Favourable Reference Values

Expert group on Reporting under the Nature Directives

21 March 2017

This note includes all the text concerning favourable reference values that is included in the Draft Article 17 Guidelines (version of 8 March).

It is presented as a stand-alone paper to give an overview of the proposals and facilitate the discussion at the expert group.

10 March 2017

European Environment Agency

Section on
Favourable Reference Values[1]
For the Article 17 reporting guidelines

Introduction (for both species and habitats)

What are favourable reference values?

The concept of favourable reference values (FRVs) is derived from definitions in the Directive, particularly the definition of favourable conservation status that relates to the 'long-term distribution and abundance' of the populations of species (Article 1i), 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 (Article 1e). This requires that the species is maintaining itself on a long-term basis as a viable component of its natural habitats. Similarly, for habitat types, the Directive requires 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 Member States do not maintain or restore such a situation, the objective of the Directive is not met.

Favourable reference values – 'range' for species and habitat types, 'population' for species, and 'area' for habitat types – are critical in the evaluation of Conservation Status. The evaluation matrices (Annexes C and E) of the reporting format require Member States to identify favourable reference values for range (FRR) and area for habitats (FRA) 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, or 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 was endorsed by the Habitats Committee back in 2004: document DocHab 04-03/03-rev3[2] 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 Directive came into force.

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 Directive came into force.

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

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[1] The present draft guidelines are largely based on the work of the ad hoc group on FRVs set-up under the Expert Group on Reporting under the Nature Directives and the study 'Defining and applying the concept of Favourable Reference Values' (EC service contract) – particularly its Chapters 3 and 4; ad-hoc group on CIRCABC https://circabc.europa.eu/w/browse/951a6763-c409-4f66-9fce-c7e9b6ed80c2

[2] 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

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 Directive came into force.'

General principles for setting favourable reference values (FRVs)

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

- Current situation and assessment of deficiencies i.e. any pressures/problems
- Trends (short-term, long-term, historic i.e. well before the directive came into force)
- Natural ecological and geographical variation (including genetic variation, inter- and intra-species interactions, variation in conditions in which habitats and species occur, variation of ecosystems)
- Ecological potential (potential extent of range taking into account physical and ecological conditions, contemporary potential natural vegetation)
- Natural range, historic distribution and abundances and causes of change, including trends
- Connectivity and fragmentation

For habitats further following factors should also be considered:

- Dynamics of the habitat type
- Requirements of its typical species

For species further the following factors should be considered:

- 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/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[3], be lower than the values when the Habitats Directive came into force as most species and habitats have been listed in the Annexes because of their unfavourable status; the distribution (range) and size (population, area) at the date of entry into force of the directive 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-

[3] E.g. Degraded-raised bogs (7120) that would ideally be all (converted) restored into Active raised bogs (7110), species with over-populations as result of non-conservation artificially feeding

, mid- & long-term targets/milestones. This obviously would not only involve technical questions but be related to resources and other factors' (European Commission 2004[4])

- 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 for species, maximum possible extent for habitats), which however should be used to understand restoration possibilities and constraints.

Setting the favourable reference values

Although FRVs have to be separately set for range, population size and surface area, there is a clear relationship between range & population size of a species and range & surface area of a habitat type 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 into account the other one e.g. population large enough with an appropriate range to include possible genetic diversity of a species.

FRVs have to be reported at the level of the Member State biogeographical/marine region. However, many of these geographical units are not appropriate for developing a rational on FRVs based on biology and ecology of habitats and particularly of species. Therefore, it is advisable to set FRVs at the most suitable scale (often national, sometimes supra-national) and 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 Member State for the present reporting period, which is to be compared to the favourable reference value.

There are basically two approaches to setting FRVs: model-based and reference-based. Model-based methods are built on biological considerations as for instance those used in Population Viability Analysis (PVA) or on other estimates of Minimum Viable Population (MVP) size; this approach requires good knowledge about the habitat type or 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 habitat type or restoring a proportion of estimated historic 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 species and habitats sections of these guidelines with practical instructions and examples.

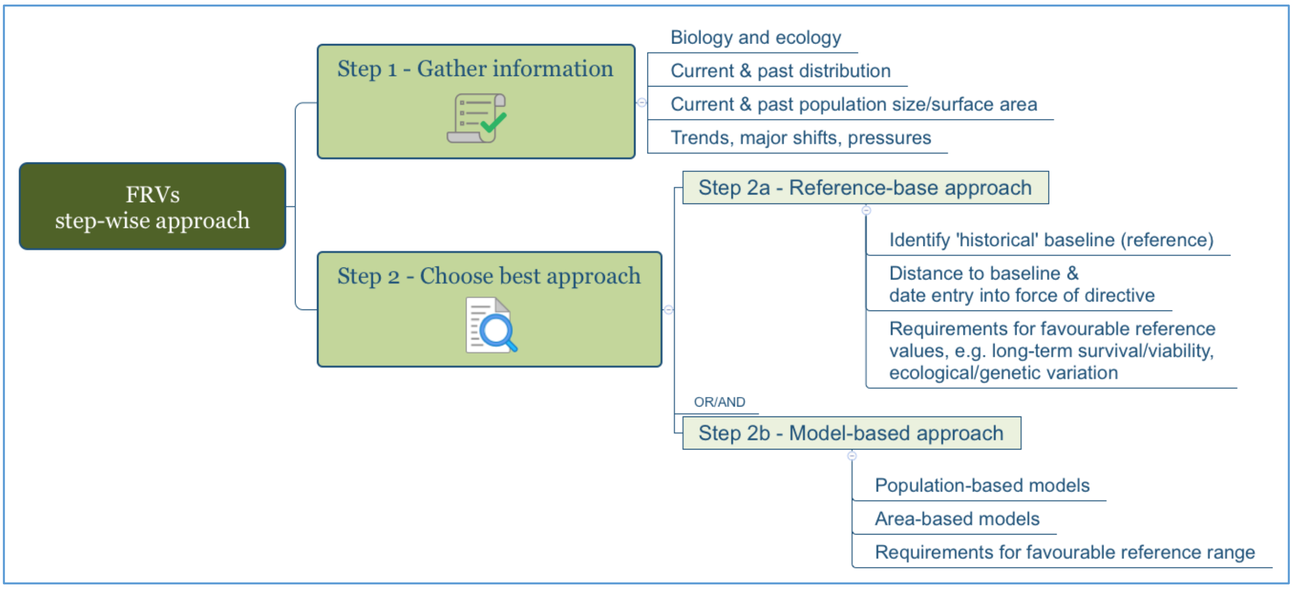
With the objective of developing practical and pragmatic guidance promoting harmonisation between Member States while allowing for the needed flexibility (e.g. the best method to be used depends on the data available), it is recommended to have a step-wise approach as summarised in the Figure XX below.

The step-wise approach and the specific methods for setting the FRVs are largely dependent on the available data and knowledge for each species and habitat type. Three levels of data availability and knowledge:

[4] 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

- 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 is sparse and/or unreliable; hardly any historical data available and no trend information.

Figure XX – Illustration of the step-wise approach to set FRVs



The recommended approach involves a certain number of steps that will be further detailed in the sections for species and habitat types. In summary, and without detailing all conditions:

- **Step 1 – Gather information**

  Collect all relevant information about a species/habitat type necessary to understand their ecological and historical context: biology and ecology; natural range, current and past distribution (including before the directive 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 the directive.

  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 operators to qualify how far the current value is from the favourable situation.

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

  Develop population-based (for species) and area-based (for habitat types) models or use available estimates derived from such models to assess the favourable reference population and the favourable reference area respectively, taking into account the requirements for a favourable reference range.

In order to better understand the practical development of the approaches above (and the steps that will be further detailed in the species and habitats sections), several 'real life' validated examples will be made available at the Article 17 reference portal. Additionally, elaborated methods and other examples are available from Bijlsma et al. 2017.

Favourable reference values for species

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

Firstly, the natural range of the species on the Member State(s) is not to be reduced (Article 1i). The ecologic/genetic diversity is often associated 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 in the EU.

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, the

European Commission supports the development of EU action plans for selected species[5] and Council of Europe has published European action plans for large carnivores[6].

In ecological studies (e.g. Beissinger & McCullogh 2002), 'viability' of a population is approached via population viability analysis (PVA) and 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, and as the directive requires, 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 and focusing on the demographic viability of populations (often represented as a 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[7] 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 example, Member State level and at Biogeographic level. The favourable reference value will generaly cover many discrete (meta-) populations within a Member State, or a Member State may just cover a part of a larger, international (meta-) population, in which case a reference value at biogeographic level may be appropriate. (Note: further develop on transboundary populations)

The distinction between a minimum viable (meta-) population and the concept of Favourable Conservation Status becomes clear from the wording in the Habitats Directive: conservation status relates to the 'long-term distribution and abundance of the populations' of species (Article 1i), aiming for the populations to be maintained or restored at favourable conservation status (Article 2.2) 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 '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.

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

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

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

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

- Spatial and genetic structure of the population: sub-populations, meta-populations, management units (marine environment)
- 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 XX).

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 the directive 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 the directive came into force (i.e. 1940s – 1950s)

This information is crucial to understand what has been happening to the species 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 species distribution and population size, **and when**. For example, whales were first hunted intensively from 1850s onwards, with the most intense period (in eastern North Atlantic) being between 1900 and 1960s; protection became widespread in mid-1980s; bottlenose dolphin appears to have been more widespread before 1900, and may also have experienced declines between 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 almost certainly has done, whilst prey depletion from over-exploitation of fish stocks may well have a role as well.

Table XX – Categories of populations in terms of structure and migratory character

Category of population	**Comments and examples**
Populations of sedentary (non-migratory) animals, more or less mobile, and of some plant species:	Large or small sedentary species, including some plant species, with more or less exchange at or below Member State level: - *Barbastella barbastellus* - several whales - *Austropotamobius pallipes* - *Carabus olympiae*, *Osmoderma eremita* Large, more or less mobile sedentary species with only one or a few clearly isolated populations - female *Ursus arctus* - *Monachus monachus* - several *Coleoptera* and *Odonata* - *Margaritifera margaritifera*, *Unio crassus* Sedentary, small and mobile animal species: - many butterflies Individuals with inherently large home ranges (> 100 km^2 up to > 1 000 km^2) - *Canis lupus* - several whales and most dolphins
Populations of sedentary (small) animal species with low mobility and of plant species	Often with diffuse, scattered distribution or isolated/single distribution; examples: - terrestrial mammals: *Microtus cabrerae* - amphibians/reptiles: most species insects: *Apteromantis aptera*, *Baetica ustulatae* - molluscs: all *Gastropoda* - vascular plants, bryophytes, lichens: most species
Populations of migratory animals:	With individuals showing large cyclic, directed movements: - several whales - *Caretta caretta* - *Salmo salar*, *Petromyzon marinus* Partially migratory: - *Miniopterus schreibersii* - *Phoca hispida botnica*, several whales and dolphins - freshwater fishes: most species

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 operators ‘approximately equal to’, ‘more than’, and ‘much more than’) and possibly set values.

The ‘decision-key’ below should be used in general, noting that for several species (e.g. several large carnivores) Step 2b using population-based approach could be more appropriate. In addition, elements from Step 2b may also be used to help estimating the FRP below. Please take into account the sections above, namely on the ‘General principles for setting FRVs’ and ‘Understanding what means long-term survival/viability’.

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 big enough to ensure the long-term viability of the species, then the
   - favourable reference range **(FRR) should be equal to the current range**
   - favourable reference population **(FRP) should be equal to the current population size**
   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**
2. 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 if the restoration of the range is technically and ecologically feasible. The availability and quality of the data used to make such 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'
   - an **operator** indicating '**more than current range**' (i.e. less than 10 % more) or '**much more than current range**' (i.e. more than 10 %)
   - in any case, the estimated FRR should not be smaller than the range at the date of entry into force of the directive
3. Identify how population size can be restored to a (past) favourable level: increase the size of an existing population (or populations) and/or re-introduce a population (or populations) within its natural range; in the case the current population(s) is viable on 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[8]. Information about past trends, if available, should inform the setting of the FRP. The availability and quality of the data used to make such 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 re-stocking/reintroduction, and/or through natural increase as a result of e.g. removing pressures)
   - an **operator** indicating '**more than current population size**' (i.e. less than 25 % more) or '**much more than current population size**' (i.e. more than 25 %)
   - in any case, the estimated FRP should not be smaller than the population size at the date of entry into force of the directive, except in cases where that population size was due to non-natural conditions, or the species naturally exhibit wide fluctuations in population size and happened to be at a 'population high' (not biologically sustainable).
4. A conclusion of **FRR or FRP 'Unknown'** should only be used in the cases where there is no information about the species historical context and hardly any data about its current range and population size.

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

[8] 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

- species for which the restoration efforts would not be proportional and reasonable in terms of the conservation objectives of the directive (e.g. implying large scale recreation of habitats for the species in currently urbanised areas).

As the name indicates, this approach is to be used to set the FRP; however, the FRR would be derived from the FRP requirements if it cannot be derived from the reference-based approach: FRR should be large enough to accommodate the FRP, cover 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 XX).

The population-based approach described below was adapted from Bijlsma et al. (2017).

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 $N_e \geq 500$ (long-term ‘genetic MVP’) or c) population-based proxies for MVPs.
2. Determine a factor to scale MVP-size up to FRP level.
   Given a 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 a 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 a 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 (marine mammals and turtles)
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 the directive

   - if the scaling factor can only be estimated qualitatively, use operators:

     if MVP is much smaller than the size of the population at the date of entry into force of the directive, then the FRP should be equal to the latter value if MVP approximately equal to or bigger than the size of the population at the date of entry into force of the directive, and scaling factor is relatively low, then FRP should be bigger than the latter value

if MVP approximately equal to or bigger than the size of the population at the date of entry into force of the directive and scaling factor is relatively high, then FRP should be bigger than the latter value

4. Consider consequences for setting the FRR
   In case of FRP being bigger or much bigger than the size of the population at the date of entry into force of the directive, determine how much additional range is necessary (or not) to include the FRP.

Box XX – 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 below 'General principles for setting favourable reference values).

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 less than 2,500 pairs. The use of PVA in plant conservation is reviewed by Brigham & Schwarz (2003) and Zeigler (2013). However, PVA analysis have not been done for most of the species listed in the annexes of the Directive.

In PVA, metapopulation viability can be assessed and modelled either through demographic and/or genetic models or by the structurally simpler occupancy models. The latter project the patterns of local extinction and (re-)colonization, respectively, of local populations into the future.[1] The very simple such 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 '500-rule' (e.g. Laikre et al. 2016). 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.

Favourable reference values for habitat types

The favourable reference values– FR range and FR area – need to capture the requirements of the directive concerning the ecologic diversity 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 directive's requirements for a favourable conservation status, is often expressed along geographical (north-south/east-west) and other environmental gradients (e.g. altitudinal, geological, climatic).

Setting the favourable reference values for habitat types

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, that may be relevant in setting the FRVs:

- Physical and ecological conditions
- Variation in species composition across geographical regions, environmental gradients (e.g. altitude) and land use
- 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 the directive 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 the directive came into force (i.e. 1940s – 1950s)

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 species distribution and population size, **and when**. For example, semi-natural habitats depending on extensive agricultural management, experienced cultivation, severe intensification and fragmentation in most parts of Europe after World War II; this caused serious declines in their quantity and quality. For some habitat types, useful information can be found in the 'Interpretation Manual of European Union Habitats'[9].

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.

The 'decision-key' below should be used in general, noting that for many habitat types (e.g. most forest types) Step 2a using area-based approach could be more appropriate. In addition, elements from Step 2b may also be used to help estimating the FRA below. Please take into account the sections above, namely on the 'General principles for setting FRVs'.

1. If both distribution 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 to the current range**
   - favourable reference area **(FRA) should be equal to the current surface area**

[9] http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

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 no sufficient historical information or when this is not useful (e.g. many forest habitats), go to Step 2b (area-based approach)

2. 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 on the long-term; this should consider if the restoration of the range is technically and ecologically feasible. The availability and quality of the data used to make such 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'
   - an **operator** indicating '**more than current range**' (i.e. less than 10 % more) or '**much more than current range**' (i.e. more than 10 %)
   - in any case, the estimated FRR cannot be smaller than the range at the date of entry into force of the directive
3. Identify what needs to be done to restore the habitat area (or to allow for recovery) to a past level; this should consider if 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 identification and estimation could lead to different ways of expressing the **FRA**:
   - a **value** equal to 'current habitat area' plus 'additional area to be restored/recreated'
   - an **operator** indicating '**more than current habitat area**' (i.e. less than 10 % more) or '**much more than current habitat area**' (i.e. more than 10 %)
   - in any case, the estimated FRA cannot be smaller than the habitat area at the date of entry into force of the directive.
4. A conclusion of **FRR or FRA 'Unknown'** should only be used in the cases where there is no information about the species historical context and hardly any data about its current range and habitat surface area.

Step 2b – Use area-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**' can be used to establish a minimum area for proper functioning of the ecosystem. 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 an Annex I habitat type, 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 Annex I habitat types are semi-natural and their existence largely dependent on human activities (e.g. extensive agriculture, including grazing and mowing, cork production) may require a combination of reference-based and area-based approaches to derive the FRVs. Therefore, Step 2a and Step 2b should be considered in an iterative way, and elements from one step to be used in the other step.

There are several habitats that are closely linked to a single species and where the approach described above for species could be appropriate (with modification to get area), for example for habitats 3230 (*Myricaria germanica*), 5130 (*Juniperus communis*), 5220 (*Zyziphus*), 9570 (*Tetraclinis articulate*).

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