2022

New Zealand Threat Classification System manual 2022

Part 1: Assessments

Jeremy Rolfe, Rod Hitchmough, Pascale Michel, Troy Makan, Jerry A. Cooper, Peter J. de Lange, Andrew J. Townsend, Colin M. Miskelly and Janice Molloy

Department of Conservation
Te Papa Atawhai

Te Kāwanatanga o Aotearoa
New Zealand Government

Cover: A family of whio (*Hymenolaimus malacorhynchos*; Threatened – Nationally Vulnerable and Conservation Dependent) at Katipō Creek.
Photo: Richard Rossiter, Department of Conservation

This document is available in pdf form on the departmental website (www.doc.govt.nz/nztcs).

The New Zealand Threat Classification System website can be accessed at nztcs.org.nz. For all enquiries, email threatstatus@doc.govt.nz.

ISBN 978-1-99-116193-2 (web PDF)

This document was prepared for publication by Te Rōpū Ratonga Auaha, Te Papa Atawhai/Creative Services, Department of Conservation; editing by Amanda Todd and layout by Holly Slade. Publication was approved by the Director, Terrestrial Ecosystem Unit, Department of Conservation, Wellington, New Zealand.

Published by Department of Conservation Te Papa Atawhai, PO Box 10420, Wellington 6143, New Zealand.

In the interest of forest conservation, we support paperless electronic publishing.

Preface

New Zealand's biota has adapted to a wide range of landscapes and aquatic habitats over a long period of isolation, resulting in many of our plants and animals being found nowhere else on Earth. However, our country has also experienced high rates of extinction within the short time since humans arrived. Over the past 150 years, land use modifications, compounded by climate change in more recent times, have reduced habitats, and introduced predators and herbivores have had severe impacts on our wildlife. The fate of the huia is a reminder of the vulnerability of New Zealand's unique biota. To date, 81 New Zealand endemic species are known to have become extinct since human arrival, and doubtless more extinctions remain unknown.

Preventing further extinctions of New Zealand's unique indigenous taxa is a critical element in the Government's Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy. This is a commitment that the Department of Conservation (DOC) has made to New Zealanders and the international community, but the task is huge and complex and will require the appropriate tools and resources. The New Zealand Threat Classification System (NZTCS) is one of these tools. This rule-based system was created in 2001 to complement the International Union for Conservation of Nature (IUCN) Red List system to assess the risk of extinction faced by all species that reside in New Zealand outside captivity or cultivation. The categories and criteria used in this system consider the country's unique environment and ecosystems, which have led to many species having naturally restricted distributions and small populations.

Over the past 20 years, the NZTCS has proven to be extremely valuable for DOC and other agencies to report on the state of biodiversity and the environment in general. To date, the risk of extinction of over 14 191 species in New Zealand has been assessed using this system. It has also allowed us to evaluate the effectiveness of conservation management. For example, in 2021 the North Island brown kiwi was assessed as being Not Threatened after two decades of being in serious decline, a recovery that is the direct result of sustained conservation efforts over 30 years by community groups, Māori, DOC and other government agencies.

In 2019, DOC led a technical review of the NZTCS to continue improving its effectiveness and relevance. This latest iteration is the result of a rigorous consultation process with experts and end-users within and outside DOC. Amongst the prominent changes to the 2008 manual is the creation of new criteria to assess the risk of extinction for fungi, a group of species with cryptic lifestyles. The observed or expected impact of climate change on a species' survival will also now be recorded using a new qualifier. This technical manual (Part 1) is complemented with a companion document (Part 2) that presents the social process behind the NZTCS.

We gratefully acknowledge all those who over the past two decades have contributed in some way to the NZTCS and made this system the robust and valuable tool it is today for the recovery of our natural heritage.

CONTENTS

New Zealand Threat Classification System manual 2022

Part 1: Assessments

Jeremy Rolfe[1], Rod Hitchmough[1], Pascale Michel[1,*], Troy Makan[2], Jerry A. Cooper[3], Peter J. de Lange[4], Andrew J. Townsend[5], Colin M. Miskelly[6] and Janice Molloy[7]

[1] Biodiversity Group, Department of Conservation, PO Box 10-420, Wellington 6143, New Zealand

[2] Biodiversity Group, Department of Conservation, PO Box 1146, Rotorua 3040, New Zealand

[3] Manaaki Whenua – Landcare Research Ltd, PO Box 69040, Lincoln 7640, New Zealand

[4] School of Environmental and Animal Sciences, Unitec Institute of Technology, 139 Carrington Road, Mount Albert, Auckland 1025, New Zealand

[5] Biodiversity Group, Department of Conservation, PO Box 824, Whangarei 0140, New Zealand

[6] Museum of New Zealand Te Papa Tongarewa, PO Box 467, Wellington 6011, New Zealand

[7] 194 Reikorangi Rd, RD1, Waikanae 5391, New Zealand

* Corresponding author. Email: pmichel@doc.govt.nz

Abstract

The New Zealand Threat Classification System (NZTCS) provides a tool for assessing the extinction risk for taxa based on the estimated sizes of and forecasted changes to their populations. This revision of the 2008 system includes removal of the conservation status At Risk – Relict; the modification of At Risk – Naturally Uncommon to include all taxa that meet its population size and trend criteria, regardless of whether their condition is natural; and the re-labelling of At Risk – Recovering A and At Risk – Recovering B into Threatened – Nationally Increasing and At Risk – Recovering, respectively. Changes to qualifiers that were implemented in 2019 are also documented, including the replacement of Data Poor by Data Poor Recognition (DPR), Data Poor Size (DPS) and Data Poor Trend (DPT); the redefinition and renaming of Sparse to Biologically Sparse (Sp); and the introduction of two new qualifiers to complement each of Secure Overseas (SO) and Threatened Overseas (TO), reflecting uncertainty about the state of taxa overseas. Seven new qualifiers have also been added: Climate Impact (CI), Conservation Research Needed (CR), Naturalised Overseas (NO), Natural State (NS), Possibly Extinct (PE), Population Fragmentation (PF) and Relict (Rel). Finally, criteria codes have been modified to include values for population state, trend and size, resulting in a unique code for every possible assessment of resident native taxa. This manual provides guidance on how to use the NZTCS and outlines the processes by which candidate taxa and taxonomically unresolved entities will be assessed. It replaces all previous NZTCS manuals. The NZTCS is due for review in 2032, or sooner if required.

Keywords: conservation status, endangered taxa, manual, New Zealand, rarity, threat classification system, threatened taxa, threat listing process

1. Background

Knowledge of the risk of extinction a taxon[1] faces is critical to conservation management, as it provides a basis for setting priorities, planning recovery programmes and research, monitoring the effectiveness of management efforts, gaining support for habitat protection, and assisting in natural resource decision making. Lists of threatened taxa can be compiled for particular taxonomic groups, sites, habitats, catchments, ecologically distinct areas, countries, regions or the whole world (e.g. Baillie et al. 2004; BirdLife International 2004; de Lange et al. 2004; Hitchmough et al. 2007).

The New Zealand Threat Classification System (NZTCS) is a rules-based system for assessing the risk of native (indigenous) taxa declining towards extinction. It is intended to complement the world view provided by the International Union for Conservation of Nature (IUCN) Red List (IUCN Standards and Petitions Committee 2019) by providing a national perspective for New Zealand that is more sensitive to the state of taxa that have naturally restricted distributions and small numbers due to insular rarity.

The New Zealand Department of Conservation (DOC) is accountable for administering the NZTCS and ensuring that assessments are carried out. Assessments by taxonomic group are undertaken by panels of independent experts, who are accountable for the assessment decisions for individual taxa.

This third iteration of the NZTCS manual is a revision of the manual of Townsend et al. (2008). The changes it presents were based on comments collected during a technical review of the NZTCS undertaken in 2018/19 (Rolfe 2019). The technical review focused on matters affecting the assessments rather than administrative and social aspects of the NZTCS, which have been reviewed separately. Consequently, the NZTCS manual has been published in two parts: Part 1 (this document), which applies to assessments; and Part 2 (Michel et al. 2022), which applies to administrative and social matters.

The technical review found that the fundamental structure of the NZTCS is sound but recommended modifications to some conservation statuses and qualifiers. As with Townsend et al. (2008), the system described here may suit other countries that have similar requirements, geographies and ecological characteristics.

This manual replaces all previous NZTCS manuals. The NZTCS is due for review in 2032, or sooner if required.

[1] For the purposes of this manual, the term 'taxon' (plural taxa) includes both formally and informally named (taxonomically unresolved) ranks below genus level. See also section 3 and the Glossary in section 9.

2. Technical review of the NZTCS

The first and second editions of the NZTCS manual (Molloy et al. 2002; Townsend et al. 2008) were published by DOC to provide criteria for assessing the conservation statuses of organisms living in the wild in New Zealand. Molloy et al. (2002) also defined 11 qualifiers to be used alongside the assessments, which were modified and expanded to a list of 15 qualifiers by Townsend et al. (2008).

A technical review of the NZTCS was carried out in 2018/19 (Rolfe 2019). During this review, 23 past and present members of NZTCS assessment panels were surveyed for their opinions on a range of technical issues with the system that had been identified since publication of the second manual (Townsend et al. 2008). The review did not address the fundamental principles of the system, which the respondents agreed were sound.

Respondents to the survey recommended changes to the status At Risk – Naturally Uncommon and removal of the status At Risk – Relict. They also recommended the addition of several new qualifiers, amendments to qualifier definitions and improvements to explanatory notes. These recommendations are implemented in this edition of the NZTCS manual.

It was also recommended that the status At Risk – Recovering was changed to resolve a problem that would arise if the population of a taxon assessed as Recovering A should stabilise, which would move it from the At Risk category to the Threatened category, despite there being no deterioration in the population. This has been resolved by moving Recovering A into the Threatened category and renaming it Nationally Increasing. 'Nationally' is included in this name for consistency with the nomenclature of the other conservation statuses in the Threatened category and should not be construed as meaning that the population of a taxon in this category is increasing consistently across its entire geographical range. The movement of this status also ensures that the population size criteria are applied consistently across the Threatened statuses.

2.1 Scope of the NZTCS

The scope of the NZTCS has remained unchanged, with any described or undescribed taxon that exists in the wild in New Zealand[2] still being a candidate for assessment (see Townsend et al. 2008). Conservation status assessments are only made for resident native taxa. Non-resident native[3] or introduced and naturalised[4] taxa may also be listed but their conservation statuses within New Zealand are not assessed. The classification system has been developed to apply equally to terrestrial, freshwater and marine biota.

Assessments are conducted on groups of taxa based on their taxonomic relationships (e.g. birds, Onychophora) or shared environmental domains (e.g. freshwater invertebrates, marine mammals).

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

[3] Includes taxa that regularly and predictably visit New Zealand (Migrant, with some exceptions), taxa that unexpectedly occur in New Zealand and whose presence is usually transitory (Vagrant), and taxa that would otherwise be assessed as Threatened but arrived in New Zealand without direct or indirect help from humans and have been breeding in the wild for less than 50 years (Coloniser).

[4] Taxa that have established resident breeding populations in New Zealand after being deliberately or accidentally introduced by human agency.

2.2 Changes to the structure

2.2.1 Categories

The NZTCS structure of Townsend et al. (2008) (see Fig. 1) remains broadly unchanged. The categories Extinct, Data Deficient, Threatened, At Risk and Not Threatened apply to native biota that are (or were) resident in the wild in New Zealand, while other taxa that occur in the wild in New Zealand continue to be categorised as either Non-resident Native (Coloniser, Migrant or Vagrant) or Introduced and Naturalised.

2.2.2 Conservation statuses

Changes have been made to conservation statuses in the At Risk and Threatened categories. These changes address issues that have become evident since Townsend et al. (2008) was published.

When making NZTCS assessments, it became apparent that some taxa did not fit the criteria for any of the At Risk statuses or the Not Threatened category, as their populations and/or areas of occupancy had stabilised after previous declines but were too large to be assessed as Threatened and too small to fit the Not Threatened category. Also, some At Risk – Recovering taxa would automatically move into a Threatened category if their populations were to stabilise and would revert to the At Risk category if a population increase subsequently resumed. Therefore, changes have been made to address these issues.

The system of Townsend et al. (2008) provided two At Risk conservation statuses for taxa with stable populations: Naturally Uncommon, which applied to taxa that naturally had relatively small populations and larger natural population sizes than the threshold for Threatened – Nationally Critical; and Relict, which applied to taxa that had experienced previous declines and subsequently stabilised at less than 10% of their former range. However, these statuses did not allow for taxa that had declined and then stabilised at a level greater than 10% of their former range. To address this, At Risk – Naturally Uncommon has been renamed At Risk – Uncommon, with the population state value (Natural, Unnatural or Unknown) indicating whether the population size is a natural or induced state. This status will apply to all taxa that have stable or increasing populations and meet the population size criteria for the At Risk category, regardless of whether their state is natural or unnatural. In addition, At Risk – Relict has been removed and replaced by a Relict qualifier for taxa with stable populations that occupy less than 10% of their former ranges. The Relict qualifier or a new Natural State qualifier may be applied to any Threatened or At Risk taxon, including At Risk – Uncommon taxa.

In the system of Townsend et al. (2008), At Risk – Recovering was defined as two separate conservation statuses based on population size: Recovering A for taxa with populations between 1000 and 5000 mature individuals or areas of occupancy less than 100 ha; and Recovering B for taxa with populations between 5000 and 20 000 mature individuals or areas of occupancy between 100 and 1000 ha. Since Recovering A taxa would be in the Threatened category if their populations were stable, it is conceivable that a taxon's conservation status could move back and forth between Threatened and At Risk depending on whether its population trend was stable or increasing at the time of assessment. To address this, Recovering A has been moved into the Threatened category and renamed Threatened – Nationally Increasing and the annotation 'B' has been dropped from At Risk – Recovering B as it is superfluous. The criteria for both categories have remained unchanged.

Finally, two statuses have been established within the Introduced and Naturalised category: Persistent, which is for extant naturalised taxa; and Eliminated, which acknowledges naturalised taxa that have been deliberately removed. Introduced taxa that breed for a short time but fail to establish persistent populations that expand beyond the point of establishment are not considered to have naturalised.

The new NZTCS structure is shown in Fig. 2.

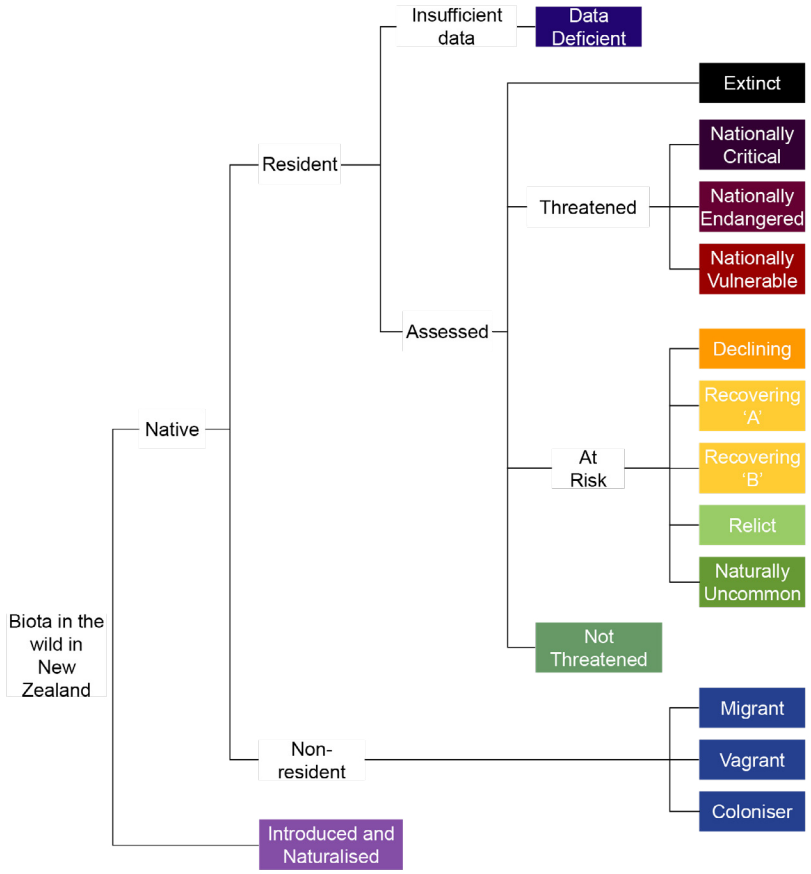

Figure 1. New Zealand Threat Classification System structure of Townsend et al. (2008).

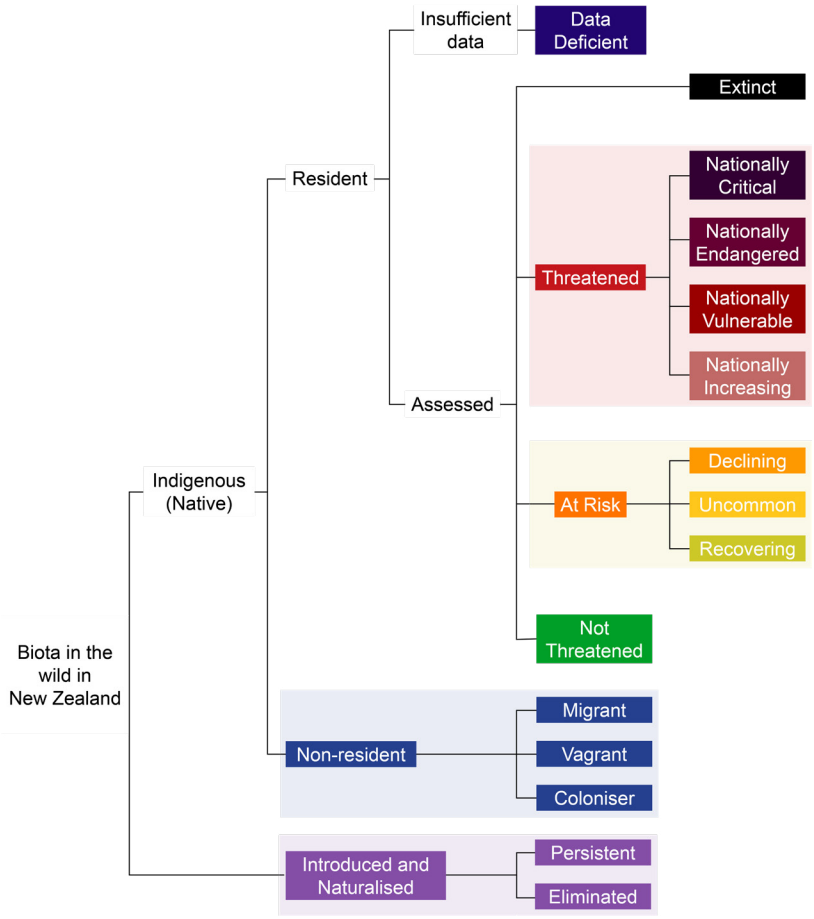

Figure 2. Revised (2022) structure of the New Zealand Threat Classification System.

2.3 Changes to the criteria codes

Criteria codes are used to summarise the values that contribute to conservation status assessments. The contents of these codes have been expanded to indicate population state as well as trend and size, and the codes have been revamped so that the code for each assessment is unique. A letter code is used for each population state setting, followed by a numeric code for each population trend setting and then a letter code for each population size setting. The codes are prefixed with letters to represent the conservation status. For example, the code NVu4p represents Threatened – Nationally Vulnerable, declining 30–50%, 6–15 sub-populations, 300–500 mature individuals in the largest sub-population. These changes enable criteria codes to be used for the assessments of all resident native taxa, regardless of their conservation statuses.

The structure of criteria codes is outlined in section 3.2.3 below.

2.4 Changes to the qualifiers

Qualifiers provide additional information about taxa and their conservation status assessments. They can help in understanding the basis for assessments and can provide conservation managers with useful information to support management decisions. This manual includes 27 qualifiers that are available for use, 13 of which are unchanged from Townsend et al. (2008) and 14 of which are new (although 3 of these are variations of the Data Poor qualifier, which is no longer used, and 4 are variations of the Secure Overseas and Threatened Overseas qualifiers). Table 1 provides a list of these qualifiers and shows how they differ from those of Townsend et al. (2008). Definitions and explanations of some qualifiers have also been amended to improve clarity. Definitions and explanatory notes for all qualifiers are provided in section 6.

2.5 Changes to the NZTCS roles

NZTCS role descriptions are to be updated to reflect the development of the NZTCS online database and changes within DOC. The roles of expert panel leads and members will be redefined to focus on their scientific contributions to assessments, with DOC becoming responsible for the administrative roles that were previously assigned to panel leads. These changes are described in detail in Part 2 of the NZTCS manual 2022, which has been published separately (Michel et al. 2022).

Table 1. Qualifiers used in the 2022 New Zealand Threat Classification System (NZTCS) and how these differ from those of Townsend et al. (2008). The list is arranged in thematic groups covering the NZTCS assessment process, biological attributes of taxa, management of pressures on taxa, population trend and population state.

QUALIFIER	CODE	COMPARISON WITH TOWNSEND ET AL. (2008)
Assessment qualifiers		
Data Poor Recognition*	DPR	New
Data Poor Size*	DPS	New
Data Poor Trend*	DPT	New
Designated	De	Unchanged
Biological attribute qualifiers		
Biologically Sparse	Sp	Unchanged
Island Endemic	IE	Unchanged
Natural State	NS	New
Range Restricted	RR	Unchanged
Pressure management qualifiers		
Conservation Dependent	CD	Unchanged
Climate Impact	CI	New
Conservation Research Needed	CR	New
Population Fragmentation	PF	New
Recruitment Failure	RF	Unchanged
Population trend qualifiers		
Extinct in the Wild	EW	Unchanged
Extreme Fluctuations	EF	Unchanged
Increasing	Inc	Unchanged
Partial Decline	PD	Unchanged
Possibly Extinct	PE	New
Population state qualifiers		
Naturalised Overseas	NO	New
One Location	OL	Unchanged
Relict	Rel	New
Secure Overseas	SO	Unchanged
Secure Overseas?	SO?	New
Secure? Overseas	S?O	New
Threatened Overseas	TO	Unchanged
Threatened Overseas?	TO?	New
Threatened? Overseas	T?O	New

* Note that the single Data Poor qualifier of Townsend et al. (2008) has been replaced by three qualifiers in the 2022 NZTCS.

3. Assessing taxa

3.1 Candidate taxa for assessment

Taxa must meet both taxonomic and native residency criteria to be candidates for assessment of their conservation status through the NZTCS.

3.1.1 Taxonomic criteria

Assessments are made for taxa at the ranks of species, subspecies, variety or form, at the lowest taxonomic rank available – for example, they are not made at the species level when infraspecific divisions are recognised in the NZTCS. To be eligible for inclusion, a taxon may be either:

- **Taxonomically determinate:** the scientific name has been legitimately and effectively published according to the provisions of the relevant nomenclatural code and the taxon is generally accepted by relevant experts as being distinct (e.g. *Ackama nubicola, Sternula nereis davisae, Coprosma spathulata* subsp. *hikuruana, Rubus schmidelioides* var. *schmidelioides, Xeronema callistemon* f. *bracteosa*); or
- **Taxonomically unresolved:** the scientific name has been legitimately and effectively published but the distinctiveness of the taxon is under debate (e.g. *Beilschmiedia tawaroa*) or the taxon has yet to be taxonomically investigated and furnished with a formal name if proven to be distinct (e.g. *Wainuia* sp. 3 (NMNZ M.305040) "Mount Oxford").

Taxa and unnamed entities that are listed as taxonomically unresolved require verification by an appropriate reference specimen[5] and acceptance by the relevant expert panel. Exceptions to this are taxa that are fully protected under the Wildlife Act 1953 or the Marine Mammals Protection Act 1978, in which case 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.

It can be difficult to determine the appropriate infrageneric or infraspecific taxonomy that should be recognised for assessments, especially when equally valid but divergent taxonomic treatments are available. When such occasions arise, the expert panel should adopt a (formal or informal) taxonomy that represents the greatest amount of variation across populations to ensure that the risk of biodiversity loss is assessed as comprehensively as possible pending resolution of the taxonomy. This approach will generally favour taxonomic splitting over lumping.

Assessments of taxonomically unresolved entities are provisional pending resolution of their taxonomic statuses. For convenience, all taxonomically indeterminate entities and disputed taxa are included in the term 'taxa' (or 'taxon') in the remainder of this document.

The expert panel is the arbiter of taxonomic criteria for inclusion in NZTCS assessments.

3.1.2 Residency criteria

The NZTCS has provisions for reporting on any taxon that lives or has lived in the wild in New Zealand, whether it is resident native, non-resident native, or introduced and naturalised:

- Resident native taxa include those taxa that breed in New Zealand (regardless of whether they migrate to other countries during their non-breeding season), as well as migratory

[5] Defined as a whole specimen, parts thereof, a clear image or a DNA sequence lodged in an appropriate, publicly accessible collection or database, e.g. herbarium, museum collection or GenBank (refer to www.ncbi.nlm.nih.gov/; viewed 31 July 2020).

taxa that do not breed in New Zealand but for which more than 25% of the global population is resident in New Zealand for more than 50% of the life cycle.

- Non-resident native taxa are listed according to their non-resident statuses (Coloniser, Migrant or Vagrant) but their conservation statuses are not assessed under the NZTCS. The Migrant status excludes migratory taxa that qualify to be included for assessment as Resident Native taxa.
- Introduced and naturalised taxa may be listed but their conservation statuses are not assessed under the NZTCS.

Figure 3 outlines the process for establishing whether taxa meet the residency criteria for assessment of their conservation statuses under the NZTCS.

3.2 Guidance on the assessment process

NZTCS assessments are based on estimates of population state, size and trend within the longer of 10 years or three generations up to a maximum of 100 years.

3.2.1 General guidance

The following points of clarification about the assessment process should be noted:

1. Assessments are for established wild populations of taxa. Populations in captivity or horticulture are considered in assessments only if they are the only known extant examples of the taxon, in which case they will be assessed as Threatened – Nationally Critical with the qualifier Extinct in the Wild (e.g. *Geranium cruentum*). Information about captive or horticultural populations may be provided in the assessment notes.
2. Translocated populations are not considered in assessments until they are considered to be self-sustaining (albeit with ongoing management, such as pest control). Information about translocations may be provided in the assessment notes.
3. Taxa that have gone extinct since the arrival of humans in New Zealand in the 13th century CE should be listed as Extinct. Taxa that were extinct before the arrival of humans should not be listed.
4. The status of a taxon should be assessed regardless of whether its current status is the result of management.
5. Where a taxon breeds in New Zealand and other countries, only the portion of the total population that breeds in New Zealand should be assessed.
6. A taxon that breeds in New Zealand and migrates to other countries when not breeding is assessed as a Resident Native taxon, but only the portion of the world population that breeds in New Zealand should be assessed.
7. Expert panels should use a precautionary approach when evaluating taxa against the criteria. For instance, in situations where information is poor and a decision is being made between two conservation statuses, the more threatened status should be chosen. An explanation of the assessment, including supporting information, must be recorded in the NZTCS database.
8. For some taxa, it may be possible to estimate population size based on the MATIND (number of mature individuals), AREA (area of occupancy) and/or SUBPOP (number of sub-populations and number of mature individuals in the largest sub-population) criteria. This may result in a taxon fitting into more than one conservation status depending on which criterion was used. The more threatened status always applies in such cases.
9. Taxa that have declining populations are considered to have 'unnatural' population states.

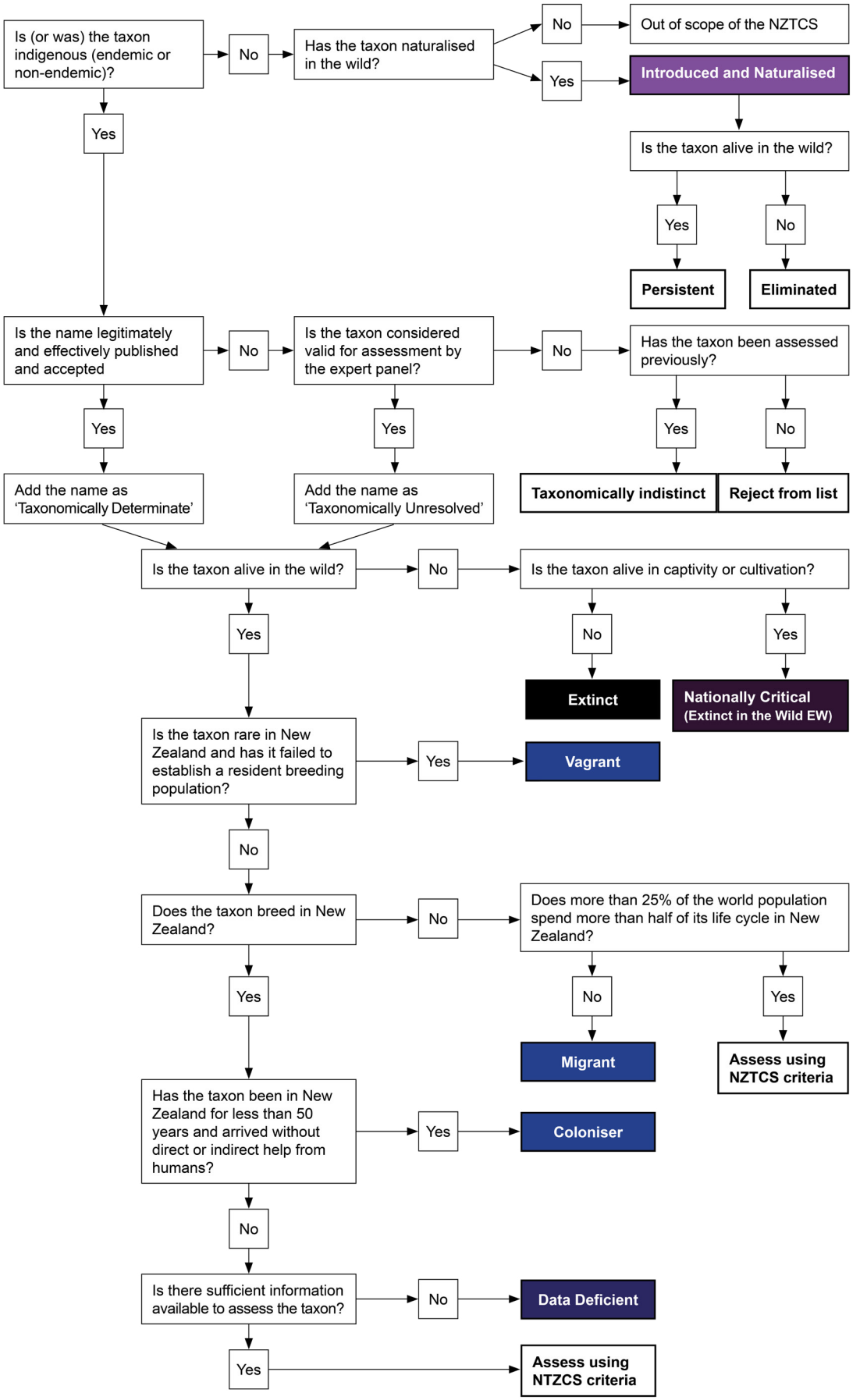

Figure 3. Flow chart for identifying candidate taxa for assessment under the New Zealand Threat Classification System (NZTCS). This chart can be used to define Introduced and Naturalised (Persistent, Eliminated), Non-resident Native (Vagrant, Coloniser, Migrant) and Resident Native taxa, as well as the Extinct and Data Deficient categories for Resident Native taxa. Note: criteria for assessing the validity of unpublished taxa are provided in section 3.1.1 'Taxonomic criteria'.

10. Where the information used to assess a taxon is poor, the expert panel should make every effort to assign the taxon a conservation status rather than report it as Data Deficient. If the expert panel is confident that the population is greater than 250 mature individuals or occupies more than 1 ha (i.e. the population size is greater than the threshold for Threatened – Nationally Critical), an assessment should be made. The Data Poor qualifiers (Data Poor Recognition, Data Poor Size and/or Data Poor Trend) are available to indicate the uncertainty about the listing due to a lack of data.
11. Any taxon with a very small population (< 250 mature individuals) is classified as Nationally Critical regardless of whether its population is naturally that size or has declined because of human-induced effects. Although population trend does not influence the assessment, it is necessary to record trend because any detectable decline in such a small population represents a heightened risk of extinction.
12. It is unlikely that a taxon with a small, stable population will be *naturally* uncommon, especially when the size of the population is near the threshold for Threatened – Nationally Critical. Therefore, it is important to carefully consider the state (natural or unnatural) of a taxon that has been assessed as At Risk – Uncommon.
13. Some candidate taxa may not fit within the criteria provided (for individual reasons), which could result in an inappropriate listing. In such rare situations, the expert panel has the discretion to designate the most appropriate assessment without application of the criteria. Where this occurs, a record of the reason(s) for the designation should be recorded in the notes to the assessment in the NZTCS database. Such taxa will be qualified Designated.

3.2.2 Population state, trend and size

Under the NZTCS, the conservation statuses of taxa are classified based on their population state, trend and size.

Population state

The population state considers whether the population is 'natural' or 'unnatural'.

A population is deemed to be 'unnatural' if its current size or area of occupancy is smaller than it would have been in the absence of human-induced influences. If the population state is unknown, the assessment will proceed as if it were 'unnatural' as a precautionary measure.

Population trend

Population trend is an estimate of the change in population size over the longest of 10 years or three generations, up to a maximum of 100 years. It is presented as INC (increase), STABLE or DECR (decrease) alongside the forecast percentage range. The estimate of trend should take into account known historical changes in population size and existing ongoing pressures that are expected to affect the size of the population in the future.

The NZTCS uses the generation definition of the IUCN Red List, in which generation length is defined as 'the average age of parents of the current cohort (i.e. newborn individuals in the population)' (IUCN 2012; IUCN Standards and Petitions Committee 2019). In taxa with separate sexes, females are usually the limiting factor in population growth, so the generation time is taken as the average difference in age between mothers and their successfully breeding daughters.

The generation times of taxa can be very difficult to calculate, especially for long-lived taxa that are reproductive for many years. Assessments are based on the 'natural' generation times of taxa unaffected by human impacts, which may be longer than those currently observed in the presence of human impacts. Consequently, care is needed when estimating generation times.

It is important to understand the relationship between the *annual rate of decline* and the *total decline over three generations*. Annual rates of decline that trigger changes in conservation status are much lower for long-lived taxa than for short-lived taxa. For example, to meet the threshold of a 50% decline over three generations, a taxon that is assessed over a 10-year period would need to decline approximately 6.7% per year whereas a taxon that is assessed over a 20-year period would only need to decline approximately 1.1% per year. Approximations of annual rates of decline that trigger changes in conservation status are provided in Appendix 1.

For taxa that decline after human-induced population increases, the population trend should be assessed as STABLE (± 10%) until the population has returned to its 'natural' level. A declining trend should only be used when the population declines below its natural level. For example, the population of the herb *Epilobium hirtigerum* is thought to have increased to exploit novel habitats created by human disturbance, but these habitats are expected to diminish as they are converted for other human uses; therefore, the population of *E. hirtigerum* is expected to decline in the future but its trend should be assessed as STABLE (± 10%) until it returns to its 'natural' size.

Population size

The population size is estimated using one of the following criteria:

- **Total number of mature individuals (MATIND):**

  This represents the number of mature individuals that contribute to the breeding population across the entire range of the population in New Zealand.
- **Area of occupancy of the total population (AREA):**

  When using AREA to estimate population size, care must be taken to consider the occupied area within the extent of occupancy (the geographical range) of a taxon and to use the smallest area that is essential at any stage in the life cycle of the taxon (e.g. the area of colonial nesting sites rather than the area occupied during non-breeding times). Using a large AREA estimate for the population size may mask a substantial decline that has resulted in a sparsely distributed population.
- **Total number of sub-populations (SUBPOP) and number of mature individuals (MATIND) in the largest sub-population:**

  When using the SUBPOP criterion to determine status, it is presumed that the largest sub-population is considerably larger than other sub-populations. If data exist on the sizes of most or all of the sub-populations of a taxon, the summed values should be used as the total population size (see section 3.2.3, Tables 2 and 3). Population estimates based on the combination of number of sub-populations and area of occupancy are not available in the NZTCS.

It is very difficult to estimate population sizes using MATIND or AREA for taxa that are widely distributed. However, the need for accurate population data is reduced through the use of size ranges for assessments (e.g. MATIND = 1000–5000, AREA = 10–100 ha).

In some circumstances, it may be possible to determine the population size of a taxon using the MATIND, AREA or SUBPOP criteria. When this occurs, the assessment should be based on the population size criterion that represents the most Threatened or At Risk conservation status.

A special case – estimating the population sizes and generation times of fungi

Many fungi have cryptic lifestyles that can make it difficult to define their populations, individuals and lifespans. Generally, their presence is only revealed when they produce sporocarps, which are often short-lived, and their distributions are patchy, inconsistent and linked to environmental conditions. Consequently, the dynamics of fungal populations are poorly understood because of their cryptic lifestyles and uncertain knowledge of the lifespans and spatial extents of individuals.

Continued on next page

The IUCN has adopted a pragmatic approach that enables metrics for fungal individuals and populations to be calculated based on available data for the occurrence of sporocarps (Dahlberg & Mueller 2011), which are described below. However, it should be noted that these metrics are based on approximations that are subject to considerable uncertainty and unquantified variances.

The term **functional individual** has been introduced for fungi to represent a genet (a group of genetically identical individuals that may not be recognisable as individuals) and is defined based on the distribution of easily observed sporocarps. Thus, for terrestrial fungi, it can be conservatively assumed that clusters of sporocarps that are separated by 10 m or more represent two different genets. Each of these genets may be fragmented into several clonal ramets (mature individuals), with the degree of fragmentation (ramets per genet) depending on the fungal lifestyle (Dahlberg & Mueller 2011). Thus, a pragmatic estimate of the number of mature individuals (ramets) in a sub-population can be obtained from observations of the distribution of sporocarps and the lifestyle of the fungus. In practice, the distribution of sporocarps within a sub-population is rarely explicitly recorded, so advice should be sought from experts who are familiar with the taxon. Where possible, there should also be surveys and ongoing monitoring of sub-populations associated with taxa identified as potentially at risk.

To derive the total number of mature individuals in the population, it is necessary not only to sum the number of mature individuals across all sub-populations at **known sites** but also to consider potential **undiscovered sites**. Since fungal fruit bodies are sporadic in occurrence, usually decay rapidly and are often cryptic, they are difficult to detect, making it important to estimate the potential for the undetected occurrence of the taxon in other suitable locations within the known extent of the taxon. As for all highly cryptic taxa, any estimate of the number of undiscovered sites should consider the difficulty of observing the taxon, the difficulty of identifying the taxon, the distribution of suitable habitats/environments in which it might occur, the known life history (especially any host-specific associations), the survey/observation effort and the expertise of those carrying out the surveying/observations. It is important to note that the degree of difficulty in observing a taxon is not related to the degree of surveying effort and, likewise, the difficulty of correctly identifying a particular taxon is not related to the expertise of those carrying out the surveying. Taxa can be inherently 'difficult' independent of the applied effort.

To summarise, an inferred measure of the total number of mature individuals in a fungal population can be derived from:

Population = (No. functional individuals × No. ramets per genet) × (No. known sites + No. undiscovered sites)

It is important to emphasise, however, that such multiplicative expansion may lead to a potentially large and unquantified variance.

Changes to the population must also be estimated over a meaningful timescale which, in the case of the NZTCS, is taken as the longer of 10 years or three generations up to a maximum of 100 years. The **generation time** is generally defined as the average age of the parents of the current cohort and provides a measure of the turnover rate of the population, but this definition cannot be applied to fungi. Therefore, an estimate of the persistence of a fungal colony may be used to achieve the same purpose. However, this is not ideal because few data are available on the persistence of fungal colonies. It has been proposed that 20–50 years (three generation times) is an appropriate measure of persistence, but this may change once more information is available. For instance, shorter timespans may be appropriate for fungi that occupy dynamic and ephemeral environments where suitable conditions can change quickly.

3.2.3 Criteria

Conservation status assessments of resident native taxa are based on population state, size and trend criteria, which are codified to provide a short-hand summary of each assessment. Thus, each assessment may be expressed as a code that comprises [conservation status] [population state] [population trend] [population size]. The status and criteria codes are shown in Table 2.

> ***Assessment code example***
>
> *Mokopirirakau cryptozoicus* (Jewell & Leschen, 2004) has been assessed as Nationally Vulnerable based on an unnatural population state, a decline of 30–50% over three generations and having 6–15 sub-populations with 300–500 mature individuals in the largest sub-population. Thus, its assessment code is **NVu4p**.

The conservation status criteria for 'natural' and 'unnatural' populations of Threatened, At Risk and Not Threatened taxa based on the number of mature adults in the population, the area of occupancy of taxa, and the number of sub-populations and the size of the largest sub-population are shown in Tables 3–5. See section 4 for the definitions and criteria for each category and conservation status, along with guidance on their application.

Table 2. Codes used in New Zealand Threat Classification System assessments. INC = increasing, DECR = decreasing, MATIND = number of mature individuals, AREA = area of occupancy, SUBPOP = total number of sub-populations.

CONSERVATION STATUS		POPULATION STATE		POPULATION TREND		POPULATION SIZE	
CODE	DESCRIPTION	CODE	DESCRIPTION	CODE	DESCRIPTION	CODE	DESCRIPTION
NC	Nationally Critical	**n**	Natural	**1**	INC >10%	**a**	MATIND < 250
NE	Nationally Endangered	**u**	Unnatural	**2**	STABLE (±10%)	**b**	MATIND 250–1000
NV	Nationally Vulnerable	**x**	Unknown	**3**	DECR 10–30%	**c**	MATIND 1000–5000
NI	Nationally Increasing			**4**	DECR 30–50%	**d**	MATIND 5000–20 000
DEC	Declining			**5**	DECR 50–70%	**e**	MATIND 20 000–100 000*
REC	Recovering			**6**	DECR >70%	**f**	MATIND >100 000†
UNC	Uncommon					**g**	AREA <1 ha
NT	Not Threatened					**h**	AREA 1–10 ha
						i	AREA 10–100 ha
						j	AREA 100–1000 ha
						k	AREA 1000–10 000 ha
						l	AREA 10 000–100 000 ha
						m	AREA >100 000 ha‡
						n	SUBPOP 2, MATIND < 200 in largest sub-population
						o	SUBPOP 3–5, MATIND 200–300 in largest sub-population
						p	SUBPOP 6–15, MATIND 300–500 in largest sub-population
						q	SUBPOP 6–15, MATIND 500–1000 in largest sub-population
						For stable and increasing populations only	
						r	MATIND 20 000–100 000 *and* AREA <100 000 ha
						s	MATIND >100 000 *and* AREA <100 000 ha
						t	AREA >100 000 ha *and* MATIND 250–20 000

* Size code 'e' presumes that stable and increasing populations occupy more than 100 000 ha; otherwise use size code 'r'.

† Size code 'f' presumes that stable and increasing populations occupy more than 100 000 ha; otherwise use size code 's'.

‡ Size code 'm' presumes that stable and increasing populations are >20 000 MATIND; otherwise use size code 't'.

Table 3. Criteria for populations of Threatened, At Risk and Not Threatened taxa based on the number of mature individuals (MATIND) in the population. Population trends are calculated over the longer of 10 years or three generations (maximum 100 years) and are based on ongoing and forecast changes due to existing threats. Populations that meet the MATIND criteria for Not Threatened are presumed to occupy an AREA greater than 100 000 ha. Criteria codes for such populations that occupy an AREA less than 100 000 ha are shown in the last two columns of the table. The letter 'K' in MATIND values represents thousands. See Table 2 for an explanation of the assessment codes.

POPULATION		MATIND							
		< 250	250–1K	1K–5K	5K–20K	20K–100K	>100K	20K–100K	>100K
STATE	TREND							AREA <100K ha	
Natural	INC >10%	NCn1a	UNCn1b	UNCn1c	UNCn1d	NTn1e	NTn1f	UNCn1r	UNCn1s
Natural	STABLE (±10%)	NCn2a	UNCn2b	UNCn2c	UNCn2d	NTn2e	NTn2f	UNCn2r	UNCn2s
Unnatural	INC >10%	NCu1a	NVu1b	NIu1c	RECu1d	NTu1e	NTu1f	UNCu1r	UNCu1s
Unnatural	STABLE (±10%)	NCu2a	NEu2b	NVu2c	UNCu2d	NTu2e	NTu2f	UNCu2r	UNCu2s
Unnatural	DECR 10–30%	NCu3a	NEu3b	NVu3c	DECu3d	DECu3e	DECu3f	DECu3e	DECu3f
Unnatural	DECR 30–50%	NCu4a	NEu4b	NVu4c	NVu4d	DECu4e	DECu4f	DECu4e	DECu4f
Unnatural	DECR 50–70%	NCu5a	NCu5b	NEu5c	NVu5d	NVu5e	DECu5f	NVu5e	DECu5f
Unnatural	DECR >70%	NCu6a	NCu6b	NCu6c	NCu6d	NCu6e	NCu6f	NCu6e	NCu6f
Unknown	INC >10%	NCx1a	NVx1b	NIx1c	RECx1d	NTx1e	NTx1f	UNCx1r	UNCx1s
Unknown	STABLE (±10%)	NCx2a	NEx2b	NVx2c	UNCx2d	NTx2e	NTx2f	UNCx2r	UNCx2s

Table 4. Criteria for populations of Threatened, At Risk and Not Threatened taxa based on the area of occupancy (AREA) in the population. Population trends are calculated over the longer of 10 years or three generations (maximum 100 years) and are based on ongoing and forecast changes due to existing threats. Populations that meet the AREA criteria for Not Threatened are presumed to have more than 20 000 MATIND. Criteria codes for such populations that have fewer than 20 000 MATIND are shown in the last column of the table. An asterisk (*) indicates that for an increasing population, the status is either one of the threatened statuses or At Risk – Recovering, as based on the number of MATIND (refer to Table 3 and definitions in section 4). The letter 'K' in AREA values represents thousands. See Table 2 for an explanation of the assessment codes.

POPULATION		AREA (ha)							
		< 1	1–10	10–100	100–1K	1K– 10K	10K–100K	>100K	>100K
STATE	TREND								MATIND <20K
Natural	INC >10%	NCn1g	UNCn1h	UNCn1i	UNCn1j	UNCn1k	UNCn1l	NTn1m	UNCn1t
Natural	STABLE (±10%)	NCn2g	UNCn2h	UNCn2i	UNCn2j	UNCn2k	UNCn2l	NTn2m	UNCn2t
Unnatural	INC >10%	NCu1g	NVu1h	NIu1i	RECu1j	UNCu1k	UNCu1l	NTu1m	*
Unnatural	STABLE (±10%)	NCu2g	NEu2h	NVu2i	UNCu2j	UNCu2k	UNCu2l	NTu2m	UNCu2t
Unnatural	DECR 10–30%	NCu3g	NEu3h	NVu3i	DECu3j	DECu3e	DECu3l	DECu3m	DECu3m
Unnatural	DECR 30–50%	NCu4g	NEu4h	NVu4i	NVu4j	DECu4e	DECu4l	DECu4m	DECu4m
Unnatural	DECR 50–70%	NCu5g	NCu5h	NEu5i	NVu5j	NVu5e	DECu5l	DECu5m	DECu5m
Unnatural	DECR >70%	NCu6g	NCu6h	NCu6i	NCu6j	NCu6k	NCu6l	NCu6m	NCu6m
Unknown	INC >10%	NCx1g	NVx1h	NIx1i	RECx1j	UNCx1k	UNCx1l	NTx1m	*
Unknown	STABLE (±10%)	NCx2g	NEx2h	NVx2i	UNCx2j	UNCx2k	UNCx2l	NTx2m	UNCx2t

Table 5. Criteria for Threatened, At Risk and Not Threatened taxa based on the number of sub-populations (SUBPOP) and the number of mature individuals (MATIND) in the largest sub-population. Population trends are calculated over the longer of the next 10 years or three generations (maximum 100 years), and are based on ongoing and forecast changes due to existing threats. The letter 'K' in MATIND values represents thousands. See Table 2 for an explanation of the assessment codes.

POPULATION		SUBPOP, MATIND			
STATE	TREND	2, ≤200	3–5, 200–300	6–15, 300–500	6–15, 500–1K
Natural	INC >10%	NCn1n	UNCn1o	UNCn1p	UNCn1q
Natural	STABLE (±10%)	NCn2n	UNCn2o	UNCn2p	UNCn2q
Unnatural	INC >10%	NCu1n	NVu1o	NIu1p	RECu1q
Unnatural	STABLE (±10%)	NCu2n	NEu2o	NVu2p	UNCu2q
Unnatural	DECR 10–30%	NCu3n	NEu3o	NVu3p	DECu3q
Unnatural	DECR 30–50%	NCu4n	NEu4o	NVu4p	NVu4q
Unnatural	DECR 50–70%	NCu5n	NCu5o	NEu5p	NVu5q
Unnatural	DECR >70%	NCu6n	NCu6o	NCu6p	NCu6q
Unknown	INC >10%	NCx1n	NVx1o	NIx1p	RECx1q
Unknown	STABLE (±10%)	NCx2n	NEx2o	NVx2p	UNCx2q

3.3 Status changes between assessments

It is intended that the status of each group of taxa will be reassessed approximately every 5 years.

Informal entities or taxa that were deemed taxonomically unresolved may have been formally described since their last assessment, and a conservation status may have been proposed in the paper that described them. In such instances, and provided the classification is consistent with the criteria specified in this manual, the recommendation of the naming author(s) will be accepted as an interim status until the next assessment is published.

In some extreme situations (e.g. following a rodent irruption), the status of a taxon may rapidly change for the worse between formal listings. In such rare situations, the relevant expert panel may convene to reassess the taxon and notification of any change in status will be made via the NZTCS website (https://nztcs.org.nz). All such listings will be regarded as interim and subject to confirmation when that taxon is next due for formal listing.

3.4 IUCN Red List categories

If a non-endemic taxon has been assessed using the IUCN Red List criteria, its IUCN assessment should be recorded alongside the NZTCS assessment.

4. Definitions and criteria for assessing resident native taxa

4.1 Data Deficient

The amount of information available for assessing the threat of extinction varies greatly between taxa and groups of taxa. At one extreme, there are taxa for which every wild individual is known (e.g. kākāpō (*Strigops habroptilus*), the herb *Gunnera hamiltonii* and the vine *Tecomanthe speciosa*), while at the other extreme, there are taxa for which there are no population data (e.g. the earthworm *Decachaetus minor* or the strap fern *Grammitis gunnii*). The Data Deficient classification is available for taxa that lack population data. Data Deficient may also be applied where there is an inability to distinguish between the focal taxon and related taxa in the field.

Expert panels should use Data Deficient only when there is extreme uncertainty about the abundance and population trend of an organism, i.e. the possible categories it truly occupies cover most or all of the range from Nationally Critical to Not Threatened. This usually occurs when the taxon is extremely cryptic in its habits, there are substantial difficulties identifying the taxon, or there has been little or no search effort for it in the field. If a likely scenario is that it could be extremely rare or even extinct, then Nationally Critical should be used with appropriate Data Poor qualifiers.

Most taxa in New Zealand fall towards the data poor end of the information spectrum. However, despite this chronic lack of detailed knowledge, expert panels should avoid listing taxa as Data Deficient wherever possible, instead making the best possible estimate of the likely status based on expert knowledge and using the most appropriate Data Poor qualifiers to indicate low confidence and the need for further research.

Three Data Poor qualifiers are available to indicate the uncertainty of the assessment: Data Poor Recognition – difficulties in determining the identity of the taxon in the field and/or in the laboratory have resulted in low confidence in the accuracy of the assessment; Data Poor Size – a lack of data on the population size has resulted in low confidence in the accuracy of the assessment; and Data Poor Trend – a lack of data on the population trend has resulted in low confidence in the accuracy of the assessment.

Panels should avoid using the Data Deficient category when:

- They are confident that the taxon is *not* Threatened – Nationally Critical.
- The taxon has not been seen for a long time or extremely seldomly despite adequate and appropriate search effort and therefore is clearly either very rare or extinct, but no population size, area of occupancy or trend data exist. In this instance, it should be listed as Nationally Critical, with some or all of the qualifiers Possibly Extinct, Data Poor Recognition, Data Poor Size and Data Poor Trend.
- The taxon is common but a population decline is suspected but not supported by concrete data. In this instance, it should be listed as either Not Threatened or At Risk – Declining if the panel agrees that a scenario of decline of >10% over the assessment period is possible.

When information is so lacking that an assessment is not possible, the taxon should be assigned to the Data Deficient category. A lack of data does not necessarily mean that a taxon is rare – for example, it may result from a lack of survey effort in suitable habitat and/or at suitable times in the life cycle of a taxon, or recognition of a taxon being so poor that demographic data cannot be collected.

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

4.2 Extinct

A taxon is classified as Extinct where 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 of extinct taxa include huia (*Heteralocha acutirostris*) and the shrub *Logania depressa*.

Taxa that have become extinct since human settlement (defined here 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; instead, they are listed as Nationally Critical with the qualifier Extinct in the Wild.

Since the Extinct category applies only to the New Zealand population of resident native taxa, it is possible for a taxon to be both Extinct in New Zealand and Secure Overseas.

Non-resident native taxa that have died out after failing to establish resident populations should not be listed as Extinct and nor should they have the qualifiers Extinct in the Wild or Possibly Extinct assigned to them.

Taxa that have not been observed for a long time but for which there is no definitive evidence of extinction (see above) may be listed with the qualifier Possibly Extinct.

4.3 Threatened

Threatened taxa whose populations are in decline face imminent extinction if current trends are not arrested. Threatened taxa that have stable or increasing populations are highly susceptible to stochastic (unpredictable) events that could lead to extinction. The Threatened category comprises four conservation statuses that reflect the severity of risk: Nationally Critical, the most severe level of threat, followed by Nationally Endangered, Nationally Vulnerable and Nationally Increasing.

Any taxon that has a population of fewer than 250 mature individuals or occupies less than 1 ha is considered highly susceptible to stochastic events and so should be assessed as Nationally Critical, regardless of whether the small population size is natural or unnatural (due to human-induced causes) and the forecast changes to the size of its population.

4.3.1 Nationally Critical (NC)

A taxon is classified as Nationally Critical when evidence indicates that it fits one trend criterion *and* one or more of the size criteria associated with each trend criterion as follows:

- **Very small population (natural, unnatural or population state unknown) regardless of the trend (NCn1, NCn2, NCu1, NCu2, NCu3, NCu4, NCu5, NCu6, NCx1, NCx2)**

  A taxon is classified Nationally Critical, regardless of the population trend and whether the population size is natural or unnatural, when evidence[6] indicates that:

  - The total population size is fewer than 250 mature individuals (**a**)
  - The total area of occupancy is less than 1 ha (0.01 km^2) (**g**)
  - There are two sub-populations *and* fewer than 200 mature individuals in the largest sub-population (**n**)

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

- **Small population that is forecast to decline 50–70% over the longer of the next 10 years or three generations (maximum 100 years) (NCu5)**

  A taxon is classified as Nationally Critical when evidence indicates that it will experience a decline of 50–70% over the longer of the next 10 years or three generations (maximum 100 years) and meets at least one of the following size criteria:

  - The total population size is 250–1000 mature individuals (**b**)
  - The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  - There are 3–5 sub-populations *and* 200–300 mature individuals in the largest sub-population (**o**)

- **Population that is forecast to decline > 70% over the longer of the next 10 years or three generations (maximum 100 years) (NCu6)**

  A taxon is classified as Nationally Critical regardless of its population size if it is forecast to decline by more than 70% over the longer of the next 10 years or three generations (maximum 100 years). Nevertheless, it is necessary to record one of the following population size estimates to provide guidance on the urgency of any management response:

  - The total population size is fewer than 250 mature individuals (**a**)
  - The total population size is 250–1000 mature individuals (**b**)
  - The total population size is 1000–5000 mature individuals (**c**)
  - The total population size is 5000–20 000 mature individuals (**d**)
  - The total population size is 20 000–100 000 mature individuals (**e**)
  - The total population size is greater than 100 000 mature individuals (**f**)
  - The total area of occupancy is less than 1 ha (0.01 km^2) (**g**)
  - The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  - The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)
  - The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)
  - The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)
  - The total area of occupancy is 10 000–100 000 ha (100–1000 km^2) (**l**)
  - The total area of occupancy is greater than 100 000 ha (10 000 km^2) (**m**)
  - There are 2 sub-populations *and* fewer than 200 mature individuals in the larger sub-population (**n**)
  - There are 3–5 sub-populations *and* 200–300 mature individuals in the largest sub-population (**o**)
  - There are 6–15 sub-populations *and* 300–500 mature individuals in the largest sub-population (**p**)
  - There are 6–15 sub-populations *and* 500–1000 mature individuals in the largest sub-population (**q**)

4.3.2 Nationally Endangered (NE)

A taxon is classified as Nationally Endangered when evidence indicates that it fits one trend criterion *and* one or more of the size criteria associated with each trend criterion as follows:

- **Small population that is forecast to remain stable ± 10% (unnatural or unknown) (NEu2, NEx2)**

  To trigger this pathway to Nationally Endangered, the current population size of a taxon must result from unnatural causes and meet one of the following size criteria:

  - The total population size is 250–1000 mature individuals (**b**)
  - The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  - There are 3–5 sub-populations *and* 200–300 mature individuals in the largest sub-population (**o**)

- **Small population that is forecast to decline 10–50% over the longer of the next 10 years or three generations (maximum 100 years) (NEu3, NEu4)**

  A taxon is classified as Nationally Endangered when evidence indicates that it will experience a decline of 10–50% over the longer of the next 10 years or three generations (maximum 100 years) and meets one of the following size criteria:

  - The total population size is 250–1000 mature individuals (**b**)
  - The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  - There are 3–5 sub-populations *and* 200–300 mature individuals in the largest sub-population (**o**)

- **Moderate population that is forecast to decline 50–70% over the longer of the next 10 years or three generations (maximum 100 years) (Neu5)**

  A taxon is classified as Nationally Endangered when evidence indicates that it will experience a decline of 50–70% over the longer of the next 10 years or three generations (maximum 100 years) and meets one of the following size criteria:

  - The total population size is 1000–5000 mature individuals (**c**)
  - There are 6–15 sub-populations *and* 300–500 mature individuals in the largest sub-population (**p**)
  - The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)

4.3.3 Nationally Vulnerable (NV)

A taxon is classified as Nationally Vulnerable when evidence indicates that it fits one trend criterion and one or more of the size criteria associated with each trend criterion as follows:

- **Small population (unnatural) that is forecast to increase by 10% or more over the longer of the next 10 years or three generations (maximum 100 years) (NVu1, NVx1)**

  A taxon is classified as Nationally Vulnerable when evidence indicates that it will experience an increase of 10% over the longer of the next 10 years or three generations (maximum 100 years) but it meets one of the following size criteria:

  - The total population size is 250–1000 mature individuals (**b**)
  - There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population (**o**)
  - The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)

- **Moderate population (unnatural) that is forecast to remain stable (± 10%) over the longer of the next 10 years or three generations (maximum 100 years) (NVu2, NVx2)**

  A taxon is classified as Nationally Vulnerable when evidence indicates that it will remain stable (± 10%) over the longer of the next 10 years or three generations (maximum 100 years) but meets one of the following size criteria:

  - The total population size is 1000–5000 mature individuals (**c**)
  - There are ≤ 15 sub-populations *and* ≤ 500 mature individuals in the largest sub-population (**p**)
  - The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)

- **Moderate population that is forecast to decline 10–50% over the longer of the next 10 years or three generations (maximum 100 years) (NVu3, NVu4)**

  A taxon is classified as Nationally Vulnerable when evidence indicates that it will decline by 10–50% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  - The total population size is 1000–5000 mature individuals (**c**)
  - The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)
  - There are 6–15 sub-populations *and* 300–500 mature individuals in the largest sub-population (**p**)

- **Moderate to large population that is forecast to decline 30–70% over the longer of the next 10 years or three generations (maximum 100 years) (NVu4, NVu5)**

  A taxon is classified as Nationally Vulnerable when evidence indicates that it will decline by 30–70% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 5000–20 000 mature individuals (**d**)

  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)

  – There are 6–15 sub-populations *and* 500–1000 mature individuals in the largest sub-population (**p**)

- **Large population that is forecast to decline 50–70% over the longer of the next 10 years or three generations (maximum 100 years) (NVu5)**

  A taxon is classified as Nationally Vulnerable when evidence indicates that it will decline by 50–70% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 20 000–100 000 mature individuals (**e**)

  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)

4.3.4 Nationally Increasing (NI)

The Nationally Increasing classification is applied to taxa that meet the following criteria:

- **Small population that has experienced a previous decline (or for which it is unknown whether it has experienced a previous decline) *and* that is forecast to increase >10% over the longer of the next 10 years or three generations (maximum 100 years) (NIu1, NIx1)**

  A taxon is classified as Nationally Increasing when it has previously experienced a decline and it fits the trend criterion of an ongoing or forecast increase of 10% or more over the longer of the next 10 years or three generations (maximum 100 years) *and* it fits one or both of the following size criteria:

  – The total population size is 1000–5000 mature individuals (**c**)

  – The total area of occupancy is 10–100 ha (1–10 km^2) (**i**)

Note: Taxa that have an increasing trend but whose populations are smaller than the size criteria listed here should be classified as either Threatened – Nationally Critical or Threatened – Nationally Vulnerable.

4.4 At Risk

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

There are three At Risk conservation statuses (Declining, Recovering and Uncommon), definitions for each of which are provided below.

While At Risk taxa are not Threatened, they would become so if pressures on them were to increase or were left unabated for a sufficiently long period. For example, some Uncommon taxa would become Threatened – Nationally Critical if a population decline was detected, whereas some Declining taxa, which are buffered by large populations, could sustain significant declines before moving to a Threatened category.

4.4.1 Declining (DEC)

A taxon is classified as Declining when evidence indicates that it fits at least one of the size criteria associated with each of the following trend criteria:

- **Moderate to large population that is forecast to decline 10–30% over the longer of the next 10 years or three generations (maximum 100 years) (DECu3, DECx3)**

  A taxon is classified as Declining when evidence indicates that it will experience a decline of 10–30% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 5000–20 000 mature individuals (**d**)

  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)

- **Large population that is forecast to decline 10–50% over the longer of the next 10 years or three generations (maximum 100 years) (DECu3, DECu4, DECx3, DECx4)**

  A taxon is classified as Declining when evidence indicates that it will experience a decline of 10–50% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 20 000–100 000 mature individuals (**e**)

  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)

- **Very large population that is forecast to decline 10–70% over the longer of the next 10 years or three generations (maximum 100 years) (DECu3, DECu4, DECu5, DECx3, DECx4, DECx5)**

  A taxon is classified as Declining when evidence indicates that it will experience a decline of 10–70% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is > 100 000 mature individuals (**f**)

  – The total area of occupancy is > 10 000 ha (100 km^2) (**m**)

4.4.2 Recovering (REC)

The Recovering classification is applied to taxa that meet the following criteria:

- **Moderate to large population that has (or may have) experienced a previous decline and that is forecast to increase by ≥ 10% over the longer of the next 10 years or three generations (maximum 100 years) (RECu1, RECx1)**

  A taxon is classified as Recovering when it has previously experienced a decline (or it is unknown whether there has been a previous decline) *and* it fits the trend criterion of an ongoing or forecast increase of 10% or more over the longer of the next 10 years or three generations (maximum 100 years) *and* it fits one or both of the following size criteria:

  – The total population size is 5000–20 000 mature individuals (**d**)

  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)

Note: Taxa that have an increasing trend after a previous decline but whose populations are smaller than the size criteria listed here should be classified as Threatened – Nationally Critical, Threatened – Nationally Vulnerable or Threatened – Nationally Increasing. Taxa that have an increasing trend after a previous decline but whose populations are larger than the size criteria listed here should be classified as either At Risk – Naturally Uncommon, At Risk – Relict or Not Threatened.

4.4.3 Uncommon (UNC)

Any taxon with a distribution that is confined to a specific substrate (e.g. ultramafic rock), habitat (e.g. high alpine fellfields, hydrothermal vents) or geographic area (e.g. subantarctic islands, seamounts) or that occurs within small and widely scattered populations is classified as Uncommon. The distribution may be natural or unnatural (i.e. the result of human-induced change) and populations may be stable or increasing.

It is unlikely that a taxon that has a small, stable population will be *naturally* uncommon, especially when the size of the population is near the threshold for Threatened – Nationally Critical. Therefore, it is important to carefully consider the state (natural or unnatural) of taxa that have been assessed as At Risk – Uncommon.

A taxon is classifed as Uncommon when evidence indicates that it fits one of each of the state, trend and size criteria, as follows:

- **Naturally small population that is forecast to increase >10% over the longer of the next 10 years or three generations (maximum 100 years) (UNCn1)**

  A taxon is classifed as Uncommon when evidence indicates that its naturally small population will experience an increase of >10% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 250–1000 mature individuals (**b**)
  – The total population size is 1000–5000 mature individuals (**c**)
  – The total population size is 5000–20 000 mature individuals (**d**)
  – The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  – The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)
  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)
  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)
  – The total area of occupancy is 10 000–100 000 ha (100–1000 km^2) (**l**)

- **Unnaturally small area of occupancy that is forecast to increase >10% over the longer of the next 10 years or three generations (maximum 100 years) (UNCu1, UNCx1)**

  A taxon is classifed as Uncommon when evidence indicates that its unnaturally small population will experience an increase in area of occupancy of >10% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)
  – The total area of occupancy is 10 000–100 000 ha (100–1000 km^2) (**l**)

- **Naturally small population that is forecast to be stable ± 10% over the longer of the next 10 years or three generations (maximum 100 years) (UNCn2)**

  A taxon is classifed as Uncommon when evidence indicates that its naturally small population will remain stable (± 10%) over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 250–1000 mature individuals (**b**)
  – The total population size is 1000–5000 mature individuals (**c**)
  – The total population size is 5000–20 000 mature individuals (**d**)
  – The total area of occupancy is 1–10 ha (0.01–0.1 km^2) (**h**)
  – The total area of occupancy is 10–100 ha (0.1–1 km^2) (**i**)
  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)
  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)
  – The total area of occupancy is 10 000–100 000 ha (100–1000 km^2) (**l**)

- **Unnaturally small population that is forecast to remain stable ± 10% over the longer of the next 10 years or three generations (maximum 100 years) (UNCu2, UNCx2)**

  A taxon is classifed as Uncommon when evidence indicates that its unnaturally small population will remain stable (± 10%) over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 250–1000 mature individuals (**b**)

  – The total population size is 1000–5000 mature individuals (**c**)

  – The total population size is 5000–20 000 mature individuals (**d**)

  – The total area of occupancy is 100–1000 ha (1–10 km^2) (**j**)

  – The total area of occupancy is 1000–10 000 ha (10–100 km^2) (**k**)

  – The total area of occupancy is 10 000–100 000 ha (100–1000 km^2) (**l**)

In some circumstances, the population size or area of occupancy of a taxon that has a stable or increasing population may be large enough to suggest that it should be assessed as Not Threatened. However, to be classifed as Not Threatened, a taxon that has a stable or increasing population must meet the criteria for both population size and area of occupancy. Stable or increasing taxa that meet only one of the population size or area criteria should be assessed as Uncommon. Additional population size codes ('r', 's', 't') are available for taxa to be assessed as Uncommon whose populations meet one but not both of the Not Threatened size criteria:

- **Naturally or unnaturally moderate to large population that has a small to moderate area of occupancy that is forecast to increase > 10% or remain stable over the longer of the next 10 years or three generations (maximum 100 years) (UNCn1, UNCu1, UNCx1, UNCn2, UNCu2, UNCx2)**

  A taxon is classifed as Uncommon when evidence indicates that its moderate to large population is forecast to increase > 10% or remain stable over the longer of the next 10 years or three generation (maximum 100 years) and it meets one of the following size criteria:

  – The total population size is 20 000–100 000 mature individuals *and* the area of occupancy is < 100 000 ha (1000 km^2) (**r**)

  – The total population population size is > 100 000 mature individuals *and* the area of occupancy is < 100 000 ha (1000 km^2) (**s**)

  Minimum area of occupancy limits apply, which vary according to the state and trend of the population. If the area of occupancy is lower than the minimum limits listed below, the taxon should be classified as Threatened or At Risk – Recovering:

  – Natural, stable or increasing: minimum 1 ha (0.01 km^2)

  – Unnatural, stable: minimum 100 ha (1 km^2)

  – Unnatural, increasing: minimum 1000 ha (10 km^2)

- **Naturally or unnaturally small to moderate population that has a large area of occupancy that is forecast to remain stable over the longer of the next 10 years or three generations (maximum 100 years) (UNCn1, UNCu1, UNCx1, UNCn2, UNCu2, UNCx2)**

  A taxon is classified as Uncommon when evidence indicates that its small to moderate population is forecast to remain stable over the longer of the next 10 years or three generation (maximum 100 years) and it meets the following size criterion:

  – The total population size is < 20 000 mature individuals *and* the area of occupancy is > 100 000 ha (1000 km^2) (**t**)

Minimum population size limits apply, which vary according to the state of the population. If the population size is lower than the minimum limits listed below, the taxon will be assessed as Threatened:

- Natural: minimum 250 mature individuals
- Unnatural: minimum 5000 mature individuals

Note: A naturally uncommon taxon that has fewer than 250 mature individuals or an area of occupancy of less than 1 ha qualifies to be Threatened – Nationally Critical, while taxa that have more than 20 000 mature individuals are not considered Uncommon unless they occupy an area of less than 100 000 ha (1000 km^2).

4.5 Not Threatened (NT)

Taxa that are assessed and do not fit into any of the categories mentioned above are listed in the Not Threatened category. Such taxa must meet the following criteria:

- **Naturally or unnaturally large population that is forecast to increase >10% or remain stable (±10%) over the longer of next 10 years or three generations (maximum 100 years) (NTn1, NTu1, NTx1, NTn2, NTu2, NTx2)**

  A taxon is classified as Not Threatened when evidence indicates that its population will remain stable (±10%) or increase by >10% over the longer of the next 10 years or three generations (maximum 100 years) and it meets one of the following population size criteria *and* the area of occupancy criterion:

  - The total population size is 20 000–100 000 mature individuals (**e**)
  - The total population size is greater than 100 000 mature individuals (**f**)
  - The total area of occupancy is greater than 100 000 ha (1000 km^2) (**m**)

  When assessing a taxon as Not Threatened, only one of the three criteria can be recorded. The expert panel should select the population size or area of occupancy criterion it deems to be most appropriate for the assessment.

5. Other categories

5.1 Non-resident Native

5.1.1 Migrant

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (with a minimum of 15 individuals being known or presumed to visit each year) but do not breed here are classified as Migrant. Examples include eastern ruddy turnstone (*Arenaria interpres*) and oceanic whitetip shark (*Carcharhinus longimanus*).

This category does not include taxa that either breed in New Zealand and migrate elsewhere during their life cycle (e.g. Chatham Island albatross (*Thalassarche eremita*), shining cuckoo (*Chrysococcyx lucida lucida*)) or taxa that are resident in New Zealand for most of their lives (e.g. longfin eel (*Anguilla dieffenbachii*)).

If a taxon in the Migrant category has been listed in the IUCN Red List for its country or countries of origin, the IUCN Red List category and source of the listing are shown alongside the taxon's name in the New Zealand list. For example, southern bluefin tuna (*Thunnus maccoyii*) has an IUCN listing of Critically Endangered (CR) and is a migratory visitor to New Zealand. Therefore, this taxon would be listed as 'southern bluefin tuna (*Thunnus maccoyii*) Non-resident Native – Migrant, TO, CR A1bd (Collette et al. 2021)' – note the use of the qualifier TO (Threatened Overseas) after Migrant.

5.1.2 Vagrant

Taxa that are found unexpectedly in New Zealand and whose presence in this region is naturally transitory or migratory taxa that have fewer than 15 individuals being known or presumed to visit each year are classified as Vagrant. This category includes taxa that have failed to establish beyond their point of arrival either because they typically breed elsewhere or for other specific ecological reasons (see de Lange & Norton 1998). Examples include red-kneed dotterel (*Erythrogonys cinctus*), blue moon butterfly (*Hypolimnas bolina nerina*) and ant orchid (*Chiloglottis trapeziformis*) from Australia; spotted sawtail (*Prionurus maculatus*) from the tropical southwest Pacific Ocean; and broad-billed sandpiper (*Calidris falcinellus*), a Holarctic migrant.

If a taxon in the Vagrant category has been listed in the IUCN Red List for its country or countries of origin, the IUCN category and source of the listing are shown alongside the taxon's name in the New Zealand list. For example, hawksbill turtle (*Eretmochelys imbricata*) has an IUCN listing of Critically Endangered (CR) and bristle-thighed curlew (*Numenius tahitiensis*) has an IUCN listing of Near Threatened (NT), and both species are vagrants in New Zealand. Therefore, these taxa would be listed as 'hawksbill turtle (*Eretmochelys imbricata*) Non-resident Native – Vagrant, TO, CR A2bd (IUCN: Mortimer & Donnelly 2008)' and 'bristle-thighed curlew (*Numenius tahitiensis*) Non-resident Native – Vagrant, TO, NT C2a(ii) (IUCN: BirdLife International 2020)', respectively – note the use of the qualifier TO (Threatened Overseas) after Vagrant.

5.1.3 Coloniser

Taxa that would trigger one of the Threatened categories because of their small population sizes but have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild for fewer than 50 years are classified as Coloniser. Examples include Nankeen night heron (*Nycticorax caledonicus*), the scoliid wasp *Radumeris tasmaniensis* and the shrub *Achyranthes velutina*.

If a taxon in the Coloniser category has been listed in the IUCN Red List for its country or countries of origin, the IUCN category and source of the listing are shown alongside 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. Therefore, this taxon would be listed as 'Indian yellow-nosed albatross (*Thalassarche carteri*) Non-resident Native – Coloniser, TO, EN A4bde (IUCN: BirdLife International 2018)' – note the use of the qualifier TO (Threatened Overseas) after Coloniser.

5.2 Introduced and Naturalised

Taxa that have become naturalised in New Zealand after being deliberately or accidentally introduced by human agency are classified as Introduced and Naturalised. To be considered naturalised, a taxon must have established a self-sustaining population in the wild over at least three generations and must have spread beyond the site of initial establishment.

If an Introduced and Naturalised taxon has been listed in the IUCN Red List for its country or countries of origin, its IUCN category and source of the assessment are shown alongside the taxon's name in the New Zealand list. Current examples of such taxa include southern bell frog (*Litoria raniformis*), which is listed as Endangered in Australia; and parma wallaby (*Macropus parma*), which is listed as Lower Risk/Near Threatened in Australia. Therefore, these taxa would be listed as 'southern bell frog (*Ranoidea raniformis*) Introduced and Naturalised, TO, EN A2ae (IUCN: Hero et al. 2004)' and 'parma wallaby (*Macropus parma*) Introduced and Naturalised, SO, NT C2a(ii) (IUCN: Lunney & McKenzie 2019)', respectively – note the use of the qualifiers TO (Threatened Overseas) and SO (Secure Overseas) after Introduced and Naturalised.

6. Qualifiers

Qualifiers are an integral part of the NZTCS, as they provide critical additional information about a taxon's assessment, status and management.

The qualifiers are listed below in thematic groups relating to the NZTCS assessment process, biological attributes of the taxon, pressures on the taxon and management of these, population state, and population trend.

6.1 Assessment process qualifiers

6.1.1 Data Poor: Recognition (DPR)

A taxon is given the Data Poor: Recognition qualifier when confidence in the assessment is low because of difficulties in determining the identity of the taxon in the field and/or laboratory.

Taxa with this qualifier will also often be given the qualifiers Data Poor: Size and Data Poor: Trend, in which case they are most likely to be Data Deficient.

6.1.2 Data Poor: Size (DPS)

The Data Poor: Size qualifier indicates that confidence in the assessment is low because of a lack of data on population size.

6.1.3 Data Poor: Trend (DPT)

The Data Poor: Trend qualifier indicates that confidence in the assessment is low because of a lack of data on population trend.

6.1.4 Designated (De)

A taxon is given the Designated qualifier when the expert panel has assigned it to what they consider to be the most appropriate status without full application of the criteria.

For example, a commercial fish stock that is being fished down to the biomass maximum sustainable yield (BMSY) may meet the criteria for Declining but could be designated as Not Threatened if the expert panel believes that this better describes its risk of extinction.

6.2 Biological attribute qualifiers

6.2.1 Biologically Sparse (Sp)

The Biologically Sparse qualifier is used when a taxon naturally consists of small and widely scattered sub-populations.

It can apply to any Threatened or At Risk taxon.

6.2.2 Island Endemic (IE)

The Island Endemic qualifier is given to a taxon whose natural distribution is restricted to one island archipelago (e.g. the Auckland Islands) and is not found on the North or South Islands of New Zealand or Stewart Island/Rakiura.

A taxon cannot be given this qualifier if it is Secure Overseas (SO, SO? or S?O) or Threatened Overseas (TO, TO? or T?O).

6.2.3 Natural State (NS)

A taxon is given the Natural State qualifier if it has a stable or increasing population that is presumed to be in a natural condition (i.e. it has not experienced a historical human-induced decline).

This qualifier is equivalent to the 'natural' population state value in the NZTCS database.

6.2.4 Range Restricted (RR)

A taxon that is naturally confined to a specific substrate or habitat or a geographic area of less than 100 000 ha (1000 km^2) is given the Range Restricted qualifier. This is assessed by taking into account the area of habitat that is occupied by each sub-population and summing these areas where there is more than one sub-population. Examples of such taxa include Chatham Island forget-me-not (*Myosotidium hortensia*) and Auckland Island snipe (*Coenocorypha aucklandica aucklandica*).

This qualifier can apply to any Threatened or At Risk taxon. However, it is redundant if a taxon is confined to one location (see above).

6.3 Pressure management qualifiers

6.3.1 Conservation Dependent (CD)

A taxon that is likely to move to a worse conservation status over the longer of the next 10 years or three generations (maximum 100 years) if current management ceases is given the Conservation Dependent qualifier.

The term 'management' can include indirect actions that benefit taxa, such as island biosecurity. A taxon is only considered conservation dependent if cessation of the management would result in a worse conservation status, and the influence of the benefits of management on the total population must be considered before using this qualifier. The benefit of managing a single sub-population may not be adequate to trigger this qualifier but may trigger Partial Decline. Furthermore, taxa that are qualified as Conservation Dependent may also be given the Partial Decline qualifier if only one or a few sub-populations have benefitted from management.

6.3.2 Climate Impact (CI)

The Climate Impact qualifier is used when a taxon is adversely affected by long-term climate trends and/or extreme climatic events.

Variations from 'normal climatic conditions' may include extended periods (e.g. a month, season or year) of higher-than-normal rainfall or below-normal sunshine hours, a short-duration extreme (i.e. rare) event such as an intense tropical storm or 10-day cold spell, or gradual long-term changes to sea level or average temperature due to climate change.

The adverse effects of climate change may be direct (e.g. the impact of extreme weather on populations) or indirect (e.g. increased impacts from predators that have benefitted from environmental changes caused by climate change).

The following questions provide a guide to using the Climate Impact qualifier:

- Is the taxon adversely affected by long-term changes in the climate, such as an increase in average temperature or sea-level rise?
  - If NO, no qualifier is given but monitoring and periodic re-evaluation are needed because projected changes to the average climate and sea-level rise may adversely

affect the taxon (including via changes to the distribution and prevalence of pests, weeds and predators) in the future.

– If YES, the Climate Impact qualifier is given.

- Is the taxon adversely affected by extreme climate events, such as a drought, storms or heatwaves?
  - If NO, no qualifier is given but monitoring and periodic re-evaluation are required because projected changes to the climate are likely to increase the frequency and/or severity of these events in the future.
  - If YES, the Climate Impact qualifier is given.

Use of the Climate Impact qualifier indicates the need for more in-depth research, ongoing monitoring of climate impacts and potentially a climate change adaptation plan for the taxon.

Additional questions that can be used to analyse climate impacts are provided in Appendix 2.

6.3.3 Conservation Research Needed (CR)

A taxon is given the Conservation Research Needed qualifier if the causes of its decline and/or solutions for its recovery are poorly understood and research is required.

6.3.4 Population Fragmentation (PF)

The Population Fragmentation qualifier is used where gene flow between sub-populations is hampered as a direct or indirect result of human activity.

It should be noted that naturally disjunct populations are not considered to be fragmented.

6.3.5 Recruitment Failure (RF)

The Recruitment Failure qualifier is used where the age structure of the current population of a taxon is such that a catastrophic decline is likely in the future.

It should be noted that a failure to produce new progeny or the failure of progeny to reach maturity can be masked by apparently healthy populations of mature specimens.

6.4 Population trend qualifiers

6.4.1 Extinct in the Wild (EW)

A taxon that is known only in captivity or cultivation or has been reintroduced to the wild but is not self-sustaining is given the Extinct in the Wild qualifier.

Assessment of a reintroduced population should be considered only when it is self-sustaining, which requires both of the following criteria to have been fulfilled:

- It is expanding or has reached a stable state through natural replenishment and at least half the breeding adults are products of the natural replenishment
- It has been at least 10 years since reintroduction

6.4.2 Extreme Fluctuations (EF)

A taxon that has an increased threat of extinction due to extreme unnatural population fluctuations or natural fluctuations overlaying human-induced declines is given the Extreme Fluctuations qualifier.

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

However, annual population fluctuations that are a natural function of a taxon's life cycle should not be considered.

6.4.3 Increasing (Inc)

The Increasing qualifier is used when a taxon has an ongoing or forecast increase of > 10% in the total population, taken over the longer of the next 10 years or three generations (maximum 100 years).

Note that this qualifier is redundant for taxa ranked as Recovering.

6.4.4 Partial Decline (PD)

A taxon that is declining over most of its range but has one or more secure populations (such as on offshore islands) is given the Partial Decline qualifier.

An example of a Partial Decline taxon is North Island kākā (*Nestor meridionalis septentrionalis*), which is declining towards a small, stable population. The Relict qualifier may be appropriate when the population has stabilised.

6.4.5 Possibly Extinct (PE)

A taxon that has not been observed for more than 50 years but for which there is insufficient evidence to support declaring it extinct is given the Possibly Extinct qualifier.

This qualifier may apply to several Data Deficient and Nationally Critical taxa.

6.5 Population state qualifiers

6.5.1 Naturalised Overseas (NO)

A taxon that is endemic to New Zealand but has been introduced (deliberately or accidentally) by human agency to another country and has naturalised there is given the Naturalised Overseas qualifier. An example of such a taxon is *Olearia traversiorum* in the Republic of Ireland.

6.5.2 One Location (OL)

The One Location qualifier is used where a taxon is found at one location (geographically or ecologically distinct area) in New Zealand that is less than 100 000 ha (1000 km^2), so a single event (e.g. a predator irruption or fire) could easily affect all individuals of the taxon. Examples of such taxa include L'Esperance Rock groundsel (*Senecio esperensis*) and Open Bay Island leech (*Hirudobdella antipodum*).

This qualifier can apply to all Threatened, At Risk, Non-resident Native – Coloniser and Non-resident Native – Migrant taxa, regardless of whether their restricted distributions in New Zealand are natural or human induced. Resident native taxa that have restricted distributions but for which it is unlikely that all sub-populations would be threatened by a single event (e.g. because water channels within an archipelago are larger than known terrestrial predator swimming distances) should be qualified as Range Restricted.

6.5.3 Relict (Rel)

The Relict qualifier is given to a taxon whose population has declined since human arrival to less than 10% of its former range but has stabilised.

The range of a relictual taxon takes into account the area currently occupied as a ratio of the taxon's former extent. Reintroduced and self-sustaining populations within or outside the former known range of a taxon should be considered when determining whether a taxon is relictual.

This definition is modified from the definition of the At Risk – Relict category provided in Townsend et al. (2008). The main difference is that trend is no longer included in the qualifier definition, allowing the qualifier to be applied to any taxon that has experienced severe range contraction, regardless of whether that contraction continues or has been arrested.

This qualifier complements the Naturally Uncommon qualifier, which can be applied to a taxon that has experienced a decrease in abundance but continues to occupy a substantial part of its natural range. It may also replace the Partial Decline qualifier once a taxon's population has stabilised within a reduced area.

6.5.4 Secure Overseas (SO)

The Secure Overseas qualifier is used when a taxon is secure in the parts of its natural range outside New Zealand.

6.5.5 Secure Overseas? (SO?)

Use of the Secure Overseas? qualifier indicates that it is uncertain whether a taxon of the same name that is secure in the parts of its natural range outside New Zealand is conspecific with the New Zealand taxon. An example of such a taxon is the bidibidi *Acaena minor* var. *antarctica*.

6.5.6 Secure? Overseas (S?O)

Use of the Secure? Overseas qualifier indicates that it is uncertain whether the taxon is secure in the parts of its natural range outside New Zealand. An example of such a taxon is the New Zealand bull kelp *Durvillaea antarctica*.

6.5.7 Threatened Overseas (TO)

The Threatened Overseas qualifier is used when the taxon is threatened in the parts of its natural range outside New Zealand.

6.5.8 Threatened Overseas? (TO?)

Use of the Threatened Overseas? qualifier indicates that it is uncertain whether a taxon of the same name that is threatened in the parts of its natural range outside New Zealand is conspecific with the New Zealand taxon.

6.5.9 Threatened? Overseas (T?O)

Use of the Threatened? Overseas qualifier indicates that it is uncertain whether the taxon is threatened in the parts of its natural range outside New Zealand. An example of such a taxon is the aquatic beetle *Gyrinus convexiusculus*.

7. Acknowledgements

Many people who have had a long history of working with the NZTCS have contributed to the revision of the qualifiers. We are grateful to the anonymous respondents of the technical survey who provided us with a clear direction to make these changes. We would specifically like to thank Hugh Robertson and Graeme Taylor (DOC), who provided ongoing advice, and Michelle Bradshaw (DOC), who made useful comments on the manuscript. The Climate Impact qualifier was developed in consultation with Andrew Tait (NIWA Taihoro Nukurangi) and Paul Phifer (Ian Axford Fellow from U.S. Fish and Wildlife Service).

8. References

Baillie, J.E.M.; Hilton-Taylor, C.; Stuart, S.N. (Eds) 2004: 2004 IUCN Red List of threatened species: a global species assessment. IUCN, Gland, Switzerland and Cambridge, UK. 191 p.

BirdLife International 2004: State of the world's birds 2004: indicators for our changing world. BirdLife International, Cambridge, UK. 74 p.

BirdLife International 2018: *Thalassarche carteri. The IUCN Red List of Threatened Species 2018*: e.T22728372A132657962. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22728372A132657962.en (downloaded on 28 September 2021).

BirdLife International 2020: *Numenius tahitiensis. The IUCN Red List of Threatened Species 2020*: e.T22693182A181357867. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22693182A181357867.en (downloaded on 28 September 2021).

Collette, B.B.; Boustany, A.; Fox, W.; Graves, J.; Juan Jorda, M.; Restrepo, V. 2021: *Thunnus maccoyii. The IUCN Red List of Threatened Species 2021*: e.T21858A170082633. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T21858A170082633.en (downloaded on 28 September 2021).

Dahlberg, A.; Mueller, G. 2011: Applying IUCN red-listing criteria for assessing and reporting on the conservation status of fungal species. *Fungal Ecology 4*: 147–162.

de Lange, P.J.; Norton D.A. 1998: Revisiting rarity: a botanical perspective on the meanings of rarity and the classification of New Zealand's uncommon plants. *Royal Society of New Zealand Miscellaneous Series 48*: 145–160.

de Lange, P.J.; Norton, D.A.; Heenan, P.B.; Courtney, S.P.; Molloy, B.P.J.; Ogle, C.C.; Rance, B.D.; Johnson, P.N.; Hitchmough, R. 2004: Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany 42*: 45–76.

Hero, J.; Gillespie, G.; Lemckert, F.; Littlejohn, M.; Robertson, P.; Brereton, R.; Brown, P. 2004: *Litoria raniformis* (errata version published in 2016). *The IUCN Red List of Threatened Species 2004*: e.T12152A86177064. https://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T12152A3327485.en (downloaded on 28 September 2021).

Hitchmough, R.; Bull, L.; Cromarty, P. (Comps) 2007: New Zealand Threat Classification System lists – 2005. Department of Conservation, Wellington. 194 p.

IUCN (International Union for Conservation of Nature) 2012: IUCN Red List categories and criteria: version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK. iv + 32 p.

IUCN Standards and Petitions Committee 2019: Guidelines for using the IUCN Red List categories and criteria. Version 14. Prepared by the Standards and Petitions Committee. www.iucnredlist.org/documents/RedListGuidelines.pdf

Lunney, D.; McKenzie, N. 2019: *Macropus parma. The IUCN Red List of Threatened Species 2019*: e.T12627A21953067. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T12627A21953067.en (downloaded on 28 September 2021).

Michel, P.; Rolfe, J.; Hitchmough, R. 2022: New Zealand Threat Classification System manual 2022. Part 2: Administration. Department of Conservation, Wellington. 11 p.

Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.; Smith, N.; Stephens, T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication 22*. Department of Conservation, Wellington. 26 p.

Mortimer, J.A.; Donnelly, M. (IUCN SSC Marine Turtle Specialist Group) 2008: *Eretmochelys imbricata. The IUCN Red List of Threatened Species 2008*: e.T8005A12881238. https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T8005A12881238.en (downloaded on 28 September 2021).

Rolfe, J.R. 2019: Decisions from 2019 technical review of NZTCS. Department of Conservation (unpublished; file DOC-5890296).

Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. 2008: New Zealand Threat Classification System manual. Department of Conservation, Wellington. 35 p.

9. Glossary

Terms that are used in this manual to define categories and criteria are listed below. Those that are derived from IUCN definitions (IUCN 2012; IUCN Standards and Petitions Committee 2019) 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 that is essential at any stage in the life cycle of the taxon will be used (e.g. colonial nesting sites).

Endemic Known to occur only within a specified area. For the purposes of the NZTCS, endemic taxa are those that occur only within New Zealand's Exclusive Economic Zone, not including the Ross Dependency in Antarctica.

Generation* The average age of parents of the current cohort (i.e. newborn individuals in the population).

Habitat The sustaining ecosystem upon which the taxon depends. An estimate of the percentage decline of habitat area should 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.

Indigenous (see native) Occurs naturally in New Zealand. A native taxon may be resident (breeds or spends most of its life in New Zealand) or non-resident (a vagrant, migrant or coloniser). Resident taxa may be endemic (found only in New Zealand) or non-endemic (occur naturally in other parts of the world). Non-resident native taxa are, by definition, non-endemic.

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

- Where the population is characterised by natural fluctuations, the minimum number will be used
- This measure is intended to count individuals that are 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 that 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

Native (= indigenous) Occurs naturally in New Zealand. A native taxon may be resident (breeds or spends most of its life cycle in New Zealand) or non-resident (a vagrant, migrant or coloniser). Resident taxa may be endemic (found only in New Zealand) or non-endemic (occur naturally in other parts of the world). Non-resident native taxa are, by definition, non-endemic.

Natural The term 'natural' in this manual refers to population sizes, distributions and abundances that are the result of the specific characteristics of taxa rather than direct or indirect human activity (the converse is 'unnatural').

Non-resident native A taxon that regularly and predictably visits New Zealand (Migrant, with some exceptions), unexpectedly occurs in New Zealand and whose presence is usually transitory (Vagrant), or would otherwise be assessed as Threatened but arrived in New Zealand without direct or indirect help from humans and has bred in the wild for less than 50 years (Coloniser).

Population* The total number of individuals that are resident or 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 the definition of sub-population.)

Self-sustaining A population (or sub-population) that survives and reproduces without direct management intervention (e.g. supplementary feeding, targeted pest control to protect individuals or their breeding sites, or managed breeding programmes). Interventions that are not targeted at individuals within a population and have broader ecosystem benefits, such as biosecurity measures to protect islands or broad-scale pest control, are not considered to be 'direct' and, therefore, do not influence consideration of whether a population is self-sustaining.

Sub-population A group of individuals that has resulted from past or ongoing fragmentation (natural or human induced) and that has a demonstrable reproductive capability and now has little genetic exchange with other similar groups. Re-introduced wild populations must be self-sustaining before they are considered a sub-population. Populations held in captive institutions or grown in nurseries or gardens are not considered to be sub-populations unless they are the only remaining individuals of the taxon.

Taxon (plural taxa) For the purposes of the NZTCS, any biological entity at the rank of species, subspecies, variety or form that has been acknowledged by relevant experts (see definitions for 'taxonomically determinate' and 'taxonomically unresolved' in section 3) for the purposes of assessment. This differs from the meaning in formal taxonomy, wherein a taxon is a named entity at any rank in a taxonomic hierarchy.

Appendix 1

Annual declines required to meet the three-generation decline criteria

GENERATION TIME (YEARS)	ASSESSMENT PERIOD (YEARS; THREE GENERATIONS)	10% DECLINE	30% DECLINE	50% DECLINE	70% DECLINE	MARINE MAMMAL EXAMPLES
1–3	10	1.0%	3.5%	6.7%	11.3%	
4	12	0.9%	2.9%	5.6%	9.5%	
5	15	0.7%	2.3%	4.5%	7.7%	
6	18	0.6%	2.0%	3.8%	6.5%	
7	21	0.5%	1.7%	3.2%	5.6%	
8	24	0.4%	1.5%	2.8%	4.9%	
9	27	0.4%	1.3%	2.5%	4.4%	
10	30	0.4%	1.2%	2.3%	3.9%	
11	33	0.3%	1.1%	2.1%	3.6%	
12	36	0.3%	1.0%	1.9%	3.3%	
13	39	0.3%	0.9%	1.8%	3.0%	Hector's dolphin (*Cephalorhynchus hectori*), Māui dolphin (*C. h. maui*)
14	42	0.3%	0.8%	1.6%	2.8%	
15	45	0.2%	0.8%	1.5%	2.6%	Common dolphin (*Delphinus delphis*)
16	48	0.2%	0.7%	1.4%	2.5%	Dusky dolphin (*Lagenorhynchus obscurus*)
17	51	0.2%	0.7%	1.3%	2.3%	
18	54	0.2%	0.7%	1.3%	2.2%	Bryde's whale (*Balaenoptera brydei*)
19	57	0.2%	0.6%	1.2%	2.1%	
20	60	0.2%	0.6%	1.1%	2.0%	
21	63	0.2%	0.6%	1.1%	1.9%	Bottlenose dolphin (*Tursiops* spp.)
22	66	0.2%	0.5%	1.0%	1.8%	
23	69	0.2%	0.5%	1.0%	1.7%	
24	72	0.1%	0.5%	1.0%	1.7%	Pilot whale (*Globicephala* spp.)
25	75	0.1%	0.5%	0.9%	1.6%	
26	78	0.1%	0.5%	0.9%	1.5%	Killer whale/orca (*Orcinus orca*)
27	81	0.1%	0.4%	0.9%	1.5%	
28	84	0.1%	0.4%	0.8%	1.4%	
29	87	0.1%	0.4%	0.8%	1.4%	Southern right whale (*Eubalaena australis*)
30	90	0.1%	0.4%	0.8%	1.3%	
31	93	0.1%	0.4%	0.7%	1.3%	
32	96	0.1%	0.4%	0.7%	1.2%	Sperm whale (*Physeter macrocephalus*)
33	99	0.1%	0.4%	0.7%	1.2%	

Appendix 2

Climate Impact (CI) qualifier for the New Zealand Threat Classification System (NZTCS)

Document version 8

1 April 2019

Jeremy Rolfe, Troy Makan, Paul Phifer and Andrew Tait

File reference: DOC-5466372

A1.1 Background

Impacts on taxa caused by the climate are often overlooked when NZTCS assessments are being done. Impacts may be from sudden events (e.g. storm surges wiping out coastal habitat) or gradual changes (e.g. changing sex ratios of tuatara in response to changes in mean temperature). As the long-term climate patterns change, acknowledgement of climate impacts on taxa is becoming an important component of NZTCS assessments. Therefore, a new qualifier has been introduced to the NZTCS to signal those taxa that are adversely affected by the climate.

A1.2 Definition of the Climate Impact qualifier

The taxon is adversely affected by long-term climate trends and/or extreme climatic events.

Variations from 'normal climatic conditions' may be extended periods (e.g. a month, season or year) of higher-than-normal rainfall or below-normal sunshine hours, a short-duration extreme (i.e. rare) event such as an intense tropical storm or 10-day cold spell, or gradual long-term changes to sea level or average temperature due to climate change.

Adverse effects of climate change may be direct or indirect. Direct effects could include, for example, the impact of extreme weather on populations. Indirect effects could include, for example, increased impacts from predators that have benefitted from environmental changes caused by climate change.

A1.3 Usage guide

The following questions provide a guide to using the CI qualifier:

1. *Is the taxon adversely affected by long-term changes in the climate, such as an increase in average temperature or sea-level rise?*
   a. **If NO = no qualifier but needs monitoring and periodic re-evaluation** because projected changes to the average climate and sea-level rise may adversely impact the taxon (including via changes to the distribution and prevalence of pests, weeds and predators) in the future
   b. **If YES = CI qualifier**
2. *Is the taxon adversely affected by extreme climate events, such as a drought, storm or heatwave?*
   a. **If NO = no qualifier but needs monitoring and periodic re-evaluation** because projected changes to the climate are likely to increase the frequency and/or severity of these events in the future
   b. **If YES = CI qualifier**

Use of the CI qualifier would indicate the need for more in-depth research, ongoing monitoring of climate impacts, and potentially a climate change adaptation plan for the taxon.

A1.4 Additional questions for the evaluation of climate impact

1. *Has there been specific research on the sensitivity of the taxon to climate variability and/or climate change?*
   - If yes, does the research indicate that the taxon is adversely impacted by climate variability and/or changing climate? (E.g. the sex ratio of tuatara is sensitive to ambient air temperature, with warming temperatures likely to exacerbate the present-day trend toward more males than females.)
2. Is the spatial distribution of the taxon influenced by average climatic conditions (e.g. does it exist primarily in warmer/cooler/wetter/drier areas)?
   - If yes, are long-term projected changes to the average climate likely to have a negative impact on its distribution?
3. Is the taxon negatively impacted by variations from the normal monthly, seasonal or annual climate (e.g. a drier-than-normal summer or a warmer-than-normal year)?
   - If yes, will projections of climate change on monthly to annual climate variability (e.g. that present-day warmer-than-normal years will become much more frequent in the future; drought frequency and intensity will increase) potentially lead to an exacerbation or reduction of impacts?
   - If no, will projections of changes to monthly to annual climate variability potentially lead to impacts on the taxon that are not currently experienced?
4. In the past, has the taxon been negatively impacted by extreme (and hence relatively rare) climatic events (e.g. heavy rainfall, flooding (coastal storm surge or riverine), high winds, heavy snowfalls, extreme hot or cold temperatures)?
   - If yes, will projections of climate change on the frequency and intensity of extreme events (e.g. that heavy rainfalls are likely to become more intense) potentially lead to an exacerbation of impacts?
   - If no, will projections of changes to extreme events potentially lead to impacts on the taxon that are not currently experienced?

A1.5 Information on climate change for New Zealand

- General information on climate change for New Zealand is available from the Ministry for the Environment (MfE) website: www.mfe.govt.nz/climate-change.
  - This page includes a link to an 'Overview of likely climate change impacts in New Zealand' page, which can be regarded as basic background reading: www.mfe.govt.nz/node/16596.
- The primary source of information on future projections of New Zealand's climate is the following 2016 MfE report: www.mfe.govt.nz/publications/climate-change/climate-change-projections-new-zealand.
  - The 'Snapshot' document is a synopsis of the full report: www.mfe.govt.nz/node/21991.
- A 2017 MfE report on coastal hazards and climate change can be found on the MfE website: www.mfe.govt.nz/publications/climate-change/coastal-hazards-and-climate-change-guidance-local-government.
  - A summary report and series of factsheets are also available: www.mfe.govt.nz/publications/climate-change/preparing-coastal-change-summary-of-coastal-hazards-and-climate-change.
- The Ministry for Primary Industries (MPI) maintains the following webpage listing published climate change reports funded by the Sustainable Land Management and Climate Change programme: www.mpi.govt.nz/funding-and-programmes/farming/sustainable-land-management-and-climate-change-research-programme/sustainable-land-management-and-climate-change-slmacc-research-reports/.
- A searchable repository of New Zealand-focused climate change reports, factsheets and published papers is available: www.climatecloud.co.nz.