



National guidelines for the assessment of potential Ramsar wetlands in New Zealand

Karen Denyer and Hugh Robertson

Cover: Waituna Lagoon, part of the Awarua Wetland Ramsar site, Southland. *Photo: Department of Conservation.*

This report is available from the departmental website in pdf form.

© Copyright May 2016, New Zealand Department of Conservation

ISBN 978-0-478-15071-1 (web PDF)

This report was prepared for publication by the Publishing Team; editing by Amanda Todd and layout by Lynette Clelland. Publication was approved by the Deputy Director-General, Science and Policy, Department of Conservation, Wellington, New Zealand.

Published by Publishing Team, Department of Conservation, PO Box 10420, The Terrace, Wellington 6143, New Zealand.

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

CONTENTS

Abstract	1
<hr/>	
1. Introduction	2
<hr/>	
1.1 Ramsar criteria for site nomination	2
1.2 Current Ramsar network in New Zealand	3
1.3 Benefits of being added to the Ramsar List	3
1.4 National Objectives and Approach	5
1.5 Ramsar Convention guidance	6
1.6 Existing lists of significant wetlands in New Zealand	6
2. Assessing potential Ramsar sites in New Zealand	7
<hr/>	
2.1 Systematic approach	7
2.2 Identify phase—Determining site boundaries	7
2.3 Describe phase—Classification system for New Zealand Ramsar sites	9
2.3.1 Biogeographic regionalisation framework	9
2.3.2 Wetland type classification system	10
2.3.3 Preferred classification system for New Zealand	10
2.4 Describe phase—collate information on ecological values	12
2.5 Assess phase—Level of compliance with Ramsar criteria	12
3. Applying the individual Ramsar criteria in New Zealand	15
<hr/>	
3.1 Criterion 1	
Representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region	15
3.2 Criterion 2	
Supports vulnerable, endangered, or critically endangered species or threatened ecological communities	17
3.3 Criterion 3	
Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region	20
3.4 Criterion 4	
Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions	22
3.5 Criterion 5	
Regularly supports 20000 or more waterbirds	24
3.6 Criterion 6	
Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird	26
3.7 Criterion 7	
Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity	28

3.8	Criterion 8	
	Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend	31
3.9	Criterion 9	
	Regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species	33
4.	Future development	36
5.	Acknowledgements	36
6.	References	36
<hr/>		
Appendix 1		
<hr/>		
	Original text of Article 2 of the Ramsar Treaty 1971	38
<hr/>		
Appendix 2		
<hr/>		
	Analysis of New Zealand's current Ramsar network	39
<hr/>		
Appendix 3		
<hr/>		
	Lists of significant wetlands in New Zealand	44
<hr/>		
Appendix 4		
<hr/>		
	Classification systems	46
<hr/>		
Appendix 5		
<hr/>		
	Template for Ramsar site assessment	54
<hr/>		
Appendix 6		
<hr/>		
	Supporting information for assessing level of compliance	55

National guidelines for the assessment of potential Ramsar wetlands in New Zealand

Karen Denyer¹ and Hugh Robertson²

¹ 27 Grey Street, Cambridge 3434

² Freshwater Section, Science & Policy, Department of Conservation, Private Bag 5, Nelson 7042
Email: harobertson@doc.govt.nz

Abstract

New Zealand became a signatory to the Convention on Wetlands of International Importance (Ramsar Convention) in 1976. A key aim of the Ramsar Convention is for each Contracting Party to designate sites of international importance based on nine criteria.

These guidelines are intended to assist those nominating or assessing candidate Ramsar sites in New Zealand, by providing information about each of the three phases of site assessment: 'Identify', which includes defining the boundaries of the site; 'Describe', which involves determining the relevant biogeographic region, classifying wetland types and collating information on ecological values; and 'Assess', whereby the level of compliance of the site with the Ramsar criteria is assessed to determine the importance of the site. A standardised approach for assessing sites against each of the Ramsar criteria is presented.

The application of these guidelines will ensure a strategic approach to future site nominations, and will provide a transparent and systematic process for assessing the national and international importance of potential Ramsar sites in New Zealand.

Keywords: Ramsar site, strategic approach, wetland classification, level of compliance

© Copyright May 2016, Department of Conservation. This paper may be cited as:

Denyer, K.; Robertson, H. 2016: National guidelines for the assessment of potential Ramsar wetlands in New Zealand. Department of Conservation, Wellington. 58 p.

1. Introduction

New Zealand became a Contracting Party to the Convention on Wetlands of International Importance (the Ramsar Convention) in 1976. Article 2 of the Ramsar Convention (1987) requires each Contracting Party to ‘designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance’, commonly known as Ramsar sites (Appendix 1).

The vision for the Ramsar List is:

... to develop and maintain an international network of wetlands which are important for the conservation of global biological diversity and for sustaining human life through the maintenance of their ecosystem components, processes and benefits/services.

(Ramsar Convention 2009)

Contracting Parties are asked to nominate at least one internationally important representative of every natural or near-natural wetland type present in each biogeographic region, giving priority, in relation to wetland type, ‘to those wetlands that play a substantial ecological or hydrological role in the natural functioning of a major river basin, lake, or coastal system’. When considering sites for the Ramsar List, Article 2 states that ‘wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology. In the first instance wetlands of international importance to waterfowl at any season should be included.’

The Ramsar Convention uses a broad definition for wetlands:

... areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

(Article 1.1)

In addition Ramsar sites ‘may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands’ (Article 2.1).

1.1 Ramsar criteria for site nomination

The underlying aim of the Ramsar List is to include wetlands that are critical to the conservation of biological diversity in each biogeographic region. A set of nine criteria have been adopted by the Ramsar Convention for identifying wetland sites of international importance (see Box 1).

When prioritising sites, Contracting Parties such as New Zealand are encouraged to give particular weight to wetland types or wetland species that are unique or endemic to the region, or for which that country holds a significant proportion of the total global extent of that wetland type or population (Ramsar Convention 2009: s48).

To nominate a site for the Ramsar List, a Ramsar Information Sheet (RIS) needs to be submitted to the Ramsar Secretariat¹. Sections of the RIS require justification for the nomination by listing and providing evidence of the Ramsar criteria met by the site.

¹ The RIS forms for New Zealand Ramsar sites are available on the National Wetland Trust website: http://www.wetlandtrust.org.nz/Site/Ramsar_Convention.ashx

Box 1. Ramsar criteria

A wetland should be considered internationally important if it:

1. Contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
2. Supports vulnerable, endangered or critically endangered species, or threatened ecological communities.
3. Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
4. Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
5. Regularly supports 20 000 or more waterbirds.
6. Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.
7. Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions, and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
8. Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.
9. Regularly supports 1% of the individuals in a population of one species or subspecies.

1.2 Current Ramsar network in New Zealand

To date, over 2200 sites have been registered on the Ramsar List across some 169 member countries. New Zealand currently has six registered Ramsar sites, covering a surface area of over 55 000 hectares (Fig. 1). While the summed extent represents approximately 8% of New Zealand's total remaining freshwater and estuarine wetland area², this number and extent is relatively low compared with other Contracting Parties of similar land area and population (e.g. Finland—49 Ramsar sites covering 799 518 ha; and Norway—63 sites covering 116 369 ha).

The current Ramsar network does not fully represent the range of wetland types in New Zealand (see Appendix 2). Of the six Ramsar sites, four are coastal/estuarine systems, three are predominantly peatlands, three are in the Waikato Region and all are below 20 m in elevation. The Ramsar criteria the six New Zealand Ramsar sites meet are listed in Table 1.

1.3 Benefits of being added to the Ramsar List

The Ramsar Convention aims to ensure the conservation and wise use of wetlands; however, registering a site on the Ramsar List does not automatically confer legal protection status.

In New Zealand, the main benefits of being on the Ramsar List largely relate to an increased profile, which is likely to lead to:

- The probable inclusion of sites on schedules of significance in planning documents under s6c of the Resource Management Act 1991.

² Based on analysis of Land Cover Database (LCDB) 2002, as per MfE (2007: table 12.4). Sum of 2002 extent for Herbaceous Saline Vegetation, Mangrove, Estuarine Open Water, Lake and Pond, River, Herbaceous Freshwater Vegetation (665 800 ha combined). LCDB extent may be under-estimated as it excludes nival (i.e. permanent snow and ice) and some classes that could be wetland (e.g. mānuka, deciduous hardwood).

- International and national expectations that the ecological character of sites will be maintained or enhanced.
- Increased priority for funding, management, community empowerment and collaboration.

However, Ramsar sites are afforded a degree of legal protection under the Crown Minerals Act 1991, whereby Ramsar sites are protected under Schedule 4 from mineral mining activities (with some exceptions for minimum impact activities). Under current legislation, future Ramsar sites in New Zealand will be automatically added to Schedule 4.



Figure 1. Current Ramsar sites in New Zealand.

Table 1. Criteria met by New Zealand's existing Ramsar sites (from RIS sheets).

CRITERION	NEW ZEALAND RAMSAR SITE						FREQ.
	AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGAMARINO WETLAND	
1	√	√	√	√	√	√	6
2	√	√	√	√	√	√	6
3	√	√	√	√	√	√	6
4	√	√		√	√		4
5		√	√			√	3
6	√	√			√	√	4
7	√						1
8	√				√		2
9*							0
Total	7	6	4	4	6	5	

* Note: Criterion 9 was added to the list after most of the RIS forms for New Zealand's Ramsar sites had been submitted.

1.4 National Objectives and Approach

The Ramsar criteria, at face value, are very general and could apply to a vast number of sites. However, the addition of lower value sites would fail to meet the aim of the Ramsar Convention to add to the List those sites that are of **international** significance, and would risk diluting the prestige value of the List. The intention of the List is not to identify all of the world's ecologically significant wetlands but, rather, to create a network of sites that 'fully represent the diversity of wetlands and their key ecological and hydrological functions' (Ramsar Convention 2009). To be on the world stage, Ramsar sites should be of a very high standard, being among the highest quality, most distinctive or most important sites for maintaining biodiversity that a nation has to offer. Consequently, various resolutions of the Ramsar Convention have urged Contracting Parties to employ a strategic approach to site nomination (e.g. Ramsar Convention 2009).

To date, the approach to Ramsar site nomination in New Zealand has been somewhat ad hoc, driven by the Department of Conservation (DOC) and its predecessors and non-government agencies (e.g. Forest and Bird Protection Society). A lack of strategic direction in site selection has resulted in New Zealand's current Ramsar network not being representative of the full suite of wetland types in this country (see Appendix 2). As the concept has become more widely promoted (e.g. by the National Wetland Trust), a number of communities have expressed an interest in nominating additional sites and New Zealand is potentially entering a phase of listing additional Ramsar sites. Consequently, DOC as Administering Authority for the Ramsar Convention in New Zealand **aims to develop a strategic process for assessing the relative importance of proposed Ramsar sites, to ensure nomination of those sites that best meet the Ramsar criteria.**

Specific objectives for DOC as Administrative Authority for developing the Ramsar List are:

1. To develop a national network of Ramsar sites that fully represents the range of wetland types in New Zealand, by nominating or encouraging nominations of, the best examples of wetland types that are under-represented.
2. To nominate, or encourage nominations of, wetland sites that are critical to the conservation of biological diversity, including national strongholds for wetland species that are threatened, taxonomically distinctive, or exhibiting a high level of endemism, and wetland sites that support > 20 000 indigenous waterbirds.
3. To use a nationally consistent approach to assessing Ramsar site nominations.

These national guidelines have been developed to help distinguish strong candidates for Ramsar site nomination from those sites that only marginally meet one or more of the Ramsar criteria. They provide guidance on each of the three phases of site assessment ('Identify', 'Describe' and 'Assess'), which includes definition of the wetland type classification system, and specific guidance to interpret the nine Ramsar criteria in a New Zealand context.

A five-step approach was used to prepare the guidelines, this involved:

- An extensive review of national literature relating to assessment of ecological significance, wetland classification systems and the application of biogeographical regions, and relevant publications and datasets to assist nominees with Ramsar criteria application in New Zealand.
- Review and application of the Ramsar Convention's **Strategic Guidance** on the development of the Ramsar List (Ramsar Convention 2007, Ramsar Convention 2009).
- Feedback on the application of the Ramsar criteria in a New Zealand context from an expert workshop held in Hamilton on 16–17 May 2011.
- Analysis of the representation New Zealand's current Ramsar network (Appendix 2).
- Peer review from both national and international experts, including representatives of the Ramsar Secretariat and Ramsar STRP (Scientific and Technical Review Panel).

The resultant guidelines are not intended to amend or replace the nine Ramsar criteria (see section 1.1), but rather to assist their application in New Zealand.

1.5 Ramsar Convention guidance

Importantly, the Ramsar Convention provides extensive guidance to assist the development of the Ramsar List. Relevant information sources or documents used in the development of these New Zealand guidelines included:

- **Strategic Framework and Guidelines:** Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands. Third edition, as adopted by Resolution VII.11 and amended by Resolutions VII.13, VIII.11 and VIII.33, IX.1 Annexes A and B, and X.20. (Ramsar Convention 2009).
- **Ramsar Handbook:** Designating Ramsar Sites: the Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance. Ramsar handbooks for the wise use of wetlands, 3rd edition, vol. 14. Ramsar Convention, Gland, Switzerland. 114 p. (Ramsar Convention 2007).
- **Resolutions:** on the Status of the Ramsar List. Refer www.ramsar.org for resolutions from COP10 (2008), COP11 (2012) and COP12 (2015).

1.6 Existing lists of significant wetlands in New Zealand

Several lists of New Zealand wetlands that are considered regionally, nationally or internationally significant have also been compiled. These vary in age, quality, scale, purpose and criteria applied, and none are suitable for immediate translation to a list of candidate Ramsar sites. However, they do indicate the types of sites that may meet the Ramsar criteria and provide a source of information about potential candidate sites. An overview of the datasets and other information sources is provided in Appendix 3.

Additional datasets and references that identify nationally or internationally significant wetland species or habitats are listed under the relevant criteria in section 3.

2. Assessing potential Ramsar sites in New Zealand

2.1 Systematic approach

This section of the report outlines the recommended approach for the assessment of potential Ramsar sites in New Zealand. The approach aims to provide a transparent method and step-wise process for the identification and evaluation of wetlands of international importance under the Ramsar Convention. A secondary aim is to provide an assessment method that will enable a tentative list of proposed Ramsar Sites to be developed for New Zealand.

A systematic process is presented that is based on three key phases: 'Identify' the site, 'Describe' the site and 'Assess' the site (Fig. 2).

Steps 1–2 are the 'Identify' phase, and relate to defining the site of interest

Steps 3–5 relate to the 'Describe' phase and require collating information about the biogeographic region, wetland types and evidence on the sites' ecological values relative to the Ramsar criteria.

Steps 6–7 are the 'Assess' phase where the level of compliance of the site against the Ramsar criteria are evaluated, and the eligibility of the site for Ramsar status is assessed

Further explanation of these phases is outlined below (sections 2.2 to 2.5), including the recommended wetland classification system for New Zealand and the approach to assessment of the level of compliance of proposed sites against the Ramsar criteria.

Comprehensive national guidance on the application of the nine Ramsar criteria for New Zealand wetlands is subsequently provided in section 3 (3.1 to 3.9).

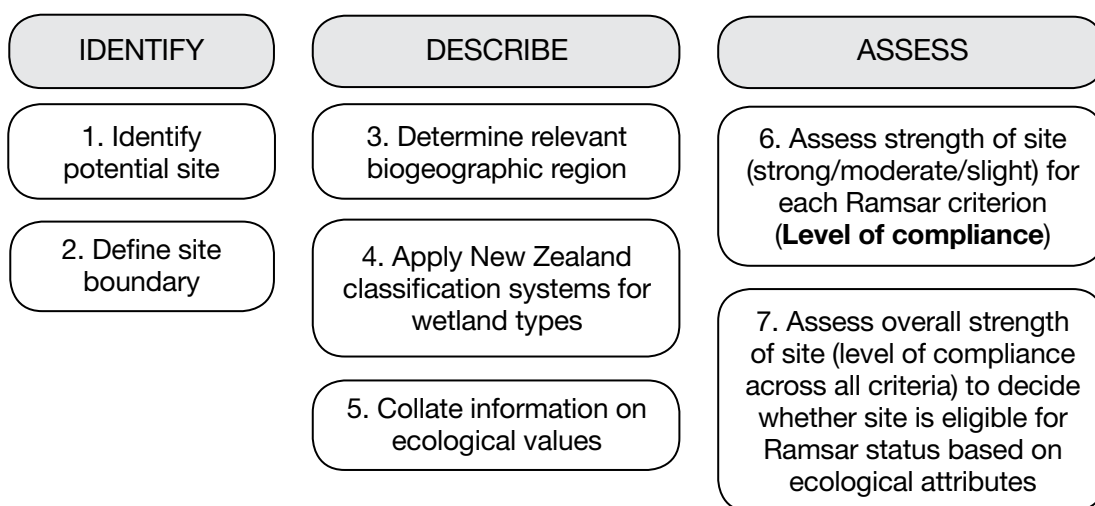


Figure 2. Approach for assessing potential Ramsar sites based on their ecological attributes.

2.2 Identify phase—Determining site boundaries

When considering an area for nomination to the Ramsar List, it is important to first define the site boundaries before applying the criteria. In many cases, expanding the site boundaries (e.g. to incorporate clusters of wetlands) can increase the chance of meeting one or more of the criteria. On the other hand, using legal boundaries, while potentially easier to apply politically, may exclude areas of equal or greater ecological importance.

The Australian Ramsar Site Nomination Guidelines (Department of Sustainability, Environment, Water, Population and Communities 2012) offer the following guidance derived from the Ramsar Strategic Framework and Guidelines for the future development of the List of Wetlands of International Importance (Ramsar Convention 2009):

The boundaries of a Ramsar site should allow management of the site to be undertaken at the appropriate scale for maintaining the ecological character of the wetland (Ramsar Convention 2007).

When determining the boundary consider including:

- *the entire wetland as well as a buffer zone - particularly important for small and vulnerable sites which may be more sensitive to outside influences including hydrological disturbance.*
- *relevant riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands.*
- *areas of land necessary to provide and maintain the hydrological functions needed to conserve the international importance and integrity of the site.*

Where it is not possible to include the entire wetland, it may be useful to include one or more of the following within the boundaries of the wetland:

- Complexes or mosaics of vegetation communities, rather than single communities of importance.
- Zones of communities or communities showing natural gradients (e.g. wet to dry, saline to brackish, oligotrophic to eutrophic, rivers to banks).
- All phases of natural succession of vegetation communities, ensuring that pioneer stages can continue to develop within the Ramsar site.
- Terrestrial habitat of high conservation value that is continuous with the wetland and will enhance its own conservation value.

In many cases, the boundary of one property may not capture the entire wetland, and a collaborative approach to the nomination and management of the site may be required. Planning and management processes should consider how to manage any potentially negative impacts arising from land-use practices on adjoining land or within the drainage basin to maintain the ecological character of the Ramsar site. This should be addressed in the management plan or system for the wetland.

Ideally, the boundary of a Ramsar site should be geographically fixed and should not be defined in terms of features that are likely to change position over time, such as rivers, shorelines, fences, levees or roads. However, this is not always possible and steps should be taken to ensure that any important mobile ecological features of the Ramsar site are not likely to migrate outside the proposed boundaries over time. The Ramsar boundary should be chosen to accommodate the likely long-term movement of such features. For coastal sites a 'retreat buffer' may be desirable to allow for shoreline movement in relation to changes in sea-level.

Cluster of wetlands

In some cases, it may be more meaningful to list a cluster of wetlands as one Ramsar site where the wetlands are:

- Component parts of a hydrologically linked system (e.g. a system of groundwater-fed wetlands along a spring line, or karst and subterranean wetland systems).
- Linked in use by a common population of an animal species (e.g. a group of alternative roost or feeding areas used by one population of waterbirds).
- Formerly geographically continuous before being separated by human activity

- Otherwise ecologically interdependent (e.g. sites forming part of a distinct wetland district/landscape with a common developmental history and/or supporting discrete species populations).
- Found in arid or semi-arid zones, where complexes of dispersed wetlands can both individually and collectively be of very great importance both for biological diversity and human populations.

Where a cluster of wetlands is designated, the rationale for treating the component parts collectively as one listed site should be clearly stated in the Ramsar Information Sheet (Ramsar Convention 2009).

2.3 Describe phase—Classification system for New Zealand Ramsar sites

A primary objective of the Ramsar List is to identify sites that represent the full range of natural or near-natural wetland types within a biogeographical region. To achieve this, there is a need for clear guidance on which biogeographic regionalisation framework and wetland type classification system to adopt.

According to the Strategic Framework (Ramsar Convention 2009: s66), Contracting Parties are encouraged to:

- Determine biogeographic regions within their territory or at the supranational/regional level;
- Within each biogeographic region, determine the range of wetland types present (using the Ramsar classification system for wetland type), noting in particular any rare or unique wetland types; and
- For each wetland type within each biogeographic region, identify for designation under the Convention those sites that provide the best examples.

2.3.1 Biogeographic regionalisation framework

Ramsar uses a biogeographic approach, which assumes that physical habitats and ecosystems that are separated by enough space (100s to 1000s of km) will contain different biological communities due to a combination of broad-scale factors (DOC & MFish 2008).

The Ramsar guidelines allow for Contracting Parties to select an appropriate biogeographic region framework; for example, the RIS sheet says: ‘Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied’. However, in the Strategic Framework, parties are urged to use a continental, regional or supranational scheme rather than a national or subnational one (Ramsar Convention 2009: s33–34 and s67).

Ramsar recommends using the Ecoregions of the World framework, which is a global biogeographic regionalisation of the Earth’s biodiversity that was developed by the World Wide Fund for Nature (WWF). Within this framework, WWF has identified 867 terrestrial ecoregions (TEOW) and approximately 450 freshwater ecoregions (FEOW³). Marine (MEOW) ecoregions have also been determined. Ramsar suggests that parties, where appropriate, review the utility of and FEOW, TEOW and MEOW systems and in some instances could apply an alternative inland regionalisation framework.

³ www.feow.org/ This classification was led by The Nature Conservancy (TNC) and the World Wildlife Fund (WWF), with broad input from a working group representing key non-government organisations, academic and intergovernmental conservation partners.

Within a New Zealand context, a coarse-level biogeographic region framework (such as MEOW and FEOW) is favoured, with finer differentiation at the wetland classification level. This is because none of the existing national or subnational bioregional frameworks are appropriate for all wetland types in New Zealand and because greater efficiency is gained through representing wetland diversity at the class level (rather than the bioregional scale). That is, multiple wetland classes may be represented at a single site while few, if any, potential Ramsar sites are likely to include multiple bioregions. In addition, it is unlikely that reliable species population data will be available at subnational bioregional scales for the application of criteria regarding % of bioregional population (criteria 6 and 9).

Following analysis of the WWF system, and a suite of national frameworks, it was determined that the FEOW ecoregion (single region for New Zealand) and the MEOW realms (Temperate Australasia and Southern Ocean) should be applied for New Zealand assessments of potential Ramsar sites. The MEOW framework will be applied to saline (including estuarine) ecosystems, while FEOW will be applied to freshwater and brackish systems.

2.3.2 Wetland type classification system

When considering sites for nomination to the Ramsar List, Contracting Parties are encouraged to use the Ramsar classification system of wetland types (see Appendix 4, section A4.1). This comprises 12 coastal and marine classes, 20 inland wetland classes, and nine artificial wetland types.

However, Ramsar wetland types are not consistent, comprising different attributes and levels. For example, some relate to landforms and others to vegetation structure, and some types are aggregated (e.g. riverine types) while others are more finely divided (e.g. palustrine types). It was therefore determined that while useful for describing a nominated site, the Ramsar types were not appropriate in a New Zealand context for identifying representative examples of their type across the full range of wetland diversity.

A number of wetland classification systems have been developed for New Zealand, as outlined in Appendix 4, section A4.2. These existing systems provided the basis for developing a New Zealand classification system suitable for the assessment of potential Ramsar sites.

The hydrosystem classification developed by Ward & Lambie (1999) and refined by Johnson & Gerbeaux (2004) was considered appropriate to differentiate the dominant freshwater, estuarine and marine systems. At the wetland class level, the Johnson & Gerbeaux (2004) framework was considered suitable for defining palustrine wetlands and a combination of other existing systems (Appendix 4, sections A4.3–A4.5) should be applied for the marine, estuarine and riverine systems.

2.3.3 Preferred classification system for New Zealand

It is recommended that for the classification of wetland types in Ramsar site assessment in New Zealand, a hierarchical classification should be used, comprising: biogeographic region + hydrosystem + wetland class (see Table 2).

Although the Ramsar wetland types (section A4.1) should be used for descriptive purposes when completing the Ramsar Information Sheet (RIS) as required by the Convention, overall assessments of proposed Ramsar sites should be based on the New Zealand classification. Artificial wetland types (e.g. oxidation ponds, hydro lakes) are excluded from this list of natural or near-natural wetland types. However, they can be added for descriptive purposes, if relevant, when applying Criteria 2 or 5.

Table 2. Wetland type classification for Ramsar site nomination in New Zealand (refer to Appendix 4 for definitions of hydrosystem and wetland class).

BIOGEOGRAPHIC REGION+	HYDROSYSTEM++	WETLAND CLASS+++ *
1. New Zealand (FEOW)	1. Marine	1. Fiord (up to 6 m depth)
2. Temperate Australasia realm (MEOW)	2. Estuarine	2. Sound (up to 6 m depth)
3. Southern Ocean realm (MEOW)	3. Palustrine	3. Shallow (subtidal) marine
	4. Lacustrine	4. Intertidal marine
	5. Riverine	5. Coastal embayment
	6. Geothermal	6. Coastal lake or lagoon/tidal lagoon shoreline lake
	7. Nival	7. Tidal river
	8. Plutonic	8. Bog
	9. Inland saline	9. Fen
		10. Swamp
		11. Marsh
		12. Seepage/flush
		13. Shallow water (excludes estuarine)
		14. Ephemeral wetland
		15. Pakihi and gumland
		16. Aeolian lake (including dune lake)
		17. Riverine lake (including tectonic, landslide, dam and oxbow lakes)
		18. Volcanic lake
		19. Glacial lake
		20. Peat lake
		21. Geothermal lake
		22. Glacier
		23. Snowfield
		24. Subterranean lake/pool
		25. Subterranean river/stream
		26. Volcanic aquifer
		27. Metamorphic aquifer
		28. Sedimentary aquifer
		29. Lowland streams/rivers
		30. Mid-elevation streams/rivers
		31. Glacially influenced streams/rivers
		32. High-elevation streams rivers (non-glacial)
		33. High-elevation streams rivers (glacial)

+ Biogeographic regions are based on FEOW and MEOW (Freshwater and Marine Ecosystems of the World, respectively). These are contiguous geographic units with broad physical/biotic characteristics reflecting the historic and evolutionary distribution patterns of indigenous species.

++ Hydrosystems are taken from Johnson & Gerbeaux (2004) and are based on broad hydrological factors (water source, movement, fluctuation, periodicity), salinity, temperature extremes, landform/geomorphology.

+++ Wetland classes are derived from Johnson & Gerbeaux (2004), Freshwater Environments of New Zealand (FENZ), Estuary Environment Classification (EEC), Ward & Lambie (1999), White (2001) and Storey (2012). Wetland classes are distinctive combinations of substrate types, specific water regime (depth, permanence, mixing regime, salinity), nutrient status, chemistry, pH and origin/geomorphic formation.

*** Additional notes**

Artificial wetland types will only be considered for nomination if they meet Criterion 5 ($\geq 20\ 000$ waterbirds), or are the best or only habitat for highly threatened endemic species under Criterion 2.

Geothermal classes include several of those above (e.g. shallow water, swamp).

Saltmarsh (per Johnson & Gerbeaux 2004) is captured by marsh class within the estuarine hydrosystem.

Riverine classes are derived by aggregating similar river types from the Level 1 (20 group) FENZ dataset (after Leathwick et al. 2010; Storey 2012).

2.4 Describe phase—collate information on ecological values

Wetlands may be significant to a local or national community for a range of values, including conservation, recreation, cultural, historic and scientific values. The Ramsar criteria focus on ecological value and, for fish, human use value. When evaluating the merit of nominated sites and the appropriate level of resourcing to support an application, DOC will take into account additional values, including cultural values, community support and the ecological pressures on the site. For instance, when prioritising applications, less urgency may be given to nominating well-protected wetlands in remote areas. For the purpose of these guidelines, however, only those values covered by the Ramsar criteria are considered.

The most common application of criteria for assessing ecological values in New Zealand is the identification of areas of significant indigenous vegetation and significant habitats of indigenous fauna under Section 6(c) of the Resource Management Act 1991 (RMA).

Criteria sets developed for national and regional policies under the RMA have been strongly influenced by pre-RMA criteria sets, including those of the Protected Natural Areas programme (Myers et al. 1987) and Sites of Special Wildlife Importance (e.g. see Walker & Lee (2004) for a discussion). The criteria typically include various attributes such as Representativeness, Rarity and distinctive features; Threat status; Naturalness; Diversity of species; Geographical limits for species; and Habitats that are important during vulnerable life stages. These attributes have been widely accepted for identifying areas of ecological or conservation significance (e.g. Whaley et al. 1995; Walker & Lee 2004; Environment Court Decisions 354/2010 and A146/2001), and are also consistent with the Ramsar criteria.

The attributes described above also form the basis of describing the ecological values of potential New Zealand Ramsar sites (Table 3).

It should be noted that several authors have recently recommended a review of ecological criteria typically applied in New Zealand to sustain ecosystems and species in healthy functioning states, and to recognise their role in performing environmental services, rather than attempting to preserve a static suite of one or more examples (e.g. Walker & Lee 2004). In the context of the Ramsar List, however, the aim is to identify those sites in New Zealand that are of global ecological significance, rather than all sites that are required to maintain the nation's biodiversity, and so the attributes listed in Table 4 are suitable.

2.5 Assess phase—Level of compliance with Ramsar criteria

The **level of compliance** of a potential site with the Ramsar criteria indicates the site's international importance relative to other sites in New Zealand. To inform the development of the assessment phase, a set of guiding principles were applied based on the feedback from an expert workshop (May 2011) and the Ramsar Strategic Guidance (Ramsar Convention 2009). The principles for the development of the Ramsar List in New Zealand are:

- A site does not have to meet all of the Ramsar criteria.
- Priority should be given to Criterion 1 to develop a network of Ramsar sites that represent the full range of wetland types in New Zealand (refer Objective 1, Ramsar Convention 2009).
- Priority should also be given to Criterion 5, to include in the Ramsar List all wetlands that regularly support > 20 000 waterbirds.

Further, to be considered of international significance, a strong candidate is likely to include some or all of the following:

- One of the best examples of a wetland type; this includes wetland types that are naturally severely depleted or severely degraded throughout their range.
- A stronghold or critical habitat for threatened, especially endemic, native species.

Table 3. Key attributes for assessing the ecological significance of potential Ramsar sites.

ATTRIBUTE	ATTRIBUTE DEFINITION	RELEVANT RAMSAR CRITERIA
Representativeness		
Complementarity	The extent to which the wetland type is already present in an existing New Zealand Ramsar site in a particular biogeographic region (to capture the full range within the Ramsar network).	1
Ecological integrity	The best example of its type based on viability/ecological functioning (e.g. peat formation in bogs, hydrological functioning), size, shape, indigenous dominance, structural intactness or degree of human/introduced species impact.	1
Proportionality	The relative importance of the site as a national or international stronghold for a species, or population. Assessed relative to the other similar sites in New Zealand. For example, % of total national/global population that occurs at the site.	1, 2, 7
Diversity		
Biodisparity	Supports species that are functionally, morphologically and/or genetically distant (e.g. number of families represented at the site).	3, 7
Distinctiveness/ uniqueness	Endemic (national, regional, local), taxonomically distinct (e.g. monotypic in New Zealand), or the only one of (or one of the few examples of) its type.	1, 3, 7
Richness	The number of indigenous species (or other taxonomic units) per unit area or the number of wetland types represented at the site.	3, 4, 6, 7, 9
Geographical limits/ isolation	Where a wetland is recognised to support a species or ecological community at its geographical limit, or is significant because of its geographical isolation.	3
Rarity		
Ecosystem/ community rarity	i) Naturally rare (e.g. occupied <0.5% of the land area prior to human arrival, after Williams et al. (2007)); ii) depleted (e.g. <20% remains nationally or 20% remains in a non degraded state nationally (e.g. Walker et al. 2006); or iii) an unusual feature/complex (e.g. <i>Donatia</i> community at sea level, estuary/lava field complex).	2
Species rarity	The relative threat status (e.g. Townsend et al. 2008), including naturally uncommon species	2, 4
Other		
Key habitat/refugia	Important habitat as a stronghold, supports viable populations, key breeding site, habitat for resident v. migrant v. vagrant species, extent of use (temporary/year-round, regularity or length of season), irreplaceability (no alternative suitable habitat accessible and available to the species of interest), capable of supporting relatively large populations/aggregations	2, 3, 4, 6, 7, 8
Migratory path	Relates to international migratory species, e.g. part of the East Asian-Australasian Flyway for migratory shorebirds	4, 8
Abundance	Absolute population size of a species	4, 5, 6, 7, 8, 9

- A relatively high diversity of wetland types or species, e.g. contains a representative suite of wetland types rather than a single type and/or high diversity of indigenous species.
- Features that contribute to the protection of global biodiversity, e.g. taxonomically distinctive species, naturally rare ecosystems, areas with a high degree of endemism.
- A relatively large area, making it more likely to be resilient or resistant to the adverse effects of human activity, support larger and therefore more viable and genetically diverse populations, contain a greater diversity of species, habitats and communities, and provide better resources (e.g. year-round food resources) than a smaller site.

A three-tiered approach for defining the level of compliance is recommended for New Zealand, whereby a site is assessed as being **strong, moderate or slight** based on its qualifying attributes.

The **strong-moderate-slight** approach enables very strong wetland sites to be identified and promoted ahead of sites that may only slightly qualify for Ramsar status. For example, considering Criterion 2, wetlands that support a diversity of species in the highest threat category (e.g. Nationally Critical) would be ‘strong’ sites, compared with wetlands that only support species with a lower degree of threat (e.g. Declining).

Section 3 of this report provides a comprehensive guide to determining the level of compliance for the nine Ramsar Criteria (see sections 3.1 to 3.9).

Once the level of compliance has been determined for each criterion, an overall assessment of the strength of the proposed site across all criteria is then possible. For example, Table 4a indicates a site that would be considered very strong, given the number of criteria that are met either strongly or moderately. In addition, sites that are strong under criteria 1, 2 and 5 should be particularly noted. In comparison, Table 4b represents a site that is relatively weak, as only one criterion is met moderately.

The overall assessment will be used to decide whether site is a high priority for Ramsar status based on ecological attributes.

Table 4a. Example of a good candidate site, based on high level of compliance across six Ramsar criteria.

CRITERION	LEVEL OF COMPLIANCE		
	STRONG	MODERATE	SLIGHT
1	√		
2	√		
3	√		
4		√	
5	√		
6		√	
7			√
8			
9			

Table 4b: Example of a poor candidate site, based on low level of compliance across three Ramsar criteria.

CRITERION	LEVEL OF COMPLIANCE		
	STRONG	MODERATE	SLIGHT
1			
2		√	
3			√
4			√
5			
6			
7			
8			
9			

Note: A template for completing the strong-moderate-slight assessment for the Ramsar Criteria is provided in Appendix 5.

3. Applying the individual Ramsar criteria in New Zealand

This section presents a standardised approach for assessing the level of compliance of a site against each of the Ramsar criteria. It includes detailed guidance notes⁴.

3.1 Criterion 1

Representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region

3.1.1 Ramsar target

To have included in the Ramsar List at least one suitable representative of each wetland type, according to the Ramsar classification system, which is found within each biogeographic region.



Te Manoroa Spring, Waikite Valley, geothermal wetland.

The Ramsar Convention offers the following guidance⁵:

- s31 The Convention's classification system for wetland type indicates the full range that Contracting Parties are urged to consider in relation to possible listing under the Ramsar Criteria related to representative, rare or unique wetlands.
- s67 It is generally most appropriate to use a continental, regional or supranational biogeographic regionalisation scheme rather than a national or subnational one.
- s68 Give priority to those wetlands whose ecological character plays a substantial role in the natural functioning of a major river basin or coastal system.
- s69 Wetlands can be selected for their hydrological importance. They may:
 - i) Play a major role in the natural control, amelioration or prevention of flooding
 - ii) Be important for seasonal water retention for wetlands or other areas of conservation importance downstream
 - iii) Be important for the recharge of aquifers
 - iv) Form part of karst or underground hydrological or spring systems that supply major surface wetlands
 - v) Be major natural floodplain systems
 - vi) Have a major hydrological influence in the context of at least regional climate regulation or stability (e.g. certain areas of cloud forest or rainforest, wetlands or wetland complexes in semi-arid, arid or desert areas, tundra or peatland systems acting as sinks for carbon, etc.)
 - vii) Have a major role in maintaining high water quality standards

⁴ The guidance notes refer to the most relevant documents and frameworks at the time of publication. When applying the criteria, use the most recent list of naturally rare ecosystems, wetland type classification and threatened species. Seek advice from your local DOC office.

⁵ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

3.1.2 Ramsar definitions⁶

Biogeographic region—A scientifically rigorous determination of regions as established using biological and physical parameters such as climate, soil type, vegetation cover, etc. In some cases, the term bioregion is used synonymously with biogeographic region. In some circumstances, the nature of biogeographic regionalisation may differ between wetland types according to the nature of the parameters determining natural variation.

Natural—Not included in the RIS glossary.

Near natural—Those wetlands which continue to function in what is considered an almost natural way (this clarification is provided in the Criteria to allow for the listing of sites that are not pristine, yet retain values making them internationally important).

Representative—A wetland that is a typical example of a particular wetland type found in a region.

Rare—Not included in the RIS glossary.

Unique—The only one of its type within a specified biogeographic region.

Wetland types—As defined by the Ramsar Convention classification system. (Note: Ramsar wetland types are listed in Appendix 4)

3.1.3 New Zealand application

Wetlands that are the best examples of a type that is under-represented within the current New Zealand Ramsar network, or that are naturally rare in New Zealand, will be strong candidates under this criterion. Sections A6.1 and A6.2 in Appendix 6 provide lists of under-represented and naturally rare wetland types in New Zealand.

Determine the extent to which it meets Criterion 1 using Table 5. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 5. Applying Criterion 1.

CRITERION 1: Representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> One of the best examples of any wetland type that is either: <ul style="list-style-type: none"> — Representative: Not currently in a New Zealand Ramsar site; or — Rare: Naturally rare ecosystem; or — Unique: The only example of its type nationally. 	<ul style="list-style-type: none"> One of the best examples of any wetland type in New Zealand that is in one existing Ramsar site; or • A good quality example of a wetland type that is naturally rare. 	<ul style="list-style-type: none"> One of the best examples of any wetland type in New Zealand that is in more than one existing Ramsar site.
<p>Notes:</p> <p>Wetland type means biogeographic region + hydrosystem + wetland class (as listed in Appendix 4).</p> <p>One of the best examples will be:</p> <ul style="list-style-type: none"> • Representative of its original condition, i.e.: <ul style="list-style-type: none"> — The example least modified by introduced species or human activities (e.g. exhibits high water quality, few weeds pests, least modified catchment, dominated by indigenous species, structurally intact, well-buffered from external impacts, has experienced a relatively low degree of fragmentation, low presence of built structures). — Functioning naturally (e.g. peat formation in bogs, hydrological functioning). • One of the largest examples of a wetland type or types, and/or will comprise a relatively high proportion of the remaining total national extent of a wetland type or types (for linear features, e.g. rivers, largest examples will include total reach and catchment size). • Likely to be documented as one of the top three examples of its type nationally, in a published peer-reviewed report, or strongly supported as such by expert knowledge. 		

Continued on next page

⁶ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

and

- It may contain a high diversity of wetland types.

A **good quality** example will not be the best or one of the best three examples of its type, but it will exhibit a very low degree of human impact, with intact structure and functioning, dominated by indigenous species, and a low level of pest species incursion.

In some cases, the best example may be degraded or in poor condition if there are no high-quality examples remaining nationally. However, to be considered as a potential Ramsar site, such a site will still be functionally operating as a wetland or highly likely to be able to be restored to a functioning state. In these situations, such a site may strongly meet the criteria for nomination, and it will meet the criterion more strongly if it is the best example at the hydrosystem level rather than the wetland class level.

Wetland types that are not currently part of, or are under-represented in the existing Ramsar network and New Zealand's biogeographic regions are listed in Appendix 6, section A6.1.

Naturally rare wetlands are listed in Appendix 6, section A6.2; also, refer to www.landcareresearch.co.nz/publications/factsheets/rare-ecosystems/wetlands.

Unique wetland types may apply to some naturally rare ecosystem types.

3.2 Criterion 2

Supports vulnerable, endangered, or critically endangered species or threatened ecological communities

3.2.1 Ramsar target

To have included in the Ramsar List those wetlands that are believed to be important for the survival of vulnerable, endangered or critically endangered species or threatened ecological communities.



Photo: Peter Langlands

Threatened bird, Australasian bittern, *Botaurus poiciloptilus*.

The Ramsar Secretariat offers the following guidance⁷:

In the RIS glossary, **survival** is defined as sites that contribute most to the survival of species or ecological communities locally, and as a whole are those that enable the geographic range of a species to be maintained on a long-term basis. The long-term persistence of species is most likely to occur where:

- i) Population dynamics data on the species concerned indicate that it is self-sustaining on a long-term basis as a viable component of its natural habitats; and
- ii) The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- iii) There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

s54 presence of introduced or non-native species should not be used to support a case for designating a site as a Wetland of International Importance.

s71 Particular consideration should be given to wetlands that support globally threatened communities or species at any stage of their life cycle.

⁷ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

- s72 Include in the Ramsar List wetlands that include threatened ecological communities or that are critical to the survival of species identified as vulnerable, endangered or critically endangered under national endangered species legislation/programmes or within international frameworks such as the IUCN Red Lists, or Appendix I of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) and the Appendices of CMS (the Convention on the Conservation of Migratory Species of Wild Animals).
- S73 Greatest conservation value will be achieved through the selection of a network of sites providing habitat for rare, vulnerable, endangered or critically endangered species. Ideally, the sites in the network will have the following characteristics:
- i) Support a mobile population of a species at different stages of its life cycle; and/or
 - ii) Support a population of a species along a migratory pathway or flyway—noting that different species have different migratory strategies with different maximum distances needed between staging areas; and/or
 - iii) Are ecologically linked in other ways, such as through providing refuge areas to populations during adverse conditions; and/or
 - iv) Are adjacent to or in close proximity to other wetlands included in the Ramsar List, the conservation of which enhances the viability of threatened species' populations by increasing the size of habitat that is protected; and/or
 - v) Hold a high proportion of the population of a dispersed sedentary species that occupies a restricted habitat type.
- s74 For identifying sites with threatened ecological communities, greatest conservation value will be achieved through the selection of sites with ecological communities that have one or more of the following characteristics:
- i) Are globally threatened communities or communities at risk from direct or indirect drivers of change, particularly where these are of high quality or particularly typical of the biogeographic region; and/or
 - ii) Are rare communities within a biogeographic region; and/or
 - iii) Include ecotones, seral stages and communities that exemplify particular processes; and/or
 - iv) Can no longer develop under contemporary conditions (because of climate change or anthropogenic interference, for example); and/or
 - v) Are at the contemporary stage of a long developmental history and support a well-preserved paleoenvironmental archive; and/or
 - vi) Are functionally critical to the survival of other (perhaps rarer) communities or particular species; and/or
 - vii) Have been the subject of significant decline in extent or occurrence.
- s75 Use a continental, regional or supranational bioregionalisation scheme rather than a national or subnational one.
- s77 Be aware also of the biological importance of many karst and other subterranean hydrological systems.

3.2.2 Ramsar definitions⁸

Ecological community—Any naturally occurring group of species inhabiting a common environment, interacting with each other (especially through food relationships) and relatively independent of other groups. Ecological communities may be of varying sizes and larger ones may contain smaller ones.

⁸ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009). Note: Some have been edited for brevity.

Species—Naturally occurring populations that interbreed, or are capable of interbreeding, in the wild. Under these (and other) criteria, subspecies are also included.

Supports—Provides habitat for a species or an assemblage of species for any period of time. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Threatened ecological community—An ecological community that is likely to become extinct in nature if the circumstances and factors threatening its extent, survival or evolutionary development continue to operate.

Vulnerable, endangered or critically endangered (globally threatened) species—Species or subspecies that are listed by IUCN Species Survival Commission’s Specialist Groups or Red Data Books as either Critically Endangered, Endangered or Vulnerable. Note that, especially for invertebrate taxa, IUCN’s Red Data listings may be both incomplete and dynamic, reflecting poor knowledge of the global status of many taxa. Interpretation of the terms ‘vulnerable’, ‘endangered’ or ‘critically endangered’ species should thus always be undertaken at a national level in the light of the best available scientific knowledge of the status of the relevant taxa.

3.2.3 New Zealand application

A wetland that is important habitat for threatened species or ecosystems is likely to be a stronghold for a number of threatened species, and/or one of the best examples of a wetland type that is depleted or degraded nationally.

New Zealand has developed its own threat classification scheme for species (Townsend et al. 2008) and regularly produces updated lists of indigenous species that are considered threatened or at risk (e.g. Robertson et al. 2013, Goodman et al. 2014). This scheme is the preferred resource for the application of the Ramsar criteria in a New Zealand context. Vulnerable, endangered or critically endangered species are those classified under Townsend et al. (2008) as Nationally Endangered, Nationally Critical, Nationally Vulnerable, Declining or Recovering. Relict and Naturally Uncommon taxa are covered by Criterion 3 because their populations are stable or increasing and they are at a lower risk of extinction.

Naturally rare wetland types (as included in the Ramsar definition of threatened community) are considered under Criterion 1, as they do not necessarily meet the definition of threatened community, i.e. likely to become extinct in nature. Although, reference to the threatened ecosystem assessment of Holdaway et al. (2012) may indicate which rare ecosystems are at risk.

When assessing potential Ramsar candidates in New Zealand, threatened communities will be assessed at the wetland class level (see Table 2), based on the degree of national depletion or the national proportion of a given class that remains in a largely undegraded state (see Appendix 6, section A6.3). They will be those wetland types that have been depleted or degraded at the national scale. Strong candidate sites will be among the few remaining high-quality examples of nationally depleted or degraded wetland classes.

The threatened environments classification that has been developed for New Zealand (LENZ; Walker et al. 2007⁹) identifies and classifies areas of similar environmental characteristics on the basis of the proportion of indigenous terrestrial vegetation that remains and that is legally protected. There is a strong link between terrestrial vegetation clearance and the degradation of waterways, and a probable strong correlation with the loss of wetlands. The threatened environments database can help identify wetland locations that are vulnerable to degradation (i.e. those in highly modified environments); however, no analysis has been undertaken on wetland classes that are largely restricted to threatened environments. Such an analysis, if undertaken in the future, may provide information to justify inclusion of a site that consists of or includes a threatened community.

Determine the **extent** to which it meets Criterion 2 using Table 6. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

⁹ www.landcareresearch.co.nz/databases/LENZ/downloads/TECUserGuideV1_1.pdf

Table 6. Applying Criterion 2.

CRITERION 2: Supports vulnerable, endangered or critically endangered species or threatened ecological communities.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> Natural or near-natural habitat for a population of one or more species that are Nationally Critical or Nationally Endangered; or Artificial wetland habitat that is a stronghold or one of the few habitats for one or more species that are Nationally Critical or Nationally Endangered; or One of the best examples of a wetland type that is severely depleted nationally, or severely degraded nationally. 	<ul style="list-style-type: none"> Natural or near-natural habitat for one or more species that are Nationally Vulnerable; or Natural or near-natural habitat for >5 species that are Declining or Recovering; or A good-quality example of a wetland type that is severely depleted nationally or severely degraded nationally. 	<ul style="list-style-type: none"> Natural or near-natural habitat for 1–5 species that are Declining or Recovering; or A good-quality example of a wetland type that is moderately depleted nationally or moderately degraded nationally.
<p>Notes:</p> <p>Threatened species are to be identified using the most recently published lists: www.doc.govt.nz/publications/conservation/nz-threat-classification-system/</p> <p>Nationally Critical, Nationally Endangered, Nationally Vulnerable, Declining and Recovering are defined in Townsend et al. (2008).</p> <p>Severely or moderately depleted wetland types are listed in Appendix 6, section A6.3.</p> <p>See Criterion 1 for definitions of best and good-quality examples.</p> <p>Population refers to a resident or regular seasonal population of a species, whether breeding at the site or not.</p>		

3.3 Criterion 3

Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region

3.3.1 Ramsar target

To have included in the Ramsar List those wetlands that are believed to be of importance for maintaining the biological diversity within each biogeographic region.

The Ramsar Secretariat offers the following guidance¹⁰:

- s79 Greatest conservation value will be achieved through the selection of a suite of sites that have the following characteristics:
- 'Hotspots' of biological diversity and are evidently species-rich even though the number of species present may not be accurately known; and/or
 - Centres of endemism or otherwise contain significant numbers of endemic species;
 - Contain the range of biological diversity (including habitat types) occurring in a region;
 - Contain a significant proportion of species adapted to special environmental conditions (such as temporary wetlands in semi-arid or arid areas);



Sporadanthus ferrugineus, giant cane rush, endemic to the Waikato Region.

¹⁰ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

- v) Support particular elements of biological diversity that are rare or particularly characteristic of the biogeographic region.

S80 Be aware also of the biological importance of many karst and other subterranean hydrological systems.

S81 Use a continental, regional or supranational biogeographic regionalisation scheme rather than a national or subnational one.

3.3.2 Ramsar definitions¹¹

Supports—Provides habitat for a species or an assemblage of species for any period of time. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Plant—Meaning vascular plants, bryophytes, algae and fungi (including lichens)

Populations—In this case meaning the population of a species within the specified biogeographical region.

3.3.3 New Zealand application

A wetland that is important for maintaining the biological diversity of the biogeographic regions of New Zealand is likely to be of special value because of its large size, diversity of hydrosystems and wetland classes, and high species richness and range of taxa. It may also be a stronghold for highly distinctive species, or those that are restricted to a few isolated populations.

Determine the extent to which it meets Criterion 3 using Table 6. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 6. Applying Criterion 3.

CRITERION 3: Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> • ≥4 hydrosystems and ≥10 wetland classes; or • An extraordinarily large diversity of species of any taxa, but particularly at family or higher taxonomic levels, compared with similar wetland types nationally; or • A national stronghold for ≥5 distinctive species; or • A national stronghold for ≥5 indigenous species or ≥2 endemic species that are range restricted. 	<ul style="list-style-type: none"> • 3 hydrosystems and 6–10 wetland classes; or • A large diversity of species of any taxa compared with similar wetland types nationally; or • A national stronghold for 1–4 distinctive species; or • A national stronghold for 2–4 indigenous species that are range restricted. 	<ul style="list-style-type: none"> • At least 2 hydrosystems and 5 wetland classes; or • A national stronghold for an indigenous species that is range restricted; or • A self-sustaining population of an indigenous species at its geographical limits.
<p>Notes:</p> <p>Strongholds are habitats that support relatively large, viable (i.e. breeding) populations of resident species, or that are one of the only habitats available for a species that visits seasonally to feed or breed. They support high proportions of the total (resident or seasonal) population extent or, for species that are difficult to count, of their total distribution extent within their biogeographic region.</p> <p>Geographical limits are the global altitudinal or latitudinal limits for viable (i.e. breeding) populations, but do not apply to limits that are extremes, e.g. do not include sea level as a minimum latitudinal limit, or New Zealand’s northern and southern biogeographic limits. Do not apply to vagrant occurrences.</p> <p>Locally endemic means that a species only breeds naturally in localised areas within an ecological region. If a species is only found within the nominated site, the site is, by definition, the national stronghold.</p>		

Continued on next page

¹¹ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

Range restricted means Relict or Naturally Uncommon (as defined by Townsend et al. 2008), or species endemic to an ecological region (as defined by McEwen 1987).

Distinctive species means endemic species that are the sole representative of their genus or higher taxonomic level in New Zealand (see Appendix 6, section A6.4).

The presence of introduced or non-native species should not be used to support a case for designating a site as a Wetland of International Importance.

3.4 Criterion 4

Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions

3.4.1 Ramsar target

To have included in the Ramsar List those wetlands that are the most important for providing habitat for plant or animal species during critical stages of their life cycle and/or when adverse conditions prevail.



Photo: Karen Denyer

Peatland pool, Awarua-Waituna, Southland.

The Ramsar Secretariat offers the following guidance¹²:

s83 Critical sites for mobile or migratory species are those that contain particularly high proportions of populations gathered in relatively small areas at particular stages of their life cycles. This may be at particular times of the year or, in semi-arid or arid areas, during years with a particular rainfall pattern. For example, many waterbirds use relatively small areas as key staging points (to eat and rest) on their long-distance migrations between breeding and non-breeding areas. For Anatidae species, moulting sites are also critical. Sites in semi-arid or arid areas may hold very important concentrations of waterbirds and other mobile wetland species, and may be crucial to the survival of populations, yet may vary greatly in apparent importance from year to year as a consequence of considerable variability in rainfall patterns.

S84 Non-migratory wetland species are unable to move away when climatic or other conditions become unfavourable and only some sites may feature the special ecological characteristics to sustain species' populations in the medium or long term. Thus, during dry periods, some crocodile and fish species retreat to deeper areas or pools within wetland complexes, as the extent of suitable aquatic habitat diminishes. These restricted areas are critical for the survival of animals at that site until rains come and increase the extent of wetland habitat once more. Sites (often with complex ecological, geomorphological and physical structures) that perform such functions for non-migratory species are especially important for the persistence of populations and should be considered as priority candidates for listing.

3.4.2 Ramsar definitions¹³

Critical stage—Stage of the life cycle of wetland-dependent species (breeding, migration stopovers, moulting sites, etc.) which, if interrupted or prevented from occurring, may threaten the long-term conservation of the species.

¹² Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

¹³ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

Plants—Meaning vascular plants, bryophytes, algae and fungi (including lichens).

Provides refuge—Locations where such critical stages gain some degree of protection during adverse condition such as drought.

Species—Naturally occurring populations that interbreed, or are capable of interbreeding, in the wild. Under these (and other) criteria, subspecies are also included.

Supports—Provides habitat for; areas that can be shown to be important to a species or an assemblage of species for any period of time. Occupation of an area need not be continuous, may be dependent on natural phenomena such as flooding or (local) drought conditions.

3.4.3 New Zealand application

A wetland that is important for supporting plant and/or animal species at a critical stage is likely to be supporting unusually high numbers of wetland-dependent organisms at certain times, including during the breeding season, seasonal feeding periods, moults, mass migrations or adverse events. They may, for instance, be deeper pools that provide refuge for aquatic species in larger wetlands during droughts, or higher areas of ground that provide roosting sites during floods or extreme high tides. Species that trigger this criterion are likely to be specialised, with few alternative habitats to meet those needs. Candidate sites will also be important for a range of species and for relatively large proportions of the population of a species.

Determine the **extent** to which it meets Criterion 4 using Table 7. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 7. Applying Criterion 4.

CRITERION 4: Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> Wetlands that are demonstrated to be key habitats and national strongholds for threatened indigenous wetland-dependent species during breeding, migration, moulting or weather extremes. 	<ul style="list-style-type: none"> Wetlands that regularly support unusually high concentrations of 'at risk' indigenous species during breeding, migration or moulting periods. 	<ul style="list-style-type: none"> Wetlands that regularly support unusually high concentrations of wetland-dependent species during breeding, migration or moulting periods; or Wetlands that include refuge sites (e.g. deep pools, well-elevated roost sites) capable of supporting relatively large numbers of indigenous wetland-dependent species during periods of extreme drought or flood.
<p>Notes:</p> <p>Strongholds are habitats that support relatively large, viable (i.e. breeding) populations of resident species, or that are one of the only habitats available for a species that visits seasonally to feed or breed. They support high proportions of the total (resident or seasonal) population extent or, for species that are difficult to count, of their total distribution extent within their biogeographic region.</p> <p>Key migration paths are those that are frequently used by the species in question to access stronghold habitats, whether those habitats are used for breeding or maturation phases.</p> <p>Threatened and at risk are as defined in Townsend et al. (2008).</p> <p>The presence of introduced or non-native species should not be used to support a case for designating a site as a Wetland of International Importance.</p> <p>Note: DOC has access to information about wetlands that are demonstrated to be key habitats and national strongholds for threatened indigenous species during breeding, migration, moulting or weather extremes.</p>		

3.5 Criterion 5

Regularly supports 20 000 or more waterbirds

3.5.1 Ramsar target

To have included in the Ramsar List **all wetlands** that regularly support 20 000 or more waterbirds.

The Ramsar Secretariat offers the following guidance¹⁴:

s53/86 Put population figures within an appropriate context; e.g. a site providing habitat for a rare/ globally threatened species may be a higher priority than a site that has larger numbers of a more common species.

s87 Non-native waterbirds should not be included within the totals.

s88 Applies to >20 000 individuals of either a single species or multi-species assemblages.

s89/90 Site may comprise one big area or a group of smaller wetlands that comprise an ecological unit. Consider turnover of waterbirds during migration periods, so that a cumulative total is reached, if such data are available (turnover leads to more waterbirds using particular wetlands than are counted at any one point in time, so that the importance of such a wetland for supporting waterbird populations will often be greater than is apparent from simple census information).

s92 The only currently available method that is considered to provide reliable estimates of turnover is that of unique capture/marketing and resighting/recapture of individually-marked birds in a population at a migratory staging site.

s93 When turnover is known to occur in a wetland but it is not possible to acquire accurate information on migration volume, consider using Criterion 4.

3.5.2 Ramsar definitions¹⁵

Regularly supports—A wetland regularly supports a population of a given size if:

- i) The requisite number of birds is known to have occurred in two-thirds of the seasons for which adequate data are available, the total number of seasons being not less than three; or
- ii) The mean of the maxima of those seasons in which the site is internationally important, taken over at least 5 years, amounts to the required level (means based on 3 or 4 years may be quoted in provisional assessments only).

In establishing long-term 'use' of a site by birds, natural variability in population levels should be considered, especially in relation to the ecological needs of the populations present. Thus, in some situations (e.g. sites of importance as drought or cold weather refuges or temporary wetlands in semi-arid or arid areas—which may be quite variable in extent between years), the simple arithmetical average number of birds using a site over several years may not adequately reflect the true ecological importance of the site. In these instances, a site may be of crucial importance at certain times ('ecological bottlenecks'), but hold lesser numbers at other times. In such situations, there is a need for interpretation of data from an appropriate time period to ensure that the importance of the site is accurately assessed.



Paradise shellducks, *Tadorna variegata*, Whitianga.

¹⁴ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

¹⁵ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

In some instances, however, for species occurring in very remote areas or which are particularly rare, or where there are particular constraints on national capacity to undertake surveys, areas may be considered suitable on the basis of fewer counts. For some countries or sites where there is very little information, single counts can help establish the relative importance of the site for a species.

The International Waterbird Census data collated by Wetlands International is the key reference source.

Supports—Provides habitat for; areas that can be shown to be important to a species or an assemblage of species for any period of time. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Waterbirds—Birds that are ecologically dependent on wetlands; includes any wetland bird species, synonymous with ‘waterfowl’ (see Ramsar guidelines for full list of families).

3.5.3 New Zealand application

The Ramsar objective is to list all wetlands that support $\geq 20\,000$ birds; therefore, meeting this Criterion should automatically qualify a site for nomination. The Manukau, Parengarenga and Kaipara Harbours, the Estuary of the Avon and Heathcote Rivers/Ihutai, Lake Ellesmere (Te Waihora), Muriwhenua wetlands, Rotorua Lakes and the combined Canterbury braided rivers are likely to automatically qualify (based on information in Cromarty & Scott (1995)).

Many New Zealand waterbird species are cryptic, particularly in palustrine systems, and so reasonable allowance should be made for estimates of their summed population (based on expert opinion incorporating habitat carrying capacity and confirmed presence of each species) where the known population is close to the Ramsar requirement (i.e. $>19\,000$ individuals). To account for the reduced level of certainty, such a site will meet this Criterion moderately.

Determine the **extent** to which it meets Criterion 5 using Table 8. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 8. Applying Criterion 5.

CRITERION 5: Regularly supports 20 000 or more waterbirds.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> Wetland habitat known to be regularly utilised by $\geq 20\,000$ indigenous waterbirds (of any species composition). 	<ul style="list-style-type: none"> Wetland habitat known to be regularly utilised by $> 19\,000$ indigenous waterbirds (of any species composition), and suspected to support at least 1000 waterbirds of cryptic indigenous species. 	n/a
<p>Notes:</p> <p>Regularly utilised means either permanent (year-round habitat) or seasonal use during the year for 2 out of every 3 years (requiring reliable data with at least 3 years of records).</p> <p>Only species for which reliable population estimates exist, or which are known from only one or a few sites, should be included when applying this Criterion.</p> <p>Indigenous waterbirds means native birds that are ecologically dependent on wetlands, including self-introduced species such as black swan (<i>Cygnus atratus</i>), spur-winged plover (<i>Vanellus spinosus</i>) and regular migrants (international or domestic).</p> <p>To account for cryptic species (e.g. rails, crakes, fernbirds, bitterns), where data are available to show that a site regularly supports over 19000 waterbirds, a case could be made for comprising the balance (to total $\geq 20\,000$) from cryptic waterbirds based on reasonable estimates of habitat capacity for species known to be present in a nominated site.</p>		

3.6 Criterion 6

Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird

3.6.1 Ramsar target

To have included in the Ramsar List all wetlands that regularly support 1% or more of a biogeographical population of a waterbird species or subspecies.



Brown teal, *Anas aucklandica chlorotis*, Great Barrier Island (Aotea).
Photo: Dick Veitch

The Ramsar Secretariat offers the following guidance¹⁶:

- This Criterion must be applied to the **regular** occurrence of >1% of a biogeographic population of a species or subspecies of waterbird.
 - In most cases the biogeographic range of waterbird populations is larger than the territory of one Contracting Party.
 - This Criterion should be applied only to those waterbird populations for which a 1% threshold is available. However, for populations of waterbird species in taxa not presently covered by *Waterbird Population Estimates 3rd Edition*, this Criterion may be applied if a reliable population estimate and 1% threshold is available from another source, in which case the information source must be clearly specified.
- s95 Greatest conservation value will be achieved through the selection of a suite of sites that hold populations of globally threatened species or subspecies. Consider also turnover of waterbirds during migration periods, so that a cumulative total is reached, if such data are available.
- s96 To ensure international comparability, wherever possible use the international population estimates and 1% thresholds published and updated every 3 years by Wetlands International.
- s97 At some sites, more than one biogeographical population of the same species can occur, especially during migration periods and/or where flyway systems of different populations intersect at major wetlands. Where such populations are indistinguishable in the field, as is usually the case, this can present practical problems as to which 1% threshold to apply. Where such mixed populations occur (and these are inseparable in the field), it is suggested that the larger 1% threshold be used in the evaluation of sites.
- s98 Where one of the populations concerned is of high conservation status, this guidance should be applied flexibly—consider the application of Criterion 4. This guidance should not be applied to the detriment of smaller, high conservation status populations.
- s99 Note that this guidance applies only during the period of population mixing (which is often, but not exclusively, during periods of migration). At other times, it is generally possible to assign a 1% threshold accurately to the single population that is present.
- s100 Turnover of individuals—see the guidance under Criterion 5.

¹⁶ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

3.6.2 Ramsar definitions¹⁷

biogeographical population—several types of ‘populations’ are recognised:

- i) The entire population of a monotypic species.
- ii) The entire population of a recognised subspecies.
- iii) A discrete migratory population of a species or subspecies, i.e. a population that rarely, if ever, mixes with other populations of the same species or subspecies.
- iv) The ‘population’ of birds from one hemisphere that spends the non-breeding season in a relatively discrete portion of another hemisphere or region. In many cases, these ‘populations’ may mix extensively with other populations on the breeding grounds, or mix with sedentary populations of the same species during the migration seasons and/or on the non-breeding grounds.
- v) A regional group of sedentary, nomadic or dispersive birds with an apparently rather continuous distribution and no major gaps between breeding units sufficient to prohibit the interchange of individuals during their normal nomadic wanderings and/or post-breeding dispersal.

Guidance on waterbird biogeographical populations (and, where data are available, suggested 1% thresholds for each population) is provided by Wetlands International.

Supports—Provides habitat for; areas that can be shown to be important to a species or an assemblage of species for any period of time. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Population—In this case meaning the relevant biogeographic population.

Waterbirds—Birds that are ecologically dependent on wetlands; includes any wetland bird species, synonymous with ‘waterfowl’ (see Ramsar guidelines for full list of families).

3.6.3 New Zealand application

The application of this Criterion is relatively straightforward: in a New Zealand context, 1% of the bioregional population is equivalent to 1% of the national population. For many uncommon species in New Zealand, the number of individuals required to meet the threshold is very low, e.g. approximately 2 individuals for kōtuku (*Ardea modesta*), 7 for Australasian bittern (*Botaurus poiciloptilus*), 15 for brown teal (*Anas chlorotis*), 20 for New Zealand dabchick (*Poliiocephalus rufopectus*) and 35 for blue duck (*Hymenolaimus malacorhynchos*) (Wetlands International 2006). However, for non-endemic species, it will be important to consider global populations (e.g. for Australasian bittern, 1% of the global population is 322 birds). Therefore, the population proportions required to strongly meet this Criterion are set relatively high. Species with small populations are also likely to be threatened species and their habitats are likely to meet Criterion 2.

Sites meeting this Criterion will be assessed based on the following:

Abundance: Actual % of total national/global population

Richness: Number of species that have an abundance of > 1% of the national population at this site

Habitat value: Regularity or length of season, resident vs. migratory, number relative to other sites

Determine the **extent** to which it meets Criterion 6 using Table 9. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

¹⁷ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

Table 9. Applying Criterion 6.

CRITERION 6: Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.		
STRONGLY	MODERATELY	SLIGHTLY*
<p>Regularly supports:</p> <ul style="list-style-type: none"> • ≥25% of a biogeographical population of one or more waterbird species or subspecies; or • >1% of a biogeographical population of 5 or more waterbird species or subspecies. 	<p>Regularly supports:</p> <ul style="list-style-type: none"> • 2–24% of a biogeographical population of one or more waterbird species or subspecies; or • >1% of a biogeographical population of 2–4 waterbird species or subspecies. 	<p>Regularly supports:</p> <ul style="list-style-type: none"> • >1% of a biogeographical population of a waterbird species or subspecies.
<p>Notes:</p> <p>Regularly supports means either permanent (year-round habitat) or seasonal use during the year for 2 out of every 3 years (requiring reliable data with at least 3 years of records). Only species for which reliable population estimates exist, or which are known from only one or a few sites, should be included when applying this Criterion.</p> <p>Biogeographical population is equivalent to the national population for New Zealand when applying the FEOW bioregionalisation scheme.</p> <p>The presence of introduced or non-native species should not be used to support a case for designating a site as a Wetland of International Importance.</p> <p>Note: Wetlands International (2006) and subsequent revisions: Provides recommended 1% thresholds, as well as a description of the biogeographic range of each population.</p>		

3.7 Criterion 7

Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity



Photo: Andrew Morrison

Koaro, *Galaxias brevipinnus*, Chatham Islands.

3.7.1 Ramsar target

To have included in the Ramsar List those wetlands that support a significant proportion of indigenous fish subspecies, species or families and populations.

The Ramsar Secretariat offers the following guidance¹⁸:

s103 A wetland can be designated as internationally important if it has a high diversity of fishes and shellfishes. Consider the number of taxa, different life-history stages, species interactions and the complexity of interactions between the above taxa and the external environment. Species counts alone are not sufficient to assess the importance of a particular wetland. In addition, the different ecological roles that species may play at different stages in their life cycles needs to be considered.

s104/7 Consider high levels of endemism and of biodisparity (i.e. the range of morphologies and reproductive styles in a community). The more heterogeneous and unpredictable the

¹⁸ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

habitats, the greater the biodisparity of the fish fauna. Measures of both biological diversity and biodisparity should be used to assess the international importance of a wetland.

S105 If at least 10% of fish are endemic to a wetland, or to wetlands in a natural grouping, that site should be recognised as internationally important. In areas with no endemic fish species, the endemism of genetically-distinct infraspecific categories, such as geographical races, should be used.

3.7.2 Ramsar definitions¹⁹

S106 The occurrence of rare or threatened fish is catered for in Criterion 2.

Fish—Any finfish, including jawless fishes (hagfishes and lampreys), cartilaginous fishes (sharks, rays, skates and their allies) and bony fishes, as well as certain shellfish or other aquatic invertebrates, including shrimps, lobsters, freshwater crayfishes, prawns and crabs (Crustacea); mussels, oysters, limpets, winkles, whelks, scallops, cockles, clams, abalone, octopus, squid and cuttlefish (Mollusca); sponges (Porifera); hard corals (Cnidaria); lugworms and ragworms (Annelida); sea urchins and sea cucumbers (Echinodermata); and sea squirts (Ascidiacea).

Life-history stage—A stage in the development of a finfish or shellfish, e.g. egg, embryo, larva, leptocephalus, zoea, zooplankton stage, juvenile, adult or post-adult.

Population—Meaning a group of fishes comprising members of the same species.

Significant proportion—In temperate zones a ‘significant proportion’ may be 15–20 subspecies, species, families, life-history stages or species interactions. A ‘significant proportion’ of species includes all fish species and is not limited to those of economic interest. Some wetlands with a ‘significant proportion’ of species may be marginal habitats for fish and may only contain a few fish species. The potential of a degraded wetland to support a ‘significant proportion’ of species if it were to be restored also needs to be taken into account. In areas where fish diversity is naturally low, genetically distinct infraspecific groups of fishes could also be counted.

Species interaction—Exchanges of information or energy between species that are of particular interest or significance, e.g. symbiosis, commensalism, mutual resource defence, communal brooding, cuckoo behaviour, advanced parental care, social hunting, unusual predator-prey relationships, parasitism and hyperparasitism. Species interactions occur in all ecosystems but are particularly developed in species-rich climax communities, such as coral reefs and ancient lakes, where they are an important component of biological diversity.

Supports—Provides habitat for; areas that can be shown to be important to a species or an assemblage of species for any period of time are said to support that species. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Wetland benefits—The services that wetlands provide to people, e.g. flood control, surface water purification, supplies of potable water, fishes, plants, building materials and water for livestock, outdoor recreation, and education. See also Resolution VI.1.

Wetland values—The roles that wetlands play in natural ecosystem functioning, e.g. flood attenuation and control, maintenance of underground and surface water supplies, sediment trapping, erosion control, pollution abatement, and provision of habitat.

3.7.3 New Zealand application

This Criterion is complex, incorporating a range of concepts, and is very open to interpretation. It also overlaps several other criteria, e.g. Criterion 2 (diversity), Criterion 8 (sites important for maintaining fish stocks) and Criterion 9 (supporting 1% of the total population of a non-avian species).

¹⁹ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

The Ramsar definition for fish includes shellfish and other aquatic invertebrates. While a case can be made for the inclusion of such species, the level of information on them is likely to be relatively low and inconsistent across wetland systems, such that national comparison is not possible. Therefore, only finfish and native crayfish will be considered in the application of Criterion 7 for New Zealand.

The Ramsar guidance notes clarify that this Criterion does not apply to threatened species (they are covered by Criterion 2). Nor does it apply to species counts alone—it is important to also consider biodiversity, i.e. the number of taxa, the range of life-history stages, the ecological roles played, species interactions, and the complexity of interactions between fish taxa and the external environment. However, given the high number of recently identified and taxonomically indeterminate indigenous finfish species, and their cryptic nature, it is likely that too little is known about inter/intra-species and species-environment interactions for this component of the Ramsar criterion to be consistently applied with any confidence in New Zealand. Information on the range, distribution and species richness of invertebrate species is particularly problematic.

Therefore, when applying this Criterion for New Zealand nominations, the focus will be on sites with an unusually high diversity and density of indigenous finfish and crayfish species, and those sites in which 10% of the indigenous fish species are endemic to that wetland or wetland complex.

The New Zealand finfish fauna is not large (around 77 native freshwater and estuarine species, some of which use both habitats; Goodman et al. 2014). The total fish species richness is larger, however, when considering marine environments such as fiords and drowned valleys (sounds) like Milford Sound, which has >50 fish species (Roberts et al. 2005). The most diverse fish fauna are likely to be found in estuaries, particularly those that are important migratory pathways and/or breeding areas for diadromous fish. In applying this Criterion, it will be important to consider the relative natural diversity of different hydrosystems. Areas of high finfish diversity include Whanganui Inlet (50 species, some may be non-native), Waimea Inlet (41), Estuary of the Heathcote and Avon Rivers/Ihutai (34), Ahuriri Estuary (29), Parengarenga Harbour (28), Lake Ellesmere (Te Waihora) (26), Buller River (19), Awarua-Waituna (18), Mohaka River (10), and Taupo Swamp (10) (Cromarty & Scott 1995). By contrast, New Zealand's largest freshwater lake, Lake Taupo (Taupomoana), supports just three native finfish species (Cromarty & Scott 1995).

The Ramsar guidance notes highlight the importance of wetlands that have a high proportion of species endemic to that site. It is assumed that s105 of the Ramsar guidelines means that 10% of fish species are endemic to a wetland, rather 10% of the individuals in the total fish population. In New Zealand, it is unlikely that any wetland complex would have more than one fish species endemic to it; thus, only wetlands with ten or fewer fish species, one of which is locally endemic would qualify. Potential candidate sites are Chatham Island southern bogs (Chatham Island mudfish *Nechanna rekohua*), the headwaters of the Clarence and Waiau Rivers (Tarndale bully *Gobiomorphus alpinus*) and the Northland dune lakes (Northland mudfish *Nechanna heleiios*, Kai Iwi dune lake galaxiid *Galaxias* sp. and Poutu Lakes dwarf inanga *Galaxias gracilis*). It is proposed that the requirement be limited to 10% of indigenous finfish species, because exotic species are not part of the natural fish fauna composition. Some taxonomically indistinct species may also prove to be locally endemic (e.g. the galaxiids found in the Nevis, Waitaki, Manuherikia and Teviot Rivers, and the Clutha River/Mata-Au).

Determine the **extent** to which it meets Criterion 7 using Table 10. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 10. Applying Criterion 7.

CRITERION 7: Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.		
STRONGLY	MODERATELY	SLIGHTLY*
<p>Regularly supports:</p> <ul style="list-style-type: none"> • ≥25 species or subspecies of indigenous native fish; or • A fish fauna of which > 15% of the indigenous species are endemic to that wetland; or • One of the largest known populations of any 5 or more indigenous fish species in New Zealand; or • A highly distinctive fish fauna community that does not exist elsewhere within wetlands of the same hydrosystem. 	<p>Regularly supports:</p> <ul style="list-style-type: none"> • ≥10 species or subspecies of indigenous native fish; or • A fish fauna of which > 10% of the indigenous species are endemic to that wetland; or • One of the largest known populations of 2 or more indigenous fish species in New Zealand; or • A highly distinctive fish fauna community that exists in fewer than 5 wetlands of the same hydrosystem. 	<p>Regularly supports:</p> <ul style="list-style-type: none"> • ≥5 species or subspecies of indigenous native fish; or • A fish fauna of which > 5% of the indigenous species are endemic to that wetland; or • One of the largest known populations of any indigenous fish species in New Zealand; or • A highly distinctive fish fauna community that exists in fewer than 10 wetlands of the same hydrosystem.
<p>Notes:</p> <p>For application of Criterion 7 in New Zealand, the term 'fish' is limited to indigenous finfish or crayfish.</p> <p>A highly distinctive fish fauna community will include unique occurrences of particular species (e.g. only recorded on the east coast of the South Island) and aspects of biodisparity, i.e. the number of taxa, the range of life-history stages, the ecological roles played, species interactions, and the complexity of interactions between fish taxa and the external environment.</p>		

3.8 Criterion 8

Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend

3.8.1 Ramsar target

To have included in the Ramsar List those wetlands that provide important food sources for fishes, or are spawning grounds, nursery areas and/or on their migration path.



Whitebait stands, Okuru Estuary, Westland.

Photo: Philippe Gerbeaux

The Ramsar Secretariat offers the following guidance²⁰:

s109 It is important to conserve all those areas that are essential for the completion of a fish's life cycle (spawning, nursery, feeding grounds, migration paths). Coastal wetlands that are extensively used as feeding and spawning grounds and nurseries by fishes with open water adult stages support essential ecological processes for fish stocks, even if they do not necessarily harbour large adult fish populations.

s110 Many fishes spawn in one part of the ecosystem but spend their adult lives in other waters. Wetlands, even apparently insignificant ones in one part of a river system, may therefore be vital for the proper functioning of extensive river reaches up- or downstream from the wetland.

RIS For the purpose of this Criterion, fish includes shellfish and other invertebrates.

²⁰ Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

3.8.2 Ramsar definitions²¹

Fish—Any finfish and bony fish, and some invertebrates (see Criterion 7 for full definition).

Fish stock—The potentially exploitable component of a fish population.

Migration path—The route along which fishes, such as salmon and eels, swim when moving to or from a spawning or feeding ground or nursery. Migration paths often cross international boundaries or boundaries between management zones within a country.

Nursery—That part of a wetland used by fishes for providing shelter, oxygen and food for the early developmental stages of their young. The ability of wetlands to act as nurseries depends on the extent to which their natural cycles of inundation, tidal exchange, water temperature fluctuation and/or nutrient pulses are retained.

Spawning ground—That part of a wetland used by fishes for courting, mating, gamete release, gamete fertilisation and/or the release of the fertilised eggs. The spawning ground may be part of a river course, a stream bed, inshore or deep water zone of a lake, floodplain, mangrove, saltmarsh, reed bed, estuary or the shallow edge of the sea. The freshwater outflow from a river may provide suitable spawning conditions on the adjacent marine coast.

3.8.3 New Zealand application

The Ramsar Secretariat offers little direct guidance on the application of this Criterion. The term ‘important’ is not defined for this Criterion in the Strategic Framework, although in the context of the long-term target for Criterion 2, importance means sites for which protection ‘will enhance the local and thus global long-term viability of species or ecological communities’.

The focus of this Criterion is the value of a site in providing resources for fish stocks, whether or not those fish species are present in the nominated wetland. Fish stocks are defined in the Strategic Framework as finfish, shellfish and other invertebrates that are potentially exploitable species (presumably whether for commercial, recreational, cultural or subsistence use). In New Zealand, such species are likely to include species of eel, whitebait, lamprey, edible shellfish (e.g. paua *Haliotis* spp., scallops, tuatua *Paphies subtriangulata*, mussels), edible marine finfish and species of recreational importance (which in New Zealand includes introduced species, such as species of trout and coarse fish, some of which can have adverse effects on native species and ecosystems).

In New Zealand, fish resources are important for commercial, cultural and recreational use, but rarely to support subsistence lifestyles. It is difficult to consider differing degrees of cultural importance because such sites are used by local communities and are therefore highly important at a local level. Recreationally, such sites could be divided on the basis of their international reputation, as a draw card for recreational users. However, with the exception of marine trophy fish, most international visitors aim to fish for introduced trout rather than native fish species.

Because of the equity issues potentially raised by elevating the significance of one site over another in the context of its cultural value, this Criterion is not heavily weighted and is more important for informing the process than for separating strong candidate sites from other sites.

Determine the extent to which it meets Criterion 8 using Table 11. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

²¹ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

Table 11. Applying Criterion 8.

CRITERION 8: Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.		
STRONGLY	MODERATELY	SLIGHTLY*
<ul style="list-style-type: none"> • One of fewer than 5 sites in the bioregion, known to provide important habitat for a fish or shellfish species, or local taonga species, that is regularly sought after for food, cultural use, commercial harvest or recreational harvest; or • Is considered of major importance for its cultural, commercial or recreational harvest of fish or shellfish species; or • Is an important migratory path for fish stocks to/from a site that meets one of the above two criteria. 	<ul style="list-style-type: none"> • One of 5–20 sites in the bioregion that provide important habitat for a fish or shellfish species, or local taonga species, that is regularly sought after for food, cultural use, commercial harvest or recreational harvest; or • Is considered of very high importance for its cultural, commercial or recreational harvest of fish or shellfish species; or • Is an important migratory path for fish stocks to/from a site that meets one of the above two criteria. 	<ul style="list-style-type: none"> • One of >20 sites in the bioregion that provide important habitat for a fish or shellfish species, or local taonga species, that is regularly sought after for food, cultural use, commercial harvest or recreational harvest; or • Is considered of high importance for its cultural, commercial or recreational harvest of fish or shellfish species; or • Is an important migratory path for fish stocks to/from a site that meets one of the above two criteria.
<p>Notes: Regularly sought after means repeatedly over the space of many years. Important habitat means spawning ground, feeding area or migration path. Bioregion relates to the FEOW or MEOW biogeographic regions (refer to Criterion 1). <i>Taonga species</i> are flora and fauna that are significant to the culture or identity of Māori tribes. Taonga species are defined by the matauranga Māori (Māori knowledge), whakapapa (genealogy) and kōrero tuku iho (stories and information transmitted from one generation to the next) that are associated with those species. A site of major importance will be internationally recognised as an important site for the sustainable harvest of fish or shellfish species, while a site of very high importance will be of national importance, and a site of high importance is recognised within a local region. For whitebait, refer to the assessment of sites of importance in the South Island (Kelly 1988).</p>		

3.9 Criterion 9

Regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species

3.9.1 Ramsar target

To have included in the Ramsar List all wetlands that regularly support 1% or more of a biogeographical population of one non-avian animal species or subspecies.



Photo: Danica Stent
New Zealand sea lion, *Phocarctos hookeri*, Otago.

The Ramsar Secretariat offers the following guidance²²:

Criterion 9 should be applied only to those species/populations for which a 1% population threshold is provided, unless other verified sources for a population estimate are provided.

This Criterion must be applied to the regular occurrence of > 1% of a biogeographic population of a species or subspecies of wetland-dependent animal—in many cases the biogeographic range of the population is larger than the territory of one Contracting Party (Ramsar Convention 2009: 55, vi).

²² Paraphrased extracts from the Strategic Framework (Ramsar Convention 2009).

- s113 Greatest conservation value will be achieved through the selection of a suite of sites that hold populations of globally threatened species or subspecies.
- s53 When applying population figures, put these within an appropriate context. A site providing habitat for a rare species may be a higher priority for listing than a site that has larger numbers of a more common species.
- s63 Consider complementary international frameworks (e.g. Convention on Biodiversity).
- s113 Consider turnover of individuals of migratory animals during migration periods, so that a cumulative total is reached, if such data are available (see notes for Criterion 5).
- s114 Wherever possible use the most current international population estimates and 1% thresholds provided and regularly updated by IUCN's Specialist Groups through the IUCN Species Information Service (SIS) and published in the Ramsar Technical Report series.
- s115 This Criterion can also be applied to nationally endemic species or populations, where reliable national population size estimates exist. Information concerning the published source of the population size estimate should be included in the justification.
- s116 Consider a range of non-avian animal taxa, but only species or subspecies for which reliable population estimates have been provided and published. Where no such information exists, consider using Criterion 4.

3.9.2 Ramsar definitions²³

Supports—Provides habitat for; areas that can be shown to be important to a species or an assemblage of species for any period of time are said to support that species. Occupation of an area need not be continuous, but may be dependent on natural phenomena such as flooding or (local) drought conditions.

Non-avian animal species—Not defined in the Ramsar glossary, but s116 refers to (among other things) mammals, reptiles, amphibians, fish and aquatic macro-invertebrates.

3.9.3 New Zealand application

This Criterion should be applied only to those animal populations for which a 1% threshold is known, or where population estimates are available from a reliable source. It is not sufficient simply to restate the Criterion, i.e. that the site supports >1% of a population, and nor is it a correct justification to list populations that have >1% of their national population at the site, except when the population is endemic to that country.

Only two New Zealand species appear on the Ramsar list of non-avian species population estimates for the purpose of applying this Criterion: New Zealand fur seal (*Arctocephalus forsteri*; 1% = 400 individuals) and New Zealand sea lion (*Phocarctos hookeri*; 1% = 100 individuals). New Zealand fur seals use shallow coastal environments (intertidal rock pools) for pup crèches and haul-out sites.

Other non-avian animal species that are, or may be, wetland-dependent include:

- Freshwater and inshore fish species
- Freshwater and inshore invertebrate species
- Hochstetter's frog (*Leiopelma hochstetteri*)—requires riverine habitats for spawning
- Long-tailed bats (*Chalinolobus tuberculata*)—not solely wetland-dependent but wetland margins and riverine areas are important forage habitat
- Potentially marine mammals that utilise estuaries or shallow marine areas (e.g. see above regarding fur seal crèche habitats)

²³ Taken from the glossary of terms used in the Strategic Framework (Ramsar Convention 2009).

- Reptile (lizard/gecko) species with a highly limited distribution that is restricted to, or includes sizable areas of, wetlands
- Locally endemic species are likely to be strong candidates for this Criterion, including the cane rush moth *Houdinia flexilissima* and isolated populations of galaxiid fish

Vagrant species (e.g. sea-snakes and turtles) are not, by definition, regular users of wetland habitat in New Zealand.

Determine the extent to which it meets Criterion 9 using Table 12. Allocate the highest category it meets for any component, and include justification from published sources and expert opinion.

Table 12. Applying Criterion 9.

CRITERION 9: Regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.		
STRONGLY	MODERATELY	SLIGHTLY*
Regularly supports: <ul style="list-style-type: none"> • ≥25% of the bioregional population of one or more wetland-dependent non-avian species; or • 1% of the global population of 5 or more wetland-dependent non-avian species. 	Regularly supports: <ul style="list-style-type: none"> • 2–24% of the global population of one or more wetland-dependent non-avian species; or • 1% of the global population of 2–4 wetland-dependent non-avian species. 	Regularly supports: <ul style="list-style-type: none"> • 1% of the global population of 1 wetland-dependent non-avian species.
<p>Notes:</p> <p>Wetland-dependent species includes taxa that utilise non-wetland habitat but for which wetlands are their main habitat. This includes species that rely on wetlands for their resources, such as long-tailed bats that forage on insects with an aquatic larval phase.</p> <p>Regularly supports means either permanent (year-round habitat) or seasonal use during the year for 2 out of every 3 years (requiring reliable data with at least 3 years of records).</p> <p>Locally endemic wetland-dependent species are likely to be strong candidates.</p> <p>Bioregional population is equivalent to the national population for New Zealand.</p> <p>Only species for which reliable population estimates exist, or which are known from only one or a few sites, should be included when applying this Criterion.</p> <p>The presence of introduced or non-native species should not be used to support a case for designating a site as a Wetland of International Importance.</p> <p>Note: STRP 2006: Provides an initial list of recommended 1% thresholds for non-avian animal species—currently only lists New Zealand fur seals and New Zealand sea lions; see ramsar.org/pdf/ris/key_ris_criterion9_2006.pdf</p>		

4. Future development

These guidelines provide for a systematic approach to the assessment of potential Ramsar sites in New Zealand. It establishes a consistent framework for evaluating the international significance of wetlands, which can be applied by government agencies, iwi, non-government organisations and community groups.

Each of the nine Ramsar criteria have been interpreted in a New Zealand context, but with reference to the overarching guidance provided by the Ramsar Convention. The underlying principle is that potential sites can be evaluated based on 'how strongly' they met the Ramsar criteria, and facilitate strategic development of the Ramsar List.

Application of these guidelines by various users over the next 5–10 years will identify aspects that can be clarified, or improved, particularly as further information on the status of wetland ecosystems, threatened species and migratory species is reported. Further guidance on the assessment of Ramsar Sites may also be provided by the Ramsar Convention that should be duly considered. It is therefore recommended for a technical review of the guidelines to occur at regular intervals.

5. Acknowledgements

This document incorporates feedback from participants of a workshop held in Hamilton (16–17 May 2011) to help interpret the international Ramsar criteria for site nomination in a New Zealand context. The workshop was facilitated by Hugh Robertson and Karen Denyer and hosted by NIWA. Participants were Philippe Gerbeaux, John Leathwick, Colin O'Donnell and Dave West (all DOC), Paul Champion (NIWA), Bev Clarkson (Landcare Research), Kevin Collier (Environment Waikato), Tim Park (Greater Wellington Regional Council) and Willie Shaw (Wildland Consultants).

We appreciated feedback on draft versions of the report from Maj de Poorter (Ramsar National Focal Point, DOC), Colin O'Donnell (Principal Science Advisor, DOC), Lew Young (Senior Advisor Asia-Oceania, Ramsar Secretariat) and Lars Dinesen (Ramsar Convention Science & Technical Review Panel). We also thank Lynette Clelland (DOC Publishing Team) and Amanda Todd (contract editor) for significant improvements to the report.

6. References

- Cromarty, P.; Scott, D. (Eds) 1995: A directory of wetlands in New Zealand. Department of Conservation, Wellington. 394 p.
- Department of Sustainability, Environment, Water, Population and Communities (2012). Australian Ramsar Site Nomination Guidelines. Module 4 of the National Guidelines for Ramsar Wetlands—Implementing the Ramsar Convention in Australia. Australian Government Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- DOC (Department of Conservation); MFish (Ministry of Fisheries) 2008: Marine Protected Areas: classification, protection standard and implementation guidelines. Ministry of Fisheries and Department of Conservation, Wellington. 54 p.
- Goodman, J.M.; Dunn, N.R.; Ravenscroft, P.J.; Allibone, R.M.; Boubee, J.A.T.; David, B.O.; Griffiths, M.; Ling, N.; Hitchmough, R.A.; Rolfe, J.R. 2014: Conservation status of New Zealand freshwater fish, 2013. *New Zealand Threat Classification Series* 7: 12 p.

- Falla, R.A. 1975: The bird fauna. Pp. 319–331 in Jolly, V.H.; Brown, J.M.A. (Eds): *New Zealand lakes*. Auckland University Press, Auckland.
- Holdaway, R.J.; Wiser, S.K.; Williams, P.A. 2012: Status assessment of New Zealand's naturally uncommon ecosystems. *Conservation Biology*, 26(4): 619–629.
- Johnson, P.; Gerbeaux, P. 2004: *Wetland types in New Zealand*. Department of Conservation, Wellington. 184 p.
- Kelly, G.R. 1988: An inventory of whitebaiting rivers in the South Island. *New Zealand Freshwater Fisheries Report No. 101*. Freshwater Fisheries Centre, MAFF, Christchurch.
- Leathwick, J.; Dey, K.; Julian, K. 2006: Development of a marine environmental classification optimised for demersal fish. *NIWA Client Report HAM2006-063*. Unpublished report prepared by National Institute of Water and Atmospheric Research Ltd, Hamilton, for the Department of Conservation. 18 p.
- Leathwick, J.R.; West, D.; Gerbeaux, P.; Kelly, D.; Robertson, H.; Brown, D.; Chadderton, W.L.; Ausseil, A-G. 2010: *Freshwater Ecosystems of New Zealand (FENZ) Geodatabase—Version 1: User Guide*. Department of Conservation. 57 p.
- McEwen, M. 1987: *Ecological Regions and Districts for New Zealand*. Third Revised Edition in four 1:500 000 maps. *New Zealand Biological Resources Centre Publication No. 5, Part 1*. Department of Conservation, Wellington. 63 p.
- MfE. 2007: *Environment New Zealand 2007*. Ministry for the Environment, Wellington. 460 p.
- Ramsar Convention 1987: *Convention on Wetlands of International Importance especially as Waterfowl Habitat*. Ramsar (Iran), 2 February 1971. *UN Treaty Series No. 14583*. As amended by the Paris Protocol, 3 December 1982, and Regina Amendments, 28 May 1987
- Ramsar Convention 2007: *Designating Ramsar sites: the Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance*. Ramsar handbooks for the wise use of wetlands, 3rd edition, vol. 14. Ramsar Convention, Gland, Switzerland. 114p.
- Ramsar Convention 2009: *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands*. Third edition, as adopted by Resolution VII.11 and amended by Resolutions VII.13, VIII.11 and VIII.33, IX.1 Annexes A and B, and X.20. Ramsar Convention, Gland, Switzerland. 91 p.
- Robertson, H.A.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Miskelly, C.M.; O'Donnell, C.F.J.; Powlesland, R.G.; Sagar, P.M.; Scofield, P.; Taylor, G.A. 2013: Conservation status of New Zealand birds, 2012. *New Zealand Threat Classification Series 4*: 22 p.
- Roberts, C.D.; Stewart, A.L.; Paulin, C.D.; Neale, D. 2005: Regional diversity and biogeography of coastal fishes on the West Coast South Island of New Zealand. *Science for Conservation 250*. Department of Conservation, Wellington. 70 p.
- Storey, R. 2012: *Freshwater Environments of New Zealand—Physical and biological characteristics of the major classes*. NIWA Client Report No: HAM2012-159. National Institute of Water & Atmospheric Research Ltd, Hamilton. 60 p.
- Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D. 2008: *New Zealand Threat Classification System manual*. Department of Conservation, Wellington. 35 p.
- Walker, S.; Lee, B. 2004: *Significance assessment for biodiversity in the South Island High Country*. Landcare Research Contract Report LC0304/111. Unpublished report prepared for Land Information New Zealand, Christchurch.
- Walker, S.; Price, R.; Rutledge, D.; Stephens, R.T.; Lee, W.G. 2006: Recent loss of indigenous cover in New Zealand. *New Zealand Journal of Ecology* 30(2): 169–177.
- Ward, J.C.; Lambie, J.S. (Eds) 1999: *Monitoring changes in wetland extent: an environmental performance indicator for wetlands*. A Ministry for the Environment SMF funded project. Final Report—Project Phase One. Lincoln Environmental, Lincoln University, Canterbury. 47 p.
- Wetlands International. 2006: *Waterbird Population Estimates - Fourth Edition*.
- Wetlands International, Wageningen, The Netherlands. 239 p.
- Whaley K.J.; Clarkson B.D. and Leathwick J.R. 1995: *Assessment of criteria used to determine 'significance' of natural areas in relation to section 6(c) of the Resource Management Act (1991)*. Landcare Research Contract Report. Prepared for Environment Waikato, Hamilton.
- White, P.A. 2001: *Groundwater resources in New Zealand*. Pp. 45–75 in Rosen, M.R.; White, P.A. (Eds): *Groundwaters of New Zealand*. New Zealand Hydrological Society Inc., Wellington.
- Williams, P.A.; Wiser, S.; Clarkson, B.; Stanley, M.C. 2007: *New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework*. *New Zealand Journal of Ecology* 31: 119–128.

Appendix 1

Original text of Article 2 of the Ramsar Treaty 1971

Article 2

- 1. Each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, hereinafter referred to as "the List" which is maintained by the bureau established under Article 8. The boundaries of each wetland shall be precisely described and also delimited on a map and they may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands, especially where these have importance as waterfowl habitat.*
- 2. Wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology. In the first instance wetlands of international importance to waterfowl at any season should be included.*
- 3. The inclusion of a wetland in the List does not prejudice the exclusive sovereign rights of the Contracting Party in whose territory the wetland is situated.*
- 4. Each Contracting Party shall designate at least one wetland to be included in the List when signing this Convention or when depositing its instrument of ratification or accession, as provided in Article 9.*
- 5. Any Contracting Party shall have the right to add to the List further wetlands situated within its territory, to extend the boundaries of those wetlands already included by it in the List, or, because of its urgent national interests, to delete or restrict the boundaries of wetlands already included by it in the List and shall, at the earliest possible time, inform the organization or government responsible for the continuing bureau duties specified in Article 8 of any such changes.*
- 6. Each Contracting Party shall consider its international responsibilities for the conservation, management and wise use of migratory stocks of waterfowl, both when designating entries for the List and when exercising its right to change entries in the List relating to wetlands within its territory.*

See: http://www.ramsar.org/sites/default/files/documents/library/original_1971_convention_e.pdf

Appendix 2

Analysis of New Zealand's current Ramsar network

Section 66 (i) of the Ramsar Strategic Guidelines direct the Contracting Parties to 'determine the range of wetland types present (using the Ramsar classification system for wetland type), noting in particular any rare or unique wetland types'. This Appendix shows the range of wetland types (using several classifications and spatial frameworks) that are present within New Zealand's existing Ramsar network, and then highlights the areas that are well covered and those that are not represented.

A2.1 Representation of wetland types within New Zealand's Ramsar network

Table A2.1.1. Representation by biogeographic region, in relation to the Marine Ecoregions of the World (MEOW), Freshwater Ecoregions of the World (FEOW) and Terrestrial Ecoregions of the World (TEOW).

	TYPE CODE	NEW ZEALAND RAMSAR SITE						FREQ.
		AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
MEOW*	195							0
	196			✓				0
	197							0
	198							0
	199		✓			✓		2
	200	✓						1
	201							0
	230							0
	231							0
	232							0
FEOW*	NZ	✓	✓	✓	✓	✓	✓	6
TEOW*	1							0
	2							0
	3		✓					1
	4					✓		1
	5			✓	✓		✓	3
	6							0
	7							0
	8	✓						1
	9							0

*** Marine ecoregions in New Zealand:**

- | | |
|-------------------------------|---------------------------------|
| 195. Kermadec Island | 200. South New Zealand |
| 196. Northeastern New Zealand | 201. Snares Island |
| 197. Three Kings–North Cape | 230. Bounty & Antipodes Islands |
| 198. Chatham Island | 231. Campbell Island |
| 199. Central New Zealand | 232. Auckland Island |

† Terrestrial ecosystems in New Zealand:

- | | |
|--------------------------------------|-------------------------------------|
| 1. Chatham Island temperate forests | 6. Rakiura Island temperate forests |
| 2. Fiordland temperate forests | 7. Richmond temperate forests |
| 3. Nelson Coast temperate forests | 8. Southland temperate forests |
| 4. Northland temperate forests | 9. Westland temperate forests |
| 5. Northland temperate kauri forests | |

Table A2.1.2. Representation by hydrosystem.

TYPE CODE	NEW ZEALAND RAMSAR SITE						FREQ.
	AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
Palustrine	✓	✓	✓	✓	✓	✓	6
Riverine	✓		?	✓	✓	✓	4
Lacustrine	✓						1
Estuarine	✓	✓	✓		✓		4
Marine		?	?				?
Inland saline							0
Plutonic							0
Geothermal							0
Nival							0

Table A2.1.3. Representation by New Zealand classification.

TYPE CODE	NEW ZEALAND RAMSAR SITE						FREQ.
	AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
1. Fiord (up to 6 m depth)							
2. Sound (up to 6 m depth)							
3. Shallow (subtidal) marine		?	?				?
4. Intertidal marine	✓	✓	✓		✓		4
5. Coastal embayment	✓	✓	✓				3
6. Coastal lake or lagoon/tidal lagoon	✓						1
7. Tidal rivers					✓		1
8. Bog	✓			✓		✓	3
9. Fen	✓			✓		✓	3
10. Swamp	✓			✓	?	✓	3
11. Marsh	✓	✓	✓		✓		4
12. Seepage/Flush							
13. Shallow water (excludes estuarine)	✓			?	?	✓	2
14. Ephemeral wetland							
15. Pakihi and gumland							
16. Aeolian lake (incl.dune lake)							
17. Riverine lake							
18. Volcanic lake							
19. Glacial lake							
20. Peat lake							
21. Geothermal lake							
22. Glacier							

Continued on next page

Table A2.1.3 continued

TYPE CODE	NEW ZEALAND RAMSAR SITE						FREQ.
	AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
23. Snowfield							
24. Subterranean lake/pool							
25. Subterranean river/stream							
26. Volcanic aquifer							
27. Metamorphic aquifer							
28. Sedimentary aquifer							
29. Lowland streams rivers	✓			✓		✓	3
30. Mid-elevation streams/rivers							
31. Glacially influenced streams/rivers							
32. High-elevation streams/rivers (non-glacial)							
32. High-elevation streams/rivers (glacial)							

Table A2.1.4. Representation by Ramsar wetland type (see section A3.2 (Appendix 3) for a description of the type codes).

✓ ? = in the Ramsar Information Sheet (RIS) only S or T or X indicated; ✓ ?? = uncertain. (Information sourced from the latest RIS for each Ramsar site.)

	TYPE CODE	NEW ZEALAND RAMSAR SITE						FREQ.
		AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
Marine/coastal (12)	A		✓	✓				2
	B			✓				1
	C							0
	D			✓				1
	E	✓	✓	✓		✓		4
	F	✓	✓	✓		✓		4
	G	✓	✓	✓		✓		4
	H	✓	✓	✓		✓		4
	I			✓				1
	J	✓	✓	✓				3
	K	✓	✓					2
	Zk(a)							0
Inland (20)	L							0
	M	✓			✓		✓	3
	N				✓			1
	O					✓		1
	P				✓			1
	Q		✓	✓				2

Continued on next page

Table A2.1.4 continued

	NEW ZEALAND RAMSAR SITE							FREQ.
	TYPE CODE	AWARUA-WAITUNA	FAREWELL SPIT	FIRTH OF THAMES	KOPUATAI	MANAWATU ESTUARY	WHANGA-MARINO	
Inland (20)	R		✓					1
	Sp				✓??		✓?	2?
	Ss	✓			✓??		✓?	3?
	Tp	✓	✓		✓		✓	4
	Ts		✓?		✓?		✓?	3?
	U	✓			✓		✓	3
	Va							0
	Vt							0
	W				✓		✓	2
	Xf				✓?		✓?	2?
	Xp	✓			✓?		✓?	3?
	Y				✓			1
	Zg							0
	Zk(b)							0
Human-made (10)	1							0
	2				✓		✓	2
	3							0
	4							0
	5							0
	6							0
	7							0
	8							0
	9				✓		✓	2
	Zk(c)							0
# types	12	11?	10	14?	4	11?		

Table A2.1.5. Ramsar wetland types that are not currently represented in New Zealand's Ramsar network (excluding human-made)

TYPE CODE	WETLAND TYPE	POTENTIAL NEW ZEALAND LOCATIONS
C	Coral reefs	None in New Zealand Kermadec Islands and Fiordland have coral but not reefs
Zk(a)	Karst and other subterranean hydrological systems, marine/coastal	Rangitoto Island (Auckland)
L	Permanent inland deltas	Tongariro River delta (South Taupo wetland)
Va	Alpine wetlands	Between treeline and permanent snow, e.g. Ruapehu crater lakes
Vt	Tundra wetlands	Auckland and Campbell Islands
Zg	Geothermal wetlands	Te Kopia, Waimangu, Waiotapu (Waikato/Bay of Plenty)
Zk(b)	Karst and other subterranean hydrological systems, inland	Limestone Waitomo caves, Takaka Hills, Thousand Acre Plateau (Nelson) Subterranean river gravels, e.g. Waimea Plains Otago basalt-fields

A2.2 Ramsar wetland types with multiple occurrences in New Zealand's Ramsar network

The following wetland types are present in at least four of New Zealand's six Ramsar sites (although they may only be present as small areas), reflecting the fact that four of the six sites are coastal:

E—Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.

F—Estuarine waters; permanent water of estuaries and estuarine systems of deltas.

G—Intertidal mud, sand or salt flats.

H—Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.

Tp—Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

A2.3 Ramsar wetland types that are not currently represented in New Zealand's Ramsar network (excluding human-made)

Appendix 3

Lists of significant wetlands in New Zealand

A3.1 Sources of lists

FENZ (Freshwater Ecosystems of New Zealand): This is a national dataset that incorporates several bodies of work that aimed to list nationally important aquatic systems. It includes three types of systems:

- **Riverine** (Chadderton et al. 2004): 177 rivers and 103 catchments/subcatchments were identified as a candidate list of rivers of national importance within 29 bioregions. The authors aimed for the 'minimum set required for representation of 100% of the river classes, and listed among the top ten sites ranked by natural heritage value within the biogeographic unit' and sites that 'contained special features (i.e. threatened species, floodplain forests), or was connected to a nationally important wetland, lake or estuary'.
- **Palustrine** (Ausseil et al. 2008): Over 1500 palustrine and inland saline wetlands are considered nationally important and the minimum to protect the full range of wetland types within 29 bioregions. This list was compiled using a modelling approach based on several Geographic Information System (GIS) datasets. Focus is on representativeness and does not consider values such as the presence of threatened species or a high proportion of the total population of a species.
- **Lacustrine:** There is currently no published list of ranked lakes. However, the FENZ database includes a national rank value for 3405 lakes (≥ 1 ha) on the basis of their condition, pressures and biological values to identify the minimum set of sites needed to adequately represent lacustrine biological values (Leathwick et al. 2010).

Directory of wetlands (Cromarty & Scott 1995): This directory includes 73 wetlands and wetland complexes that are considered by the compilers to meet Ramsar Convention standards for international significance. It includes lakes, bogs, swamps, estuaries, rivers and karst (plutonic) wetlands, but no marine or geothermal systems. It was compiled on the basis of expert opinion but using the Ramsar criteria (pre-1999 set). At that time, a site needed to meet only one of the Ramsar criteria to be considered internationally important, but most, if not all, would meet multiple criteria. The information contained in the report is valuable, though some is likely out of date.

WERI (Wetlands of Ecological and Representative Importance): This database, which was compiled in the 1980s, contains records for c. 3000 wetlands throughout New Zealand, including 138 sites that are considered internationally significant. Information includes size, location, land ownership, classification (hydrosystem, geomorphic origin, community class, dominant plant species), threats, buffer, wildlife and vegetation values, other ecological values, cultural values, significance, and sources of information.

Coastal Resource Inventory (range of dates and authors, mostly early to mid-1990s): This is a series of inventories by former DOC conservancies, which includes estuarine wetlands. Copies may be available from local DOC offices.

Sites of Special Wildlife Interest (1977–1985): This is a wildlife habitat ranking system that was developed by the Fauna Survey Unit of the former New Zealand Wildlife Service. A set of standard criteria were used to evaluate and rank areas that are important as habitat for one or more species of wildlife into five groups on the basis of their value to wildlife, i.e. outstanding, high, moderate-high, moderate and potential.

World Heritage Sites (DOC 2006): A number of sites that contain wetland areas have been proposed to the United Nations Educational, Scientific and Cultural Organization (UNESCO) as

potential World Heritage Sites, including: 1. Kahurangi National Park, Farewell Spit, Te Waikoropupū Springs and the Canaan karst system; 2. waters and seabed of Fiordland (Te Moana o Atawhenua); 3. Kermadec Islands and Marine Reserve; and 4. Whakaruia Moutere (the North-East Islands). The Canterbury high country braided rivers and lakes, and the Rotorua geyser fields and geothermal sites were also considered. Lake Taupo (Taupomoana) has been recommended for future consideration. The criteria tend to use superlatives to identify outstanding examples.

Important Plant Areas: The New Zealand Plant Conservation Network has developed five criteria for the identification of important plant areas in New Zealand²⁴. However, the list of sites that are considered to meet these criteria has not yet been published.

Protected Natural Areas Programme (various reports and authors): This provides a list of recommended areas for protection. However, it is not a national dataset, and mainly includes terrestrial ecosystems and some palustrine wetlands, with few lakes/streams, if any, included. The criteria that were used may be relevant for the assessment of representativeness.

Regional Coastal Plans (various regions): These are prepared by regional councils. Some contain schedules of Areas of Significant Coastal Value (ASCVs) based on criteria in the 1994 National Coastal Policy Statement. These criteria are similar to the Ramsar criteria, e.g. referring to habitats that are important for threatened species, migratory species, species at vulnerable life stages or outstanding examples of their type. There is no national schedule of ASCVs.

Conservation Management Strategies (various regions): These were prepared by former DOC conservancies and include schedules of important natural areas (terrestrial, wetland and some marine).

A3.2 References

- Ausseil, A.; Gerbeaux, P.; Chadderton, L.; Stephens, T.; Brown, D.; Leathwick, J. 2008: Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important inland wetlands. *Landcare Research Contract Report LC 07/08/158*. Unpublished report prepared for the Department of Conservation, Wellington. 171 p.
- Chadderton, W.L.; Brown, D.J.; Stephens, R.T. 2004: Identifying freshwater ecosystems of national importance for biodiversity: criteria, methods, and candidate list of nationally important rivers. Discussion document. Department of Conservation, Wellington. 112 p.
- Cromarty, P.; Scott, D. (Eds) 1995: A directory of wetlands in New Zealand. Department of Conservation, Wellington. 394 p.
- DOC (Department of Conservation) 2006: Our world heritage: a tentative list of New Zealand cultural and natural heritage sites. A report to the Department of Conservation by the Cultural and Natural Heritage Advisory Groups. Department of Conservation, Wellington. 79 p.

²⁴ Refer to: http://www.nzpcn.org.nz/page.aspx?ecosystems_important_plant_areas_identification

Appendix 4

Classification systems

A4.1 Ramsar classification system for wetland types

(Taken from Information Sheet on Ramsar Wetlands (RIS) 2009–2012²⁵)

Marine/Coastal Wetlands

A—Permanent shallow marine waters in most cases less than 6 m deep at low tide; includes sea bays and straits.

B—Marine subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows.

C—Coral reefs.

D—Rocky marine shores; includes rocky offshore islands, sea cliffs.

E—Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.

F—Estuarine waters; permanent water of estuaries and estuarine systems of deltas.

G—Intertidal mud, sand or salt flats.

H—Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.

I—Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.

J—Coastal brackish/saline lagoons; brackish to saline lagoons with at least one relatively narrow connection to the sea.

K—Coastal freshwater lagoons; includes freshwater delta lagoons.

Zk(a)—Karst and other subterranean hydrological systems, marine/coastal.

Inland Wetlands

L—Permanent inland deltas.

M—Permanent rivers/streams/creeks; includes waterfalls.

N—Seasonal/intermittent/irregular rivers/streams/creeks.

O—Permanent freshwater lakes (over 8 ha); includes large oxbow lakes.

P—Seasonal/intermittent freshwater lakes (over 8 ha); includes floodplain lakes.

Q—Permanent saline/brackish/alkaline lakes.

R—Seasonal/intermittent saline/brackish/alkaline lakes and flats.

Sp—Permanent saline/brackish/alkaline marshes/pools.

Ss—Seasonal/intermittent saline/brackish/alkaline marshes/pools.

Tp—Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

Ts—Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.

²⁵ Ramsar Convention Secretariat. 2009. (Appendix B).

U—Non-forested peatlands; includes shrub or open bogs, swamps, fens.

Va—Alpine wetlands; includes alpine meadows, temporary waters from snowmelt.

Vt—Tundra wetlands; includes tundra pools, temporary waters from snowmelt.

W—Shrub-dominated wetlands; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.

Xf—Freshwater, tree-dominated wetlands; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.

Xp—Forested peatlands; peat swamp forests.

Y—Freshwater springs; oases.

Zg—Geothermal wetlands.

Zk(b)—Karst and other subterranean hydrological systems, inland.

Note: 'floodplain' is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

1—Aquaculture (e.g., fish/shrimp) ponds

2—Ponds; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).

3—Irrigated land; includes irrigation channels and rice fields.

4—Seasonally flooded agricultural land (including intensively managed or grazed wet meadow or pasture).

5—Salt exploitation sites; salt pans, salines, etc.

6—Water storage areas; reservoirs/barrages/dams/impoundments (generally over 8 ha).

7—Excavations; gravel/brick/clay pits; borrow pits, mining pools.

8—Wastewater treatment areas; sewage farms, settling ponds, oxidation basins, etc.

9—Canals and drainage channels, ditches.

Zk(c)—Karst and other subterranean hydrological systems, human-made.

A4.2 Wetland type classifications for New Zealand

Table A4.2.1. Wetland type classifications for New Zealand.

SOURCE	HYDROSYSTEM	DESCRIPTION
Ward & Lambie 1999*	All hydrosystems	Hierarchical classification framework for palustrine, estuarine, geothermal, plutonic, marine, lacustrine and riverine systems (see Appendix 3, section A3.4). Further refined by Johnson & Gerbeaux (2004) for palustrine systems, with the addition of the nival hydrosystem.
Johnson & Gerbeaux 2004	All hydrosystems	A hierarchical classification of nine hydrosystems covering the full range of wetlands that meet the Ramsar definition, and a further subdivision into nine wetland classes within the palustrine hydrosystem. Their emphasis is on 'inland freshwater wetlands, those near coastal estuaries, and those of lake and river margins'. See Appendix 3, section A3.5 for the list of hydrosystems and classes, and their definitions.
Snelder & Biggs 2002	Riverine	River Environment Classification (REC). Hierarchical river and stream classification with 20 classes at the topmost level and 300 at the fourth level. Each class has unique elements of biodiversity (i.e. distinctive communities or species assemblages) capturing a representative range of riverine biological diversity. Based on six environmental variables: climate, topography, geology, land-cover, network position and valley landform.
Leathwick et al. 2010	Riverine	River system classification based on both biological and physical-chemical attributes. River type classification able to be summarised as few ($n = 20$) or many ($n = 200$) groups according to application.
Falla 1975; Vant 1987; Ward & Pyle 1997; Ward & Lambie 1999; Burns et al. 2000	Lacustrine	Several lake classification systems, largely based on elements of water quality (nutrient status, clarity) and thermal stratification regime.
Lowe & Green 1987	Lacustrine	A non-hierarchical-level lake classification based on formation/origin, including artificially constructed lakes, and lakes formed by aeolian, glacial, volcanic, tectonic, geothermal and other processes.
Snelder 2006	Lacustrine	A multivariate classification system for lakes, with seven classes at the primary level based on variables that influence mixing and stratification regimes, including depth, area, climatic and morphological characteristics. The combination includes elements of biogeographic regions in the single level classification system, e.g. 'small lakes in warm (northern) locations' and 'small lakes in cool (southern) locations'. The primary classes were further subdivided on the basis of condition and catchment characteristics. They have been applied in the FENZ database (Leathwick et al. 2010).
Leathwick et al. 2010	Lacustrine	In the FENZ database, a ten-class typology for geomorphic origin was attributed to each lake: aeolian (wind-formed, dune), dam, geothermal, glacial, landslide, peat, riverine, shoreline, tectonic and volcanic, based on a range of published sources. A separate typology classifies lakes on the basis of temperature, depth and size, generating a seven-group system.
Hume et al. 2003, 2007	Estuarine	New Zealand Estuarine Environment Classification (EEC). An estuarine classification. Level 1 differentiates global-scale variation based on differences in climatic and oceanic processes, which are discriminated by latitude, oceanic basins and large landmasses (approximating biogeographic regions). Level 2 differentiates estuaries into eight types (A–H) based on hydrodynamic processes, discriminated by estuary basin morphometry, river and oceanic forcing. Level 3 differentiates variation among estuaries that are due to catchment processes, measured by catchment geology and catchment land cover [†] .
Walls 1995; DOC & MFish 2008	Marine and estuarine	Coastal Marine Classification (earlier version named Coastal Biogeographic Regions Classification; Walls 1995). Hierarchy of five layers which categorise the physical environment. Layer 1 is biogeographic region (14 regions); Level 2 Environment type (Estuarine or Marine); Level 3 Depth (Intertidal, Subtidal, Intertidal, Shallow, Subtidal, Deep Subtidal); Level 4 Exposure (low, med, high); Level 5 Substrate type (e.g. mudflat, sand flat, cobble field). Within each biogeographic region, there are 44 potential habitats; however, not all of these will be present in every biogeographic region.

Continued on next page

Table A4.2.1 continued

SOURCE	HYDROSYSTEM	DESCRIPTION
Snelder et al. 2005	Marine	Marine Environment Classification. Classifies New Zealand's Exclusive Economic Zone (EEZ) into an ecosystem-based spatial framework. It uses eight physical factors (e.g. depth, sea-surface temperature, seabed slope, tidal current and annual solar radiation) to classify and map marine areas that have a similar environmental character. Can be mapped to different levels of detail, ranging from 2 to >70 marine environment groups. Most of the classes apply to marine environments deeper than the Ramsar maximum of 6 m. A greater level of detail was generated for the Hauraki Gulf, where some classes are in water within the 6 m limit.
White 2001	Plutonic	Nine groundwater (aquifer) types are described on the basis of geology and depositional process, including aquifers in sedimentary, volcanic and metamorphic lithologies, and in geothermal systems.

A4.3 Alignment of New Zealand classification with the Ramsar wetland types

Table A4.3.1. Wetland type classifications for New Zealand.

	NZ CLASSIFICATION	HYDROSYSTEM/S	RAMSAR WETLAND TYPE/S	RAMSAR CODE
1	Fiord	Marine	Shallow marine waters	A
2	Sound	Marine	Shallow marine waters	A
3	Shallow (subtidal) marine	Marine	Shallow marine waters Subtidal beds	A B
4	Intertidal marine	Marine Estuarine	Rock shores Sand/shingle shores Estuarine waters Intertidal sand/mudflats Intertidal forest	D E F G I
5	Coastal embayment	Marine Estuarine	Subtidal beds Estuarine waters	B F
6	Coastal lake or lagoon/tidal lagoon/shoreline lake	Lacustrine Estuarine	Brackish lagoons Freshwater lagoons	J K
7	Tidal river	Riverine Estuarine	Permanent rivers	M
8	Bog	Palustrine	Non-forest peatlands Alpine Tundra Shrublands Forested peatlands	U V Vt W Xp
9	Fen	Palustrine	Non-forest peatlands Alpine Tundra Shrublands Forested peatlands	U Va Vt W Xp
10	Swamp	Palustrine Lacustrine Riverine Geothermal	Non-forest peatlands Shrublands Swamp forests Forested peatlands Geothermal	U W Xf Xp Zg
11	Marsh	Palustrine Estuarine Lacustrine Inland saline	Intertidal marshes Permanent saline/alkaline pools/ marshes Seasonal saline/alkaline pools/ marshes Permanent freshwater pools/ marshes Seasonal freshwater pools/ marshes Swamp forest	H Sp Ss Tp Ts Xf

Continued on next page

Table A4.3.1 continued

	NZ CLASSIFICATION	HYDROSYSTEM/S	RAMSAR WETLAND TYPE/S	RAMSAR CODE
12	Seepage	Palustrine	Non-forest peatlands Alpine Tundra	U Va Vt
13	Shallow water	Palustrine Geothermal Inland saline	Permanent saline/alkaline pools/ marshes Seasonal saline/alkaline pools/ marshes Permanent freshwater pools/ marshes Seasonal freshwater pools/ marshes Springs/oases Geothermal	Sp Ss Tp Ts Y Zg
14	Ephemeral wetland	Palustrine	Seasonal saline/alkaline pools/ marshes Seasonal freshwater pools/ marshes	Ss Ts
15	Pakihi and gumland	Palustrine	Non-forest peatlands Forested peatlands Shrublands	U Xp W
16	Aeolian lake (incl. dune)	Lacustrine Inland saline	Permanent lake Seasonal lake Seasonal saline lake	O P R
17	Riverine lake (incl. tectonic, landslide, dam)	Lacustrine	Permanent lake Seasonal lake	O P
18	Geothermal lake	Geothermal Lacustrine	Permanent lake Geothermal	O Zg
19	Volcanic lake	Lacustrine	Permanent lake	O
20	Glacial lake	Lacustrine	Permanent lake	O
21	Peat lake	Lacustrine	Permanent lake Seasonal lake	O P
22	Glacier	Nival	Alpine	Va
23	Snowfield	Nival	Alpine	Va
24	Subterranean lake/pool	Plutonic	Karst	Zk(b)
25	Subterranean river/stream	Plutonic	Karst Permanent rivers	Zk(b) M
26	Volcanic aquifer	Plutonic	Karst	Zk(a)
27	Metamorphic aquifer	Plutonic	Karst	Zk(a) Zk(b)
28	Sedimentary aquifer	Plutonic	Karst	Zk(a) Zk(b)
29	Lowland streams/rivers	Riverine	Permanent rivers Seasonal rivers Inland deltas Springs/oases	M N L Y
30	Mid-elevation streams/rivers	Riverine	Permanent rivers Seasonal rivers Springs/oases	M N Y
31	Glacially influenced streams/ rivers	Riverine	Permanent rivers	M
32	High-elevation streams rivers (non-glacial)	Riverine	Permanent rivers Alpine	M Va
33	High-elevation streams rivers (glacial)	Riverine	Permanent rivers Alpine	M Va

A4.4 Definitions of hydrosystems

(Taken from Johnson & Gerbeaux 2004.)

HYDROSYSTEM	DEFINITION
Marine	A hydrosystem that includes saline open waters (c. 35‰ marine salts), the seabed and the foreshore of open sea coasts.
Estuarine	A hydrosystem that includes the subtidal and intertidal zones of estuaries themselves, coastal river mouths, and coastal lagoons affected by the mixing of freshwater and seawater, tidal reaches of rivers, and supratidal zones of coasts affected by splash and spray. The inland boundary of the estuarine hydrosystem is where marine salt concentration measures 5‰.
Palustrine	A hydrosystem of all freshwater wetlands that are fed by rain, groundwater or surface water, but that are not directly associated with estuaries, lakes or rivers.
Lacustrine	A hydrosystem associated with lakes and other bodies of open freshwater that are large enough to be influenced by characteristic lake processes such as permanent non-flowing deep water, fluctuating water level and wave action.
Riverine	A hydrosystem associated with rivers, streams and other open channels, both natural and artificial, where the dominant function is continually or intermittently flowing freshwater. Although many wetlands occupy landforms such as valley floors, floodplains and deltas, which owe their genesis to river processes, the riverine hydrosystem extends only as far as flowing channels retain a current influence, which can be defined as the extent covered by the mean annual flood.
Geothermal	A hydrosystem where volcanic activity produces hot surface waters or heated wet soils (30°C or more), or where geothermal chemistry affects wetland habitats.
Nival	A hydrosystem embracing snowfields and glaciers; a type of wetland insofar as snow and ice can be a habitat for algal communities.
Plutonic	A hydrosystem of underground wetlands, especially waterways that run through cave systems where a lack of light excludes any plant production, but other organisms may be present.
Inland saline	A hydrosystem embracing sites in semi-arid climates in inland basins where localised areas of saline soils are associated with seasonally wet habitats.

A4.5 Definitions of wetland classes

WETLAND CLASS	DEFINITION	SOURCE
Fiord	Definition of estuarine and coastal wetlands under development.	P. Gerbeaux (DOC), pers. comm. 2015
Sound		
Shallow (subtidal) marine		
Intertidal marine		
Coastal embayment		
Coastal lake or lagoon/ tidal lagoon/shoreline lake		
Tidal river		
Bog	A peatland that receives its water supply only from precipitation, and therefore is virtually unaffected by moving groundwater and nutrients from adjacent or underlying mineral soils; bogs are oligotrophic (nutrient-poor), usually markedly acidic and their water table is at or near the surface.	Johnson & Gerbeaux 2004
Fen	A peatland that receives inputs of water and nutrients from adjacent mineral soils, and where the water table is usually close to the peat surface; fens have low to moderate acidity and nutrient status.	
Swamp	A soligenous wetland, usually combining mineral and peat substrates, which has moderate water flow and fluctuation, often with the presence of standing water or surface channels; swamps are relatively rich in nutrients.	

Continued on next page

Table A4.5.1 continued

WETLAND CLASS	DEFINITION	SOURCE
Marsh	A mineral wetland that may have a peat component that is periodically inundated by standing or slowly moving water; water levels may fluctuate markedly. Marshes are usually of moderate to high nutrient status.	Johnson & Gerbeaux 2004
Seepage	An area on a slope that carries a moderate to steady flow of groundwater, and often also surface water, including water that has percolated to the land surface, the volume being less than that which would be considered as a stream or spring. (A flush is a type of seepage that carries a periodic pulse of moving surface water from a higher level, as from a rain event or snow melt.)	
Shallow water	An aquatic habitat with water generally less than a few metres deep, which has standing water for most of the time; includes the margins of lakes, streams, rivers and estuarine waters, plus small bodies of water that may occur within or adjacent to other wetland classes.	
Ephemeral wetland	Typically occupies a closed depression that lacks a permanent surface outlet channel, with mineral soil, and a marked seasonal alternation between being ponded and dried, the wetness and the wetland tending therefore to be ephemeral.	
Pakihi and gumland	A wetland class that is characterised by mineral or peat soils of very low fertility and poor drainage because of leached and impervious basement materials on land that is level or of low relief, with the water supply being mainly from precipitation.	
Aeolian lake	A lake that has formed as a result of Aeolian processes. Includes dune lakes.	
Riverine lake	A lake that is functionally linked with riverine systems. Includes lakes formed via tectonic processes, landslides and dams.	
Geothermal lake	A lake that is functionally dominated by geothermal processes, e.g. with water temperature influenced by geothermal spring inputs.	
Volcanic lake	A lakes of volcanic origin, but that is not functionally dominated by geothermal processes. Includes large volcanic lakes in the central North Island.	
Glacial lake	A lake that formed as a result of glacial processes.	
Peat lake	A lake that is functionally linked with peat soils.	
Glacier	Not currently defined.	n/a
Snowfield	Not currently defined.	n/a
Subterranean stream	Not currently defined.	n/a
Subterranean lake/pool	Not currently defined.	n/a
Volcanic aquifer	Not currently defined.	White 2001
Metamorphic aquifer	Not currently defined.	
Sedimentary aquifer	Not currently defined.	
Lowland streams/rivers	Classification for rivers and streams based on statistical model. Descriptive definitions to be developed.	Leathwick et al. 2008
Mid-elevation streams/rivers		
Glacially influenced streams/rivers		
High-elevation streams rivers (non-glacial)		
High-elevation streams rivers (glacial)		

A4.6 References

- Burns, N.; Bryers, G.; Bowman, E. 2000: Protocol for monitoring trophic levels of New Zealand lakes and reservoirs. Ministry for the Environment, Wellington. 130 p.
- DOC (Department of Conservation); MFish (Ministry of Fisheries) 2008: Marine Protected Areas: classification, protection standard and implementation guidelines. Ministry of Fisheries and Department of Conservation, Wellington. 54 p.
- Falla, R.A. 1975: The bird fauna. Pp. 319–331 in Jolly, V.H.; Brown, J.M.A. (Eds): New Zealand lakes. Auckland University Press, Auckland.
- Hume, T.M.; Snelder, T.; Weatherhead, M.; Liefiting, R. 2007: A controlling factor approach to estuary classification. *Ocean & Coastal Management* 50(11-12): 905–929.
- Hume, T.M.; Snelder, T.; Weatherhead, M.; Liefiting, R.; Shankar, U.; Hicks, M. 2003: A new approach to classifying New Zealand's estuaries, in Kench, P.; Hume, T. (Eds): Proceedings of Coasts and Ports Australasian Conference 2003, Auckland.
- Johnson, P.; Gerbeaux, P. 2004: Wetland types in New Zealand. Department of Conservation, Wellington. 184 p.
- Leathwick, J.R.; Julian, K.; Elith, J.; Chadderton, L.; Ferrier, S.; Snelder, T.H. 2008: A biologically optimised environmental classification of New Zealand's rivers and streams: reanalysis using human impact variables. *NIWA Client Report HAM 2008-027*. National Institute of Water and Atmospheric Research Ltd, Hamilton. 51 p.
- Leathwick, J.R.; West, D.; Gerbeaux, P.; Kelly, D.; Robertson, H.; Brown, D.; Chadderton, W.L.; Ausseil, A-G. 2010: Freshwater Ecosystems of New Zealand (FENZ) Geodatabase—Version 1: User Guide. Department of Conservation. 57 p.
- Snelder, T. 2006: Definition of a multivariate classification of New Zealand Lakes. *NIWA Client Report CHC2006-084*. National Institute of Water & Atmospheric Research Ltd, Christchurch. 32 p.
- Snelder, T.H.; Biggs, B.J.F. 2002: Multi-Scale River Environment Classification for water resources management. *Journal of the American Water Resources Association* 38: 1225–1240.
- Snelder, T.; Leathwick, J.; Dey, K.; Weatherhead, M.; Fenwick, G.; Francis, M.; Gorman, R.; Grieve, J.; Hadfield, M.; Hewitt, J.; Hume, T.; Richardson, K.; Rowden, A.; Uddstrom, M.; Wild, M.; Zeldis, J. 2005: The New Zealand Marine Environment Classification. Ministry for the Environment, Wellington. 80 p.
- Walls, K. 1995: The New Zealand experience in developing a marine biogeographic regionalisation. Pp. 33–48 in Muldoon, J. (Ed.): Towards a Marine Regionalisation for Australia: proceedings of a workshop held in Sydney, NSW: 4–6 March 1994.
- Great Barrier Reef Marine Park Authority, Australia.
- Ward, J.C.; Lambie, J.S. (Eds) 1999: Monitoring changes in wetland extent: an environmental performance indicator for wetlands. A Ministry for the Environment SMF funded project. Final Report—Project Phase One. Lincoln Environmental, Lincoln University, Canterbury. 47 p.
- Ward, J.C.; Pyle, E. 1997: Environmental indicators for the sustainable management of freshwater. Contract report to the Ministry for the Environment, Wellington.
- Information Paper No. 57 21. 86 p.
- White, P.A. 2001: Groundwater resources in New Zealand. Pp. 45–75 in Rosen, M.R.; White, P.A. (Eds): Groundwaters of New Zealand. New Zealand Hydrological Society Inc., Wellington.

Appendix 5

Template for Ramsar site assessment

A5.1 Template for assessing a potential Ramsar site

Insert justification for the **highest level** of each criterion met, or write 'n/a' for those criteria not currently met by the proposed site.

CRITERION*	STRONGLY	MODERATELY	SLIGHTLY
1. Representative, rare or unique type			
2. Rare or endangered species or communities			
3. Important for maintaining biological diversity			
4. Supports species at critical life-cycle stage			
5. Supports 20 000 or more waterbirds			
6. Supports >1% of waterbird population			
7. Supports significant proportion of indigenous fish			
8. Important food source for fishes			
9. Supports >1% of non-avian animal species population			

* See section 3 for the full wording of each criterion.

Appendix 6

Supporting information for assessing level of compliance

A6.1 Under-represented wetland types and biogeographic regions

(See Appendix 4 for details on the classification.)

CLASSIFICATION	NO. OF CATEGORIES	UNDER-REPRESENTED IN CURRENT RAMSAR SITES* (NUMBER OF NEW ZEALAND RAMSAR SITES PER CATEGORY)
FEOW (Freshwater Ecoregions of the World)	1 ecoregion	No need to assess non-marine proposed sites for FEOW as New Zealand is a single FEOW ecoregion
MEOW (Marine Ecosystems of the World)	2 realms	Southern Ocean realm (0)
Hydrosystem	9 hydrosystems	Marine (0) Inland saline (0) Plutonic (0) Geothermal (0) Nival (0) Lacustrine (1)
Palustrine wetland types	9 wetland types	Seepage (0?) Ephemeral wetlands (0?) Pakihi and gumlands (0)
Estuarine/marine types	7 marine/estuarine types	Fiord (0) Sound (0) Coastal lagoon (1) Tidal river (1)
Lake types	9 lake types	All lake types (0)
River types	5 river group types	All except lowland rivers
Plutonic/nival types	7 types	All plutonic/nival types (0)

* Two or fewer Ramsar sites occur in the listed ecoregions or contain the listed wetland types.

A6.2 Naturally rare wetland ecosystems

(See Appendix 4 for details on the classification)

Table A6.2.1 Naturally rare wetland ecosystems.

CLASSIFICATION	WETLAND ECOSYSTEMS [†]	RAMSAR TYPE EQUIVALENT
Naturally rare wetland ecosystems (excluding marine): prior to human arrival covered <0.05% New Zealand land area (i.e. <134000 ha). Palustrine from Williams et al. (2007)*; lakes from Leathwick et al. (2010); rivers after Storey (2012). Note: in Williams et al. (2007), estuaries, blanket mires and lagoons are included as ecosystem types that may not be nationally rare and have therefore been excluded from this list of naturally rare ecosystems.	<ul style="list-style-type: none"> • Lake margins • Cushion bogs • Ephemeral wetlands • Gumlands • Pakihi • Damp sand plains • Dune slacks • Domed bogs • String mires • Tarns • Seepages and flushes • Snow banks • Fumeroles • Geothermal streamsides • Braided river beds • Subterranean • Inland saline wetlands[‡] • Aeolian lakes • Peat lakes 	Marine/coastal B, D, E, F, G, H, J, J, K Freshwater/inland M, N, O, P, Q, Tp, Ts, U, Va, Vt, W, Zg Note: not a one-to-one correlation with the wetland types listed in column 2.

Continued on next page

Table A6.2.1 continued

CLASSIFICATION	WETLAND ECOSYSTEMS [†]	RAMSAR TYPE EQUIVALENT
	<ul style="list-style-type: none"> • Geothermal lakes • Large rivers draining glacial lakes • Glacier-fed streams/rivers • Peatland-fed lowland streams/rivers • Braided river tributaries • Wet western streams/rivers 	
Naturally rare marine ecosystems. Note: 0.05% of the territorial sea area for New Zealand is approximately 87 500 ha.	Use reliable published resources or analysis of robust national databases to justify rarity (i.e. originally occupying <0.05% of New Zealand land area or territorial sea).	

* Williams et al. (2007) originally referred to such systems as 'historically rare'; the term was later revised to 'naturally rare'.

[†] Note that these wetland types do not necessarily accord with the wetland type classification developed for the New Zealand assessment of potential Ramsar sites, but these classes can be applied with justification.

[‡] Inland saline wetlands were estimated to have covered less than 134 000 ha prior to human arrival by Ausseil et al. (2008).

A6.3 Nationally depleted or degraded ecological communities

(See Appendix 4 for details on the classification.)

Table A6.3.1. Nationally depleted or degraded ecological communities.

CLASSIFICATION	WETLAND TYPES
Severely depleted wetland types: ≤10% of its type remains in New Zealand (Ausseil et al. 2008)	Swamp (6% remains) Marsh (8.2%)
Moderately depleted wetland types: ≥10 – ≤20% of its type remains in New Zealand (Ausseil et al. (2008)	Pakihi (16.8% remains) Inland saline (18.4%) Fen (19.3%)
Severely degraded wetland types (≤10% of the current national extent is in a near-natural condition) (Based on FENZ Ecological Integrity (SumPressure) score, where ≥0.7 indicates 'near-natural')	Inland saline Geothermal lakes (<1% national extent is near-natural) Shoreline lakes (2% national extent is near-natural) Volcanic lakes (10% national extent is near-natural) [Note: Analysis includes Lake Taupo (Taupomoana)] River types have not been assessed
Moderately degraded wetland types (>10 – ≤20% of the current national extent is in a near-natural condition) (Based on FENZ Ecological Integrity (SumPressure) score where ≥0.7 indicates 'near-natural')	Aeolian (dune) lakes (15% national extent is near-natural) River types have not been assessed
Severely or moderately depleted or degraded estuarine, marine, nival and plutonic systems	These systems have not been assessed nationally for their state of depletion or degradation Use reliable published resources or analysis of robust national databases to justify inclusion (i.e. <20% of their original state remains, or <20% remains in a natural or near-natural condition)

A6.4 Distinctive, regionally endemic and range-restricted populations of New Zealand wetland species

Note: the examples provided are only accurate as at the date of publication; up-to-date information must be used to justify the application of these components.

Table A6.4.1 Distinctive, regionally endemic and range-restricted populations of New Zealand wetland species

COMPONENT	EXAMPLES
<p>Distinctive species (Endemic species that are the sole representative of their genus or higher taxonomic level in New Zealand)</p>	<p>Endemic globally monotypic* animal species Blue duck, whio <i>Hymenolaimus malachorhynchos</i> Torrentfish <i>Cheimarrichthys fosteri</i> Stokells smelt <i>Stokellia anisodon</i></p> <p>Endemic nationally monotypic† animal species Auckland Islands rail <i>Dryolimnas muelleri</i> Estuarine triplefin <i>Grahamina nigripenne</i> Black flounder <i>Rhombosolea retiarda</i> Common smelt <i>Retropinna retropinna</i></p> <p>Endemic globally monotypic vascular plant species <i>Waireia stenopetala</i> <i>Aporostylis bifolia</i> <i>Monoao Manaoa colensoi</i> <i>Oreostylidium subulatum</i></p> <p>Endemic nationally monotypic vascular plant species <i>Actinotus novae-zelandiae</i> <i>Apodasmia similis</i> Kahikatea <i>Dacrycarpus dacrydioides</i> <i>Forstera tenella</i> <i>Iphigenia novae-zelandiae</i> Pukatea <i>Laurelia novae-zelandiae</i> <i>Marsippospermum gracile</i> <i>Spiranthes novae-zelandiae</i> <i>Stackhousia minima</i> <i>Suaeda novae-zelandiae</i> Swamp maire <i>Syzygium maire</i> <i>Tetrachondra hamiltonii</i> <i>Trithuria inconspicua</i></p> <p>No wetland-dependent reptiles or amphibians are monotypic in New Zealand.</p> <p>Refer to relevant expertise for other wetland-dependent taxa.</p>
<p>Range restricted species (Indigenous species that breed naturally in a localised part of New Zealand)</p> <p>Includes species that are classified as Relict or Naturally Uncommon as per Townsend et al. (2008).</p> <p>Also includes species of other threat status that are endemic to a specific ecological region (McEwen et al. 1987).</p>	<p>Relict (Miskelly et al. 2008; Allibone et al. 2010; de Lange et al. 2013) Marsh crake <i>Porzana pusilla affinis</i> (endemic subspecies) Spotless crake <i>Porzana tabuensis plumbea</i> (not endemic) Black mudfish <i>Neochanna diversus</i> Waikato giant cane rush <i>Sporadanthus ferrugineus</i> Bladderwort <i>Utricularia delicatula</i> Chatham Island button daisy <i>Leptinella featherstonii</i></p> <p>Naturally uncommon (Miskelly et al. 2008; Allibone et al. 2010) Antipodes Island snipe <i>Coenocorypha aucklandica meinertzhagenae</i> Auckland Island banded dotterel <i>Charadrius bicinctus exilis</i> Auckland Island rail <i>Dryolimnas muelleri</i> Auckland Island snipe <i>Coenocorypha aucklandica aucklandica</i> Banded rail <i>Gallirallus philippensis assimilis</i> (endemic subspecies) Black shag <i>Phalacrocorax carbo novaehollandiae</i> (not endemic) Campbell Island shag <i>Leucocarbo campbelli</i> Codfish Island fernbird <i>Bowdleria punctata wilsoni</i> Little black shag <i>Phalacrocorax sulcirostris</i> (not endemic) Little shag <i>Phalacrocorax melanoleucos brevirostris</i> (endemic subspecies) Royal spoonbill <i>Platalea regia</i> (not endemic) Snares fernbird <i>Bowdleria punctata caudata</i> Snares Island snipe <i>Coenocorypha huegeli</i></p>

Continued on next page

Table A6.4.1 continued

	<p>Stokell's smelt <i>Stokellia anisodon</i> Tarndale bully <i>Gobiomorphus alpinus</i> Chatham Island mudfish <i>Neochanna rekohua</i> Dwarf inanga <i>Galaxias gracilis</i></p> <p>For a list of Naturally Uncommon vascular plant species, see de Lange et al. (2013).</p> <p>Other species may include (seek expert advice): Landlocked mudfish and other non-migratory galaxiid species (various locations) <i>Houdinia flexilissima</i> (Waikato) <i>Corybas carsei</i> (Waikato, 1 population, 'doubtfully endemic') Freshwater invertebrates</p> <p>Refer to relevant expertise for other wetland-dependent taxa.</p>
<p>Geographical limits (Altitudinal and latitudinal limits for wetland species)</p>	<p>Refer to relevant expertise.</p> <p>Altitudinal or latitudinal limits apply to the global distribution of a species and only to limits that are not at the extremes, e.g. does not include sea-level as a minimum latitudinal limit, or New Zealand's northern and southern biogeographic limits.</p>

* Globally monotypic mean that the genus has only one species.

† Nationally monotypic means that other species in this genus occur outside New Zealand, but New Zealand has only one species in that genus.

A6.5 References

- Allibone, R.; David, B.; Hitchmough, R.; Jellyman, D.; Ling, N.; Ravenscroft, P.; Waters, J. 2010: Conservation status of New Zealand freshwater fish, 2009. *New Zealand Journal of Marine and Freshwater Research* 44: 271–287.
- Ausseil, A.; Gerbeaux, P.; Chadderton, L.; Stephens, T.; Brown, D.; Leathwick, J. 2008: Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important inland wetlands. Landcare Research Contract Report LC 07/08/158. Unpublished report prepared for the Department of Conservation, Wellington. 171 p.
- de Lange, P.J.; Rolfe, J.R.; Champion, P.D.; Courtney, S.P.; Heenan, P.B.; Barkla, J.W.; Cameron, E.K.; Norton, D.A.; Hitchmough, R.A. 2013: Conservation status of New Zealand indigenous vascular plants, 2012. *New Zealand Threat Classification Series* 3. Department of Conservation, Wellington. 70 p.
- Leathwick, J.R.; West, D.; Gerbeaux, P.; Kelly, D.; Robertson, H.; Brown, D.; Chadderton, W.L.; Ausseil, A-G. 2010: Freshwater Ecosystems of New Zealand (FENZ) Geodatabase—Version 1: User Guide. Department of Conservation. 57 p
- McEwen, M. 1987: Ecological Regions and Districts for New Zealand. Third Revised Edition in four 1:500 000 maps. *New Zealand Biological Resources Centre Publication No. 5*, Part 1. Department of Conservation, Wellington. 63 p.
- Miskelly, C.M.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, H.A.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2008: Conservation status of New Zealand birds. *Notornis* 55(3): 117–135.
- Storey, R. 2012: Freshwater Environments of New Zealand-Physical and biological characteristics of the major classes. *NIWA Client Report No: HAM2012-159*. National Institute of Water & Atmospheric Research Ltd, Hamilton. 60 p.
- Williams, P.A.; Wiser, S.; Clarkson, B.; Stanley, M.C. 2007: New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31: 119–128.