Part D – Criteria for listing ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999* and *Environment Protection and Biodiversity Conservation Regulations 2000*

Criteria for Listing Threatened Ecological Communities

Item	Criterion	CATEGORY		
		Critically Endangered	**Endangered**	**Vulnerable**
1	Its decline in geographic distribution is:	very severe	severe	substantial
2	Its geographic distribution is:	very restricted	restricted	limited
	and the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:	the immediate future	the near future	medium term future
3	For a population of a native species that is likely to play a major role in the community, there is a:	very severe decline	severe decline	substantial decline
	to the extent that restoration of the community is not likely to be possible in:	the immediate future	the near future	the medium-term future
4	The reduction in its integrity across most of its geographic distribution is:	very severe	severe	substantial
	as indicated by degradation of the community or its habitat, or disruption of important community processes, that is:	very severe	severe	substantial
5	Its rate of continuing detrimental change is:	very severe	severe	substantial
	as indicated by: (a) a rate of continuing decline in its geographic distribution, or a population of a native species that is believed to play a major role in the community, that is:	very severe	severe	serious
	or (b) intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:	very severe	severe	serious
6	A quantitative analysis shows that its probability of extinction, or extreme degradation over all of its geographic distribution, is:	at least 50% in the immediate future	at least 20% in the near future	at least 10% in the medium-term future

Applying criteria to assess the level of threat to ecological communities

Preamble

Application of guidelines

The intention of the guidelines is to provide guidance in interpreting criteria for application in new situations as they arise and to provide indicative thresholds that can be applied to better known communities,

Dealing with uncertainty

The guidelines should be applied to a community based on the available evidence on its distribution and trend, making due allowance for uncertainties. These uncertainties arise from natural variability (resulting from changes in community composition and structure in time, and across the range of environments in which it occurs), measurement error (arising from inaccuracies in estimating values) and uncertainty (e.g. lack of accuracy in definition of community boundaries). In cases where there are evident threats to a community through, for example, deterioration of its only known habitat, it is important to consider listing the ecological community as threatened, even though there may be little direct information of the ecological status of the community itself.

One of the simplest ways to represent uncertainty is to specify a best estimate and a range of values around this estimate. The range might be based on scientifically derived confidence intervals, the opinion of a single expert, or the consensus opinion of a group of experts, and should be justified.

The concept of natural

International guidelines for the management of protected areas define 'natural ecosystems' as those where, since the industrial revolution (1750) human impact has (a) been no greater than that of any other native species, and (b) not affected the ecosystem's structure. In Australia, national standards[1] assume this definition to refer to those ecosystems (or ecological communities) presumed to be present at the time of European settlement. However, these national standards also recognise that few parts of Australia can now be regarded as substantially free of the influence of European settlement (e.g. the presence of introduced species) and that a strict definition of natural could be too exclusive. Accordingly natural areas are more generally regarded as those which largely retain the ecosystem structure that existed prior to European settlement. However, ecological communities are inherently complex in their natural state. These complexities may reflect the age of the landscape, the variability of Australia's soils and the severity and frequency of episodic natural events such as wildfire, drought, cyclones etc. The result is that natural ecological communities may undergo transitions from one state to another, or from one ecological community to another with unclear delineation between them. Where ecological communities now occur in fragmented landscapes, natural resource management and land use changes often also distort the underlying natural variation. (For further information refer to http://www.environment.gov.au/epbc/publications/pubs/ecological-communities-listing-approach.pdf.)

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[1] Australian Nature Conservancy Agency and New South Wales National Parks & Wildlife Service 1995. Application of IUCN Protected Area Management Categories Draft Australian Handbook. Unpublished report prepared for the Australian and New Zealand Environment and Conservation Council (ANZECC).

Geographic distribution

Geographic distribution of an ecological community can be considered in terms 'extent of occurrence' and 'area of occupancy' in the sense defined in the IUCN Red List Criteria for species (See Attachment B). Extent of occurrence (sometimes called range) is the total area contained within the shortest continuous boundary that can be drawn to encompass all the areas where the ecological community occurs. Area of occupancy is defined as the area within its extent of occurrence that is actually occupied by the community. The distinction reflects the fact that a community will not usually occur throughout its extent of occurrence, which may, for example, contain areas of unsuitable habitats. Area of occupancy is the more precise measure, but the size of the area of occupancy is a function of the scale at which it is measured, which should be relevant to the attributes of the particular community being considered.

Problems of scale

Classifications based on geographic distributions are complicated by problems of spatial scale. In general, the finer the scale at which distributions are mapped, the smaller will be the area mapped as occupied by the community. It is impossible to provide any strict but general rules for mapping; the most appropriate scale will depend on the ecological community in question, and the origin and comprehensiveness of the distributional data.

For terrestrial communities defined in terms of their vegetation assemblage (i.e., vegetation communities on land) an appropriate mapping scale would usually be of the order of 1:100 000. However, coarser scales (e.g. 1:250 000) may be appropriate for very widespread communities, and finer scales (e.g. 1:50 000) may be more appropriate for communities with very restricted distributions.

Concept of community integrity

The concept of 'integrity' applied to an ecological community is intended as a specific application of the concept of biological integrity. This has been defined as a system's wholeness, including the presence of all appropriate elements and occurrences of all processes at appropriate rates. It specifically refers to natural conditions; an ecological community with high integrity reflects natural evolutionary and biogeographic processes are still operating.

Condition Class

Vegetation condition is frequently used as a surrogate for ecological community condition. The condition of a particular area of vegetation describes how far the vegetation has changed from the unmodified, or ideal, ecological community that existed prior to European settlement. However, the influences outlined above under *the concept of natural* heading, lead to various states or expressions of an ecological community occurring in different conditions from unmodified to locally extinct. When determining condition classes for an ecological community (or its component states) variables such as patch size, connectivity, native species diversity, overstorey foliage cover and understorey composition and cover are considered. An area that is in good condition resembles the ideal ecological community (or its natural states) more closely than an area in poor condition. A condition class describes a range of conditions that are thought to be of similar value. The possibility of restoration of degraded communities is also considered when determining which regions are included or excluded from the listed ecological community.

Determining when an ecological community has become extinct

While it is possible to determine with a reasonable degree of certainty when a community has been totally destroyed (e.g. by clearing), it is much more difficult to determine at what point a modified or degraded ecological community should be presumed extinct. Final determination will continue to rely on subjective judgement by experts. Judgement should be guided by the notion that an ecological community may be considered effectively extinct when all representatives of the community have undergone an irreversible loss of integrity: when re-establishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future, even with positive human intervention.

Indicative time frames (as relevant to the table 'Criteria for listing threatened ecological communities' provided above)

When considering extinction risk, it is not possible to define absolute time frames appropriate across the range of ecological communities that exist. Defining appropriate time frames is especially problematic for ecological communities in which functionally important species are very long-lived. While very short time frames are clearly inappropriate for such communities, very long time frames may be unreliable and irrelevant. The IUCN Red List Criteria for species deal with this issue by specifying time frames in either years or numbers of generations, whichever is longer. Recent updates also incorporate placing a cap on the maximum time frame to be considered. The following indicative time frames should be interpreted in the light of these considerations.

- Immediate future (or past): the next (or previous) 10 years, or 3 generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 60 years

- Near future (or recent past): the next (or previous) 20 years, or 5 generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 100 years

- Medium-term future (or past): the next (or previous) 50 years, or within 10 generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 100 years

Note that generation is defined to reflect the turnover rate of breeding or propagating individuals in a population, i.e., the average age of parents of the current cohort (e.g. newborn or newly established individuals in the population). Generation length is greater than the age at first breeding or propagation, except in taxa that breed or propagate only once. Where generation length varies under threat, the more natural, i.e., pre-disturbance, generation length should be used. Generation length can be estimated in many ways.

Interpreting specific criteria

Criterion 1. Decline in geographic distribution

This criterion can refer to a decrease in the total area of the community without a contraction in range, a decrease in the range over the whole or part of the area in which the community originally existed, or fragmentation of the community through a decrease in the size of patches. A decrease sufficient to meet the criterion is considered to be a measurable change whereby: the ecological community has contracted to less than some threshold proportion of its former range; or the total area occupied by the community is less than the threshold proportion of its former area; or where less than the threshold proportion of the former area of the community is in patches of a size sufficiently large or well connected with other patches for them to be likely to persist beyond the *near future.*

Indicative decline thresholds for terrestrial vegetation communities are:

- Critically Endangered = a very severe decline ≅ 95% or more
- Endangered = a severe decline ≅ 90% or more
- Vulnerable = a substantial decline ≅ 70% or more

These thresholds are indicative only; other thresholds might be more appropriate for other kinds of communities (e.g. invertebrate or aquatic communities) or for terrestrial vegetation communities that originally covered a relatively large or a particularly small area.

The application of a specific time frame (such as since 1750) is not considered critical. However, it is important to demonstrate that the ecological community has declined to its present state from some convincingly defined former state.

Where possible, a measurable contraction in distribution should be demonstrated by an appropriate scale of mapping. Where it is not possible to provide precise spatial information on the distribution of an ecological community, particularly at the map scale available (e.g. a very narrow riparian ecosystem), other supporting evidence demonstrating a contraction in distribution may be considered, provided it is supported by independent scientific assessment.

Criterion 2. Small geographic distribution coupled with demonstrable threat

The categories under this criterion provide for the listing of ecological communities that have a small geographic distribution and for which a threatening process exists within an understood or predicted time-frame. The general thrust is to recognise that an ecological community with a distribution that is currently small has an inherently higher risk of extinction if it is subject to a threatening process. This criterion is not likely to be considered for an ecological community which has a naturally small distribution but is not currently subject to any threatening process or likely to be subject to such processes in the foreseeable future. It applies only to ecological communities with distributions that are small on a national scale, taking into account all bioregional occurrences regardless of State boundaries.

Indicative thresholds for identifying terrestrial vegetation communities with small distributions are:

- Very restricted: Total area of occupancy of < 10 km^2 (1,000 ha) or total extent of occurrence < 100 km^2 (10,000 ha) or patch sizes of generally < 0.1 km^2 (10 ha), depending on the particular community. (Communities tend to have a typical range of patch size that reflects the nature of the habitat and is relevant to their assessment.)

- Restricted: Total area of occupancy of <100 km^2 or total extent of occurrence <1,000 km^2, or patch sizes of generally < 1 km^2 (100 ha), depending on the particular community

- Limited: Total area of occupancy of <1,000 km^2 or total extent of occurrence <10,000 km^2

The categories are nested: very restricted is a subset of restricted and limited. The thresholds between categories are indicative only; other thresholds might be more appropriate for particular vegetation communities or communities defined by other attributes.

Criterion 3. Loss or decline of functionally important species

This criterion refers to native species that are critically important in the processes that sustain or play a major role in the ecological community, and whose removal has the potential to precipitate change in community structure or function sufficient to lead to the community's eventual extinction (functionally important species). Examples of species that are functionally important in some ecological communities include the dominant seagrass species in a seagrass community or a keystone disperser of fruits, such as the cassowary, in some rainforest communities.

To determine the eligibility of an ecological community under this criterion, there are two linked, inseparable components:

1. the decline of a population of native species that is likely to play a major role in the community; and
2. based on that decline, the specified threshold within which restoration of the community is **not likely** to be possible.

The category for which the ecological community may be eligible for listing under this criterion (Critically Endangered, Endangered or Vulnerable) is dependent on the level of decline of a functionally important species. The community as a whole is only eligible for listing under the appropriate category if it also meets the appropriate timeframe threshold for restoration. If the timeframe threshold is not met, the ecological community is not eligible for listing under any category using this criterion.

In simple terms, this criterion provides timeframes, linked with the severity of decline, in which the decline of the functionally important species must be halted, or reversed, to ensure the continuation of the ecological community.

Basically, if an ecological community had only one key seed disperser, and that key seed disperser was undergoing a very severe decline, then if the species could not be recovered within ten years (the timeframe for critically endangered), the ecological community would be considered critically endangered. If that same key seed disperser was suffering from a substantial decline, instead of a very severe decline, then the species would need to be able to be recovered within 50 years, otherwise it would meet the timeframe for classification as a vulnerable ecological community.
In making an assessment against the criterion, the following steps are followed:

Step 1: determine the level of decline experienced by a population of a functionally important species of that community.

Based on the IUCN species criteria, the TSSC provides the following thresholds as guidance:

- very severe decline: an estimated decline of at least 80% over the last 10 years or three generations, whichever is longer;
- severe decline: an estimated decline of at least 50% over the last 10 years or three generations, whichever is longer; and
- substantial decline: an estimated decline of at least 20% over the last 10 years or three generations, whichever is longer.

Step 2: determine in which category the community **may** be eligible for listing, according to the level of decline determined in step 1:

Level of decline	**Category**
very severe	Critically Endangered
severe	Endangered
substantial	Vulnerable

Step 3: predict whether restoration of the community is **not likely** to be possible within a certain timeframe. Restoration is defined as the more or less complete recovery of species composition, structure and ecological processes, with or without active intervention.
The timeframe threshold used to determine eligibility depends on the level of decline of the functionally important species:
If the decline is **very severe:**

the threshold is **immediate future**- the next 10 years, or three generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 60 years.

If the decline is **severe**:

the threshold is **near future**- the next 20 years, or five generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 100 years.

If the decline is **substantial**:

the threshold is **medium-term future**- the next 50 years, or ten generations of any long-lived species believed to play a major role in sustaining the community, whichever is the longer up to a maximum of 100 years.

The criterion is met if the time within which restoration of the ecological community is **not likely** to be possible is longer than the relevant threshold.

In summary, under this criterion a community is eligible for listing:

- as **Critically Endangered** if, for a population of functionally important species there is a very severe decline, to the extent that restoration of the community is not likely to be possible in the immediate future; or
- as **Endangered** if, for a population of functionally important species there is a severe decline, to the extent that restoration of the community is not likely to be possible in the near future; or
- as **Vulnerable** if, for a population of functionally important species there is a substantial decline, to the extent that restoration of the community is not likely to be possible in the medium-term future.

Example 1, to assess an ecological community for which it is known that a functionally important species has declined by 85% over the past 10 years; and restoration of the community is likely to be possible in 100 years:
Step 1: the level of decline is over 80%, which is a **very severe decline**;
Step 2: based on this decline the community **may be eligible for listing as Critically Endangered**;
Step 3: based on the decline, the timeframe threshold is **immediate future**. Since restoration may be possible in 100 years, it is not likely to be possible in the immediate future (10 years), so the community meets the threshold.
The community therefore meets this criterion for listing as Critically Endangered.
Example 2, to assess an ecological community for which it is known that a functionally important species has declined by 53% over the past 10 years; and restoration is likely to be possible in 17 years.
Step 1: the level of decline is at least 50% and less than 80%, which is a **severe decline**;
Step 2: based on this decline the community **may be eligible for listing as Endangered**;
Step 3: based on the decline, the timeframe threshold is **near future**. Since restoration is likely to be possible in 17 years, it does not meet the threshold, as restoration is likely to be possible in the near future (20 years).
The ecological community therefore does not meet this criterion under any category.

Criterion 4. Reduction in community integrity

This criterion recognises that an ecological community can be threatened with extinction through on-going modifications that do not necessarily lead to total destruction of all elements of the community. Changes in integrity can be measured by comparison with a benchmark state that reflects, as closely as possible, the natural condition of the community with respect to the composition and arrangement of its abiotic and biotic elements and the processes that sustain them.

The following guidelines apply to particular risk categories:

- Critically Endangered = change in integrity such that *regeneration* is unlikely within the *immediate future*, even with positive human intervention
- Endangered = change in integrity such that *regeneration* is unlikely within the

near future, even with positive human intervention

- Vulnerable = change in integrity such that *regeneration* is unlikely within the *medium-term future*, even with positive human intervention

[Where *regeneration* is defined as the re-establishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community; and *indicative time frames* associated with extinction risk are as discussed in the Preamble.]

The first part of this criterion is intended to capture detrimental changes in the identity and number of component species, the relative and absolute abundances of those species and the state of the abiotic environment that supports them. It includes irretrievable loss of native species and invasion by non-native species, as well as changes in the physical environment sufficient to lead to ongoing change in biota.

It may be helpful to assess the level of degradation using non-biological factors known to support the community and the species most significant in its description. For example, if the species of invertebrates that characterise a cave community have no mechanism to survive desiccation, the complete drying out of the cave could be considered sufficient to cause the extinction of that community.

The second part of this criterion recognises that ecological processes are important to maintain an ecological community (e.g. fire regimes or flooding) and that disruption to those processes can lead to the decline in integrity of the ecological community. This criterion could apply where disruption of processes is evident or imminent (e.g. altered hydrology leading to rising water tables and/or dryland salinity) prior to a measurable decline in integrity of the ecological community. It could also apply where recruitment to the community is known to be disrupted but where long lived species mask immediate community breakdown (e.g. when seedlings of a dominant tree species are not able to persist in the face of grazing by exotic herbivores). Such a criterion allows for recognition of a problem at an early stage.

Criterion 5. Rate of continuing detrimental change

A continuing change refers to a recent, current or projected future change whose causes are either not known or not adequately controlled, and so is liable to continue unless remedial measures are taken. Natural fluctuations will not normally count as a continuing change, but an observed change should not be considered to be part of a natural fluctuation unless there is evidence for this.

This criterion has been divided into an expression of change with two alternative expressions of the indication of that change. In doing this, the TSSC has recognised that the rate of continuing detrimental change occurring in a community is relevant to its risk of extinction independently of any pre-European data. It is difficult to quantify because detrimental change can be manifest in many different ways and adequate data for monitoring change may not be available. The TSSC will have to exercise “ecological judgement” in applying these criteria, submissions should therefore provide as much evidence as possible of the factors affecting decline and how these factors act on the community.

The following rates drawn from the updated IUCN Red List Criteria for species are intended to provide guidance only:

- Critically Endangered ≅ an observed, estimated, inferred or suspected *detrimental change* of at least 80% over the immediate past or projected for the immediate future

- Endangered ≅ an observed, estimated, inferred or suspected *detrimental change* of at least 50% over the immediate past or projected for the immediate future

- Vulnerable ≅ an observed, estimated, inferred or suspected *detrimental change* of at least 30% over the immediate past or projected for the immediate future

[Where *detrimental change* may refer to any one of the components of this criterion, i.e. to (a) geographic distribution or populations of critically important species, or (b) degradation or disruption of important processes.]

Data to demonstrate this criterion must be documented. They can be in the form of direct measurements of any of the components, actual or potential levels of exploitation, or the known effects of introduced biotic or abiotic elements on any of the components.

Criterion 6. Quantitative analysis showing probability of extinction

This criterion is intended to include any form of analysis that estimates the extinction probability of an ecological community based on known characteristics of important species or other components, habitat requirements, ecological processes, threats and any specified management options. The TSSC has recognised that this is an emerging area of science and will examine any acceptable modelling that may be provided to it. The Committee will use peer review as part of its process for this criterion.

Population Viability Analysis (PVA) is an example of such a technique appropriate for species, but no formal equivalent has been developed for ecological communities. Regardless of their form, quantitative analyses should make full use of all relevant available data. In a situation in which there is limited information, such data as are available can be used to provide an estimate of extinction risk (for example, estimating the impact of stochastic events on habitat). In presenting the results of quantitative analyses, the assumptions (which must be explicitly stated) and the data used must be documented.