following factors should, when available, be gathered and used for estimating FRVs for species:

- current situation and assessment of deficiencies, i.e. any pressures/problems;
- trends (short-term, long-term, historical, i.e. well before the Bern Convention came into force);
- natural ecological and geographical variation (including genetic variation, inter- and intra-species interactions, variation in conditions in which species occur);
- ecological potential (potential extent of range, taking into account physical and ecological conditions);
- natural range, historical distribution and abundances and causes of change, including trends;
- connectivity and fragmentation;
- requirements for populations to accommodate natural fluctuations, allow a healthy population structure, and ensure long-term genetic viability;
- migration routes, dispersal pathways, gene flow, population structure (e.g. continuous, patchy, metapopulation).

The following general principles should be taken into account in the process of setting FRVs:

- FRVs should be set on the basis of ecological and biological considerations;
- FRVs should be set using the best available knowledge and scientific expertise;
- FRVs should be set taking into account the precautionary principle and include a safety margin for uncertainty;

  FRVs should not, in principle, be lower than the values when the Resolution No. 8 (2012) came into force, as most species have been listed in the Resolution No. 6 (1998) because of their unfavourable status; the distribution (range) and size (population) at the date of entry into force of the Convention does not necessarily equal the FRVs;
- FRV for population is always bigger than the minimum viable population (MVP) for demographic and genetic viability;
- FRVs are not necessarily equal to ‘national targets’: ‘Establishing favourable reference values must be distinguished from establishing concrete targets: setting targets would mean the translation of such reference values into operational, practical and feasible short-, mid- and long-term targets/milestones. This obviously would not only involve technical questions but be related to resources and other factors’ (European Commission, 2004[6]);
- FRVs do not automatically correspond to a given ‘historical maximum’, or a specific historical date; historical information (e.g. a past stable situation before changes occurred due to reversible pressures) should, however, inform judgements on FRVs;
- FRVs do not automatically correspond to the ‘potential value’ (carrying capacity) which,

[6] Assessment, monitoring and reporting of conservation status – preparing the 2001–2007 report under Article 17 of the Habitats Directive (DocHab-04-03/03 ver.3). DG Environment, 2004

however, should be used to understand restoration possibilities and constraints.

Although FRVs must be set separately for range and population size, **there is a clear relationship** between range and population size of a species because within the natural range all significant ecological variations must be considered. This calls for an iterative process in setting the FRVs to ensure that one value takes the other one into account, e.g. population large enough with an appropriate range to include and maintain the evolutionary potential of a species or a range sufficiently large enabling a species population to carry out all stages of its life cycle.

FRVs must be reported at the level of the country biogeographical/marine region. However, these geographical units may not be appropriate for developing a rationale for FRVs based on biology and ecology of species. Therefore, it is advisable to set FRVs at the most suitable scale (often national, sometimes supranational) and to derive the national biogeographical numbers from this value, e.g. using a proportion based on distribution and/or size/area.

The term 'current value' will be used often in these guidelines. It should be interpreted as being the value reported by the country for the present reporting period, which is to be compared to the favourable reference value.

Model-based and reference-based approach

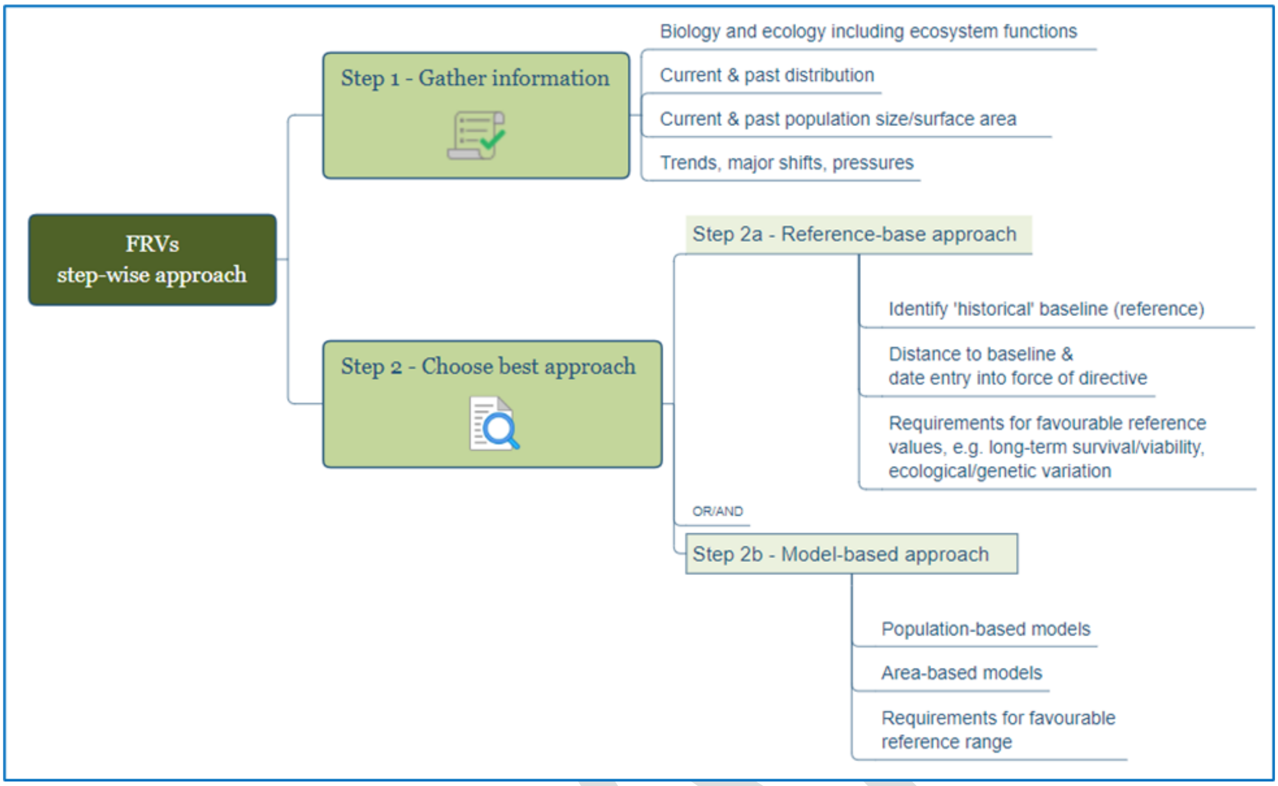
There are basically two approaches to setting FRVs: model-based and reference-based. Model-based methods are built on biological considerations, such as those used in Population Viability Analysis (PVA) or on other estimates of Minimum Viable Population (MVP) size. This approach requires good knowledge about species ecology and biology, and a spreading of viable populations across the species' natural range. Reference-based approaches are founded on an indicative historical baseline corresponding to a documented (or perceived by conservation scientists) good condition of a particular species or restoring a proportion of estimated historical losses. Both approaches take into account information about distribution, trends, known pressures and declines (or expansions). These approaches are not mutually exclusive and will be further explained in the sections below with practical instructions and examples.

With the objective of developing practical and pragmatic guidance promoting harmonisation between countries, while allowing for the needed flexibility (e.g. the best method to be used depends on the data available), a stepwise approach, as summarised in Figure 1 below, is recommended.

The stepwise approach and the specific methods for setting the FRVs are largely dependent on the available data and knowledge for each species. Three generic levels of data availability and knowledge are suggested:

- High: good data on actual distribution and ecological requirements/features; good historical data and trend information;
- Moderate: good data on actual distribution and ecological requirements/features; limited historical distribution data (only trend data available);
- Low: data on actual distribution and ecological requirements/features are sparse and/or unreliable; hardly any historical data available and no trend information.

Figure 1: Illustration of the stepwise approach to set FRVs



The recommended approach involves a certain number of steps that will be further detailed below[7]. In summary, and without detailing all conditions, they are:

- **Step 1: Gather information**

Collect all relevant information about a species necessary to understand their ecological and historical context: biology and ecology; natural range, current and past distribution (including before the Resolution No. 8 (2012) came into force) and population size/surface area; trends, their causes and when major changes occurred, pressures.

- **Step 2: Choose best approach**

Depending on the availability and quality of the data and information gathered, choose the best way of setting the FRVs.

- **Step 2a: Use reference-based approach**

Compare the current distribution and population size or surface area with those of a past favourable period and at the date of entry into force of Resolution No. 8 (2012), i.e. 2012.

Check if the values above are sufficient to ensure long-term survival and viability, as well as coverage of ecological variations.

Set values or use percentage classes to qualify how far the current value is from the favourable situation.

[7] In order to better understand the practical development of the approaches above (and the steps that will be further detailed), several examples will be available on the Reporting Reference Portal. Additionally, elaborated methods and other examples are available from Bijlsma et al., 2019.

- **Step 2b: Use model-based approach**

  Develop population-based models or use available estimates derived from such models to assess the favourable reference population, taking into account the requirements for a favourable reference range.

The favourable reference values for species – FR range and FR population – need to capture the ecological/genetic diversity and the long-term survival of the species.

Firstly, the natural range of the species in the Contracting Party is not to be reduced. The ecological/genetic diversity is often associated with geographical (north–south/east–west) and environmental gradients (e.g. altitudinal, geological, climatic).

The next section elaborates in more detail the issues about long-term viability and survival of the population or populations of a species in its natural range.

Understanding long-term viability/survival

The interpretation of a species being, or maintaining itself, 'viable' in the long term is discussed in many publications on conservation biology or in a broader context of conservation planning and management. For some species, 'action plans' have been prepared, either at local, regional, national or European scale, and although these plans do not use the term 'favourable reference value', they do sometimes consider related concepts and may be a source of ideas and information. For example, in the EU, the European Commission supports the development of EU action plans for selected species[8] and the Bern Convention has published European action plans for large carnivores[9].

In ecological studies (e.g. Beissinger & McCullogh, 2002), 'viability' of a population is approached via population viability analysis (PVA) and the associated concept of minimum viable population (MVP). MVP size refers to the number of individuals required for a sufficiently high probability of population persistence or for sufficient retention of genetic variation for maintaining evolutionary potential.

However, the most recent publications on this topic emphasise that the viability of a species should not be understood merely as an avoidance of extinction risk, focusing on the demographic viability of populations (often represented as an MVP). For example, the 'role the species plays in the ecosystem (Epstein et al., 2015), ecological functionality allowing a species to respond to changes in a species' communities and resilience achievable through large dynamic metapopulations' (Redford et al., 2011) are equally important. Caughley (1994) distinguished between 'small population' and 'declining populations' paradigms in conservation biology. Whereas Matthews (2016) warns that a narrow focus on population viability can result in a tendency towards 'ecology of the minimal'.

The concept of a viable (meta)population[10] can usefully inform the FRP, but is distinct from the concept of favourable population and needs upscaling: a (meta)population may be viable at a very local scale (e.g. for largely sedentary species) to international scale (e.g. for migratory species), whereas 'favourable population' considers the conservation status of populations across the natural range of the species, which, for the purpose of assessment and reporting, can be divided into references at, for

[8] http://ec.europa.eu/environment/nature/conservation/species/action_plans/

[9] http://www.coe.int/en/web/bern-convention/on-large-carnivores

[10] A metapopulation consists of a group of spatially separated subpopulations of the same species which interact at some level through immigration or exchange of individuals between the distinct subpopulations. While a single subpopulation may not be sufficient to guarantee the long-term viability of a species in a given area, the combined effect of several connected subpopulations may be able to do this.

example, country level and at biogeographical level. The favourable reference value will generally cover many discrete (meta)populations within a country, or a country may just cover a part of a larger, international (meta)population, in which case a reference value at biogeographical level may be appropriate (see Table 6 below).

The distinction between a minimum viable (meta)population and the concept of Favourable conservation status can be understood as follows: conservation status relates to the 'long-term distribution and abundance of the populations*'* of species, aiming for the populations to be maintained or restored at Favourable conservation status in their natural range, so that the species remains a viable component of its natural habitats. It is therefore important for favourable reference populations to reflect the 'long-term viable component of the natural habitat' at the level of the species across its natural range and distribution, rather than solely a minimum viable population.

Stepwise process for setting the favourable reference values for species

Step 1: Gather information about the species

The list below includes examples of data and information about the species biology and ecology that may be relevant:

- life history strategies and dispersal capacity;
- spatial and genetic structure of the population: subpopulations, metapopulations;
- habitat requirements for each stage of the life cycle: reproduction, foraging, resting, migration, pollination;
- geographical variation (differentiation) in habitat requirements, migration routes;
- potential range.

Knowledge about the structure of the species' populations is useful to understand the spatial scale at which they function and choose the approach for setting the FRVs (Table 6).

Table 6: Categories of populations in terms of structure and migratory character and indicative level for setting the FRVs

Category of population	Comments and examples
Populations of sedentary (non-migratory) animals, more or less mobile	Large or small sedentary species with more or less exchange at or below country level; FRVs to be normally set at the country level (or at the country biogeographical level) or in cooperation with neighbouring countries, depending on the species distribution and if their populations are transboundary or not. For instance: • *Barbastella barbastellus* • *Austropotamobius pallipes* • *Osmoderma eremita.* Large, more or less mobile sedentary species with only one or a few clearly isolated populations; FRVs to be normally set at the country biogeographical level or at the country level if population(s) is distributed in more than one region. • *Ursus arctus* • *Monachus monachus* • several *Coleoptera* and *Odonata* • *Margaritifera margaritifera, Unio crassus.* Sedentary, small and mobile animal species; FRVs to be normally set at the country biogeographical level. • many butterflies. Individuals with inherently large home ranges (> 100 km^2 up to > 1 000 km^2); FRVs to be normally set for the whole population (or meta-population) or populations, which may imply cooperation between country sharing the same population (meta-population). • *Canis lupus* • several whales and most dolphins.
Populations of sedentary (non-migratory) animal species with low mobility and of plant species	Often with diffuse, scattered distribution or isolated/single distribution; FRVs to be normally set at the country biogeographical level. • terrestrial mammals: *Microtus cabrerae* • amphibians/reptiles: most species • many insect species • molluscs: all *Gastropoda* • vascular plants, bryophytes, lichens.

Category of population	Comments and examples
Populations of migratory animals	With individuals showing large cyclic, directed movements; FRVs to be normally set through cooperation between countries where the species normally occurs at given periods of the year. • several whales • *Caretta caretta* • *Salmo salar*, *Petromyzon marinus.* Partially migratory; FRVs to be normally set at the country or country-biogeographical level taking into account possible occurrences in neighbouring countries. • *Miniopterus schreibersii* • *Phoca hispida botnica (Pusa hispida botnica)*, several whales and dolphins • freshwater fish and lampreys: most species.

Another set of information to be collected includes data and information on distribution (and therefore range) and population sizes in the historical (far and recent) past, when Resolution No. 8 (2012) came into force, and currently (i.e. when the assessment is being done). The far historical past would cover the last two or three centuries (where applicable), and the recent historical past up to about 50 years before Resolution No. 8 (2012) came into force.

This information is crucial to understand what has been happening to the species and to support the setting of FRVs in the following steps. Where available this evidence should be complemented with information on trends and pressures, to understand which events caused major changes/shifts in the status and trends of species distribution and population size, and when. For example, whales were first hunted intensively from the 1850s onwards, with the most intense period (in the eastern North Atlantic) being between 1900 and the 1960s; protection became widespread in the mid-1980s. The Bottlenose dolphin appears to have been more widespread before 1900 and may also have experienced declines between the 1960s and 1980s; Harbour porpoise also appear to have experienced declines during the twentieth century, particularly the latter half. In both cases, increased pollution may have played a role; in the latter case, additionally, by-catch has almost certainly played a role, whilst prey depletion from overexploitation of fish stocks may well have a role as well.

Step 2a: Use reference-based approach to set FRVs

The availability and quality of the data and information gathered in Step 1 will be very different from species to species, but also for distribution (range) and for population size.

However, it should be possible to use that information in a pragmatic way to have a rough estimation of how far from favourable reference values the current values on range (based on distribution) and population size are (using the 'approximately equal to the FRV' and the pre-defined ranges given in the reporting format). This information can be useful when estimating, for example restoration needs.

The 'decision key' below should be used in general, noting that for several species (e.g. several large carnivores) Step 2b, using the population-based approach, could be more appropriate. In addition, elements from Step 2b may also be used to help estimate the FRP below. Consider the above sections 'General principles for setting favourable reference values (FRVs)' and 'Understanding long- term viability/survival'.

Point 1

If both distribution and population size have not undergone visible shifts or reductions (trends have been relatively stable) in the past, including in the recent past, AND current population size is large enough to ensure the long-term viability of the species, then the:

- favourable reference range (FRR) should be equal or approximately equal to the current range;
- favourable reference population (FRP) should be equal or approximately equal to the current population size[11].

If the current range is smaller than the past range, ⇨ go to point 2.

If the current population size is smaller than the past population, ⇨ go to point 3.

Point 2 – the current range is smaller than the past range

Identify which additional areas should be covered by the species in the future in order to re-establish a (past) range that is large enough and well distributed to accommodate a population or populations that are viable in the long term; this should take into account whether the restoration of the range is technically and ecologically feasible. The availability and quality of the data used to make such an identification and estimation could lead to different ways of expressing the FRR:

- a **value** equal to 'current range value' plus 'additional range area to be restored';
- a **pre-defined range** indicating more than the current species range; e.g. species range is 2–10% smaller than the FRR, 11 – 50% smaller than the FRR, 51 – 100% smaller than the FRR;
- in any case, the estimated FRR should not be smaller than the range at the date of entry into force of Resolution No. 8 (2012).

[11] Or in exceptional cases (for example of species with overpopulations as result of non-conservation artificially feeding or of species which population is increasing since Resolution No. 8 (2012) came into force and which are harmful to other protected species) the favourable reference population (FRP) should be lower than the current population.

Point 3 – the current population size is smaller than the past population
Identify how population size can be restored to a (past) favourable level: increase the size of an existing population (or populations) and/or reintroduce a population (or populations) within its natural range. If the current population(s) is viable in the long term, but information on past distribution indicates that one or several populations are locally extinct, the favourable reference population must take this fact into consideration. However, this should consider if the reintroduction is technically and ecologically feasible[12]. Information about past trends, if available, should inform the setting of the FRP. The availability and quality of the data used to make such an identification and estimation could lead to different ways of expressing the FRP: • a **value** equal to 'current population size' plus 'additional individuals to be restored' (restoration can be through restocking/reintroduction, and/or through natural increase as a result of e.g. removing pressures); • a **pre-defined range** indicating 'more than current population size' e.g. population size 5 – 25% smaller than the FRP, 26 – 50% smaller than the FRP, 51 – 100% smaller than the FRP; • in any case, the estimated FRP should not be smaller than the population size at the date of entry into force of Resolution No. 8 (2012), except in cases where that population size was due to non- natural conditions, or the species naturally exhibits wide fluctuations in population size and happened to be at a 'population high' (not biologically sustainable).
Point 4 – unknown FRR or FRP
A conclusion of FRR or FRP 'unknown' should only be used in the cases where there is hardly any data about species' current range and population size and no information about its historical context.

Step 2b: Use population-based approach to set FRVs

There are several species for which a reference-based approach is not possible or appropriate to set the FRVs:

- species for which there is not sufficient historical information about distribution, population size, trends, pressures;
- species for which restoration of range and/or population to some historical levels would not be feasible at all;
- species for which the restoration efforts would not be proportional and reasonable in terms of the conservation objectives of the Convention (e.g. implying large-scale recreation of habitats for the species in currently urbanised areas).

[12] The IUCN *Guidelines for Reintroductions and Other Conservation Translocations* provides useful information to decide about and plan a reintroduction. https://portals.iucn.org/library/efiles/documents/2013-009.pdf

Box 3: Considerations about population viability analysis (PVA), minimum viable population (MVP) and generalised genetic rules

Population viability analysis (PVA) and the concept of minimum viable population (MVP) can be useful tools to inform favourable reference values. However, FRP is always bigger than the minimum viable population (MVP) for demographic and genetic viability (see also above 'General principles for setting favourable reference values (FRVs)').

PVA is a quantitative modelling method that uses demographic and abundance data of species and incorporates identifiable threats to population survival to estimate the probability of extinction or loss of genetic variation (Beissinger & McCullough, 2002). PVA uses models of population dynamics which incorporate causes of fluctuations in population size in order to predict probabilities of extinction, and to help identify the processes which contribute to a population's vulnerability. PVA requires a lot of biological data. Some recent examples of applied PVA are available for Scandinavian wolf, bear, lynx, wolverine (Nilsson, 2013; Bruford, 2015), Woodland brown butterfly (Bergman & Kindvall, 2004), pool frog and Glanville fritillary (Sjögren-Gulve & Hanski, 2000). Brambilla et al. (2011) provided favourable reference population figures based on PVA for populations of Italian breeding birds of fewer than 2,500 pairs. The use of PVA in plant conservation is reviewed by Brigham & Schwarz (2003) and Zeigler (2013). However, PVA analyses have not been done for most of the species listed in Resolution No. 6 (1998) of the Bern Convention.

In PVA, metapopulation viability can be assessed and modelled either through demographic and/or genetic models or by the structurally simpler occupancy models. The occupancy models project the patterns of local extinction and (re)colonisation, respectively, of local populations into the future. Very simple models may build on quite unrealistic assumptions, but the more sophisticated spatially explicit patch occupancy models (SPOMs), which allow for multiple environmental and spatial factors to influence the metapopulation dynamics, can make projections, given plausible environmental scenarios, so that risks and long-term trends can be assessed and evaluated.

Generalised genetic rules, derived from population genetic analyses and PVA, recommend general thresholds for viable population sizes ('genetic viability'). A much used and debated generalisation is the '50/500 rule', which states that an effective population size $N_e = 50$ is sufficient to prevent inbreeding depression in naturally outbreeding species in the short term, and $N_e \geq 500$ to retain evolutionary potential (Franklin, 1980; Jamieson & Allendorf, 2012). Frankham et al. (2014) proposed revised recommendations including a '100/1000 rule' instead, but also more recent papers still use the '50/500 rule' (e.g. Laikre et al., 2016). Species which have very large fluctuations in population size and a high reproduction rate generally require an effective population size much higher than 500. Based on the meta-analysis by Traill et al. (2007), the MVP for 99 % persistence for 40 generations for a typical outbreeding species may be in the order of several thousands (N) (Frankham et al., 2014: 6.3).

Generalised genetic rules have been used in the last reporting round in setting FRPs, e.g. by Belgium (Flanders) and the Netherlands.

As the name indicates, this approach is to be used to set the FRP. However, the FRR can be derived from the FRP requirements if it cannot be derived from the reference-based approach: FRR should have sufficient connectivity and be large enough to accommodate the FRP, covering possible ecological variations, etc.

Consider using population viability analysis (PVA), available estimates of minimum viable population (MVP) size from literature, or generalised genetic rules (see Box 3).

The population-based approach described below was adapted from Bijlsma et al. (2019).

Point 1

Determine or infer the minimum viable population size (MVP) considering evolutionary potential ('genetic MVP') and the population's genetic connectivity with other relevant conspecific populations.

- If high data quality: perform a Population Viability Analysis (PVA).
- If moderate/low data quality: use MVP estimates from a) species-specific literature, b) generalised genetic rules corresponding to an effective population size Ne ≥ 500 (long-term 'genetic MVP') or other effective population size adequate for the species reproduction rate and population dynamics or c) population-based proxies for MVPs.

Point 2

Determine a factor to scale MVP size up to FRP level.

Given an MVP estimate, the required favourable population size or the number of required more or less isolated (favourable) populations will at least depend on ecological and genetic variations within the natural range of the species and often on known trends as well. Several (not always independent) approaches are available for upscaling an MVP estimate to FRP level.

For all approaches: take into account: 1) ecological/genetic variations within the (historical) natural range, i.e. geographical, climatological, geological and altitudinal gradients as well as significant differences in historical land use, and 2) technical/ecological feasibility.

Possible approaches:

- If high data quality: use models for potential range and habitat suitability or available estimates of population density, amount of suitable area and maximum dispersal distance to constrain the number of required populations or the spatial extent of one mixing population.
- If high data quality: use population trends to determine an MVP multiplier.
- If low data quality: consider ecological/genetic variations within the historical range and find the minimum number of populations (connected or isolated) needed to cover this variation.
- For migratory species and species with large home ranges: consider structured populations according to management units (e.g. marine mammals and turtles).

Point 3

Determine FRP.
 	
- If the scaling factor can be estimated with sufficient confidence:
- FRP equal to MVP multiplied by scaling factor (number of required populations or multiplier); in any case, the calculated FRP cannot be lower than the population size at the date of entry into force of Resolution No. 8 (2012).
- If the scaling factor can only be estimated qualitatively, use the following principles:
    o if MVP is much smaller than the size of the population at the date of entry into force of Resolution No. 8 (2012), then the FRP should be at least equal to the latter value;
    o if MVP is approximately equal to or bigger than the size of the population at the date of entry into force of Resolution No. 8 (2012), and scaling factor is relatively low, then FRP should be bigger than the latter value;
    o if MVP is approximately equal to or bigger than the size of the population at the date of entry into force of Resolution No. 8 (2012), and scaling factor is relatively high, then FRP should be bigger than the latter value.
- If a precise favourable reference population could not be given, use the pre-defined ranges increments mentioned above and in the Guidelines on ‘Explanatory notes in support to the Reporting Format’, part B 6.18 (b).

Point 4
Consider consequences for setting the FRR. If FRP is bigger than the size of the population at the date of entry into force of Resolution No. 8 (2012), determine how much additional range is necessary (or not) to include the FRP.

1.4 Maps

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Distribution maps

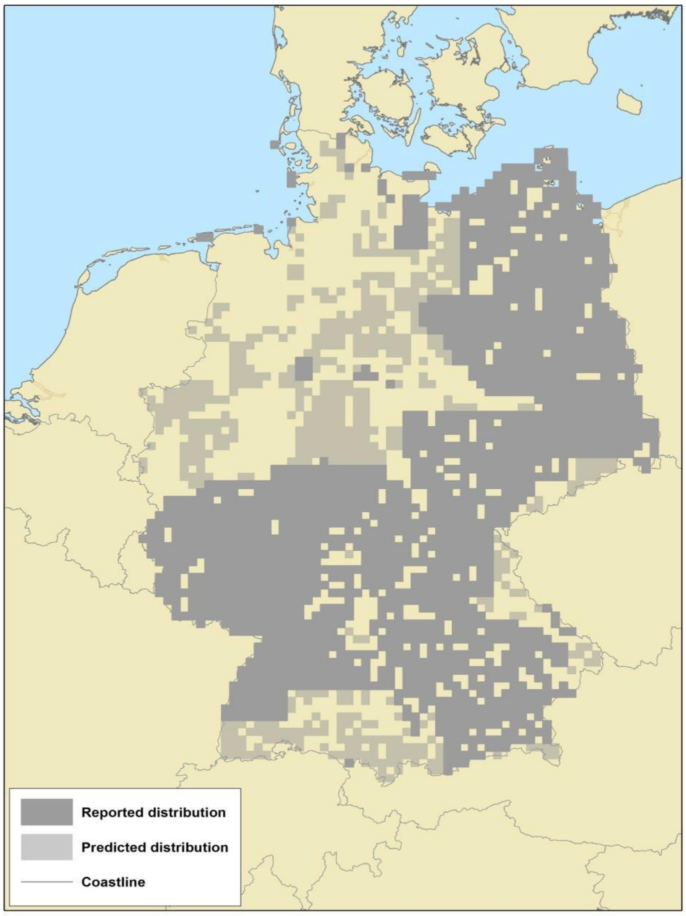
Submission of maps of the distribution of species present in a country is a basic requirement of the reporting under Resolution No. 8 (2012). Principal requirements for distribution maps are described in the Guidelines on 'Explanatory notes in support to the Reporting Format' and further technical specifications will be provided on the Reporting Reference Portal.

Ideally the distribution map should provide complete and up-to-date information about the actual occurrence of the species based on the results of a comprehensive mapping programme/initiative/project/inventory or a statistically robust model.

In many cases, field data will only cover part of a species' actual distribution or only relatively old data will be available. In this situation, the reporting format foresees that the distribution map is derived from a model or extrapolation. Countries are encouraged to report a more up-to-date or complete distribution by remapping the available distribution using other data, such as the results of a monitoring programme or data on a suitable habitat.

In some cases, even with the use of extrapolation, the resulting distribution map will be highly incomplete when compared with presumed species distribution (see Figure 2). In this case, countries are encouraged to provide even the incomplete distribution map, but if the reported distribution map obtained as a result of comprehensive mapping, modelling or extrapolation or expert interpretation covers less than 75 % of the presumed actual species distribution (the resulting map is incomplete in relation to the presumed species distribution), the 'Method used' should be reported as '(d) Insufficient or no data available'.

Figure 2: Hypothetical distribution map of a species in Germany with predicted (presumed) and reported distribution. Reported distribution represents less than 75 % of a presumed distribution, so the 'Method used' should be evaluated as '(d) Insufficient or no data available'.


Reported distribution
Predicted distribution
Coastline

Some issues related to distribution maps (in relation to range calculation)

Occasional occurrences, outlying occurrences

The range for the reporting under Resolution No. 8 (2012) reporting is shown as an external envelope around the species distribution. The size and shape of the range is therefore to a large extent determined by the occurrences of the species on the outer limits of the distribution. The area of distribution is used as a weighting parameter in the Pan-European biogeographical assessment when information on population is not available.

Species are occasionally recorded beyond their usual area of distribution, but these occasional records should not influence the shape and size of the range, nor should they be counted when weighting by the species distribution during the Pan-European biogeographical assessment. Therefore, the distribution map is based only on regular occurrences of the species (except for maps of 'occasional' or 'newly arriving' species. For the species for which a joint report is expected, a joint global distribution is expected. The species to be reported are included in the checklist of the reporting under Resolution No. 8 (2012) available on the Reporting Reference Portal, where species occurrence is also included.

On the other hand, particularly on the boundaries of the natural geographical range, species may occur in limited numbers in atypical conditions. These outliers should be included in the distribution of the species if they represent regular and/or stable occurrences, as they are important for calculating the range.

Metapopulations

Many species have a metapopulation structure, which is characterised by local extinctions and (re) colonisations (e.g. Warren 1994). Although the distribution map should provide information on the actual species distribution, the localities with repeatedly recorded absence of the species (if known) but where suitable habitat is still present and recolonisation is expected should be included in the distribution map, if they form part of the area used by the metapopulation.

Highly mobile or migratory species

Some highly mobile or migratory species can occupy large territories during their life cycle. For example, the home range of the Eurasian lynx or wolf can exceed 100 km^2 under some conditions (in northern Europe the wolf territories are around 800–1 000 km^2, territories of lynx females are around 400 km^2 and of males over 1 000 km^2) or the home ranges of harbour porpoise can vary from 7 700 to 70 000 km^2. For these species, distribution is mostly mapped on their home-range basis or as a territory used by a population. In these situations, the distribution map represents a space that is used regularly by the population(s) of species.

For anadromous fish and lampreys often recorded only in a few localities in the river systems, e.g. the spawning grounds or at fish passes, the complete migration route in the rivers from the mouths in the sea to the highest know stretches should be included in the distribution.

Occasional and newly arriving species and species extinct prior to entry into force of the Resolution No. 8 (2012)

Unlike the distribution of regularly occurring species, the distribution of occasional and newly arriving species will consist of all grids where the occurrence of a species was recorded (including occasional occurrences). A map of species extinct prior to the entry into force of Resolution No. 8 (2012) should contain grids with the reintroduction location(s) (if there is a reintroduction project) and/or known occurrences (for species with signs of recolonisation).

1.5 Range

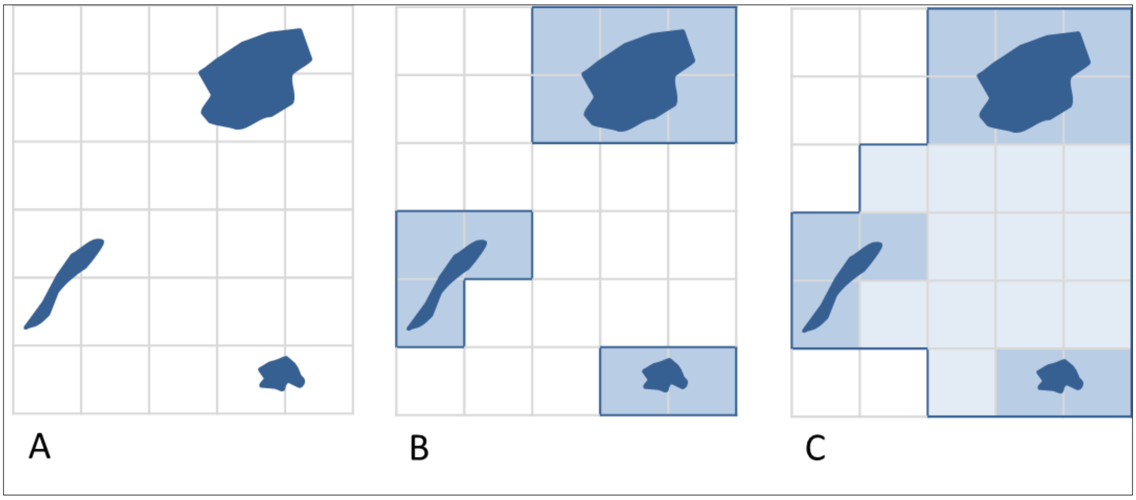
This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Concept of range

Range is defined as 'the outer limits of the overall area in which a species is found at present and it can be considered as an envelope within which areas actually occupied occur'. It is a dynamic parameter allowing the assessment of the extent of and the changes in the species' distribution.

Range is a spatial generalisation of distribution, which is a representation of the species occurrences in the 10 × 10 km grid. The relationship between species occurrence, distribution and range is illustrated in Figure 3.

Figure 3: Relationship between occurrence of species, distribution and range. 'A' occurrence of species, usually a polygon, point or a linear feature; 'B' distribution – occurrence in 10 x 10 km grids; 'C 'range – spatial generalisation of the distribution



The range concept describes range as follows:

> *The natural range describes roughly the spatial limits within which the habitat or species occurs. It is not identical to the precise localities or territory where a habitat, species or subspecies permanently occurs. Such actual localities or territories might for many habitats and species be patchy or disjointed (i.e. habitats and species might not occur evenly spread) within their natural range. If the reason for disjunction proves to be natural i.e. caused by ecological factors, the isolated localities should not be interpreted as continuous natural range, for example for an alpine species the range may be the Alps and the Pyrenees, but not the lower area between. The natural range includes however areas that are not permanently used: for example, for migratory species 'range' means all the areas of land or water that a migratory species inhabits, stays in temporarily, crosses or overflies at any time on its normal migration*[13]*. Vagrant or occasional occurrences (in the meaning of accidental, erratic, unpredictable) would not be part of the natural range.*

> *Natural range as defined here is not static but dynamic: it can decrease and expand. Natural range can also be in an unfavourable condition for a habitat or a species i.e. it might be insufficient to*

[13] See also Article 1 of the Bonn Convention.

allow for the long-term existence of that habitat or species.

When a species or habitat spreads naturally (on its own) to a new area/territory or when a re-introduction of a species into its natural range has taken place of a species into its former natural range, this territory must be considered a part of the natural range. Similarly, restoration/recreation or management of habitat areas, as well as certain agricultural and forestry practices can contribute to the expansion of a habitat or a species and therefore its range. However, individuals or feral populations of an animal species introduced on purpose or accidentally by man to places where they have not occurred naturally in historical times or where they would not have spread to naturally in foreseeable future, should be considered as being outside their natural range and consequently not covered by Resolution No. 8 (2012).

Calculation of range

Bearing in mind the dynamics of the range as defined above, the range should be calculated based on the map of the actual (or presumed if also modelling, extrapolation or expert opinion were used) distribution used for each reporting period. The calculation should involve a standardised method. A standardised process is needed to ensure repeatability of the range calculation in different reporting rounds and for comparison of results between countries. It will also allow for estimating range trends.

The standardised process proposed in these guidelines consists of two steps:

1. Creating an envelope(s) around the distribution grids. This spatial calculation is done using the procedure of 'gap closure' where a predefined set of rules specify where two distribution points/grids will be joined together to form a single range polygon, and where an actual gap in the range will be left.
2. Excluding unsuitable areas. After the automated calculation, areas which are not appropriate, such as marine areas in the range of a terrestrial species, should be excluded.

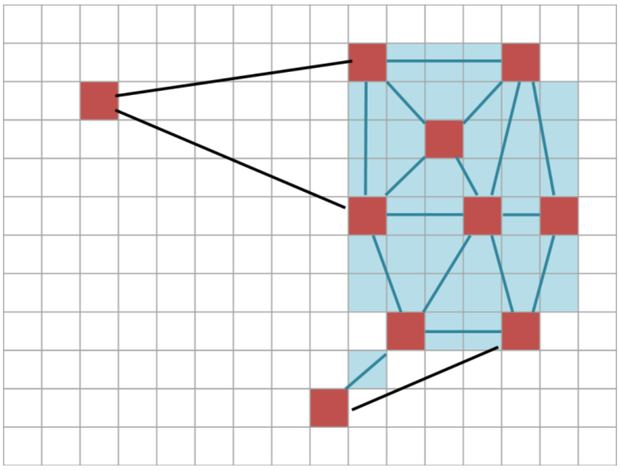
Step 1: Creating an envelope(s) around distribution

grids What is a gap distance?

Most of the basic principles for the range estimation, including the size of gaps which will represent a discontinuity in the range, were established during the 2000–2006 Nature directives reporting period and are still valid. Range should exclude major discontinuities that are natural, i.e. caused by ecological factors. What is considered as a natural discontinuity is largely dependent on the ecological characteristic of the species and the character of the surrounding landscape. Ideally, the criteria for the range discontinuities should be defined separately for each species in each particular landscape, but this is practically impossible. The guidelines for reporting provide a generalised and simplified approach to range discontinuities.

In the process of calculating a range the natural discontinuities are represented by a 'gap distance'. A gap distance should be understood as the distance between two distribution grids that will not be joined together to form a single range polygon but will be shown as discontinuities in a range (see Figure 4).

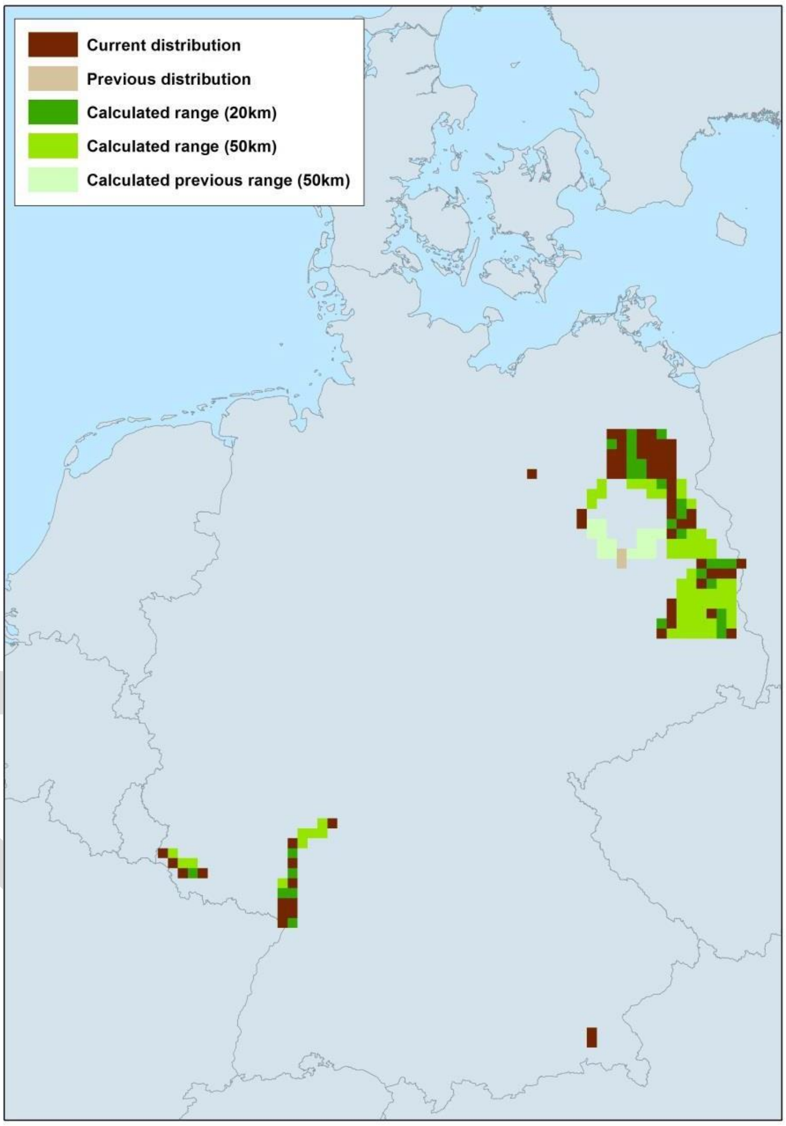
Figure 4: A schema illustrating use of the gap distance in calculating range. If the distance between two occupied distribution grids (red grids) is smaller than the gap distance (blue lines), the distribution grids are joined to form a range (blue grids). If the distance between two distribution grids is higher than the gap distance (black lines), two distribution grids are not joined and represent a discontinuity in the range.



Constraints for selecting the gap distance

The gap distance should correspond to the definition of range (as an envelope generalising the distribution with major discontinuities excluded) and it should allow the calculation of range polygons, which are capable of detecting large-scale changes in the distribution. A range that is calculated with larger gap distances (i.e. 40–50 km) is more sensitive to changes at the margins of the distribution and large-scale changes within the outer limit of the distribution. On the other hand, range calculated with smaller gap distances (e.g. 20 km) is sensitive to small-scale changes (see Figure 5). A discontinuity of at least 40–50 km (depending on species group) is considered a gap in the range of species.

Figure 5: An example of range maps created using different gap distances. This map shows the difference between the range calculated with 20-km and 50-km gap distances. Where a single marginal population occupying two 10 × 10 km grids on the map is lost (Previous distribution), the range calculated with 50-km gap distance (Calculated range 50 km) will decrease by more than 15 % of its original area (Calculated previous range 50 km). Using the gap distance of 20 km, where this marginal population will remain isolated from the main range polygon (Calculated range 20 km), the decline in the range area will be around 3 % of its original area. With a 12-year reporting period the same situation would lead to different conclusions: 'unfavourable-bad' for the range with a 50-km gap and 'unfavourable-inadequate' for the range with a 20-km gap.



The gap distance should, on the other hand, reflect the ecological characteristic of the species. This means that for mobile species, the range will be calculated using larger gaps and, conversely, smaller gaps will be used for less mobile species. Precise knowledge about the dispersal capacity of many species is still lacking, and in addition the possible dispersal distance will be greatly influenced by the quality of the surrounding landscape matrix. The proposed gap distances are rather broad and reflect major ecological differences between broad species groups. The recommended gap distances for each species group are outlined in Table 7, but other gap distances can be used if based on detailed knowledge of the species within the Country.

Table 7 Recommended maximum gap distance for major species groups

Species group	Gap distance
Lower plants	40 km
Higher plants	40 km
Invertebrates	40 km
Fish and lampreys	50 km
Terrestrial mammals	40–90 km[14], depending on dispersal ability and movement
Amphibians	50 km
Terrestrial reptiles	50 km
Marine mammals and reptiles	90 km[15]

For very rare and/or localised species occurring in particular environmental conditions, the range may be equal to the distribution.

For small countries or for other small territories for which the distribution map is provided using the 1 × 1 km grid or 5 × 5 km grid (see Guidelines on 'Explanatory notes in support to the Reporting Format') the gap distances can be adapted accordingly (e.g. a gap distance of 4 grids = 4 km can be used for plants instead of 40 km recommended in Table 7).

Step 2: Excluding unsuitable areas

Technically, range is calculated by filling in the unoccupied grids between the cells of distribution. The following types of unsuitable areas should be excluded from the calculated range:

- marine areas automatically included in the range of terrestrial species;
- terrestrial areas automatically included in the range of marine species;
- areas beyond national boundaries;
- areas identified by the range tool as part of the range falling in the adjacent biogeographical or marine regions for which the species is not noted on the checklist;
- areas without water bodies for freshwater species and vice versa.

Although the distinction between suitable and unsuitable areas is very coarse, the purpose of this step is to correct only the most important contradictions resulting from automated calculation. Technically, the process described in this step should be simple and applicable across all countries.

[14] The gap distance in range calculation for highly mobile species should be adapted to reflect the movements of the species. These, on contrary to any changes in the range should not affect calculated range trends.

[15] For some species the gridded distribution will approximate the range because the distribution was derived from the large scale surveys, modelling and/or expert extrapolation or will be mapped as area used by the population. In these cases the range calculation is not relevant. The gap distance in range calculation for highly mobile species should be adapted to reflect the movements of the species and can be larger than 90 km.

1.6 Population

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Population size units

Population is one of the four parameters needed for the assessment of the conservation status of species as part of the reporting under Resolution No. 8 (2012). The evaluation matrix requires that in order to be assessed as 'favourable', the population size of a species should not be lower than its favourable reference population, and population dynamics and structure should not deviate from normal. It is acknowledged that population size is a difficult feature to obtain and precise quantitative data that cannot be acquired for many species.

Each country has its own tradition of species monitoring. One of the main purposes of these national monitoring schemes (where they exist) is to assess the population trend and the trend magnitude of the monitored species. Many different types of units are used by countries in their monitoring in order to estimate the size of population and/or species trends; these can include individuals, localities, area occupied (possibly based on a buffer zone around individual records) and number of occupied ponds or groups of adjacent ponds for amphibians such as newts (with a suggested distance of less than 500 m between ponds), or relative units such as abundance, density, or number of records per unit of effort.

To assess the conservation status of a given species at Pan-European biogeographical level, there is a need to compare the population size of the species in the different countries within the same biogeographical. It is therefore essential that the population size reported by each country is made available in a unit that allows this comparison. Weighting by population is the preferred method for producing the Pan-European regional assessments.

For the reporting period 2013-2018 1 × 1 km grids were widely used as population unit. However, the 1 × 1 km grid is not a population but a distribution unit and its use gives limited information on the population of the species present in the biogeographical region of a Country, if not even a false impression. Grids should ideally be combined with abundance to be able to give some estimation of population (some grids can be densely populated while others not).

For the 2019 – 2024 reporting, as part of a move towards better data on reporting species populations under Resolution No. 8 (2012), the species groups vertebrates and vascular plants should be reported in individuals as a general rule. For clonal plants, ramets or above-ground shoots, individuals will be used (unless the species occurs in one country, then m^2 can be used). Shoots can be reported as individuals but under additional information it should be indicated that the number of individuals refers to number of above ground shoots. Monitoring should continue in the unit of the monitoring system of each country. It is encouraged to use modelling or other statistical techniques to extrapolate individuals at national biogeographical level. There are certain difficulties in doing the extrapolation as the models are sensitive to violations of their assumptions, however, crude estimates in individuals with a broad minimum and maximum value from modelling that may be subject to bias, or the use of population size classes still gives more information about the population size than 1 × 1 km grids.

Examples of extrapolations in individuals will be published in the Reporting Reference Portal.

As raised by some countries, reporting in individuals for the proposed groups entails a number of difficulties:

- for most vertebrate species the number of individuals reported will be given in a very wide range, significantly reducing the reliability and usefulness of the data;

- as the numbers will be rough estimations, it will be more difficult to detect relevant trends and estimate trend amplitudes over time;
- species with low detectability and limited local abundance are a complicated case for obtaining correct abundance estimates;
- for species difficult to access, the methods to be used for monitoring may damage natural populations;
- for widespread and highly scattered species it is enormously labour intensive to make counts;
- for species forming colonies that are moving from one place to the other or hibernating, it is very hard to get a reliable estimate;
- species characterised by a huge reproductive potential and fecundity like fish have high abundances of larvae and juveniles and assessments of local densities (expressed as number of individuals) may be very significantly biased by seasonal effects;
- the population of many taxa fluctuates by one or even several magnitudes, which renders any population figure practically meaningless;
- the human capacity and financial resources to obtain reliable figures for population size is very high.

Therefore, it is acknowledged that the first reporting using individuals will not be of highest quality and the value might be left empty for species, mostly for those that are widespread or difficult to access.

When the population of the species cannot be provided in individuals, the field 6.2 can be left blank. In this case, the use of the field for reporting additional population size (field 6.5) is becoming of higher importance as this is the field where countries can provide the figures they obtain from national monitoring schemes. The list of population units to be used for this field is expanded to include units proposed by countries. Relative units like average number of individuals per km^2 or per m^2 are now allowed. These figures may differ in each country and do not allow for an estimation of the population at Pan-European level but they are a good indication of the monitoring of population size within the countries. 1 x 1 km grids can still be reported under ‘Additional population size’ as a last resort if countries choose to. The figures reported in the field ‘Additional population size’ can be used from the countries for the estimation of the Favourable Reference Values and for the estimation of the conservation status of the species at national biogeographical level.

An empty field on population size (field 6.2) will not affect the estimation of ‘unknown’ of the parameter population, as the additional population size in the monitoring unit can still be used for the assessment of conservation status of the parameter at national biogeographical level. However, it is anticipated that in the coming years the information provided in the field on population size in individuals will increase.

Population size units are listed in the checklist of species of Resolution No. 8 (2012) available on the Reporting Reference Portal.

In situations where the information on population is only available from a partial survey and it is not possible to derive more accurate figures covering the entire population by either modelling or based on expert opinion, it is still preferable that the values available are provided in respective minimum fields.

Depending on the uncertainty of the estimate the methods used should be either ‘c) Based mainly on expert opinion with very limited data’ or ‘d) Insufficient or no data available’. Any details and explanations that could help to understand the uncertainty of minimum estimates should be provided as ‘Additional information’.

In general, ‘individuals’ (understood as mature individuals) should be used for all *vertebrates* and most *vascular plants* from the period 2019-2024 onwards in the field 6.2 'population size'. For invertebrates and non-vascular plants, the 1 × 1 km grids (or other agreed population units) should be used due to the nature of these species and the difficulties in estimating their population.

Regarding *Vascular plants,* exceptions to the use of individuals are the units 'area covered by population in m^2', and '1 × 1 km grid'. The 'area covered by population in m^2' is still a distribution and not a biologically meaningful population unit but it can give a better estimation of the population compared to units already in use (such as 1 × 1 km grid or localities).

Area covered by population in m^2 should be used for (See table 9 below):

- species growing in dense stands or forming colonies where individuals cannot be easily separated visually, e.g. aquatic plants;
- species occurring in defined sites where it is difficult, dangerous or very expensive to collect adequate population data, e.g. ponds, fens, single trees and cliffs;

Regarding vascular plant species restricted in one Country:

- they should be reported using either individuals or area covered by population in m^2
- reporting in individuals versus m^2 is strongly encouraged

Table 8: Population units for each species group (more detailed information and possible updates to this table can be found on the Reporting Reference Portal).

Species group	**Individuals**	**m²**	**Individuals or m²**	**1 × 1 grids**
Fish and lampreys				
All fish and lampreys	X			
Amphibians				
All amphibians	X			
Reptiles				
All reptiles	X			
Mammals				
All mammals	X			
Vascular plants				
Aquatic vascular plant		X		
Vascular plants which are difficult to access for survey		X		
Vascular plants occurring in one Country			X	
All other vascular plants	X			
Remaining species groups [including *Lycopodium* sp. from vascular plants]				X

Table 9: Vascular plant species for which reporting in m² is required

Aquatic and amphibian vascular plants growing in dense stands or forming colonies	
Aldrovanda vesiculosa	*Luronium natans*
Apium repens	*Marsilea batardae*
Arctophila fulva	*Marsilea quadrifolia*
Caldesia parnassifolia	*Marsilea strigosa*
Coleanthus subtilis	*Myosotis rehsteineri*
Elatine gussonei	*Najas flexilis*
Eleocharis carniolica	*Najas tenuissima*
	Persicaria foliosa
Vascular plants which are difficult to access for surveying	
Viola delphinantha	*Dianthus rupicola*
Centaurea immanuelis-loewii	*Saxifraga florulenta*
Galium sudeticum	*Vandenboschia speciosa (Trichomates speciosum)*
Tozzia carpathica	

Reporting population size in individuals

The definition of ‘individuals’ for the purpose of the reporting under Resolution No. 8 (2012) is the IUCN 2022 ‘mature individuals’.

Box 4: Mature individuals

Although no strict definition of 'mature individual' is available, in general, adult individuals are included, i.e. those known or thought to be capable of reproducing offspring, but plant seedlings, for example, are not. For most animal species, individuals are quite easy to delineate and understand. However, for some plants it is more problematic. For several species (e.g. clonal populations with vegetative reproduction) it is not possible to distinguish individuals from each other above ground, while ferns (e.g. *Trichomanes speciosum (Vandenboschia speciosa)*) may have both gametophyte and sporophyte generations. As a pragmatic solution it is recommended to treat shoots or tufts as individuals. This guidance is in line with the IUCN (2012b) guidelines[16] for estimating number of mature individuals, which states that reproducing units within a clone should be counted as individuals, except where such units are unable to survive.

Guidance for converting nationally used (monitoring) units into 1 × 1 km grids

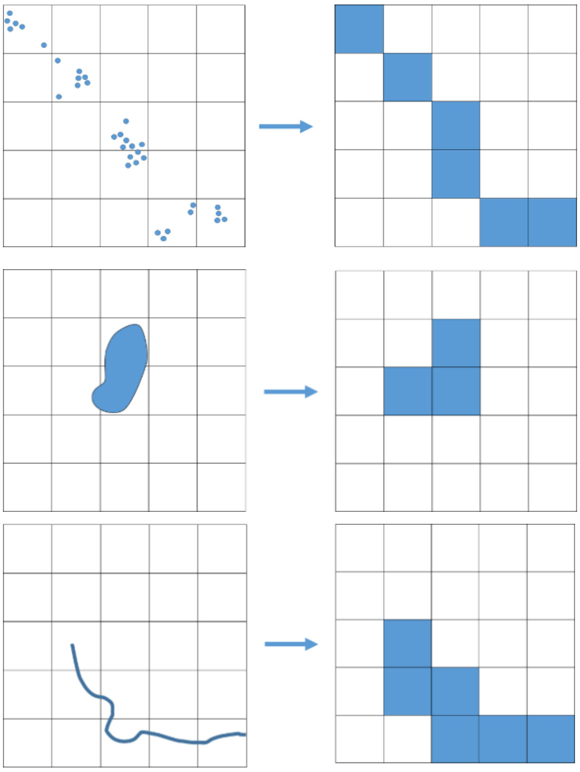
For the species groups where reporting in 1 × 1 km grids is still accepted and where the information concerning the number of occupied 1 × 1 km grids is not directly available, it will be extrapolated from the available data. Guidance is proposed for the main cases commented on by countries.

- **Converting monitoring units to the number of occupied 1 x 1 km grids**

The rules detailed in Figure 6 for converting monitoring units to the number of occupied 1 × 1 km grids should be applied to relatively well-known species:

[16] http://www.iucnredlist.org/technical-documents/categories-and-criteria

Figure 6: Converting monitoring units to a number of occupied 1 x 1 km grids



a) The monitoring unit involves **point data**
- Each 1 × 1 km grid in which a point occurs should be counted, in this case 6 grids

b) The monitoring unit involves **polygon data**
- Each 1 × 1 km grid in which the polygon occurs should be counted, in this case 3 grids

c) The monitoring unit is a **linear feature**
- Each 1 × 1 km grid in which a segment of the linear feature occurs should be counted, in this case 6 grids

a) Point data: this approach can be used for relatively well-known and more or less sedentary species occurring (at least for part of their life cycle) in discrete localities, which are represented in the monitoring schemes by a point location. The population size at the country’s biogeographical level can often be estimated as the number of localities. This applies to many insect or mollusc species in many parts of Europe, to some amphibians (where the monitoring unit is a breeding pond), and to some rare species of reptiles.

b) Polygon data: this approach can be used for cases where localities have been delineated as polygons. The locality or polygon can be delineated from the distribution of peripheral points (records of a species’ occurrence) or can be delineated as a suitable habitat for a species (for example, in cases where limited observations exist but the species is probably present in the wider area; this can be the case for some saproxylic beetle or amphibian species).

c) Linear features: this approach can be used for species linked to rivers (or other linear features) where a locality often represents a stretch of a river with recorded species occurrence.

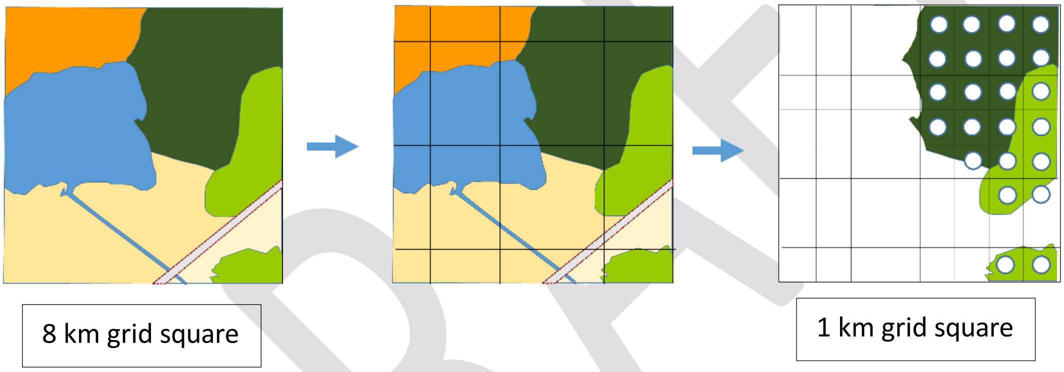
- **Converting distribution to number of occupied 1×1 km grids**

There are a number of cases where information is only available as a presence in a large grid (e.g. 5 × 5 km or 10 × 10 km). This concerns species that are abundant and widespread and/or poorly known (e.g. cave-dwelling species, saproxylic beetles). As a general rule, a direct conversion of large grids into smaller grids (e.g. one 10 × 10 km grid equals one hundred 1 × 1 km grids) should not be used. Where possible, countries should provide the number of grids potentially occupied.

This information can be obtained, for example, through intersecting the distribution data with other spatial data with information related to suitable ecological conditions for the species, such as land cover, habitat/vegetation maps and/or elevation models. Depending on the ecology of the species, there are often a number of 1 × 1 km grids (within a 10 × 10 km grid) where the species is most likely to be absent (e.g. unsuitable habitat types, artificial land cover, and fragmentation), which should be excluded when converting the distribution data into a population size estimated as number of 1 × 1 km grids. Methods used for downscaling the species' distribution may be useful, if they exist. Where possible, the methods and the thresholds applied to assess the probability of the absence and/or presence of a species in a 1 × 1 km grid in the procedure described above should be statistically robust.

The number of occupied grids can be estimated by the elimination of grids where the occurrence of a species is unlikely. Figure 7 provides an example for a forest species. First a 1 × 1 km grid is intersected with a land-cover map. The species is presumed to be only present in forest habitats (corresponding to green = forest polygons). Then the 1 × 1 km grids, which are not intersected with forest areas, are eliminated. In addition, a 100-m buffer was applied to the forest polygons to eliminate the edges where the species is assumed to be absent.

Figure 7: Proposed method for converting distribution to the number of occupied 1 × 1 km grids (green polygons = forest; blue = aquatic habitats; orange = agricultural land; grey = roads; white circles = occupied 1 x 1 km grids)



Population size in other agreed population units

Table 10 lists these species for which the use of another agreed unit is retained for the 2019–2024 reporting period (i.e. this population size unit should be used to report the population size in field 6.2 'Population size (in reporting units)'.

Table 10: List of alternative population units for Resolution No. 8 (2012) reporting

Species name	Species group	Alternative unit
Agathidium pulchellum	Arthropod	Number of inhabited trees
Aradus angularis	Arthropod	Number of inhabited trees
Xyletinus tremulicola	Arthropod	Number of inhabited trees
Cephalozia macounii	Non-vascular plant	Number of inhabited logs
Cynodontium suecicum	Non-vascular plant	Area covered by population in m^2
Dichelyma capillaceum	Non-vascular plant	Number of inhabited stones
Hamatocaulis lapponicus	Non-vascular plant	Area covered by population in m^2
Herzogiella turfacea	Non-vascular plant	Area covered by population in m^2
Hygrohypnum montanum	Non-vascular plant	Number of inhabited stones

Orthothecium lapponicum	Non-vascular plant	Area covered by population in m²
Riella helicophylla	Non-vascular plant	Area covered by population in m²

Population size in reporting units and Additional population size in assessment of conservation status

The reporting units should allow the quantification of the species' population within the country's biogeographical region. The use of the agreed reporting units does not imply that monitoring or assessment of the species' status (including short-term population trend and distance to the favourable reference population) at the country level needs to be done using this unit.

The population size in reporting units can be obtained via a conversion of the population size estimated in the units used nationally (monitoring and assessment units). In some cases, the reporting units can imply a loss of information and/or introduce errors. The population size in local units can therefore be reported under the field 6.5 'Additional population size'. Where abundance or density units are used, the Additional information field can be used to record further information such as the area the density unit refers to.

Ideally, the monitoring and assessment of the species' status at the country level is done using the most appropriate unit to capture the population trend and is also biologically suitable for expressing the favourable reference population.

Population structure and genetics

Although Part B (species assessment) does not require information on population structure (age, classes, etc.), some knowledge of the population structure is needed for the assessment of population in Part C (matrix to assess the conservation status of a species).

In general, the absence of or unnaturally low recruitment would indicate an unfavourable population structure. Similarly, an unnaturally high mortality rate for all or certain age classes can lead to an unfavourable population structure. The lack of young individuals in many monitored local populations may also indicate an unfavourable population structure. In those situations, the conservation status should be regarded as 'unfavourable' even though the population trend is stable or increasing and current population size is not lower that the reference population.

Similarly, it may be relevant to consider the genetic structure of a species. In many cases only sparse information is available, although some genetic studies have focused on particularly rare species, such as plants *Borderea chouardii* (Segarra-Moragues et al. 2005) and *Dracocephalum austriacum* (Dostálek et al. 2009). The importance of genetics in the evaluation of conservation status is discussed in more detail in Laikre et al. (2009).

Population and genetic structure are closely related to long-term viability of a species which is an essential part of the assessment of Favourable reference values. Section '1.3 Favourable reference values' gives more information on how the population and genetic structure should feed into the process of setting the reference values.

1.7 Habitat for the species

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Definition of the 'habitat for a species'

To survive and flourish a species needs a sufficiently large area of habitat of suitable quality and spatial distribution. This is assessed in the parameter 'Habitat for the species' which is based on the definition of Favourable conservation status (FCS) for a species which reads: 'There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis'. The habitat for a species is also defined as: 'an environment defined by specific abiotic or biotic factors, in which the species lives at any stage of its biological cycle'.

Although it is not possible to give a detailed definition of habitat for a species that will be valid for all of the species listed in Resolution No. 6 (1998), some general principles can be established and 'habitat for the species' should be interpreted to take into account the following:

- physical and biological requirements of the species; this includes prey, pollinators, etc.
- all stages of its life cycle are covered and seasonal variation in the species' requirements is reflected.

'Habitat for the species' uses habitat in its original meaning of the resources (biological and physical) used by a species during its life. This is sometimes referred to as the ecological niche of a species. It is important to note that the meaning of 'habitat' in 'Habitat for the species' is different to 'natural habitat' defined under the Bern Convention and the habitats listed in Resolution No. 4 (1996) using the EUNIS classification, which are more accurately biotopes (or in many cases biotope complexes).

Habitat for a species may be mostly abiotic, for example, the Freshwater pearl mussel (*Margaritifera margaritifera*) spends its larval stage attached to the gills of salmonid fish while the moss *Dicranum viride* grows on trees. Many species use different biotopes at different times of the year or at different stages of their life cycle. 'Habitat for the species' should include all of these. For example, a butterfly may use different habitats during its larval, pupal and adult stages. For hibernating animals, such as bats, habitat for both winter (hibernation sites) and summer (foraging and roosting sites) must be considered. For example, the Long-fingered bat *(Myotis capaccinii*) in France requires suitable roosting sites (often caves and tunnels which in winter are usually between 4 and 6°C) together with foraging areas with suitable prey (small insects flying over wetlands, often with scrub and/or riparian woodland; Anon., 2002).

For some highly mobile species (for example marine mammals or turtles) the actual habitat for the species will often equal range.

Area, quality and spatial organisation – elements for assessing the habitat for a species

There are three key elements for assessing habitat for a species: area, quality and spatial organisation (Hodgson et al., 2011). The questions in field 7.1 (a) 'Is area of **occupied** habitat sufficient (for long-term survival)?', b) 'Is quality of **occupied** habitat sufficient (for long-term survival)?', and, 'If NO to a), is there a sufficiently large area of **unoccupied** habitat of suitable quality (for long-term survival)?' aim to identify if habitat, in its broadest sense, is the factor limiting a species from being in a Favourable conservation status. For example, a species may have a small, potentially non-viable population which cannot expand because of a lack of suitable habitat or of a particular element of its habitat, such as suitable nesting sites. Alternatively, a species may have a large area of habitat but of poor quality. The question in field 7.1 aims to address which element, if any, of the habitat for the species, is a limiting factor.

There is increasing evidence that habitat quality plays an important role in determining the distribution and dynamics of species, both for plants and animals (Mortelliti, Amori & Boitani, 2010), and it can be defined in several ways, as reviewed by Johnson (2007). Habitat quality should be understood as the 'ability of the environment to provide conditions appropriate for individual and population persistence' (Hall et al., 1997). The habitat quality should be assessed in relation to the species' requirements. Quality must be understood as an adequacy or suitability for the species (sometimes for a particular life stage of a species), and not as habitat condition as such without taking into account the particular requirements of the species (at its particular life stage). Habitat quality is a continuous variable (from high to low) and refers to resources available for survival, reproduction and population persistence.

Although 'Habitat for the species' should cover all physical and biological requirements of the species throughout all stages of its life cycle and in any season, special emphasis should be given to key habitats such as reproduction or hibernation sites in the assessment of sufficiency of habitat area and quality.

Indices/measures of the habitat quality

Habitat quality is frequently related to reproductive success, although information on population dynamics related to habitat selection is likely to be unavailable for many of the species covered by Resolution No. 6 (1998). Although abundance or density has been used as a relatively simple way of measuring habitat quality, this may be misleading where abundance or density in a given site is controlled by factors elsewhere, perhaps in a different season for migratory species (Van Horne, 1983). Many studies have used vegetation as a proxy for habitat quality and, although this has been criticised (e.g. Mathewson & Morrison, 2015), this may be the only method available for poorly known species. Sometimes knowledge of the species allows population dynamics to be linked to vegetation. Wehn & Olsson (2015) measured a few population parameters for the plant *Primula scandinavica* (Resolution No. 6 (1998)) allowing comparison of different vegetation types for the species, and found that semi-natural vegetation, such as heath or grassland, was of higher quality for this species than forest, although the species did occur in all.

Spatial organisation and fragmentation

Spatial arrangement of habitat patches has been shown to be less important than area or quality (Hodgson et al., 2011) although fragmentation of habitat is frequently cited as a threat. If habitat patches are close, colonisation and genetic exchange between subpopulations is more likely to occur, although corridors allowing the movement of individuals through the landscape may also play a role. Also, the quality of surrounding environment may have significant effect on populations, for example, by increasing habitat patch isolation or through edge effects. However, disentangling the relative role of quality and spatial organisation may often be difficult (Mortelliti, Amori & Boitani, 2010), as consequence, for the reporting under Resolution No. 8 (2012), the two have effectively been grouped together.

Generalists and specialists

When assessing 'Sufficiency of area and quality of occupied habitat' (field 7.1(a), (b) and (c)) it is necessary to have an understanding of the species' biology in order to identify the species' key requirements and type of areas (habitats) potentially suitable for it. Species are frequently considered as habitat specialists or generalists, although in reality there is a wide spectrum (see e.g. Devictor et al., 2010) and a species may be both a generalist and a specialist at different parts of its life cycle. A broad grouping into habitat generalists and specialists may help in determining the key elements for assessing the sufficiency of the habitat area or quality.

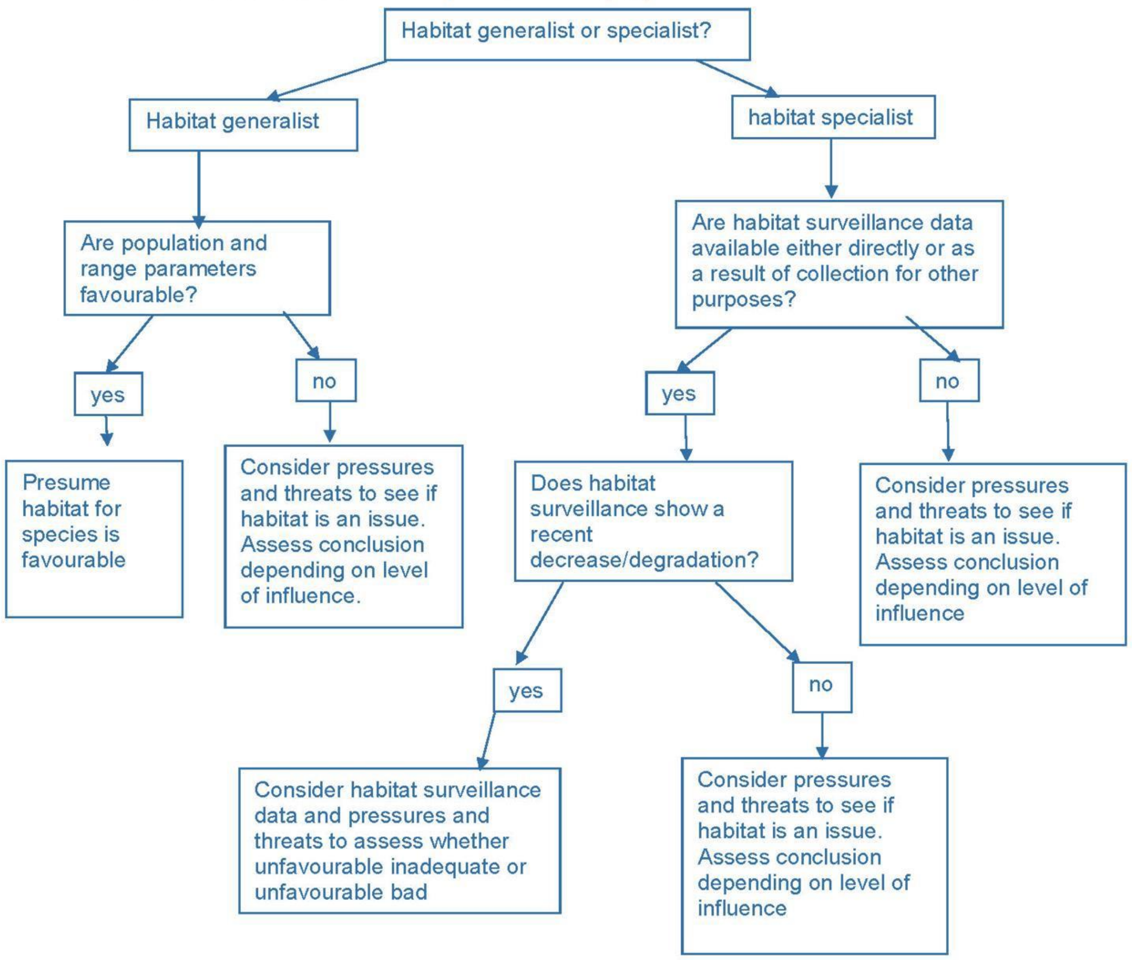
Some species are known to be restricted to particular habitats. For example, the beetle *Agathidium pulchellum* is dependent on the slime mold *Trichia decipiens* living on dead wood in Boreal forests (Laaksonen et al., 2009), while the larvae of the beetle *Stephanopachys linearis* lives in burnt pine trees in the Boreal region and in damaged larch trees in the French Alps (Brustel et al., 2013). Therefore, Boreal forests with sufficient quality and quantity of dead wood can be considered a suitable habitat for *Agathidium pulchellum*, and pine forests with natural (or controlled) fire dynamics as a suitable habitat for *Stephanopachys linearis* in the Boreal region. A species is expected to prosper if the extent of these habitats is sufficient and the functions of the habitat, which correspond to key requirement of a species (dead wood, fire, etc.), are well preserved.

For some species, the requirements are well known. For example, many saproxylic insects are dependent on old trees. However, these may be features that can be found in many habitats, such as woods, hedgerows and parks. In this situation, the assessment of the sufficiency of the habitat quality should mainly target the quantity and quality of the specific features (exposed old trees) in the landscape, and the precise area of habitat is not the decisive factor for the species status.

For species which use a wide range of habitats, often termed ‘generalists’, it is difficult to identify the area used with any precision, and factors such as availability of prey (which represents the qualitative aspects of the habitat for a species) are often more important than the extent of the habitat. For the generalist species it is less likely that the ‘habitat area’ is a limiting factor controlling the population size or reproduction than for a ‘specialist’ species dependent on one or a limited number of habitats (habitat types).

In many cases it will be enough to assess the ‘Sufficiency of area and quality of occupied habitat’ (field 7.1(a), (b) and (c)) in relation to the reported pressures. The direct measurement of the physical quality of the species’ environment will not be necessary (Box 5 shows the example of the decision tree used in previous reporting rounds in the UK)

Box 5: A flow chart to help assessments of habitat for a species, developed by JNCC and used in previous reporting rounds by the UK, which may be useful, particularly when data are limited. It outlines different approaches used in the assessment of the habitat for the species, for habitat generalists and specialists.



For many species, the exact requirements are not well understood, so it is difficult to know if the areas currently unoccupied are really suitable. This is demonstrated in a recent study of the reintroduction of European Bison (*Bison bonasus*) to the Carpathians (Ziółkowska et al., 2016).

Availability of unoccupied habitat

In many cases, the habitat requirements for a species are known, and areas which are not currently occupied can be identified. For example, the wolf (*Canis lupus*) and the otter (*Lutra lutra*) are both recolonising parts of their former ranges from which they have been absent for many years and it is clear that further suitable, but as yet unoccupied, habitat occurs. It may be possible to model the habitat used by a species, for example Kuemmerle et al (2011) show how the habitat for *Bison bonasus* can be modelled and is much larger than currently used.

Field 7.1(c) asks if unoccupied habitat of suitable quality is available. For some species for which the requirements are well known this may be relatively easy to answer. An example of how the habitat for a species can be identified is given in Box 6. However, for many species our lack of knowledge may mean that the only response is 'unknown'.

Box 6: Defining suitable but unoccupied habitat for a species – the snail *Vertigo geyeri* in Ireland

Vertigo geyeri is strict in its requirement of saturated water conditions in calcareous, groundwater-fed flushes that are often limited in size to a few metres square. Their habitats often occur in mosaics of suitable patches within wider fen macrohabitats, that in Ireland can themselves fall within habitats as diverse as raised bog laggs, transition mires, lake shores, hill or mountain slopes, and wetlands associated with coastal dunes and machair. Within these macrohabitats, however, the snail is consistent in where it lives: within the saturated and decaying roots of small calcareous sedges (particularly *Carex viridula* ssp*. brachyrrhyncha*), associated fen mosses (particularly *Drepanocladus revolvens* and *Campyium stellatum*). The greatest indicator of optimum *V. geyeri* habitat is the presence of a tufa-forming spring.

Source: Moorkens & Killeen (2011).

The potential unoccupied habitat may not include all occurrences of a potential habitat within the biogeographical region, but only areas that can be recolonised by the species. If, for example, there are stretches of rivers inaccessible to the species' populations due to waterfalls or barriers, these should not be included under potential unoccupied habitat as it is unlikely that they can be recolonised by the species, even though they are of suitable quality.

1.8 Main pressures and threats

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Although the information on pressures and threats is required for the conservation status assessment, the importance of pressures and threats goes beyond their use in the assessment. They provide information on the main drivers related to results of the conservation status assessment. They can help to identify actions required for restoration and they are essential to communicate the results of the status assessment to various stakeholders.

For the reporting under Resolution No. 8 (2012), pressures are considered to be factors which have acted within the current reporting period, while threats are factors expected to be acting in the future (in the future two reporting periods, i.e. within 12 years following the end of the current reporting period). It is possible for the same impact to be both a pressure and a threat if it is having an impact now and this impact is likely to continue.

For the 2019–2024 reporting period one list of pressures will be submitted where the 'timing' of each pressure indicates if the pressure also acts as a threat. The list of pressures still retains the same system from the 2013 – 2018 reporting period (based principally on a cause (drivers) oriented system), with only minor modifications for coherence (e.g. merging of pressures, splitting, etc.). There are 14 pressure categories.

Table 11: Pressure categories in the list of pressures and threats

Pressure code	Pressure category	Note
PA	**Agriculture related practices**	Includes pressures and threats caused by agricultural practice.
PB	**Forestry related practices**	Includes pressures and threats caused by forestry activities, including thinning, wood harvesting, pest control in trees.
PC	**Extraction of resources (minerals, peat, non-renewable energy resources)**	Includes pressures related to extraction of materials, such as mining or quarrying, pollution or waste disposal.
PD	**Energy production processes and related infrastructure development**	Includes pressures related to production of energy, e.g. the construction and operation of power plants, water use for energy production, waste from energy production, activities and infrastructure related to renewable energy.
PE	**Development and operation of transport systems**	Includes pressures related to transportation of materials or energy, such as construction of infrastructure, pollution and disturbances or increased mortality due to traffic.

PF	**Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas.**	Includes pressures related to development, construction and use of residential, commercial, industrial and recreational infrastructure, e.g. infrastructural changes on existing built areas, expansion of built areas, land use and hydrological changes for urban or industrial development, disturbances or pollution due to residential, commercial, industrial, or recreational infrastructure. Includes also pressures related to sport, tourism and leisure activities and infrastructure.
PG	**Extraction and cultivation of biological living resources (other than agriculture and forestry)**	Includes pressures linked to uses of biological resources other than agriculture and forestry.
PH	**Military action, public safety measures, and other human intrusions**	Includes pressures related to public safety and other human intrusions.
PI	**Alien and problematic species**	Includes pressures related to problematic inter-specific relationships with non-native species which cannot be associated with other pressure categories. Includes also problematic relationships with native species, which came out of balance due to human activities.
PJ	**Climate change**	Includes pressures related to climate change.
PK	**Mixed source pollution**	Includes pollution which cannot be associated with other pressure categories.
PL	**Human induced changes in water regimes**	Includes hydrological and physical modifications of water bodies, which cannot be associated with other pressures categories.
PM	**Geological events, natural processes and catastrophes**	Includes pressures such as natural fires, storms, tsunamis and natural processes, such as natural succession, competition, trophic interaction, erosion.
PN	**Unknown pressures, no pressures and pressures from outside the country**	

Further information on the list of pressures, crosswalks to the previous pressures list and examples of how to report pressures can be found on the Reference Portal.

1.9 Conservation measures

This chapter provides complementary information to Guidelines on ‘Explanatory notes in support to the Reporting Format’.

Conservation measures are defined in Article 2 of the Bern Convention as: ‘The Contracting Parties shall take requisite measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements’ and in Resolution No. 8 (2012) as ‘The national designation of the adopted Emerald sites will ensure that they are protected from external threats and subject to an appropriate regime for achieving a satisfactory conservation status of the species and natural habitats listed in Resolutions No. 4 (1996) and No. 6 (1998) present on the site, involving, if and where appropriate, management plans, administrative measures and contractual measures’.

Article 2c of Resolution No. 1 (1989) interprets the term ‘conservation’ as the ‘*maintenance and, where appropriate, the restoration or improvement of the abiotic and biotic features which form the habitat of a species or a natural habitat (...), and includes, where appropriate, the control of activities which may indirectly result in the deterioration of such habitats (...)*’;

The main purpose of reporting on conservation measures is to obtain information allowing for a ‘broad-brush’ overview of the conservation measures: whether measures have been taken and if so, which measures, the purpose of the measures, their location (inside/outside the Emerald Network), and their scope and impact on the conservation status of species. Conservation measures are to be reported for all species.

The information included in the section 1.10 ‘Emerald Network (Proposed, Candidate and Adopted Sites) coverage for species listed in Resolution No. 6 (1998)’ can also further help to understand any trends in conservation status globally and is important for communicating the results of the conservation status assessment to different stakeholders.

The conservation measures should be reported using the codified list of measures, which mirrors the list of pressures and threats as conservation measures are principally understood as an action to mitigate the impact of past and present pressures. The measures are classified into 13 categories corresponding to the main pressure categories (see Table 12), from which up to 20 can be reported.

Table 12: Categories of conservation measures

Measure code	Categories of conservation measures
MA	Measures related to agricultural practices and agriculture-related habitats
MB	Measures related to forestry practices and forest-related habitats
MC	Measures related to resources extraction and energy production
ME	Measures related to development and operation of transport systems
MF	Measures related to residential, commercial, industrial and recreational infrastructures, operations and activities
MG	Measures related to the effects of extraction and cultivation of biological living resources

MH	Measures related to military installations and activities and other specific human activities
MI	Measures related to alien and problematic native species
MJ	Measures related to climate change
MK	Measures related to mixed source pollution and human-induced changes in hydraulic conditions for several uses
MM	Measures related to natural processes, geological events and natural catastrophes
MS	Measures related to management of species from Resolution No. 6 (1998) and other native species
MX	Measures outside the country

Further information on the list of conservation measures and practical guidance on how to use it for reporting will be found on the Reporting Reference Portal.

1.10 Future prospects

This chapter provides complementary information to the guidance provided in the Guidelines on Explanatory Notes in support to the reporting Format.

What are future prospects?

Assessments of conservation status must take into account the likely future prospects of the species; as for favourable conservation status, it is required that:

- *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;*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

The parameter 'Future prospects' focuses on the requirement for the long-term maintenance of population of the species and the need for habitat and range to be and to remain stable or increase in the foreseeable future. Although the definition of the Favourable conservation status of a species presumes ‘long-term maintenance’ of population and sufficiency of range and habitat in the ‘foreseeable future’, the concept of ‘foreseeable future’ is not defined in the legal texts. For the assessment of Future prospects this should be interpreted as meaning the two future reporting cycles, i.e. the next 12 years. The common perspective towards the future is important in harmonising the countries’ assessments, but some flexibility is permitted, and the Future prospects can be assessed over longer future periods than the proposed 12 years. For example, for certain well-studied threats, such as climate change, reasonably robust models are available much further than the next 12 years, indicating a bad perspective for a species. For some species, for example those with long generation lengths, it is unlikely that any positive future impact will be measurable within a 12-year period and possibly longer periods are needed to estimate future improvement. In either case, a common framework for the assessment is needed in order to harmonise the assessment of Future prospects and it should be assessed considering the next 12-year period.

The Future prospects parameter should reflect the anticipated future improvements and deteriorations of the conservation status[17] which correspond to future trends in the assessment. The anticipated future improvements and deteriorations should be assessed in relation to the current conservation status. For example, the impact of future deterioration on the assessment of Future prospects will be different if the current status is 'favourable' or, on the other hand, 'unfavourable- bad'.

Assessing future prospects

Future prospects should be evaluated by assessing the expected individual future trends and subsequently future prospects of each of the other three parameters (range, population, habitat for a species), taking primarily into account the current conservation status of the parameter, threats (related to the parameter assessed) and the conservation measures being taken or planned for the future. Once the future prospects of each of the other three parameters have been evaluated, they should be combined to give the overall assessment of Future prospects. The assessment can be divided into three steps:

- Step 1: Future trends of a parameter.
- Step 2: Future prospects of a parameter.
- Step 3: Assessing overall Future prospects for a species.

The method described here relies to some extent on expert judgement, but within a clear framework allowing comparability between assessments from different countries. It should also help to standardise assessments within countries where several teams are involved, each dedicated to a particular species group.

In order to assess the impact of a threat the approach as described in Table 14 can be utilised. However, a more general assessment of the impact can also be used.

Step 1: Future trends of a parameter

Future prospects of each of the three parameters range, population and habitat for a species should principally reflect the future trends which are the result of balance between threats and conservation measures as described in Table 13.

Future trends of a species are dependent on the identified (known and likely) threats which will have a negative impact and any action plans, conservation measures and other provisions which will have a positive impact. For example, climate change, land-use scenarios and trends in certain policies are aspects that will influence future trends. The measures should be restricted to those anticipated to have a positive impact in the next 12 years (regardless of whether they were already being implemented during the current reporting period or not). Threats are reported in Section 8 'Main pressures and threats' of the reporting format and the existing measures are reported in Section 9 'Conservation measures'.

In most cases, positive (management actions, policy changes, etc.) and negative influences (threats) will simultaneously affect the species. The assessment of future trends therefore has to take into account whether the sum of positive and negative influences (threats) will balance out for the parameter under consideration, or whether either of the positive or negative effects are likely to be stronger.

In some cases, threats or measures may affect the three parameters differently. For example, the

[17] The Future prospects parameter should reflect the anticipated future improvements and deteriorations of the conservation status regardless of how far the future status is likely to be from the reference situation captured via favourable reference values.

measure ‘restoration of forest habitat’ might increase the area of a habitat for a species relatively quickly but may have little impact on the range or population within a 12-year period. Only threats and conservation measures related to the specific parameter should be considered.

In many cases it will be difficult to foresee whether the influence of threats and conservation measures on the status of the parameter will balance out and whether the resulting trend will be negative, positive or stable. It can therefore be helpful to interpret the current trend in relationship to the impact of current pressures and measures and to assess the future trend on the basis of potential improvement, deterioration or continuation of the current situation.

Establishing whether the future trend is negative or very negative (or positive/very positive) will be difficult in most cases, although it may be easier if the current trend and trend magnitude are known or in cases of dominating pressures or measures. To differentiate between negative and very negative (and positive or very positive) trends the threshold of 1 % per year, meaning approximately 12 % in 12 years, is recommended. This threshold is used in the assessment matrix for current trends to distinguish between inadequate and bad status for range and population. In theory this threshold should represent a difference between a slight and moderate (< 1 % per year) deterioration/improvement and important (≥ 1 % per year) deterioration/improvement. The trend in habitat for the species has both quantitative and qualitative components. **The assessment matrix does not request an exact measure of trend magnitude for habitat for the species**. For this parameter, the difference between negative and very negative (and positive or very positive) trends should follow the same logic as for the two other parameters and should reflect the difference between slight/moderate and important future deterioration/improvement.

Step 2: Future prospects of a parameter

The future prospects of a parameter are assessed by taking into consideration, principally, the future trends and current conservation status. Deciding between the two options proposed for each combination of future trends and current conservation status will mainly depend on the potential trend magnitude (negative/very negative or positive/very positive). This is a pragmatic and mechanistic approach aimed at simplifying and harmonising the assessment of Future prospects.

Table 13: Assessing the future prospects of a parameter (Steps 1 and 2)

Step 1 Future trends of parameters			Step 2 Future prospects of a parameter	
Balance between threats and measures	**Predicted future trend reflects balance between threats and measures**	**Current conservation status of parameter**	**Resulting future Prospects of parameter (over next 12 years)**	
Balance between threats acting on the parameter (mostly threats with Low or Medium impact) and conservation measures; no real change in status of the parameter expected	overall stable	Favourable	good	
		Unfavourable-inadequate	poor	
		Unfavourable-bad	bad	
		Unknown	unknown	
Threats expected to have negative influence on the status of the parameter (threats with mostly High or Medium impact), irrespective of measures taken	negative / very negative	Favourable	poor (negative)	bad (very negative)
		Unfavourable-inadequate	poor (negative)	bad (very negative)
		Unfavourable-bad	bad	
		Unknown	poor (negative)	bad (very negative)
None (or only threats with Low impact) and/or effective measures taken: positive influence on the status of the parameter expected	positive / very positive	Favourable	good	
		Unfavourable-inadequate	poor (positive)	good (very positive)
		Unfavourable-bad	poor (positive)	good (very positive)
		Unknown	poor (positive)[30]	good (very positive)
Threats and/or measures taken unknown or interaction not possible to predict	Unknown	Favourable	unknown	
		Unfavourable-inadequate		
		Unfavourable-bad		
		Unknown		

[30] Unknown is considered as not being favourable, therefore the assessment of Future prospects of a parameter is as for unfavourable inadequate or bad

Although the concept of High/Medium pressures/threats is no longer used in the reporting format, in order to evaluate the impact of a pressure/threat, the scope and influence can be used in combination (see table 14). The scope and influence of the threat is not requested to be reported but it can be assessed by experts in a similar way for the evaluation of future prospects.

Table 14: Assessing the impact of reported threats using scope and influence

	Influence		
Scope	*High influence*	*Medium influence*	*Low influence*
whole (>90%)			
majority (50-90%)			
minority (<50%)			

High impact	Medium impact	Low impact

Step 3: Assessing overall Future prospects for a species

Once the future prospects of each of the other three parameters have been evaluated, they should be combined to give the overall assessment of Future prospects using the rules set in Table 15.

Table 15: Combining the evaluation of the three parameters to give Future prospects for a species

Assessment of Future prospects	Favourable	Unfavourable-inadequate	Unfavourable-bad	Unknown
Prospects of parameter: Range, Population and Habitat for the species	All parameters have 'good' prospects OR prospects of one parameter 'unknown', the other prospects' good'	Other combination	One or more parameters have 'bad' prospects	Two or more 'unknown' and no parameter with 'bad' prospects

Box 7: Assessing Future prospects of *Euphydryas aurinia*

Range is stable; Population and Habitat for a species are both declining; and the following threats are recorded. *The evaluation of scope and influence is not requested for threats* but could help for the assessment of future prospects. A combination of scope and influence would give an indication of the impacts (see table 14 e.g. scope >90% or scope 50-90% and influence High indicates high impact, scope <50% and influence High indicates medium impact). However, the evaluation of the impact of a threat can be done in a more empirical way.

Code	Threat	Timing	Scope	Influence	Estimated Impact
PA06	Mowing or cutting of grasslands	ongoing and likely to be in the future	whole >90%	High	High
PA07	Intensive grazing or overgrazing by livestock	only in the future	majority (50-90%)	Medium	Medium
PA13	Application of natural or synthetic fertilisers on agricultural land	only in the future	whole >90%	High	High
PB01	Conversion to forest from other land uses, or afforestation (excluding drainage)	ongoing and likely to be in the future	whole >90%	High	High
PA04	Removal of small landscape features for agricultural land parcel consolidation	ongoing and likely to be in the future	minority (<50%)	medium	Low

	(hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.)				
PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	only in the future	whole >90%	High	High

The only measure from the measure list that is implemented is ‘MA05 Adapt mowing, grazing and other equivalent agricultural activities’. This measure is expected to counteract some of the high impact threats affecting the majority of the population and habitat quality, but other high impact threats having an impact on both habitat quality and area as well as population are not counteracted. So, the population and habitat for the species trends will most likely remain decreasing.

Parameter	**Assessment of parameter**	**Expected future trend**	**Future prospect**
Range	Favourable	Stable	Good
Population	Unfavourable-inadequate	Decreasing	Poor
Habitat for the species	Unfavourable-inadequate	Decreasing	Poor

By using the combination rules in Table 14, two ‘poor’ conclusions and one ‘good’ conclusion lead to an overall assessment for Future prospects of ‘unfavourable-inadequate’.

1.11 Emerald Network (Proposed, Candidate and Adopted Sites) coverage for species listed in Resolution No. 6 (1998)

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

The evaluation of the contribution of the Emerald Network to the conservation status of species has three principal components:

1. evaluation of the relevance of the network for different species (based on the proportion of the population within the network);
2. possible differences in trends (population trends) within the network compared to the general trend (overall species population trend including populations inside and outside the network);
3. understanding what type of conservation/management measures have been implemented.

The contribution of the Emerald Network to the conservation status of a species is likely to vary in relation to the dependence of the species on sites, the coverage by the network, and site management. Therefore, the population size included in the network for each given biogeographical should be provided.

Another element to be taken into consideration when evaluating the contribution of the network is the possible difference in trends both within the network and globally (mainly for species where a significant proportion of a species' population occurs outside the network). For species, this should be expressed by comparing the trend of the population size in the biogeographical region with the trend of the population size inside the Emerald Network in that same biogeographical region. Trend information within the network is also requested for the 'habitat for a species'. This further allows comparison with the global trend reported for this parameter and to see the impact of the network.

The information on conservation measures completes and helps to understand the potential differences between the trends within the network and global trends.

2 HABITAT GUIDANCE

2.1 Habitats to be reported

2.1.1 All habitats

Occurrence categories used in the habitat checklist

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

The following categories and codes are used for the 2019–2024 reporting:

- **Present regularly (PRE)**

This category applies to habitats which occur in the region.

- **Marginal (MAR)**

The category 'marginal occurrence' should be used in situations where the habitat occurs principally in one region (or Country) but extends to a neighbouring region (or Country), where the area of habitat is insignificant, and the occurrence represents a limit of the natural range of a habitat in a given area. It is not expected that the conservation status of the marginal habitat will be assessed. However, if the conservation status is evaluated the assessment should consider their marginal position, for example when estimating the favourable reference area or when assessing structure and functions.

The 'marginal' category should reflect the history of the habitat in a given area and its use should be restricted to cases where habitat occurs naturally as 'marginal'. The 'marginal' category should not be used for habitats that were more common in the past in a given area and where the marginal status is a result of past declines due to human pressures. In this case the category 'present' should be used.

- **Scientific reserve (SCR)**

For habitats, this category applies if it is not possible to judge whether or not a habitat occurs in the biogeographical region due to problems with interpretation of the habitat definition in the Interpretation Manual.

This category should not be used in situations where:

- interpretation of the habitat is unclear or ambiguous;
- where the occurrence of the habitat is unresolved due to the absence of inventories. Such a habitat should be treated as 'present' and the report should reflect the fact that there are no data available.

For example:

The presence of the habitats 'E1.71 *Nardus stricta* swards' and 'E1.83 Mediterraneo-montane *Nardus stricta* swards' is unclear in the Caucasus region because although some typical species are present, the definitions of both habitats make reference to restrict geographical areas. To try to solve this situation in the Caucasus, both grasslands were considered to be included in 'E4.3 Acid alpine and subalpine grassland'.

Overlapping habitats

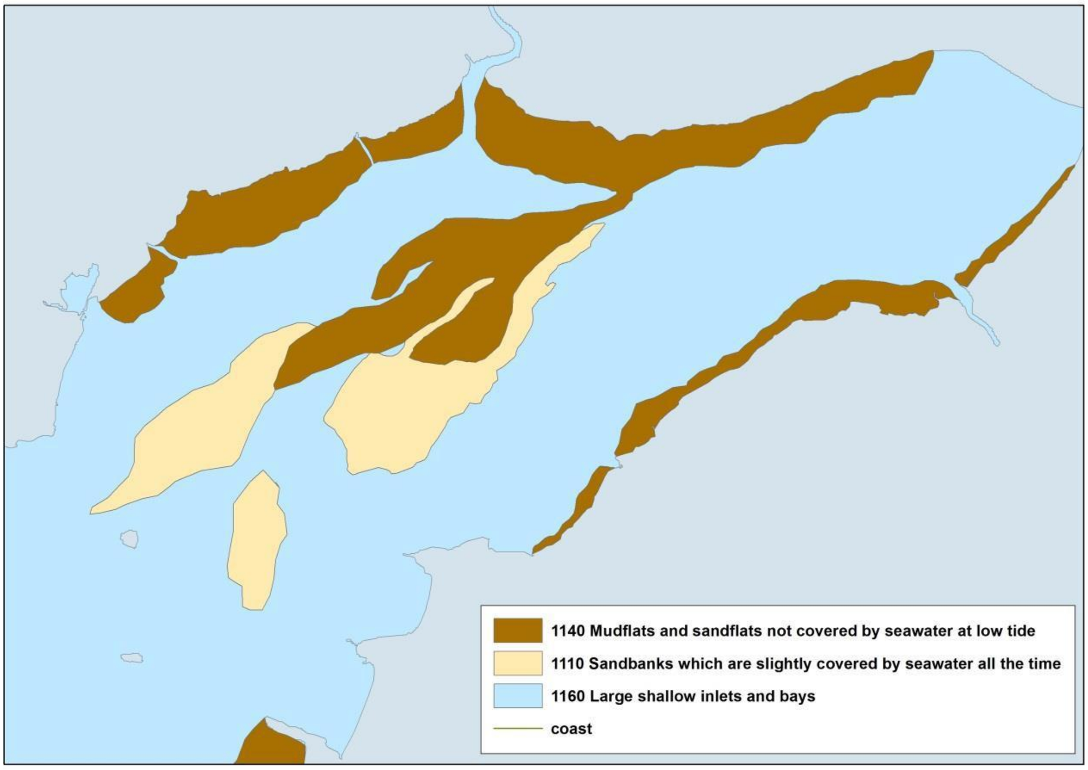
This section provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Habitats listed in Resolution No. 4 (1996) can be both biotopes or biotope complexes and sometimes one habitat listed in Resolution No. 4 (1996) is a component of another habitat. As a result, patches of one or several habitats listed in Resolution No. 4 (1996) can occur within another habitat (see examples in Table 16).

Table 16: Examples of overlapping habitats

'X01 Estuaries'' could include areas of: • A2.2 Littoral sand and muddy sand • A5 Sublittoral sediment • A2.2 Littoral sand and muddy sand
'D1.2 Blanket bogs' often have small areas of: • C1.4 Permanent dystrophic lakes, ponds and pools • D2.3 Transition mires and quaking bogs

Figure 8: How to treat overlapping habitats
Note: The area to be reported for 'X01 Estuaries' (blue) will also include the areas of 'A5 Sublittoral sediment' (yellow) and 'A2.2 Littoral sand and muddy sand' (brown*).*



Where this happens, each habitat should be reported in its entirety. Therefore, some areas may have contributed to two or more assessments, as illustrated in Figure 8. This will allow an effective estimate of the total area of the different habitats for each Country and region.

2.1.2 Marine habitats

This chapter provides complementary information to Guidelines on ‘Explanatory notes in support to the Reporting Format’.

Marine regions

The map of biogeographical regions was prepared from terrestrial data and is therefore not appropriate for reporting on non-coastal marine habitat types and species.

For marine habitats, countries should report conservation status using the following marine regions:

- Marine Artic
- Marine Atlantic;
- Marine Baltic;
- Marine Black Sea;
- Marine Caspian
- Marine Mediterranean;
- Marine Macaronesian.

Habitats to be reported in marine regions

For the purposes of the reporting under Resolution No. 8 (2012), habitat types ‘always open to the sea’ are classified as marine (e.g. estuaries, although they can also extend beyond the coastline). Coastal lagoons, which do not have a permanent opening to the sea, are therefore classified as terrestrial. For the reporting under Resolution No. 8 (2012) the only habitats listed on Resolution No. 4 (1996) to be considered for this exercise is ‘X01 Estuaries’.

Listing of the habitat types as ‘marine’ does not have any effect on the definition of these habitat types.

2.1.3 Sources of information for assessing habitat types

As is the case for species, countries are committed to monitor the status of habitats under Resolution No. 8 (2012).

In many countries there are also existing inventories of certain habitat types (e.g. forests or grasslands) which have been produced for a variety of purposes. These may not use the same classification of habitats as Resolution No. 4 (1996) (EUNIS), but in many cases they can be reinterpreted, possibly with the aid of further information such as soil or geological maps. Many countries have published ‘translations’ between various habitat classifications and the typology used in Resolution No. 4 (1996), EUNIS, and the Palearctic classifications (Devillers & Devillers-Terschuren, 1996). The EEA with its ETC/BD developed the EUNIS Habitat Classification[18], a system that can be used for crosslinking different habitat classification systems.

Where no map of habitat range exists, it may be possible to model the range from other sources of data, such as maps of potential natural vegetation (e.g. Bohn et al., 2004), distribution of key species, soil and geological maps, climate data or topographical maps.

Several countries have monitoring schemes based on stratified random sampling, such as the Countryside Survey[19] in the United Kingdom or Nationell Inventering av Landskapet i Sverige (NILS)[20] project in Sweden. Although these methods might not give detailed information on distribution of detailed habitat types listed in Resolution No. 4 (1996), they can give good estimates

[18] https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification-1

[19] UKCEH Countryside Survey | UK Centre for Ecology & Hydrology

[20] https://www.slu.se/en/Collaborative-Centres-and-Projects/nils/

of habitat type area and trends in area. Similarly, information collected for national forest inventories or repeated phytosociological surveys may be important sources of information if they can be linked to habitats listed in Resolution No. 4 (1996).

There are numerous remote sensing projects (e.g. GeoBON[21]) used to both map and assess quality of habitat types. However, such techniques are to some extent still under development and have to be tested or adapted for operational use for most of the habitats listed in Resolution No. 4 (1996).

[21] https://geobon.org/

2.2 Trends

This chapter provides complementary information to the Guidelines on ‘Explanatory notes in support to the Reporting Format’.

The conservation status assessment stresses the importance of trend information: trends are decisive for the assessment of the conservation status since usually only stable or increasing trends can result in an overall Favourable conservation status (FCS) conclusion. Therefore, in general, more attention should be paid to the methodology of monitoring schemes to improve the quality of trend information.

Trends are an essential part of assessing all conservation status parameters except Future prospects. A comparison between the overall trend of habitat area and the area in good condition in the biogeographical region and trends within the Emerald Network sites is important in assessing the impact of the Emerald Network on conservation status (see Section 2.10 Emerald Network (Proposed, Candidate and Adopted Sites) coverage for the habitat types listed in Resolution No. 4 (1996).).

Trends are usually derived from modelling or existing monitoring schemes which are based on sampling, as complete surveys are exceptional and usually only undertaken for very rare habitats, sampling methods should be statistically robust wherever possible. In the absence of dedicated monitoring schemes, **trends are usually a result of expert opinion and in that case should be reported only as directions (increasing/decreasing/stable), without absolute values**. Unknown trends should be reported as ‘unknown’. If the available data are not sufficient to determine trend direction, this can be reported as ‘uncertain’.

Trend is a (measure of a) directional change of a parameter over time. Trends should ideally be the result of a statistical regression of a time series. Fluctuation (or oscillation) is not a directional change of a parameter, and therefore fluctuation is not a trend. However, fluctuations can occur within a long- term trend (of some habitats) and can affect the measurement of short- term trends because it is difficult to assess whether there is a real trend in the short term, or whether there is simply a fluctuation effect.

Fluctuation is an intrinsic character of all natural systems and can be observed for all directions of the trend (increasing, decreasing, and stable). However, it is only detectable in regularly surveyed habitats. Fluctuations are only likely to be detected when the parameter is measured several times within a given timeframe. Ideally, they will be based on more frequent sampling. In reality, this is unlikely to happen in short timeframes (such as 12-year intervals), and setting short- term trends in a long- term context will help to identify where fluctuations are occurring.

Fluctuations in Range or Area covered by habitat are rarely detectable over a 12- year period and any fluctuation of these values is mostly long term. However, measurement of these parameters can be inexact and longer- term information may be required to detect any real changes, given the range of data availability, sample sizes and possible survey methods.

The criteria used to decide whether a trend should be categorised as ‘stable’, ‘increasing’, or ‘decreasing’ varies depending on the type of trend information available.

If trend data are robust and they allow statistically significant modelling, but the trend (magnitude) is very small (e.g. if the confidence limits do not overlap zero and are narrow enough to allow for a high degree of confidence), even small trends should be reported as directional trends (‘decreasing’ or ‘increasing’). If the status assessment deviates from the matrix rules (the status cannot be favourable if the trend is decreasing) due to negligible trend magnitude this should be explained in the field ‘12.1 Justification of % thresholds for trends’.

On the other hand, **if the data quality is not good enough and it is not possible to model a statistically significant directional trend (confidence limits do overlap zero), the trend should be considered and reported as stable**. Any further details can be provided in the corresponding field ‘Additional information’.

Short- and long-term trends

The reporting under Resolution No. 8 (2012) considers a period of six years, but estimates of trends are more likely to be statistically robust over longer time periods. It is therefore recommended to estimate short-term trend over two reporting cycles, i.e. 12 years (or a period as close to this as possible), as this should give a more reliable and comparable estimate of the trend; see Table 17). Long-term trends, which are likely to be more statistically robust, can also be reported (in a series of optional fields). The recommended period for assessing longer-term trends is four reporting cycles (24 years).

The short-term trend information should be used in the evaluation matrix to undertake the conservation status assessment. In particular, the short-term trend magnitude is important for distinguishing the conservation status categories for unfavourable i.e. U1 unfavourable-inadequate and U2 unfavourable-bad. For the range and area parameters a loss of >1% per year trend magnitude (over the short-term trend period) signifies an unfavourable-bad conservation status.

Table 17 Period for assessing trends

Trend	Period to assess trend
Short-term	Two reporting cycles (12 years; or a period as close as possible)
Long-term	Four reporting cycles (24 years; or a period as close as possible)

The trend magnitude reported should be the change over the relevant period (e.g. 12 years for short-term trend). Where magnitude is derived from data covering a different time interval, estimate the change for the reporting period by simple proportion. For example, a change of 150 km^2 over 15 years would be equivalent to 10 km^2 per year or 120 km^2 over the 12-year interval for short-term trend magnitude. When a change appeared at a specific time (for example, as a result of a catastrophe) precise time period or year should be reported, and an explanation should be provided under the field ‘Additional information’.

2.3 Favourable reference value

This chapter provides complementary information to the guidance provided on favourable reference values in the Guidelines on 'Explanatory notes in support to the Reporting Format'. Examples of setting favourable reference values can be found in the Reporting Reference Portal.

What are favourable reference values?

The concept of favourable reference values (FRVs) is derived from the definition of Favourable conservation status that relates to the 'long-term distribution and abundance' of the populations of species, and for habitats to the 'long-term natural distribution, structure and functions as well as the long-term survival of its typical species' in their natural range. This requires that the species is maintaining itself on a long-term basis as a viable component of its natural habitats. Similarly, for habitats, it is required that the specific structure and functions necessary for its long-term maintenance exist and will continue to exist and that its typical species are in favourable status, i.e. are maintaining themselves on a long-term basis. If Contracting Parties do not maintain or restore such a situation, the objective of the Convention is not met.

Favourable reference values – 'range' for species and habitats, 'population' for species, and 'area' for habitats – are critical in the evaluation of conservation status. The evaluation matrices (Parts C and E) of the reporting format require Countries to identify favourable reference values for range (FRR) and area (FRA) for habitats and for range (FRR) and population (FRP) for the species. The conservation status assessment then looks at the difference between current values and reference values. Basically, the range, area, and population must be sufficiently large in relation to favourable reference values (as defined in the evaluation matrix) to conclude, alongside other criteria (e.g. trends), whether the parameter is 'favourable' or 'unfavourable'.

The concept of favourable reference values describes the favourable reference range, population and habitat area as follows:

> *Range within which all significant ecological variations of the habitat/species are included for a given biogeographical region and which is sufficiently large to allow the long-term survival of the habitat/species; favourable reference value must be at least the range (in size and configuration) when Resolution No. 8 (2012) came into force; if the range was insufficient to support a favourable status the reference for favourable range should take account of that and should be larger (in such a case information on historic distribution may be found useful when defining the favourable reference range); 'best expert judgement' may be used to define it in absence of other data.'*

> *Population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species; favourable reference value must be at least the size of the population when Resolution No. 8 (2012) came into force; information on historic distribution/population may be found useful when defining the favourable reference population; 'best expert judgement' may be used to define it in absence of other data.*

> *Total surface area of habitat 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; favourable reference value must be at least the surface area when Resolution No. 8 (2012) came into force; information on historic distribution may be found useful when defining the favourable reference area; 'best expert judgement' may be used to define it in absence of other data.*

Setting favourable reference values (FRVs) for habitat types

Overview of general principles for setting reference value

Before setting the favourable reference values, it is advisable to collect all the relevant information about a habitat in order to understand its ecological and historical context. Therefore, ideally, data and information on the following factors should, when available, be gathered and used when estimating FRVs for habitats:

- current situation and assessment of deficiencies, i.e. any pressures/problems;
- trends (short-term, long-term and historical, i.e. before the Bern Convention came into force);
- natural ecological and geographical variation (including variation in species composition, variation in conditions in which habitats occur, variation of ecosystems);
- ecological potential (potential extent of range, taking into account physical and ecological conditions, contemporary potential natural vegetation);
- natural range, historical distribution and abundances and causes of change, including trends;
- connectivity and fragmentation;
- dynamics of the habitat type;
- requirements of its typical species.

The following general principles should be considered in the process of setting FRVs:

- FRVs should be set on the basis of ecological/biological considerations;
- FRVs should be set using the best available knowledge and scientific expertise;
- FRVs should be set taking into account the precautionary principle and include a safety margin for uncertainty;
- FRVs should not, in principle, be lower than the values when Resolution No. 8 (2012) came into force, as most habitats have been listed in the Resolution No. 4 (1996) because of their unfavourable status; the distribution (range) and size (area) at the date of entry into force of the Resolution No. 8 (2012) does not necessarily equal the FRVs;
- FRVs are not necessarily equal to 'national targets': 'Establishing favourable reference values must be distinguished from establishing concrete targets: setting targets would mean the translation of such reference values into operational, practical and feasible short-, mid- and long-term targets/milestones. This obviously would not only involve technical questions but be related to resources and other factors' (European Commission, 2004[22]);
- FRVs do not automatically correspond to a given 'historical maximum', or a specific historical date; historical information (e.g. a past stable situation before changes occurred due to reversible pressures) should, however, inform judgements on FRVs;
- FRVs do not automatically correspond to the 'potential value' (maximum possible extent) which, however, should be used to understand restoration possibilities and constraints.

Although FRVs have to be set separately for range and surface area, **there is a clear relationship between range and surface area of a habitat**, because within the natural range all significant ecological variations must be considered. This calls for an iterative process in setting the FRVs to ensure that one value takes the other one into account, e.g. habitat stands/parcels large enough with an appropriate range to include all its structural components, its typical species and a characteristic functioning.

[22] Assessment, monitoring and reporting of conservation status – preparing the 2001–2007 report under Article 17 of the Habitats Directive (DocHab-04-03/03 ver.3). DG Environment, 2004.

FRVs have to be reported at the level of the Country biogeographical/marine region. However, these geographical units may not be appropriate for developing a rationale for FRVs based on ecology of habitats. Therefore, it is advisable to set FRVs at the most suitable scale (often national, sometimes supranational) and to derive the national biogeographical numbers from this value, e.g. using a proportion based on distribution and/or size/area.

When setting FRAs it should be remembered that several habitats potentially can occupy the same site, e.g. a given area of land, depending on history and current management, could be a grassland, a heathland or a forest[23]. In case where potentially several habitat types could occupy the same place, priority should be given to the rarer or more threatened habitat type, to regionally important subtypes or specific sets of typical species which can only be developed in this place. Care should also be taken to ensure that the combined FRAs do not exceed the area of the region.

The term 'current value' will be used often in these guidelines. It should be interpreted as being the value reported by the Country for the present reporting period, which is to be compared to the favourable reference value.

Model-based and reference-based approach

There are basically two approaches to setting FRVs: model-based and reference-based. Model-based methods are built on biological considerations. This approach requires good knowledge about the habitat type ecology, its typical species and its structure and functions. Reference-based approaches are founded on an indicative historical baseline corresponding to a documented (or perceived by conservation scientists) good condition of a particular habitat or restoring a proportion of estimated historical losses. Both approaches consider information about distribution, trends, known pressures and declines (or expansions). These approaches are not mutually exclusive and will be further explained in the sections below with practical instructions and examples.

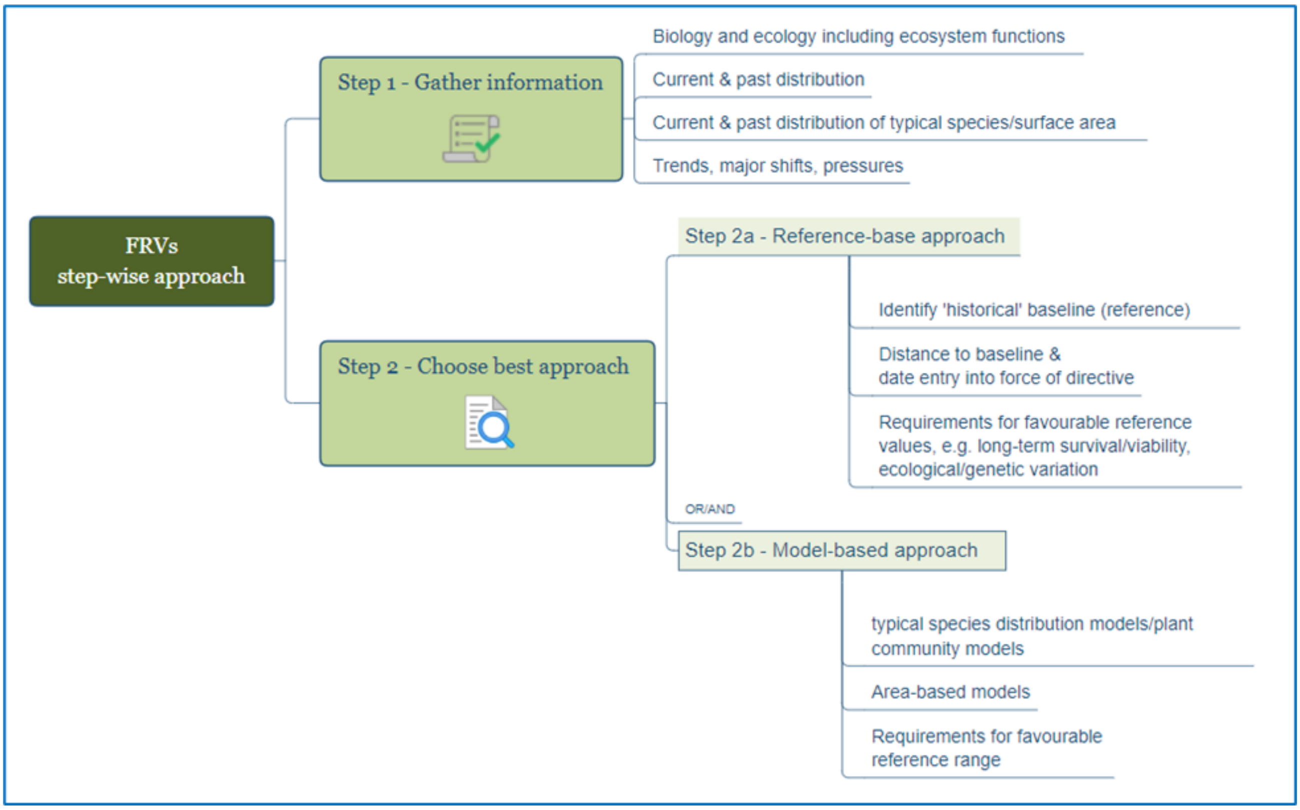
With the objective of developing practical and pragmatic guidance promoting harmonisation between Contracting Parties, while allowing for the needed flexibility (e.g. the best method to be used depends on the data available), a stepwise approach, as summarised in Figure 9 below, is recommended.

The stepwise approach and the specific methods for setting the FRVs are largely dependent on the available data and knowledge for each habitat. Three generic levels of data availability and knowledge are suggested:

- High: good data on actual distribution and ecological requirements/features; good historical data and trend information;
- Moderate: good data on actual distribution and ecological requirements/features; limited historical distribution data (only trend data available);
- Low: data on actual distribution and ecological requirements/features are sparse and/or unreliable; hardly any historical data available and no trend information.

Figure 9: Illustration of the stepwise approach to set FRVs

[23] For example, these two habitat types typical of limestone areas in much of Europe: E1.12 Euro-Siberian pioneer calcareous sand swards and F3.16 Juniperus communis scrub.



The recommended approach involves a certain number of steps that will be further detailed below. In summary, and without detailing all conditions, they are:

- **Step 1: Gather information**

Collect all relevant information about a habitat type necessary to understand their ecological and historical context: biology and ecology including ecosystem functions; typical species; natural range, current and past distribution (including before Resolution No. 8 (2012) came into force) and population size/surface area; trend and when major changes occurred, pressures.

- **Step 2: Choose best approach**

Depending on the availability and quality of the data and information gathered, choose the best way of setting the FRVs.

Step 2a: Use reference-based approach

Compare the current distribution and surface area with those of a past favourable period and at the date of entry into force of Resolution No.8 (2012).

Check if the values above are sufficient to ensure long-term survival and viability, as well as coverage of ecological variations including typical species.

Set values or use percentage classes to qualify how far the current value is from the favourable situation.

Step 2b: Use model-based approach

Develop area-based models or use available estimates derived from such models to assess the favourable reference area, taking into account the requirements for a favourable reference range.

The favourable reference values – FR range and FR area – need to capture the requirements of the Convention concerning the ecological diversity (subtypes) within the habitat type natural range and the structure and functions necessary for its long-term maintenance and the favourable status of its typical species.

The ecological diversity, one of the requirements for a Favourable conservation status, is often expressed along geographical (north–south/east–west) and other environmental gradients (e.g. altitudinal, geological, climatic) and is frequently reflected in changes in floristic composition.

Stepwise process for setting the favourable reference values for habitats

Step 1: Gather information about the habitat type

The list below includes examples of data and information about the habitat type, linked to its definition, which may be relevant in setting the FRVs:

- physical and ecological conditions;
- variation in species composition and abundance across geographical regions, environmental gradients (e.g. altitude, depth) and land use or other impacts of human activities;
- physical structure, dynamics and possible successional stages;
- characteristic structure and functions;
- typical species, their range and conservation status.

Another set of information to be collected includes data and information on distribution (and therefore range) and surface area of the habitat type in the historical and recent past, when Resolution No. 8 (2012) came into force, and currently (i.e. when the assessment is being done). The historical past would go up to the last two or three centuries (where applicable), and the recent past up to about 50 years before Resolution No. 8 (2012) came into force.

This information is crucial to understand what has been happening to the habitat type and support the setting of FRVs in the following steps. This evidence should be complemented with information on trends and pressures, to understand which events caused major changes/shifts in the status and trends of habitat distribution and area covered by habitat, and when. For example, semi-natural habitats depending on extensive agricultural management, experienced cultivation, severe intensification and fragmentation or even abandonment in most parts of Europe after World War II have caused serious declines in their quantity and quality. For some habitat types, useful information can be found in the *Interpretation manual of the habitats listed in the Resolution No. 4 (1996)*[24].

Step 2a: Use reference-based approach to set FRVs

The availability and quality of the data and information gathered in Step 1 will vary from habitat to habitat, but also for distribution (range) and for habitat areas.

However, it should be possible to use that information in a pragmatic way to have a rough estimation of how far from ‘favourable reference values’ the current values on range (based on distribution) and area are (using the ‘approximately equal to the FRV’ and the pre-defined ranges given in the reporting format).

The ‘decision key’ below should be used in general, noting that for many habitat types (e.g. most forest types) Step 2a, using the model-based approach, could be more appropriate. In addition, elements from Step 2b may also be used to help estimate the FRA below. Consider the above section ‘General principles for setting favourable reference values (FRVs)’.

[24] Annex I (coe.int)

Point 1
If both distribution (range) and surface area of the habitat have not undergone visible shifts or reductions (trends have been relatively stable) in the past, including in the recent past, AND current area of the habitat is large enough to ensure long-term viability of the habitat and its typical species, then the: • favourable reference range (FRR) should be equal or approximately equal to the current range; • favourable reference area (FRA) should be equal or approximately equal to the current surface area. If the current range is smaller than the past range, ⇨ go to point 2. If the current habitat area is smaller than the past area, ⇨ go to point 3. If there is not sufficient historical information or if this is not useful (e.g. many forest habitats), go to Step 2b (model-based approach).

Point 2 – the current range is smaller than the past range
Identify which additional areas, within its natural range, should be covered by the habitat type in the future in order to re-establish a past range that is big enough and well distributed to accommodate viable areas in the long term; this should consider whether the restoration of the range is technically and ecologically feasible. The availability and quality of the data used to make such an identification and estimation could lead to different ways of expressing the FRR: • a **value** equal to 'current range value' plus 'additional range area to be restored'; • a **pre-defined range** indicating more than the current e.g. range is 2 – 10% smaller than the FRR, 11 – 50% smaller than the FRR, 51 – 100% smaller than the FRR • in any case, the estimated FRR cannot be smaller than the range at the date of entry into force of the Resolution No. 8 (2012).

Point 3 – the current habitat area is smaller than the past area
Identify what needs to be done to restore the habitat area (or to allow for recovery) to a past level; this should consider whether the restoration/recreation is technically and ecologically feasible. Information about past trends, if available, should inform the setting of the FRA. The availability and quality of the data used to make such an identification and estimate could lead to different ways of expressing the FRA: • a **value** equal to 'current habitat area' plus 'additional area to be restored/recreated'; • a **pre-defined range** indicating larger than current habitat area e.g. habitat area 2 – 10% smaller than the FRA, 11– 25% smaller than the FRA, 25 – 50% smaller than the FRA, 51 – 100% smaller than the FRA; in any case, the estimated FRA cannot be smaller than the habitat area at the date of entry into force of Resolution No.8 (2012).
Point 4 – unknown
A conclusion of FRR or FRA 'unknown' should only be used in the cases where there is hardly any data about habitat's current range and surface area and no information about its historical context.

Step 3b: Use model-based approach to set FRVs

There are some habitat types for which a purely reference-based approach is not possible or inappropriate to set the FRVs, particularly the favourable reference area, e.g. for forest types with very small areas in the recent past. In this case the concept of 'minimum dynamic area' (MDA) can be used to establish a minimum area for proper functioning of the habitat and to buffer against natural disturbance and anthropogenic impacts. Next, this area must be scaled up to a favourable area by considering historical distribution and ecological variations in the natural range.

In general, if there are typical species whose conservation status is clearly related to the area of a habitat listed in Resolution No. 4 (1996), an evaluation of the status of those species may help setting a value for favourable reference area.

In addition to the considerations above, the fact that many habitat types listed in Resolution No. 4 (1996) are semi-natural and their existence largely dependent on human activities (e.g. extensive agriculture, including grazing and mowing, traditional forest management such as cork production or coppicing) may require a combination of reference-based and model-based approaches to derive the FRVs. Therefore, Step 2a and Step 2b should be considered in an iterative way, and elements from one step used in the other step.

There are some habitats that are closely linked to a single species and for which the approach described above for species could be appropriate (with modification to get area), for example for habitats 'F3.16 Juniperus communis scrub' and F3.16 Juniperus communis scrub.

2.4 Maps

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Distribution maps

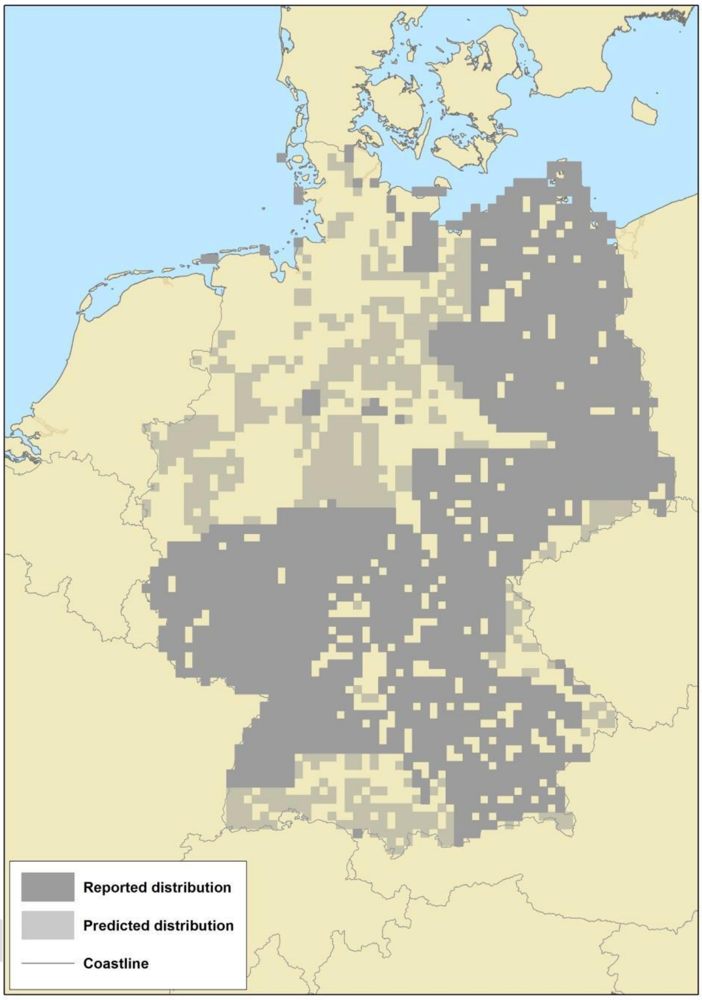
Submission of maps of the distribution of habitats listed in Resolution No. 4 (1996) present in a country is a basic requirement of the reporting under Resolution No. 8 (2012). Principal requirements for distribution maps are described in the Guidelines on 'Explanatory notes in support to the Reporting Format' and further technical specifications will be provided on the Reporting Reference Portal.

Ideally, the distribution map should provide complete and up-to-date information about the actual occurrence of the habitat based on the results of a comprehensive mapping programme/initiative/project/inventory or a statistically robust model.

In many cases up-to-date field data will only cover part of a real habitat distribution or only relatively old data will be available. In these situations, the reporting format foresees that the distribution map is derived from a model or extrapolation. Countries are encouraged to report a more up-to-date or complete distribution by remapping the available distribution using other data, such as the results of a monitoring programme or data on potential vegetation.

In some cases, even with the use of extrapolation, the resulting distribution map will be highly incomplete when compared with presumed habitat distribution (see Figure 10). The countries are encouraged to provide the incomplete distribution map. If the reported distribution map obtained as a result of comprehensive mapping, modelling or extrapolation or expert interpretation covers less than 75 % of the presumed actual species distribution (the resulting map is incomplete in relation to the presumed species distribution), **the 'Method used' should be reported as '(d) Insufficient or no data available'**.

Figure 10: Hypothetical distribution map of a habitat in Germany with predicted (presumed) and reported distribution. Reported distribution represents less than 75 % of a presumed distribution, so the 'Method used' should be evaluated as '(d) Insufficient or no data available'.



2.5 Range

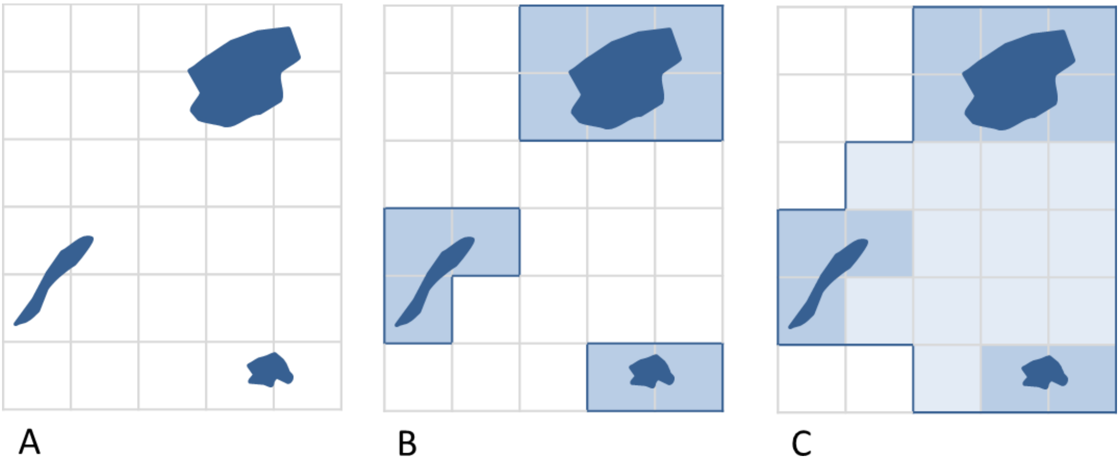
This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Concept of range

Range is defined as 'the outer limits of the overall area in which a habitat is found at present and it can be considered as an envelope within which areas actually occupied occur.' It is a dynamic parameter allowing the assessment of the extent of and the changes in the habitat distribution.

Range is a spatial generalisation of distribution, which is a representation of the habitat occurrences in the 10 x 10 km grid. The relationship between habitat occurrence, distribution and range is illustrated in Figure 11.

Figure 11: Relationship between occurrence of habitat, distribution and range. 'A' occurrence of habitat, usually a polygon, point or a linear feature (the total area of polygons is reported as a Surface area covered by habitat, field 5.2); 'B' distribution – occurrence in 10 x 10 km grids; 'C 'range – spatial generalisation of the distribution



The range can be described as follows:

The natural range describes roughly the spatial limits within which the habitat or species occurs. It is not identical to the precise localities or territory where a habitat, species or sub-species permanently occurs. Such actual localities or territories might for many habitats and species be patchy or disjointed (i.e. habitats and species might not occur evenly spread) within their natural range. If the reason for disjunction proves to be natural i.e. caused by ecological factors, the isolated localities should not be interpreted as continuous natural range, for example for an alpine species the range may be the Alps and the Pyrenees, but not the lower area between. The natural range includes however areas that are not permanently used: for example, for migratory species 'range' means all the areas of land or water that a migratory species inhabits, stays in temporarily, crosses or overflies at any time on its normal migration[25]. Vagrant or occasional occurrences (in the meaning of accidental, erratic, unpredictable) would not be part of the natural range.

Natural range as defined here is not static but dynamic: it can decrease and expand. Natural range can also be in an unfavourable condition for a habitat or a species i.e. it might be insufficient to allow for the long-term existence of that habitat or species.

When a species or habitat spreads naturally (on its own) to a new area/territory or when a reintroduction of a species as referred to in the Chapter V, Article 11 of the Bern Convention and the Recommendation No. 158 (2012) has taken place into its former natural range, this territory has to be considered a part of the natural range. Similarly, restoration/recreation or management of habitat areas, as well as certain agricultural and forestry practices can contribute to the expansion of a habitat or a species and therefore its range.

However, individuals or feral populations of an animal species introduced on purpose or accidentally by man to places where they have not occurred naturally in historical times or where they would not have spread to naturally in foreseeable future, should be considered as being outside their natural range and consequently not covered by the Resolution No. 4 (1996).

Calculation of range

Bearing in mind the dynamics of the range as defined above, the range should be calculated based on

[25] See also article 1 of the Bonn Convention

the map of the actual (or presumed if also modelling, extrapolation of expert opinion was used) distribution used for each reporting period. The calculation should involve a standardised method. A standardised process is needed to ensure repeatability of the range calculation in different reporting rounds and for comparison of results between countries. It will also allow for estimating range trends.

The standardised process proposed in these guidelines consists of two steps:

1. Creating an envelope(s) around the distribution grids. This spatial calculation is done using the procedure of 'gap closure' where a predefined set of rules specify where two distribution points/grids will be joined together to form a single range polygon, and where an actual gap in the range will be left.
2. Excluding unsuitable areas. After the automated calculation, areas which are not appropriate, such as marine areas in the range of a terrestrial habitat, should be excluded.

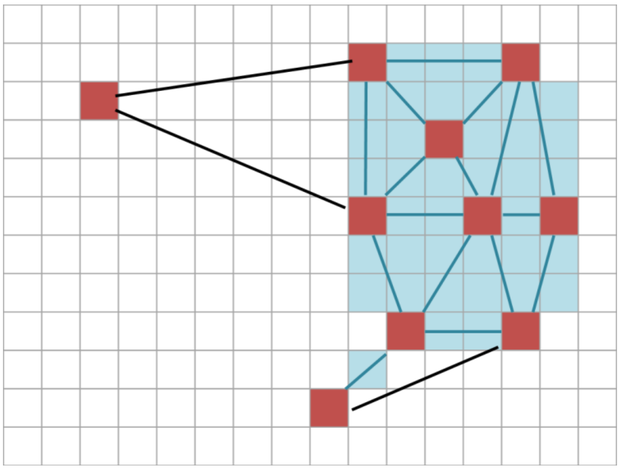
Step 1: Creating an envelope(s) around distribution

grids What is a gap distance?

Most of the basic principles for the range estimation, including the size of gaps which will represent a discontinuity in the range, were established during the 2000–2006 Nature directives reporting period and will still be valid. Range should exclude major discontinuities that are natural, i.e. caused by ecological factors. What is considered as a natural discontinuity is largely dependent on the ecological characteristic of the habitat and the character of the surrounding landscape. Ideally, the criteria for the range discontinuities should be defined separately for each habitat in each particular landscape, but this is practically impossible. The guidelines for reporting provide a generalised and simplified approach to range discontinuities.

In the process of calculating a range the natural discontinuities are represented by a 'gap distance'. A gap distance should be understood as the distance between two distribution grids that will not be joined together to form a single range polygon but will be shown as discontinuities in a range (see Figure 12).

Figure 12: A schema illustrating use of the gap distance in calculating range. If the distance between two occupied distribution grids (red grids) is smaller than the gap distance (blue lines), the distribution grids are joined to form a range (blue grids). If the distance between two distribution grids is higher than the gap distance (black lines), two distribution grids are not joined and represent a discontinuity in the range.



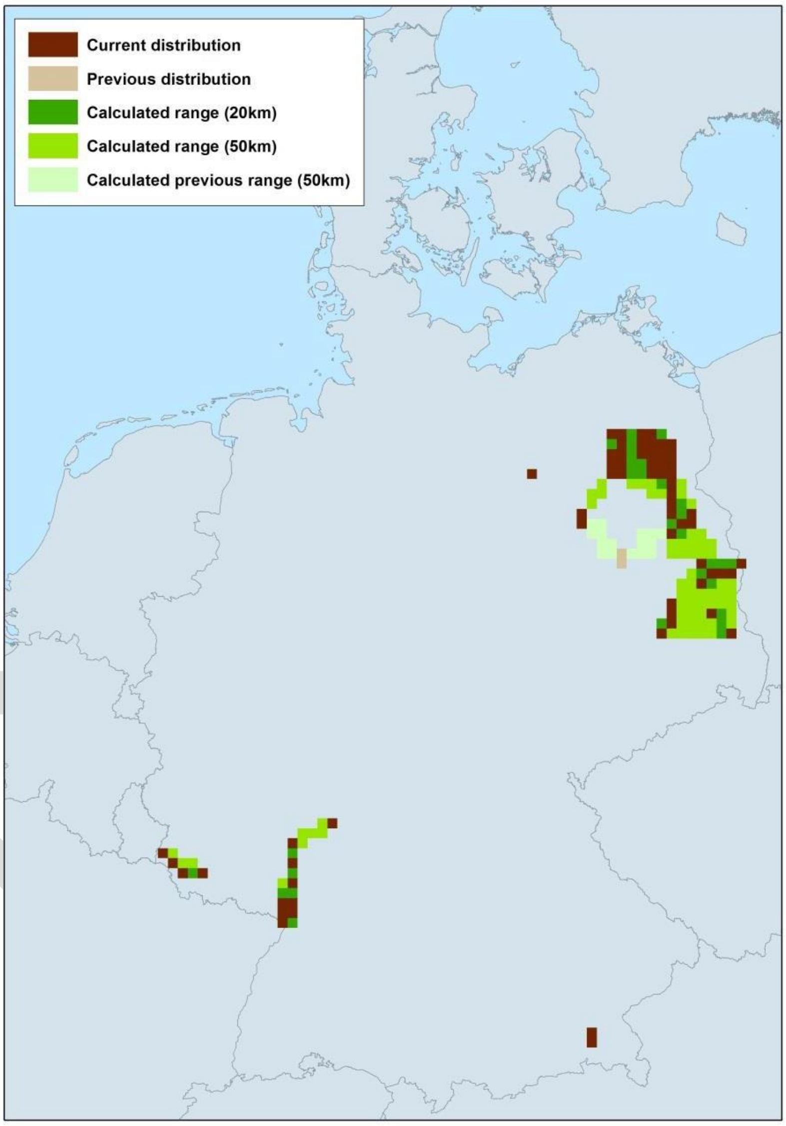
Constraints for selecting the gap distance

The gap distance should correspond to the definition of range (as an envelope generalising the distribution with major discontinuities excluded) and it should allow the calculation of range polygons, which are capable of detecting large-scale changes in the distribution. A range that is calculated with larger gap distances (i.e. 40–50 km) is more sensitive to changes at the margins of the distribution and large-scale changes within the outer limit of the distribution. On the other hand, range calculated with smaller gap distances (e.g. 20 km) is sensitive to small-scale changes (see Figure 13).

A discontinuity of at least 40–50 km (depending on whether the habitat is rare and localised or common and widespread) is considered a gap in the range of habitat. For relatively localised habitat types a gap distance of 40 km is recommended, which is equal to the recommended gap distance for plant species which represent the main structural components of the majority of the habitats. However, for widespread habitats which are structurally similar to the surrounding landscape matrix the gap distance could be increased to 50 km.

For small countries or for other small territories for which the distribution map is provided using the 1 x 1 km grid or 5 x 5 km grid (see ‘Explanatory notes in support to the Reporting Format’) the gap distances can be adapted accordingly (e.g. a gap distance of 4 -5 grids = 4-5 km can used instead of 40-50 km recommended above).

Figure 13: An example of range maps created using different gap distances. This map shows the difference between the range calculated with 20-km and 50-km gap distances. Where a single marginal population occupying two 10 x 10 km grids on the map is lost (Previous distribution) the range calculated with 50-km gap distance (Calculated range 50 km) will decrease by more than 15 % of its original area (Calculated previous range 50 km). Using the gap distance of 20 km, where this marginal population will remain isolated from the main range polygon (Calculated range 20 km), the decline in the range area will be around 3 % of its original area. With a 12-year reporting period the same situation would lead to different conclusions: 'unfavourable-bad' for the range with a 50-km gap and 'unfavourable-inadequate' for the range with a 20-km gap.



For very rare and/or localised habitats occurring in particular environmental conditions, the range should be equal to the distribution.

Step 2: Excluding unsuitable areas

Technically, range is calculated by filling in the unoccupied grids between the cells of distribution. The following types of unsuitable areas should be excluded from the calculated range:

- marine areas automatically included in the range of terrestrial habitats;
- terrestrial areas automatically included in the range of marine habitats;

- areas beyond national boundaries;
- areas identified by the range tool as part of the range falling in the adjacent biogeographical or marine regions for which the habitat is not noted on the checklist;
- areas more than 20 km from coastline for coastal habitats;
- areas without water bodies for freshwater habitats and vice versa.

Although the distinction between suitable and unsuitable areas is very coarse, the purpose of this step is to correct only the most important contradictions resulting from automated calculation. Technically, the process described in this step should be simple and applicable across all countries.

2.6 Structure and functions (including typical species)

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

Structure and functions is one of the four parameters used for assessing the conservation status of a habitat when reporting under Resolution No. 8 (2012). The parameter is based on part of the definition of Favourable conservation status of a habitat type, which reads: '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.'

Structures are considered to be the physical components of a habitat type. These will often be formed by assemblages of species (both living and dead), e.g. trees and shrubs in a woodland, corals in some forms of reef, but can also include abiotic features, such as gravel used for spawning. Functions are the ecological processes occurring at several temporal and spatial scales and they vary greatly between habitat types. For example, tree regeneration and nutrient cycling are important functions in woodland habitats. Fragmentation can disrupt the functioning of habitats which are not naturally fragmented and is a factor that should be taken into account when assessing Structure and functions.

The composition of a given habitat type may vary geographically. For instance, the species composition of a widely distributed habitat type such as 'G1.6 *Fagus woodland*' will differ; in France alone, 13 subtypes have been recognised (Bensettiti et al., 2001), reflecting regional variation. However, for a given habitat type, the associated functions will be similar throughout its range. Structure is relatively simple to observe/measure, but functions are usually more difficult. However, as functions are often related to a particular species or species groups, the presence of certain species can indicate that functions are favourable.

For a habitat type to be considered as being at Favourable conservation status, its structure and functions need to be favourable and its 'typical species' to be at Favourable conservation status. Given the wide range of habitat types listed in Resolution No. 4 (1996) and their inherent variability, it is not possible to give detailed guidance for each individual habitat type, but clearly, the various ecological processes essential for a habitat type have to be present and functioning well for the habitat type to be considered as being at Favourable conservation status.

The assessment of Structure and functions is carried out for each biogeographical of a country. In many cases, it is not necessary for all components of the structures or functions to be present on all sites where a habitat type occurs. For example, although all age classes of a woodland type, from saplings and young (natural) regrowth to senescent trees and natural decay phases, need to be present at a regional scale, together with sufficient regeneration, it is not necessary for every stand site to have all the age classes. A single site of a habitat type can be considered to be in 'good' status even if not all age classes, etc. are present if the various stages are well represented in the habitat at a regional scale.

For cave habitats their number can be used as a proxy to inform the conclusion on Structure and functions. However, the number of caves should not be reported in the fields '5.2 Surface area' or '6.1 Condition of habitat' as these two fields relates explicitly to area in km^2. In case the Structure and functions assessment is based on the number of caves, any details (like number of caves with good or not good conditions) should be provided in the field '6.8 Additional information'. A similar approach (using km as the length measurement for assessments but recording extrapolated area in km^2) can be used for cliffs, if the area measurement is not available and if using lengths will give more accurate assessments (supposing that for all three values: area covered by habitat, habitat area in good/not good condition and favourable reference area) the extrapolation method and precision will be the same.

Condition of habitat type

Previous reporting on the conservation status of Structure and functions did not give any information on what proportion of the habitat type is in good condition, and this has limited the use of reporting data to help identify priorities for restoration or for broader ecosystem assessment studies.

Therefore, it has been agreed to report the area in 'good condition', 'not-good condition', and 'not known' (field 6.1 'Condition of habitat') together with the short-term (12 years) trend direction in the area assessed as 'good'. The direction of the trend ('stable', 'increasing', 'decreasing', 'uncertain', 'unknown') will help measure progress towards Favourable conservation status and towards progressing on the conservation of habitats and species.

Several countries have published detailed guidance on assessing the condition of habitats at the site/stand level (see Table 18). Maciejewski et al. (2016)[26] review many of the concepts necessary for evaluating the condition of habitats at the site scale.

Table 18: Examples of detailed guidance on assessing habitat condition

Poland	Methodological guides - Monitoring gatunków i siedlisk przyrodniczych[27] Przewodniki metodyczne - Monitoring gatunków i siedlisk morskich[28] Dla siedlisk przyrodniczych - Monitoring gatunków i siedlisk przyrodniczych[29]
Sweden	Handledning för miljöövervakning[30] Biogeografisk uppföljning av naturtyper och arter[31] National Inventories of Landscapes in Sweden, NILS | Externwebben[32]

Although it may be possible to have information for every occurrence of a very rare habitat with a small total area, for most of the habitat types listed in Resolution No. 4 (1996) some form of sampling will be required. Ideally, such sampling should be based on statistical principles, for example stratified random sampling. There is a large literature on sampling methodologies; a recent publication which focuses on habitats is Brus et al. (2011).

The evaluation matrix states that if more than 25 % of the habitat type area in the region being assessed is considered 'unfavourable' (i.e. not in good condition), then the status of Structure and functions is 'unfavourable-bad'. However, it does not give numerical criteria for 'favourable' or 'unfavourable-inadequate'. It appears that in previous reports, countries have used very different thresholds of the proportion of habitat area that must be in good condition to justify assessing Structure and functions as 'favourable'. Ideally, the entire area of a habitat type should be in good condition for Structure and functions to be considered 'favourable'. However, this is hardly achievable in practice, and it could be acceptable to have part of the habitat type in 'not-good' condition, but still consider

[26] Maciejewski, Lise; Lepareur, Fanny; Viry, Déborah; Bensettiti, Farid; Puissauve, Renaud; Touroult, Julien (2016) État de conservation des habitats : propositions de définitions et de concepts pour l'évaluation à l'échelle d'un site Natura 2000. Revue d'Écologie 71 (1): 3–20. https://hal.science/hal-03530365/

[27] https://siedliska.gios.gov.pl/publikacje-menu/przewodniki-metodyczne/methodological-guides

[28] http://morskiesiedliska.gios.gov.pl/pl/do-pobrania/przewodniki-metodyczne

[29] https://siedliska.gios.gov.pl/publikacje-menu/przewodniki-metodyczne/dla-siedlisk-przyrodniczych

[30] https://www.naturvardsverket.se/vagledning-och-stod/miljoovervakning/handledning-for-miljoovervakning/

[31] https://www.naturvardsverket.se/om-miljoarbetet/miljoovervakning/programomraden/biogeografisk- uppfoljning-av-naturtyper-och-arter

[32] https://www.slu.se/en/Collaborative-Centres-and-Projects/nils/

Structure and functions to be assessed as ‘favourable’.

It is recommended to use an indicative value of 90 % of the habitat type area (field 6.1) in ‘good’ condition as the threshold to conclude on ‘favourable’ Structure and functions. If a country uses a different value, this should be noted and explained in field 10.8 ‘Additional information’. This indicative value could, for example, be adapted according to the rarity/abundance of the habitat type: closer to 100 % for rare habitat types with a restricted area (e.g. many grasslands with only a few tens of km^2 in the biogeographical region) and less than 90 % for very common and widespread habitat types (e.g. several forest types with several thousand km^2 in the biogeographical region). In the special case where a particular habitat listed in Resolution No. 4 (1996) is managed to restore another habitat type listed in Resolution No. 4 (1996) (e.g. natural succession is not prevented), lower thresholds than 90 % can be used.

If a different threshold than the recommended 90 % is used, this should be noted in field 10.8 ‘Additional information’.

It is important to note that regardless of the threshold used, the trend must be stable or increasing for the conclusion on Structure and functions to be considered ‘favourable’.

In situations where the information on habitat area (or other equivalent fields) is only available from a partial survey and it is not possible to derive more accurate figures covering the entire habitat area by either modelling or based on expert opinion, it is still preferable that the values available are provided in respective minimum fields and leave the maximum fields empty.

Depending on the uncertainty of the estimate the Methods used should be either ‘c) Based mainly on expert opinion with very limited data’ or ‘d) Insufficient or no data available’. Any details and explanations that could help to understand the uncertainty of minimum estimates should be provided as ‘Additional information’.

For habitats with ‘area in good condition’ equal to 0 km^2, but for which the ‘area in good condition’ was higher than 0 km^2 around the start of the short-term trend period (i.e. around 2013; but perhaps even earlier if the decline was recorded earlier) the short-term trend should be reported as ‘decreasing’. The trend period should capture the period from when the decline was recorded.

On the contrary for habitats for which ‘area in good condition’ equal to 0 km^2 for the long-term (well before 2013, the recommended start of the short-term trend period), trend information is not expected. Further details can be provided in field Additional information.

Typical Species

Although the term ‘typical species’ is used in the reporting, legal texts do not provide a definition, either for use in reporting or for use in impact assessments. As undertake an assessment of the conservation status of each typical species using the methodology stated for species would mean a considerable increase in the necessary work, the assessment of typical species is included as part of the assessment of the Structure and functions parameter.

The term ‘typical species’ is part of the definition of Favourable conservation status for a habitat type, when the conservation status of its typical species is favourable, the habitat has greater probability of having a favourable conservation status.

The list of potential ‘typical species’ for most of the habitat types listed in Resolution No. 4 (1996) is very long and the selection of ‘typical species’ for reporting should reflect favourable structure and functions of the habitat type, although it will not be possible to associate species with all aspects of structure and functions. Given the ecological and geographical variability of habitats listed in Resolution No. 4 (1996), it is not realistic to have recommended lists of typical species, even for a biogeographical region. Indeed, even within one country different species may be present in different parts of the range of a habitat type or in different subtypes.

Given the variability of habitat types across their range, even within a single biogeographical region, it is very unlikely that all typical species will be present in all examples of a given habitat type, particularly in large countries. The sum of sites and occurrences of each habitat type should, however, support viable populations of typical species on a long-term basis within the region being assessed for Structure and functions to be favourable. Many species may be typical for several habitats (including non-habitats which are not listed in Resolution No. 4 (1996)) and not dependent on a single habitat type listed in Resolution No. 4 (1996). Such species may be threatened (e.g. red-listed) at a national or regional scale even though they are thriving in the habitat and region being evaluated.

It is natural that there will be a turnover in the species pool, so that local loss and recolonisation of distinct species out of the selected group of typical species will occur. As long as these processes balance over the long term for each typical species, the Structure and functions of the habitat type should be regarded as 'favourable'. If several typical species are red-listed, i.e. threatened to some degree by extinction at country or biogeographical level, this would indicate that typical species are not in a good condition[33] and Structure and functions cannot be 'favourable'.

When choosing typical species for reporting under Resolution No. 8 (2012), the following considerations should be taken into account (it is not expected that the chosen species should qualify for all of these criteria):

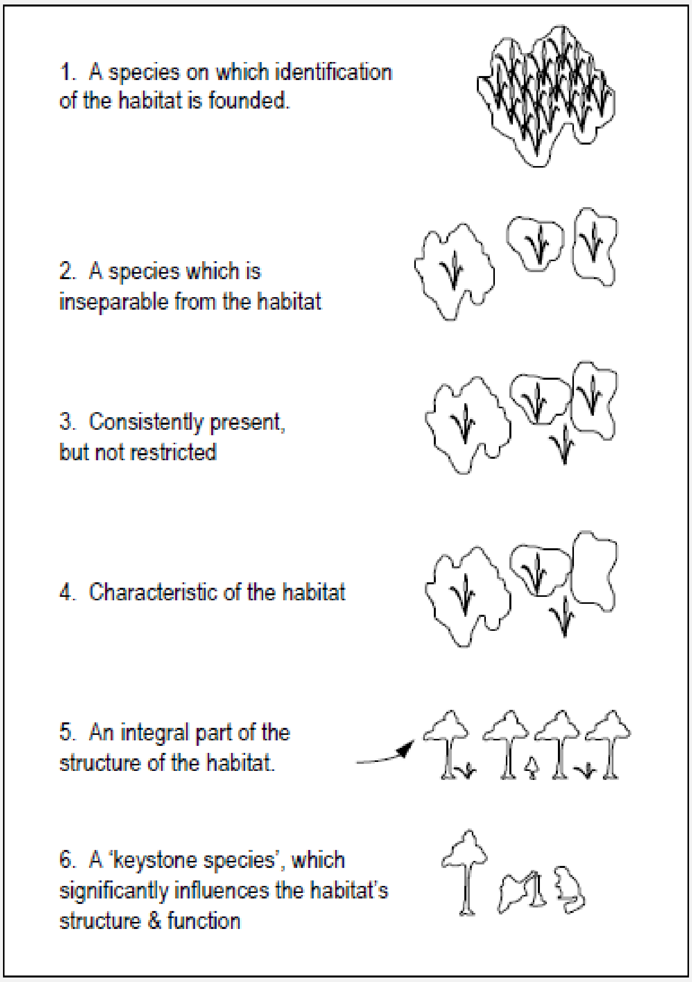
- 'typical species' should be species which occur regularly at a high constancy (i.e. are 'characteristic') in a habitat type or at least in a major subtype or variant of a habitat type;
- 'typical species' should include species which are good indicators of favourable habitat quality, e.g. by indicating the presence of a wider group of species with specific habitat requirements. They should include species sensitive to changes in the condition of the habitat ('early warning indicator species');
- species which can be monitored easily by non-destructive and/or inexpensive means should be favoured.

The list of 'typical species' chosen for the purpose of assessing conservation status should ideally remain stable over the medium to long term, i.e. across reporting periods. Characteristic species listed in the *Interpretation Manual of Habitats*, although chosen to help identify habitats, may be used as typical species if they meet one or more of the criteria noted above. In some habitats there are key species which often form a major element of the structure, such as dominant trees in a forest habitat. However, the dominant species may not necessarily be a good choice for monitoring typical species. For example, beech (*Fagus sylvatica*) is usually dominant or co-dominant and forms an important part of the canopy in the habitat type '*G1.6 Fagus woodland*'' but using *Fagus sylvatica* as a typical species does not give any additional information on Structure and functions. Box 8 gives a graphical representation of groups of potential typical species and how to select those appropriate for assessing Structure and functions.

[33] This does not apply to species which are red-listed due to naturally very small and restricted population (partly IUCN Red List criterion D).

Box 8: Options for selecting 'typical species'

Potential typical species can be grouped, they may be 'keystone' species or may, for example, require specific conditions essential to the maintenance of the habitat (e.g. occurrence of fire), or may themselves have a significant role to play in maintaining the structure and function of the habitat.



Assuming that the habitat's area and structure and function are already being monitored, it is unlikely that options 1 and 5 would provide any useful additional information. Similarly, the effects of keystone species would be revealed through monitoring habitat structure directly. Monitoring of 'typical species' selected under options 2–4 would more likely yield meaningful information, with option 2 representing the ideal: species whose ecological requirements are met only by the habitat in question.

Adapted from Shaw & Wind (1997)

Typical species may be drawn from any species group and, although most species noted were vascular plants, consideration should be given to also selecting lichens, mosses, fungi, and animals, including birds. Many important functions, such as pollination and litter decomposition, rely mainly on invertebrates, and their exclusion may lead to incomplete assessments of function. The choice of species should not be restricted to the species listed in Resolution No. 6 (1998) or in the Bern Convention Appendixes.

Invasive species, either alien or native, but not normally occurring in the habitat type, are often very good indicators of ‘not good’ habitat condition. Examples of this are the invasive plants *Paspalum distichum*, *Ludwigia peploides* and *L. grandiflora*, which are considered as negative indicators for habitat type ‘C3.4 Species-poor beds of low-growing water-fringing or amphibious vegetation’ in France (Grillas et al. 2004), while *Rhododendron ponticum* is considered an invasive alien in many woodland habitat types in the British Isles. However, these species cannot be considered as ‘typical species’, but where appropriate they should be reported under Pressures and threats.

A full assessment of the conservation status (as for species listed in Resolution No. 6 (1998)) of each typical species is not required. The reporting format only requires a list of typical species for a given habitat listed in Resolution No. 4 (1996) in a given biogeographical region of a country as well as a brief description of the method used to assess their conservation status globally as part of the overall assessment of Structure and functions, which may be based on expert judgement, Red Lists, or general surveys. The list of typical species should be reported in Section 6.6 of the format of the reporting under Resolution No. 8 (2012).

2.7 Main pressures and threats

This chapter provides complementary information to the guidance provided in the ‘Explanatory notes in support to the reporting format’.

Although the information on pressures and threats is required for the conservation status assessment, the importance of pressures and threats goes beyond their use in the assessment. They provide information on the main drivers related to results of the conservation status assessment. They can help to identify actions required for restoration and they are essential to communicate the results of the status assessment to various stakeholders.

For the reporting under Resolution No. 8 (2012), pressures are considered to be factors which have acted **within the current reporting period**, while threats are factors expected to be acting in the future (in the future two reporting periods, i.e. within 12 years following the end of the current reporting period). It is possible for the same impact to be both a pressure and a threat if it is having an impact now and this impact is likely to continue.

For the 2019–2024 reporting period, one list of pressures will be submitted by the country, indicating the ‘timing’ to inform if the pressure also acts as a threat. The list of pressures for the 2019–2024 reporting period is largely based on that of the 2013 – 2018 reporting period; although efforts have been made to further streamline the list by addressing the numbers of pressures under each category and also to merge or split pressures where necessary. The list is classified into 14 categories corresponding to the main sectoral driver (see Table 19).

Table 19: Pressure categories in the list of pressures and threats

Pressure code	Pressure category	Note
PA	**Agriculture related practices**	Includes pressures and threats caused by agricultural practice.
Pressure code	**Pressure category**	**Note**

PB	**Forestry related practices**	Includes pressures and threats caused by forestry activities, including thinning, wood harvesting, pest control in trees.
PC	**Extraction of resources (minerals, peat, non-renewable energy resources)**	Includes pressures related to extraction of materials, such as mining or quarrying, pollution or waste disposal.
PD	**Energy production processes and related infrastructure development**	Includes pressures related to production of energy, e.g. the construction and operation of power plants, water use for energy production, waste from energy production, activities and infrastructure related to renewable energy.
PE	**Development and operation of transport systems**	Includes pressures related to transportation of materials or energy, such as construction of infrastructure, pollution and disturbances or increased mortality due to traffic.
PF	**Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas.**	Includes pressures related to development, construction and use of residential, commercial, industrial and recreational infrastructure, e.g. infrastructural changes on existing built areas, expansion of built areas, land use and hydrological changes for urban or industrial development, disturbances or pollution due to residential, commercial, industrial, or recreational infrastructure. Includes also pressures related to sport, tourism and leisure activities and infrastructure.
PG	**Extraction and cultivation of biological living resources (other than agriculture and forestry)**	Includes pressures linked to uses of biological resources other than agriculture and forestry.
PH	**Military action, public safety measures, and other human intrusions**	Includes pressures related to public safety and other human intrusions.
PI	**Alien and problematic species**	Includes pressures related to problematic inter-specific relationships with non-native species which cannot be associated with other pressure categories. Includes also problematic relationships with native species, which came out of balance due to human activities.
PJ	**Climate change**	Includes pressures related to climate change.
PK	**Mixed source pollution**	Includes pollution which cannot be associated with other pressure categories.

Pressure code	Pressure category	Note
PL	**Human induced changes in water regimes**	Includes hydrological and physical modifications of water bodies, which cannot be associated with other pressures categories.
PM	**Geological events, natural processes and catastrophes**	Includes pressures such as natural fires, storms, tsunamis and natural processes, such as natural succession, competition, trophic interaction, erosion.
PN	**Unknown pressures, no pressures and pressures from outside the country**	

Further information on the list of pressures, crosswalks to the previous pressures list and examples of how to report pressures can be found on the Reporting Reference Portal.

2.8 Conservation measures

This chapter provides complementary information to Guidelines on 'Explanatory notes in support to the Reporting Format'.

Conservation measures are defined as: 'a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status'.

The main purpose of reporting on conservation measures is to obtain information allowing for a 'broad-brush' overview of the conservation measures: whether measures have been taken and if so which measures, their purpose, their location (inside/outside the Emerald Network) and their scope and impact on the conservation status of a habitat. Information on conservation measures feeds into the evaluation of the contribution of the Emerald Network to the conservation status of the habitats listed in Resolution No. 4 (1996) (see also Section 2.10 Emerald Network (Proposed, Candidate and Adopted Sites) coverage for the habitat types listed in Resolution No. 4 (1996) (in 'Habitat Guidance'). This information can further help to understand any trends in conservation status globally and is important for communicating the results of the conservation status assessment to different stakeholders.

The conservation measures should be 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 measures are classified into 14 categories corresponding to main pressure categories (see Table 20). The list of measures contains additional category for measures related to management of target species and other native species.

Table 20: Categories of conservation measures

Measure code	Categories of conservation measures
MA	Measures related to agricultural practice and agriculture-related habitats
MB	Measures related to forestry practices and forest-related habitats
MC	Measures related to resources extraction and energy production
ME	Measures related to development and operation of transport systems
MF	Measures related to residential, commercial, industrial and recreational infrastructures, operations and activities
MG	Measures related to the effects of extraction and cultivation of biological living resources
MH	Measures related to military installations and activities and other specific human activities
MI	Measures related to alien and problematic native species
MJ	Measures related to climate change
MK	Measures related to mixed source pollution and human-induced changes in hydraulic conditions for several uses
MM	Measures related to natural processes, geological events and natural catastrophes
MS	Measures related to management of species from Resolution No. 6 (1998) and other native species
MX	Measures outside the countries

Further information on the list of conservation measures and practical guidance on how to use it for reporting can be found on the Reference Portal.

2.9 Future prospects

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

What are future prospects?

Assessments of conservation status must take into account the likely future prospects of the habitat; as for Favourable conservation status, it requires that:

- *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 favourable.*

The parameter 'Future prospects' focuses on the requirement for the long-term maintenance of structure and functions and the need for area and range to be and to remain stable or increasing in the foreseeable future. Although the definition of the Favourable conservation status of habitat presumes 'long-term maintenance' and existence of specific structure and functions in the 'foreseeable future', the concept of 'foreseeable future' is not defined in the reference texts. For the assessment of Future prospects this should be interpreted as meaning the two future reporting cycles, i.e. the next 12 years. The common perspective towards the future is important in harmonising the countries' assessments, but some flexibility is permitted, and the Future prospects can be assessed over longer future periods than the proposed 12 years. For example, for certain well-studied threats, such as climate change, reasonably robust models are available much further than the next 12 years, indicating bad perspective for a habitat.

The Future prospects parameter should reflect the anticipated future improvements and deteriorations of the conservation status[34] which correspond to future trends in the assessment. The anticipated future improvements and deteriorations should be assessed in relation to the current conservation status. For example, the impact of future deterioration on the assessment of Future prospects will be different if the current status is 'favourable' or, on the other hand, 'unfavourable- bad'.

Assessing future prospects

Future prospects should be evaluated by individually assessing the expected future trends and subsequently future prospects of each of the other three parameters (range, area of the habitat, structure and functions), taking primarily into account the current conservation status of the parameter, threats (related to the parameter assessed) and the conservation measures being taken or planned for the future. Once the future prospects of each of the other three parameters have been evaluated, they should be combined to give the overall assessment of Future prospects. The assessment can be divided into three steps:

- Step 1: Future trend of a parameter.
- Step 2: Future prospects of a parameter.
- Step 3: Assessing overall Future prospects for a habitat.

The method described here relies to some extent on expert judgement, but within a clear framework allowing comparability between assessments from different countries. It should also help to standardise assessments within countries where several teams are involved, each dedicated to a particular habitat group.

In order to assess the impact of a threat, the approach as described in Table 22 can be utilised. However, a more general assessment of the impact can also be used.

Step 1: Future trends of a parameter

Future prospects of each of the other three parameters should principally reflect the future trends which are the result of balance between threats and conservation measures as described in Table 21. Future trends of a habitat types are dependent on the identified (known and likely) threats which will have a negative impact and any action plans, conservation measures and other provisions which will have a positive impact. For example, climate change, land-use scenarios and trends in certain policies are aspects that will influence future trends.

The measures should be restricted to those anticipated to have a positive impact in the next 12 years (regardless of whether they were already being implemented during the current reporting period or not). Threats are reported in Section 7 'Main pressures and threats' of the reporting format and the existing measures are reported in Section 8 'Conservation measures'.

[34] The Future prospects parameter should reflect the anticipated future improvements and deteriorations of the conservation status regardless of how far the future status is likely to be from the reference situation captured via favourable reference values.

In most cases, positive (management actions, policy changes, etc.) and negative influences (threats) will simultaneously affect the habitat. The assessment of future trends therefore needs to consider whether the sum of positive and negative influences (threats) will balance out for the parameter under consideration, or whether either of the positive or negative effects are likely to be stronger.

In some cases, threats or measures may affect the three parameters differently. For example, the measure ‘restoration of forest habitats’ might increase the area of a forest habitat relatively quickly, but may have little impact on the range within a 12-year period. Only threats and conservation measures related to the specific parameter should be considered.

Sometimes, it will be difficult to foresee whether the influence of threats and conservation measures on the status of the parameter will balance out and whether the resulting trend will be negative, positive or stable. It can therefore be helpful to interpret the current trend in relationship to the impact of current pressures and measures and to assess the future trend on the basis of potential improvement, deterioration or continuation of the current situation.

Establishing whether the future trend is negative or very negative (or positive/very positive) will be difficult in most cases, although it may be easier if the current trend and trend magnitude are known or in cases of dominating pressures or measures. To differentiate between negative and very negative (and positive or very positive) trends the threshold of 1 % per year, meaning approximately 12 % in 12 years, is recommended. This threshold is used in the assessment matrix for current trends to distinguish between inadequate and bad status for range and area covered by habitat. In theory, this threshold should represent a difference between a slight and moderate (< 1 % per year) deterioration/improvement and important (> 1 % per year) deterioration/improvement. The reporting format does not request an exact measure of trend magnitude for habitat area in good condition. For this parameter the difference between negative and very negative (and positive or very positive) trends should follow the same logic as for the two other parameters and should reflect the difference between slight/moderate and important future deterioration/improvement.

Step 2: Future prospects of parameters

The future prospects of a parameter are assessed by taking into consideration, principally, the future trends and current conservation status. Deciding between the two options proposed for each combination of future trends and current conservation status will mainly depend on the potential trend magnitude (negative/very negative or positive/very positive). This is pragmatic and a mechanistic approach aimed at simplifying and harmonising the assessment of Future prospects.

Table 21: Assessing the future prospects of a parameter (Steps 1 and 2)

Step 1 Future trends of parameters			**Step 2 Future prospects of a parameter**	
Balance between threats and measures	**Predicted future trend reflects balance between**	**Current conservation status of parameter**	**Resulting future Prospects of parameter (over next 12 years)**	
Balance between threats acting on the parameter (mostly threats with low or medium impact) and conservation measures; no real change in status of the parameter expected	overall stable	Favourable	good	
		Unfavourable-inadequate	poor	
		Unfavourable-bad	bad	
		Unknown	unknown	
Threats expected to have negative influence on the status of the parameter (threats with mostly High or Medium impact), irrespective of measures taken.	negative / very negative	Favourable	poor (negative)	bad (very negative)
		Unfavourable-inadequate	poor (negative)	bad (very negative)
		Unfavourable-bad	bad	
		Unknown	poor (negative)	bad (very negative)
None (or only threats with low impact and/or effective measures taken: positive influence on the status of the parameter expected.	positive / very positive	Favourable	good	
		Unfavourable-inadequate	poor (positive)	good (very positive)
		Unfavourable-bad	poor (positive)	good (very positive)
		Unknown	poor (positive)[72]	good (very positive)
Threats and/or measures taken unknown or interaction not possible to predict	unknown	Favourable	unknown	
		Unfavourable-inadequate		
		Unfavourable-bad		
		Unknown		

[2] Unknown is considered as not being favourable, therefore the assessment of Future prospects of a parameter is as for unfavourable inadequate or bad.

Although the concept of High/Medium pressures/threats is no longer used in the reporting format, in order to evaluate the impact of a pressure/threat, the scope and influence can be used in combination (see table 22 for possible combinations). The scope and influence of the threat is not requested to be reported but it can be assessed by experts in a similar way for the evaluation of future prospects.

Table 22: Assessing the impact of reported threats using scope and influence.

	Influence		
Scope	*High influence*	*Medium influence*	*Low influence*
whole (>90%)	High impact	High impact	Medium impact
majority (50-90%)	High impact	Medium impact	Low impact
minority (<50%)	Medium impact	Low impact	Low impact

High impact	Medium impact	Low impact

Step 3: Assessing overall Future prospects for a habitat

Once the future prospects of each of the other three parameters have been evaluated, they should be combined to give the overall assessment of Future prospects using the rules in Table 23.

Table 23: Combining the evaluation of the three parameters to give Future prospects for a habitat type

Assessment of Future prospects	Favourable	Unfavourable-inadequate	Unfavourable-bad	Unknown
Prospects of parameter: Range, Surface area and Structure and function	All parameters have 'good' prospects OR prospects of one parameter 'unknown', the other prospects 'good'	Other combination	One or more parameters have 'bad' prospects	Two or more 'unknown' and no parameter with 'bad' prospects

Box 9: Assessing Future prospects of habitat 'E1.2 Perennial calcareous grassland and basic steppes (assessment example for the specific subtype *Festuco-Brometalia* '

Range and Area are both stable and the following threats are recorded. _The evaluation of scope and influence is not requested for threats_ but could help for the assessment of future prospects. A combination of scope and influence would give an indication of the impacts (see table 23 e.g. scope >90% or scope 50-90% and influence High indicates high impact, scope <50% and influence High indicates medium impact). However, the evaluation of the impact of a threat can be done in a more empirical way.

Code	Threat	Timing	Scope	Influence	Estimated impact
PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	ongoing and likely to be in the future	whole >90%	High	High
PA13	Application of natural or synthetic fertilisers on agricultural land	ongoing and likely to be in the future	majority 50-90%	Medium	Medium
PI01	Invasive alien species of Bern Convention concern	ongoing	majority 50 – 90%	Low	Low
PI02	Other invasive alien species (other than species of Bern Convention concern)	ongoing	whole >90%	High	High
PA02	Conversion from one type of agricultural land use to another (excluding drainage and burning)	ongoing and likely to be in the future	whole >90%	High	High
PA07	Intensive grazing or overgrazing by livestock	ongoing and likely to be in the future	whole >90%	High	High

The only measure from the measure list that is implemented is 'MA05 Adapt mowing, grazing and other equivalent agricultural activities'. This measure is expected to be sufficient to keep Range stable but to lead to a moderate decline in both Area and Structure and functions.

Parameter	Assessment of parameter	Expected future trend	Future prospect
Range	Favourable	stable	good
Area	Unfavourable-inadequate	decreasing	poor
Structure and functions	Unfavourable-inadequate	decreasing	poor

By using the combination rules in Table 21, two 'poor' conclusions and one 'good' conclusion led to an overall assessment for Future prospects of '**unfavourable-inadequate**'.

2.10 Emerald Network (Proposed, Candidate and Adopted Sites) coverage for the habitat types listed in Resolution No. 4 (1996)

This chapter provides complementary information to the Guidelines on 'Explanatory notes in support to the Reporting Format'.

The evaluation of the contribution of the Emerald Network to the conservation status of habitat has three principal components:

1. evaluation of the relevance of the network for different habitats (based on the proportion of the habitat area within the network);
2. possible differences in trends (trend of habitat area in good condition) within the network compared to the general trend (reported under Section 6 'Structure and functions');
3. understanding what type of conservation/management measures have been implemented (see Section '2.8 Conservation measures' (in 'Habitat Guidance')).

The contribution of the Emerald Network to the conservation status of habitat is likely to vary depending on the coverage of the habitat by the network and on-site management. Therefore, the habitat area included in the network for each given biogeographical should be provided.

Another element to be taken into consideration when evaluating the contribution of the network is the possible difference in trends both within the network and globally (mainly for habitats where a significant proportion of a habitat area occurs outside the network). For habitats, this should be expressed by comparing the trend of habitat area in good condition in the biogeographical region with the trend of area in good condition inside the Emerald Network in that same biogeographical region. Trend information within the network is also requested for the 'habitat area within the network'. This further allows comparison with the global trend reported for this parameter and to see the impact of the network.

The information on conservation measures completes and helps to understand the potential differences between the trends within the network and global trends.

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