New Zealand Threat Classification System manual

Department of Conservation
Te Papa Atawhai

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Andrew J. Townsend, Peter J. de Lange, Clinton A.J. Duffy, Colin M. Miskelly, Janice Molloy and David A. Norton

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Foreword

New Zealand is a biodiversity hotspot—one of the world's treasure chests of unusual and fascinating life forms. Among these are such internationally valued taonga as the tuatara, kiwi, kakapo, native frogs, and the short-tailed bat. Unfortunately, New Zealand also has a record of extinctions. Our biota evolved in the absence of predatory and browsing mammals, making it particularly vulnerable to the arrival of humans and the species they introduced. However, for over 100 years New Zealanders have been fighting back against the invading tide, and have achieved many remarkable successes in island pest eradications and threatened species recovery programmes.

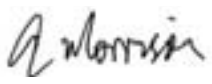
Preventing the extinction of New Zealand's unique plant and animal species is a critical element in the Government's New Zealand Biodiversity Strategy. It is a responsibility that we owe to ourselves and future generations, and not just New Zealanders but the international community. The challenge is huge.

An effective species threat classification system provides a fundamental framework to biodiversity recovery programmes. In order to demonstrate the value of conservation, we must establish objective benchmarks to determine the risk of extinction faced by each species, and then reassess each species over time. This provides a demonstrable measure of the level of conservation management, and its effectiveness. It also allows us to report on the state of New Zealand's biodiversity.

The Department's threat classification system has ramifications far beyond hands-on threatened species recovery programmes. The risk of extinction faced by a species is one of the main factors used when prioritising use of conservation resources, along with such factors as the expected cost and likely effectiveness of any management action. It helps answer how many threatened species there are, and how many we are attempting to manage. It is a measure of the difference our efforts make.

The Department of Conservation has led the process to develop an effective and relevant species threat classification over the last 15 years. This latest iteration follows a rigorous review of the 2002 system and introduces improvements that will enhance our ability to measure and report the effectiveness of conservation management. Prominent among these is the creation of a new category 'Recovering', specifically for threatened taxa that have responded well to management actions.

The authors have undertaken a comprehensive review, and produced a clear and concise manual. Expert users of the threat classification system, inside and outside of the Department, have contributed their knowledge and time. It is a demonstration that biodiversity recovery is far bigger than any one agency. I trust that this manual will be useful to all New Zealanders with an interest in the recovery of our natural heritage.



Al Morrison
Director-General of Conservation

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New Zealand Threat Classification System manual

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ABSTRACT

The New Zealand Threat Classification System provides a tool for assigning a threat status to candidate taxa. In this revision of the 2002 system, substantial changes include the addition of the new categories 'Declining', 'Naturally Uncommon', 'Recovering' and 'Relict'. The category 'Naturally Uncommon' is adopted to distinguish between biologically scarce and threatened taxa; 'Recovering' allows for threatened taxa whose status is improving through management action; and 'Relict' is used to encompass taxa that have experienced very large historic range reductions and now exist as remnant populations that are not considered unduly threatened. The 'Extinct' category is expanded to include taxa that have become extinct since humans first visited the New Zealand archipelago (defined as c. 1000 years before present). Definitions, qualifiers and criteria for inclusion have been revised as necessary for all categories. The present manual provides guidelines on how to use the New Zealand Threat Classification System, and outlines the processes by which candidate taxa and informal entities will be listed. This classification system is due for review in 2018, or sooner as needs dictate.

Keywords: threat classification system, threatened species, endangered species, rarity, threat listing process, threat ranking, manual, New Zealand

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1. Background

The risk of extinction that a taxon[1] faces is a critical facet of conservation management. Succinct listings of taxa by threat are often the basis for prioritising recovery programmes and research, monitoring the effectiveness of management efforts, gaining support for habitat protection, and assisting in natural resource decisions. Lists of threatened taxa can be compiled for particular taxonomic groups, sites or habitats, catchments, ecologically distinct areas, countries, regions and indeed the whole world (e.g. Baillie et al. 2004; BirdLife International 2004; de Lange et al. 2004; Hitchmough et al. 2007).

This second major iteration of the New Zealand Threat Classification System is intended to complement the world view provided by the IUCN Red Lists (www.iucnredlist.org/; viewed 1 November 2007). It is focussed at the national level, and provides a more sensitive classification for taxa with naturally restricted distributions and small numbers as a result of insular rarity.

The New Zealand Department of Conservation (DOC) is accountable for developing and reviewing the system, and ensuring that listings are carried out. Listings by taxon groupings are undertaken by independent expert panels, each of which is accountable for listing decisions for individual taxa.

This manual revises and improves upon Molloy et al. (2002). The changes made are based on comments that were collected during a review of that system, which was undertaken by the authors on behalf of DOC between November 2006 and May 2007. As with Molloy et al. (2002), the system described here may suit other countries with similar requirements, geography and ecological characteristics.

2. Review of the threat classification system

Consultation took place with Expert Panel members and other individuals who have contributed to past listing processes. This included individuals from DOC, research institutions, universities, other government departments, and non-government organisations. A standard questionnaire was used to gain feedback on the existing threat system and the listing process. Using the responses given, the authors of this document made adjustments to the system, had these tested by acknowledged experts, and prepared this manual.

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[1] For the purposes of this manual, a taxon (plural taxa) comprises not only any formally named rank below Family but also any biological entity as yet without a formal name; see also section 3 and Appendix 1.

3. Revised Threat Classification System

SCOPE

The scope of the New Zealand Threat Classification System has not changed (see Molloy et al. 2002). Any described or undescribed taxon that exists in the wild in New Zealand[2] has potential to be listed. The classification system has been developed to apply equally to terrestrial, freshwater and marine biota.

As previously, two parallel lists are produced:

Taxonomically determinate: Taxa that are legitimately and effectively published and generally accepted by relevant experts as distinct (this system is designed for the ranks genera, species, subspecies, varieties and forma)[3], e.g. *Ackama nubicola*, *Sterna nereis davisae, Coprosma spathulata* subsp. *hikuruana*, *Fissidens oblongifolius* var. *oblongifolius*, *Xeronema callistemon* f. *bracteosa*.

Taxonomically indeterminate: Taxa that are legitimately and effectively published but not generally accepted as distinct, e.g. *Beilschmiedia tawaroa*; or entities that are yet to be furnished with a formal name, e.g. *Lepidium* aff. *oleraceum* (a) (AK 230459; Chatham Islands).

Any disputed taxa and unnamed entities listed in the Taxonomically Indeterminate list require verification by an appropriate reference specimen[4] and consensus acceptance by the relevant Expert Panel. The only exceptions to this are taxa that are fully protected under the Wildlife Act (1953) or the Marine Mammals Protection Act (1978), where the relevant Expert Panel has the discretion to accept an unnamed entity in the absence of a reference specimen, provided there is sufficient scientific evidence to accept its distinctiveness. Voucher specimens or other evidence must be lodged at an appropriate institution. For convenience, all taxonomically indeterminate entities and disputed taxa are included in the term 'taxa' in the remainder of this document.

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[2] Includes all terrestrial, freshwater and marine areas within the New Zealand Exclusive Economic Zone, not including the Ross Dependency in Antarctica.

[3] Since the purpose of the listing process is to assign threat, the taxonomic rank of the entity is irrelevant and all have equal status.

[4] Defined as a whole specimen, parts thereof, a clear image, or DNA sequence lodged in an appropriate, publicly accessible collection or database, e.g. herbarium, museum collection or GenBank (refer www.ncbi.nlm.nih.gov; viewed 1 November 2007).

SYSTEM STRUCTURE

In the original threat classification structure, the categories 'Acutely Threatened', 'Chronically Threatened' and 'At Risk' were included in the super-category 'Threatened' (Molloy et al. 2002). In the present revision, only those categories formerly in 'Acutely Threatened' remain within the super-category 'Threatened', and the terms 'Acutely' and 'Chronically' are no longer used (Fig. 1). This is to distinguish between taxa that are facing imminent extinction and those that, although declining, have small populations or have small areas of occupancy, are not facing imminent extinction. These latter groups of taxa are listed in one of the 'At Risk' categories.

CATEGORIES

Categories for introduced[5] and transient visitors are provided, as well as categories for resident, indigenous threatened and non-threatened taxa, and taxa that have insufficient information available to rank them. The three categories 'Nationally Critical', 'Nationally Endangered' and 'Nationally Vulnerable' also remain, although some changes have been made to the population size and decline rate criteria that define them. 'Chronically Threatened', 'Serious Decline' and 'Gradual Decline' have been mostly replaced by a single new category, 'Declining', which includes taxa not deemed to be seriously threatened, but which may become so over time if population trends continue on their current trajectory. Changes to the criteria mean that some taxa that were formerly listed in 'Serious Decline' are now listed in the revised 'Nationally Vulnerable' category.

The 'At Risk' categories 'Range Restricted' and 'Sparse' have been replaced by a single category called 'Naturally Uncommon'. This is because some taxa, such as the endemic ultramafic grass *Trisetum serpentinum*, are both range-restricted and biologically sparse. In the revised system, 'Range Restricted' and 'Sparse' are now treated as qualifiers for the new category 'Naturally Uncommon'.

Some taxa have been eliminated from large parts of their range, but now exist in stable populations within secure habitats, e.g. the large restiad rush *Sporadanthus ferrugineus*, and the red-crowned parakeet (*Cyanoramphus novaezelandiae novaezelandiae*). To recognise this particular situation, the category 'Relict' has been created.

Lastly, through recent or past conservation management, some previously threatened taxa are now undergoing population recovery, e.g. Holloway's crystalwort (*Atriplex hollowayi*) and the shrub *Myrsine oliverii*. In many cases, their populations are still relatively small and therefore the taxa are considered 'At Risk'. Under the original system, taxa that were recovering were either qualified as such and left within a category whose definition implied they were still declining, or placed within 'Range Restricted' or

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[5] Includes all introductions known to be affected by human agency, whether deliberate or accidental.

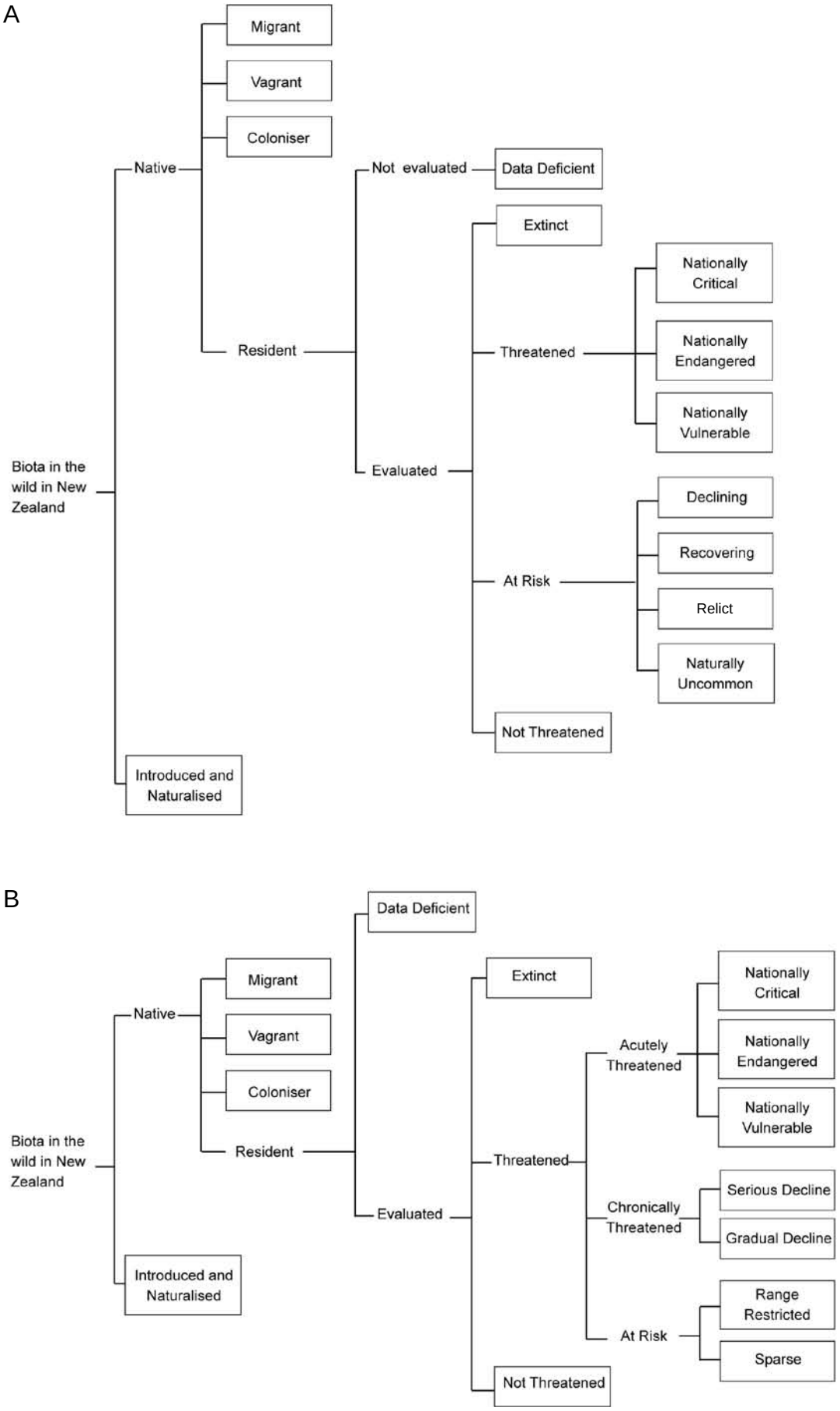

Figure 1. A. Revised (2007) and B. original (2002) structure of the New Zealand Threat Classification System.

'Sparse' categories, which did not truly reflect their status. Such taxa will now be listed in the new category 'Recovering'.

Criteria for each category are outlined in sections 8–10.

QUALIFIERS

As applied in the previous version of this manual, qualifiers provide additional information on each taxon, and all qualifiers that apply for a taxon are to be included. Table 1 lists the qualifiers used in this document and states whether they have changed. Additional definitions are provided in section 11.

TABLE 1. QUALIFIERS USED IN THE CLASSIFICATION AND CHANGES THAT HAVE BEEN MADE FROM MOLLOY ET AL. (2002).

QUALIFIER	STANDS FOR	STATUS
CD	Conservation Dependent	Unchanged
DP	Data Poor	Unchanged
EF	Extreme Fluctuations	Unchanged
EW	Extinct in the Wild	Unchanged
OL	One Location	Unchanged
RF	Recruitment Failure	Unchanged
SO	Secure Overseas	Unchanged
TO	Threatened Overseas	Unchanged
St	Stable	Changed
De	Designated	Added
IE	Island Endemic	Added
Inc	Increasing	Added
PD	Partial Decline	Added
RR	Range Restricted	Added
Sp	Sparse	Added
HI	Human Induced	Removed
RC	Recovering	Removed

4. The listing process

Figure 2 and Tables 2 and 3 outline the process to be used when listing taxa according to their threat status. Table 2 shows the criteria for each 'Threatened' or 'At Risk' category; written descriptions of each are also provided. Alternative criteria are again provided for the 'Threatened' categories, in case the total population size is not known: taxa can be classified using the number of sub-populations and the size of the largest sub-population, *or* the area of occupancy (as a surrogate for total population size). These criteria are shown in Table 3.

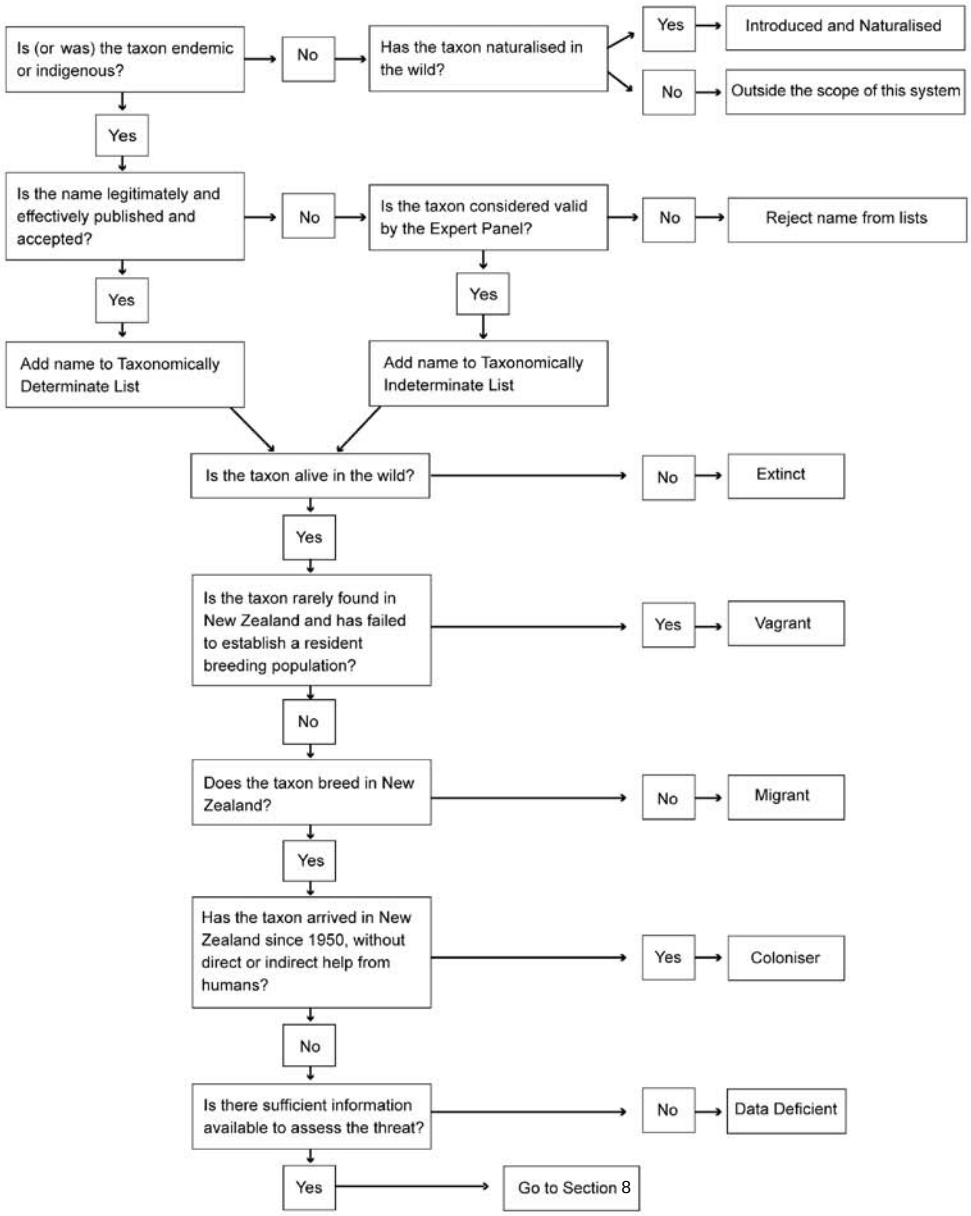

Figure 2. Flow chart for defining 'Introduced and Naturalised', 'Vagrant', 'Coloniser', 'Migrant', 'Extinct' and 'Data Deficient' categories. Note: criteria for assessing the validity of unpublished taxa are provided in section 3. See Appendix 2 for Expert Panel role description.

TABLE 2. PRIMARY CRITERIA FOR 'THREATENED', 'AT RISK' AND 'NOT THREATENED' TAXA.

Note that population changes are calculated over 10 years or three generations, whichever is longer. See Table 3 for secondary criteria (based on sub-population number and size, or area of occupancy). Abbreviations: Dec = Declining, NC = Nationally Critical, NE = Nationally Endangered, NT = Not Threatened, NU = Naturally Uncommon, NV = Nationally Vulnerable, Rec = Recovering, Rel = Relict, RR = Range Restricted.

	TOTAL NUMBER OF MATURE INDIVIDUALS					
TOTAL POPULATION TREND*	< 250	250–1000	1000–5000	5000–20 000	20 000–100 000	> 100 000
> 10% increase	NC	NV/NU	NU/Rec	NU/Rec	NT/ NU_{RR}/Rel	
Stable (± 10%)		NE/NU	NV/NU	NU/Rel		
10–30% decline		NE				Dec
30–50% decline				NV		
50–70% decline			NE			
> 70% decline						

* Predicted and ongoing due to existing threats.

TABLE 3. OVERVIEW OF SECONDARY CRITERIA FOR 'THREATENED' CATEGORIES, BASED ON A. SUB-POPULATION NUMBER AND SIZE, OR B. AREA OF OCCUPANCY.

For explanation, see main text. Population trends are calculated over 10 years or three generations, whichever is longer. Abbreviations: Dec = Declining, NC = Nationally Critical, NE = Nationally Endangered, NU = Naturally Uncommon, NV = Nationally Vulnerable, Rec = Recovering.

A

TREND	NUMBER AND SIZE OF SUB-POPULATIONS											
NUMBER:	≤ 2				3–5				6–15			
SIZE*:	≤ 200	≤ 300	≤ 500	≤ 1000	≤ 200	≤ 300	≤ 500	≤ 1000	≤ 200	≤ 300	≤ 500	≤ 1000
> 10% increase	NC	NV/ NU	†	†	NV/ NU	NV/ NU	†	†	†	†	†	†
Stable (± 10%)	NC	NE/ NU	NV/ NU	†	NE/ NU	NE/ NU	NV/ NU	†	NV/ NU	NV/ NU	NV/ NU	†
10–30% decline	NC	NE	NV	†	NE	NE	NV	†	NV	NV	NV	†
30–50% decline	NC	NE	NV	NV	NE	NE	NV	NV	NV	NV	NV	NV
50–70% decline	NC	NC	NE	NV	NC	NC	NE	NV	NE	NE	NE	NV
> 70% decline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

B

TREND	AREA OF OCCUPANCY (ha)				
	≤ 1	≤ 10	≤ 100	≤ 1000	≤ 10 000
> 10% increase	NC	NV/ NU	†/ Rec	†/ Rec	†
Stable (± 10%)	NC	NE/ NU	NV/ NU	†	†
10–30% decline	NC	NE	NV	†/ Dec	†/ Dec
30–50% decline	NC	NE	NV	NV	†/ Dec
50–70% decline	NC	NC	NE	NV	NV
> 70% decline	NC	NC	NC	NC	NC

* Number of mature individuals in largest sub-population.

† Several possible threat categories could apply to a taxon that fits this criterion and more information is required to determine the most appropriate category. Refer to Table 2 or section 8 and apply the precautionary principle to determine the most applicable category.

Points of clarification about the listing process are as follows:

1. The status of the taxon should be assessed regardless of whether its current status is the result of management.
2. For indigenous taxa, only the portion of the population that is resident in New Zealand should be assessed.
3. For taxa that migrate to New Zealand and breed here, only the portion of the total population that breeds in New Zealand should be assessed.
4. The Expert Panels should use a precautionary approach when evaluating a taxon against the criteria. For instance, in situations where information about a taxon is poor and a decision is being made between two categories, the higher threat category should be chosen; this decision and supporting information must be kept on file by the List Facilitator. When predicting future declines caused by existing threats, recent declines should be used to extrapolate forward.
5. Where taxa appear to fit more than one threat category due to the use of unbounded < or > symbols, the higher threat category always applies.
6. When using the sub-population criteria to determine status, it is assumed that the largest sub-population is significantly larger than other sub-populations. If data exist on the sizes of most or all of the sub-populations, then the summed values should be used as the total population size (see Tables 2 and 3).
7. Where the information used to assess a taxon is poor, the Expert Panel should make every effort to assign the taxon a threat category rather than list it as 'Data Deficient'. The qualifier 'Data Poor' (DP) will then be used to indicate the uncertainty about the listing due to lack of data.
8. As soon as an Expert Panel reassesses a taxon against the system and finds it does not meet the criteria of its former category, it will be upgraded or downgraded appropriately. This contrasts with the IUCN classification system, which requires a period of 5 years to elapse before a taxon is downgraded.
9. Taxa with very small populations (< 250 mature individuals) are classified as 'Nationally Critical' whether their population is naturally this size or has been reduced due to human causes. Taxa with stable or increasing naturally small populations with more than 250 mature individuals are considered 'Naturally Uncommon'.
10. Sometimes candidate taxa may, for reasons peculiar to those taxa, not fit within the criteria provided, which could result in an inappropriate listing. In such rare situations, the Expert Panel has the right to designate the most appropriate listing without application of the criteria. Where this occurs, a clear written record of the reason(s) why the taxon could not be ranked using the available criteria and the basis for its designated listing must be prepared, for purposes of transparency. This record will be held by DOC. Such taxa will be qualified 'De' (Designated).

Where practical, lists will be published by the Expert Panels in the relevant peer-reviewed literature, as well as being made available on the DOC website. Formal publication in this manner enhances the scientific credibility of the lists.

5. Status changes between listings

Informal entities or other taxa deemed taxonomically indeterminate may have been formally described since the last threat listing, and a threat classification may have been proposed in a peer-reviewed journal. In such instances, and provided the classification has been made in consultation with the relevant Expert Panel, the recommendation of the naming author(s) is accepted as an interim status until the next list is published.

In some extreme situations, e.g. following a rodent irruption, the status of a taxon can rapidly change for the worse, and this may happen between formal listings. In such rare situations, the relevant Expert Panel will convene and may make an appropriate change in status. Notification of the change in status will be made via the DOC website (www.doc.govt.nz). All such listings will be regarded as provisional and subject to confirmation when that taxon is next due for formal listing.

If the status of a taxon changes during the list preparation or publication phase, the revised status will be adopted in consultation with the Expert Panel where possible.

6. Review period

This classification system is due for review in 2018, or sooner as needs dictate. Note that each taxon group will be assessed against the criteria on a 3-year cycle; therefore, three cycles should be completed before 2018.

7. Application of criteria

Taxa are classified using one or more of the following criteria, depending on the category:

- Total number of mature individuals
- Ongoing or predicted population trend (due to existing threats)
- Total number of populations
- Number of mature individuals in the largest population
- Area of occupancy of the total population

Table 2 summarises the criteria for each of the 'Threatened' or 'At Risk' categories. Alternative criteria for the 'Threatened' categories are shown in Table 3.

8. Criteria for 'Threatened' taxa

'Threatened' taxa are grouped into three categories: 'Nationally Critical', 'Nationally Endangered' and 'Nationally Vulnerable'.

Taxa with populations that are small (< 250 mature individuals) are considered highly susceptible to stochastic events and so are listed as 'Nationally Critical', regardless of whether their small population size is due to human-induced or natural causes[6].

NATIONALLY CRITICAL

A. Very small population (natural or unnatural)

A taxon is 'Nationally Critical', regardless of population trend and regardless of whether the population size is natural or unnatural, when evidence[7] indicates that:

1. There are fewer than 250 mature individuals; or
2. There are ≤ 2 sub-populations *and* ≤ 200 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1 ha (0.01 km^2).

B. Small population (natural or unnatural) with a high ongoing or predicted decline

A taxon is 'Nationally Critical' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The population comprises 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Population (irrespective of size or number of sub-populations) with a very high ongoing or predicted decline (> 70%)

A taxon is 'Nationally Critical' when the population has an ongoing trend or predicted decline of > 70% in the total population due to existing threats taken over the next 10 years or three generations, whichever is longer.

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6 See definition of 'Natural' in Appendix 1.

7 Evidence in this context is defined as quantitative data and supporting information about the status of a candidate taxon.

A. Small population (natural or unnatural) that has a low to high ongoing or predicted decline

A taxon is 'Nationally Endangered' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Small stable population (unnatural)

To trigger this pathway to 'Nationally Endangered', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Endangered' when evidence indicates that they fit at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is stable (± 10%) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population and high ongoing or predicted decline

A taxon is 'Nationally Endangered' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or
2. There are ≤ 15 sub-populations *and* ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

A. Small, increasing population (unnatural)

To trigger 'Nationally Vulnerable', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Vulnerable' when evidence indicates that they fit at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is increasing (> 10%) and is predicted to continue to increase over the next 10 years or three generations, whichever is longer.

B. Moderate, stable population (unnatural)

To trigger 'Nationally Vulnerable', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Vulnerable' when evidence indicates that they fit at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or
2. There are ≤ 15 sub-populations *and* ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

The population is stable (± 10%) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population, with population trend that is declining

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or
2. There are ≤ 15 sub-populations *and* ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

D. Moderate to large population and moderate to high ongoing or predicted decline

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion *and* the Trend criteria as follows:

Status

1. The total population size is 5000–20 000 mature individuals; or
2. There are ≤ 15 sub-populations *and* ≤ 1000 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1000 ha (10 km^2).

Trend

There is an ongoing or predicted decline of 30–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

E. Large population and high ongoing or predicted decline

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 20 000–100 000 mature individuals; or
2. The total area of occupancy is ≤ 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

9. Criteria for 'At Risk' taxa

Taxa that qualify as 'At Risk' do not meet the criteria for any of the 'Threatened' categories. However, they are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations.

Four 'At Risk' categories exist: 'Declining', 'Recovering', 'Relict' and 'Naturally Uncommon'. Definitions for each are provided below.

DECLINING

'Declining' taxa do not qualify as 'Threatened' because they are buffered by a large total population size and/or a slower decline rate. However, if the declining trends continue, these taxa may be listed as 'Threatened' in the future.

A. Moderate to large population and low ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 5000–20 000 mature individuals; or
2. The total area of occupancy is ≤ 1000 ha (10 km^2).

Trend

There is an ongoing or predicted decline of 10–30% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Large population and low to moderate ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is 20 000–100 000 mature individuals; or
2. The total area of occupancy is ≤ 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Very large population and low to high ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion *and* the Trend criterion as follows:

Status

1. The total population size is > 100 000 mature individuals; or
2. The total area of occupancy is > 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 10–70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

RECOVERING

Taxa that have undergone a documented decline within the last 1000 years and now have an ongoing or predicted increase of > 10% in the total population or area of occupancy, taken over the next 10 years or three generations, whichever is longer. Note that such taxa that are increasing but have a population size of < 1000 mature individuals (or total area of occupancy of < 10 ha) are listed in one of the 'Threatened' categories, depending on their population size.

A. Moderate population

A taxon is eligible for listing as 'Recovering (A)'[8] if its total population size is between 1000 and 5000 mature individuals or its area of occupancy is ≤ 100 ha (1 km^2).

B. Moderate to large population

A taxon is eligible for listing as 'Recovering (B)'[8] if its total population size is between 5000 and 20 000 mature individuals or its area of occupancy is ≤ 1000 ha (10 km^2).

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[8] Recovering (A) and Recovering (B) are two different categories, rather than two pathways to the same category, and hence it is necessary to add '(A)' or '(B)' when classifying taxa, unlike for other categories.

RELICT

Taxa that have undergone a documented decline within the last 1000 years, and now occupy less than 10% of their former range and meet one of the following criteria:

A. Have 5000–20 000 mature individuals and are stable (± 10%)

B. Have more than 20 000 mature individuals and are stable or increasing at > 10%

The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. 'Relict' can also include taxa that exist as reintroduced and self- sustaining populations within or outside their former known range. (See definition of sub-population, Appendix 1.)

NATURALLY UNCOMMON

Taxa whose distribution is naturally confined to specific substrates (e.g. ultramafic rock), habitats (e.g. high alpine fellfield, hydrothermal vents), or geographic areas (e.g. subantarctic islands, sea-mounts), or taxa that occur within naturally small and widely scattered populations. This distribution is not the result of past or recent human disturbance. Populations may be stable or increasing. Note that a naturally uncommon taxon that has fewer than 250 mature individuals qualifies for 'Nationally Critical'. Taxa that have more than 20 000 mature individuals are not considered 'Naturally Uncommon', unless they occupy an area of less than 100 000 ha (1000 km^2).

10. Other categories

INTRODUCED AND NATURALISED

Taxa that have become naturalised in the wild after being deliberately or accidentally introduced into New Zealand by human agency.

If an 'Introduced and Naturalised' taxon has an IUCN Red Listing in its country or countries of origin, then the IUCN category and source of the listing are shown after the taxon's name in the New Zealand list. Current examples of this include the southern bell frog (*Litoria raniformis*), which is listed as 'Endangered' in Australia; and the parma wallaby (*Macropus parma*), which is listed as 'Lower Risk/Near Threatened' there. These taxa are thus listed as: southern bell frog (*Litoria raniformis*) Introduced and Naturalised$_{TO}$, EN A2ae (IUCN 2006); and parma wallaby (*Macropus parma*) Introduced and Naturalised$_{SO}$, LR/nt (IUCN 2006). Note the use of qualifiers 'TO' (Threatened Overseas) and 'SO' (Secure Overseas) as subscripts after 'Introduced and Naturalised'.

MIGRANT

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (a minimum of 15 individuals known or presumed to visit per year), but do not breed here.

Where the number of individuals visiting per annum is uncertain, the evidence used by the relevant Expert Panel to determine whether a taxon is either 'Migrant' or 'Vagrant' will be documented and held on file by DOC.

Examples include eastern bar-tailed godwit (*Limosa lapponica baueri*) and striped marlin (*Tetrapturus audax*).

In contrast, taxa that either breed here and migrate beyond New Zealand during their life cycle, e.g. Chatham Island albatross (*Thalassarche eremita*), or taxa that are resident in New Zealand for most of their lives, such as longfin eel (*Anguilla dieffenbachii*), are not included in this category.

If a taxon in the 'Migrant' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN Red List category and source of the listing is included. For example, southern bluefin tuna (*Thunnus maccoyii*) has an IUCN listing of Critically Endangered (CR) and is a migratory visitor to New Zealand. This taxon would then be listed as: southern bluefin tuna (*Thunnus maccoyii*) Migrant$_{TO}$, CR A1bd (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Migrant'.

VAGRANT

Taxa that are found unexpectedly in New Zealand and whose presence in this region is naturally transitory, or migratory species with fewer than 15 individuals known or presumed to visit per year.

These are invariably taxa that have failed to establish themselves beyond their point of arrival due to reproductive failure, because they typically breed elsewhere, or for other specific ecological reasons (see de Lange & Norton 1998).

Examples include the red-kneed dotterel (*Erythrogonys cinctus*), blue moon butterfly (*Hypolimnas bolina nerina*) and ant orchid (*Myrmechila trapeziformis*) from Australia, the spotted sawtail (*Prionurus maculatus*) from the tropical southwest Pacific Ocean, and the broad-billed sandpiper (*Limicola falcinellus*), a holarctic migrant.

If a taxon in the 'Vagrant' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list. For example, green turtle (*Chelonia mydas*) has an IUCN listing of Endangered (EN), and the bristle-thighed curlew (*Numenius tahitiensis*) has an IUCN listing of Vulnerable (VU); both are vagrants in New Zealand. These taxa would then be listed as: green turtle (*Chelonia mydas*) $\text{Vagrant}_{\text{TO}}$, EN A2bd (IUCN 2006); and bristle-thighed curlew (*Numenius tahitiensis*) $\text{Vagrant}_{\text{TO}}$, VU C2a(ii) (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Vagrant'.

COLONISER

Taxa that otherwise trigger 'Threatened' categories because of small population size, but have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild since 1950.

Three examples are the Nankeen night heron (*Nycticorax caledonicus*), the scoliid wasp *Radumeris tasmaniensis*, and the herb *Achyranthes velutina*.

If a taxon in the 'Coloniser' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list. For example, Indian yellow-nosed albatross (*Thalassarche carteri*) has an IUCN listing of Endangered (EN) and is a coloniser in New Zealand. This taxon would then be listed as: Indian yellow-nosed albatross (*Thalassarche carteri*) $\text{Coloniser}_{\text{TO}}$ EN A4bde (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Coloniser'.

DATA DEFICIENT

The amount of information available for assessing the threat of extinction is highly variable between taxa and groups of taxa. At one extreme there are taxa such as kakapo (*Strigops habroptilus*), *Gunnera hamiltonii* and *Tecomanthe speciosa*, where every wild individual is known, while at the other extreme there are taxa for which we have no population data, e.g. New Zealand storm-petrel (*Oceanites maorianus*) or the strap fern (*Grammitis gunnii*).

Certain criteria and/or definitions must be met for a taxon to be listed in a category. Where information is so lacking that an assessment is not possible, the taxon is assigned to the 'Data Deficient' category. If a taxon is listed in a category other than 'Data Deficient' but confidence in the listing is low due to poor-quality data, then the listing can be qualified with the letters 'DP' (Data Poor) to indicate this. Some data deficient taxa that have not been seen for many years may well be extinct.

Collection of sufficient demographic data to allow evaluation is a high priority for 'Data Deficient' taxa, as such data may confirm whether these taxa are 'Threatened' or 'At Risk'.

EXTINCT

There is no reasonable doubt, after repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon's historic range, that the last individual has died.

Examples include huia (*Heteralocha acutirostris*) and the shrub *Logania depressa*. Taxa that have become extinct since human settlement (here defined as the last 1000 years) are included in the list. Taxa that are extinct in the wild but occur in captivity or cultivation are not listed in this category; these are listed instead as 'Nationally Critical' with qualifier 'EW' (Extinct in the Wild).

NOT THREATENED

Taxa that are assessed and do not fit any of the other categories are listed in the 'Not Threatened' category.

11. Qualifiers

Qualifiers are an integral part of this classification system and must be cited in publications referring to the threat status of taxa listed under this system. Qualifiers provide critical additional information about a taxon's listing, status and management. When a taxon is listed, all of the qualifiers that apply to it are recorded in alphabetical order as subscripts after the threat category. For example:

Anzybas carsei 'Nationally Critical $_{CD, EF, OL, RF}$'

CONSERVATION DEPENDENT (CD)

The taxon is likely to move to a higher threat category if current management ceases.

DATA POOR (DP)

Confidence in the listing is low due to there being only poor data available for assessment.

DESIGNATED (De)

A taxon that does not fit within the criteria provided, and which the Expert Panel has designated to the most appropriate listing without full application of the criteria. For example, a commercial fish stock that is being fished down to Biomass Maximum Sustainable Yield (B_{MSY}) may meet criteria for 'Declining'; however, it could be designated as 'Not Threatened' if the Expert Panel believes that this better describes the taxon's risk of extinction.

EXTINCT IN THE WILD (EW)

The taxon is known only in cultivation or captivity.

EXTREME FLUCTUATIONS (EF)

The taxon experiences extreme unnatural population fluctuations, or natural fluctuations overlaying human-induced declines, that increase the threat of extinction.

When ranking taxa with extreme fluctuations, the lowest number of mature individuals should be used for determining population size, as a precautionary measure.

INCREASING (Inc)

There is an ongoing or predicted increase of > 10% in the total population, taken over the next 10 years or three generations, whichever is longer. Note that this qualifier is redundant for taxa ranked as 'Recovering'.

ISLAND ENDEMIC (IE)

A taxon whose natural distribution is restricted to one island archipelago (e.g. Auckland Islands) and is not part of the North or South Islands or Stewart Island/Rakiura.

ONE LOCATION (OL)

Found at one location (geographically or ecologically distinct area) of less than 1000 km^2 (100 000 ha), in which a single event (e.g. a predator irruption) could easily affect all individuals of the taxon, e.g. L'Esperance Rock groundsel (*Senecio lautus* var. *esperensis*) and Open Bay Island leech (*Hirudobdella antipodum*). Taxa with restricted distributions but where it is unlikely that all sub-populations would be threatened by a single event (e.g. because water gaps within an archipelago are larger than known rodent swimming distances) should be qualified as 'Range Restricted' (RR). 'OL' can apply to all 'Threatened' and 'At Risk' taxa, regardless of whether their restricted distribution is natural or human-induced.

PARTIAL DECLINE (PD)

Taxa undergoing decline over the majority of their range, but with one or more secure populations (such as on offshore islands). Partial decline taxa (e.g. North Island kaka *Nestor meridionalis septentrionalis* and Pacific gecko *Hoplodactylus pacificus*) are declining towards 'Relict' status rather than towards extinction.

RANGE RESTRICTED (RR)

Taxa confined to specific substrates, habitats or geographic areas of less than 1000 km^2 (100 000 ha); this is assessed by taking into account the area of occupied habitat of all sub-populations (and summing the areas of habitat if there is more than one sub-population), e.g. Chatham Island forget-me-not (*Myosotidium hortensia*) and Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). This qualifier can apply to all 'Threatened' and 'At Risk' taxa regardless of whether their restricted distribution is natural or human-induced, but is redundant if a taxon is confined to 'One Location' (OL).

RECRUITMENT FAILURE (RF)

The taxon's current population may appear stable but the age structure is such that catastrophic declines are likely in the future.

SECURE OVERSEAS (SO)

The taxon is secure in other parts of its natural range outside New Zealand.

SPARSE (Sp)

Taxa that occur within typically small and widely scattered populations.

STABLE (St)

The total population is stable (± 10%), taken over the last 10 years or three generations, whichever is longer.

THREATENED OVERSEAS (TO)

The taxon is threatened in those parts of its natural range outside New Zealand.

12. Acknowledgements

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Appendix 1

DEFINITIONS OF TERMS

Terms used to define categories and criteria are listed below. Those derived from IUCN definitions (IUCN 2001) are marked with an asterisk.

Area of occupancy* The area occupied by the taxon, taking into account the fact that a taxon may not occupy all areas throughout its range because of unsuitable habitat. The smallest area essential at any stage in the life cycle of the taxon will be used (e.g. colonial nesting sites).

Generation The average time between the birth/germination of successive generations of reproducing individuals. In groups where there are separate sexes, females are usually the limiting factor in population growth, so generation time is the average difference in age between mothers and their successfully breeding daughters.

Habitat The sustaining ecosystem upon which the taxon depends. When estimating percentage decline of habitat area, include those areas where the taxon has not been able to complete all of its life cycle because of the presence of animals and plants that do not naturally occur there.

Mature individuals* The number of mature individuals is defined as the number known, estimated or inferred to be capable of reproduction. When estimating this quantity, the following points will be borne in mind:

- Where the population is characterised by natural fluctuations, the minimum number will be used
- This measure is intended to count individuals capable of reproduction and will therefore exclude those whose reproductive capacity is suppressed in the wild through environmental, behavioural or other factors
- In the case of populations with biased adult or breeding sex ratios, it is appropriate to use lower estimates for the number of mature individuals, which take this into account (i.e. the estimated effective population size)
- Reproducing units within a clone will be counted as individuals, except where such units are unable to survive alone (e.g. corals)
- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate will be made at the time when mature individuals are available for breeding

Natural The term 'Natural' in this manual refers to taxa with population sizes, distributions and abundances that are the result of natural characteristics peculiar to these taxa and not the result of direct or indirect human activity (converse is 'Unnatural').

Population* The total number of individuals that are resident or that breed in New Zealand. For functional reasons, primarily owing to differences between life-forms, population numbers are expressed as numbers of mature individuals only. (See also definition of sub-population.)

Sub-population Groups of individuals that have resulted from past or ongoing fragmentation (natural or human induced) between which there is now little genetic exchange. Sub-populations must have a demonstrable reproductive capability. Re-introduced wild populations must be self-sustaining before they are included as a sub-population. Populations held in captive institutions or grown in nurseries or gardens are not considered to be within the definition of sub-population, unless they are the only remaining individuals of the taxon.

Taxon (plural **taxa**) Any taxonomic entity that has been acknowledged by relevant experts (see definitions for taxonomically determinate and taxonomically indeterminate in section 3).

Appendix 2

LISTING PROCESS ROLES

Expert Panel

Typically, each Expert Panel will comprise up to six people, as this is deemed sufficiently small to be cost-effective but not so small that relevant experts for particular groups of taxa are missing.

Expert Panel Members should be available for at least two listings (ideally more), as this will allow each member to become fully familiar with the classification system and its application.

Expert Panel Members should be selected through consultation with a relevant society or societies (e.g. New Zealand Entomological Society, Ornithological Society of New Zealand, New Zealand Plant Conservation Network, Society for Research on Amphibians and Reptiles of New Zealand, New Zealand Marine Sciences Society).

The Members' function is to provide knowledge on their particular field of expertise at the threat classification list meeting, to answer queries on listing decisions reached, and to consult with peers to bring as much information as possible to the meetings.

Expert Panel Leader

Panel Leaders will be selected by the List Facilitator in consultation with acknowledged experts and relevant societies, and ratified by the Department of Conservation's Terrestrial Species Science Manager, prior to each leader and the facilitator initiating the listing process.

Their role is to:

- Act as a liaison point between the List Facilitator and the Expert Panel Members
- Coordinate the process of notifying intent to list a taxonomic group as threatened
- Oversee and coordinate the submission process and compile the submissions, in consultation with the facilitator
- Schedule and arrange meetings
- Chair expert panel meetings
- Attend expert panel leader briefings as necessary
- Lead publication of the threatened taxa in a relevant science publication (e.g. *New Zealand Journal of Botany, New Zealand Journal of Zoology, New Zealand Journal of Marine and Freshwater Research*, or elsewhere as appropriate)

These roles will be assumed by the List Facilitator in situations where a Panel Leader is unavailable.

List Facilitator

The Facilitator will understand the workings of the system, and will be an effective channel between the Expert Panel Members and the list. His or her role is to:

- Maintain the electronic lists and background information relating to them through regular contact with the Expert Panel Members and Leaders
- Answer questions about the system and the lists in consultation with the Expert Panel Leaders (and Members)
- Select a Leader for each Expert Panel and, in consultation with the Leader, select a panel (to be signed off by the Department of Conservation's Terrestrial Species Science Manager)
- Brief Expert Panel Members and Leaders on their roles
- Ensure that standards are maintained in the quality of the data gathered for listings
- Assist with organising threat-listing meetings
- Ensure that electronic copies of the listings are available via the DOC website
- Prepare national cross-taxa summaries of threat listings and other high-level analyses as appropriate

During threat-listing meetings, the List Facilitator's role is to:

- Ensure that an accurate record is kept of decisions reached by each Expert Panel and which members were the main proponent(s) of that decision
- Ensure that the threat system is applied consistently and without bias by each Expert Panel, and act as an independent and impartial recorder of decisions made by each panel

Dispute resolution

If a dispute arises over such things as the listing of a taxon or interpretation of criteria, an independent advisory group will be formed to investigate the dispute and provide a final ruling.

Guidance on timelines

Each taxonomic group list is to be updated every 3 years. Once a decision to list a particular taxonomic group has been made, the following guidelines for each part of the project should be followed:

ACTION	TIMEFRAME
Notification of intent to list	6 months prior to listing
Call for submissions for taxa to be assessed or changed using a standardised template	3 months prior to listing
Threat list meeting (discussion → consensus → list generation and documentation held by DOC)	2–5 days
Paper preparation, draft sent out for consultation (limited to comment on major anomalies—1 month), submission, publication	c. 6 months post listing meeting

New Zealand Government