



# **ECOLOGICAL DISTRICT REPORT 01**

BIODIVERSITY VALUES OF SIGNIFICANT NATIVE HABITATS

# Motueka Ecological District Report



# ECOLOGICAL DISTRICT REPORTS

## BIODIVERSITY VALUES OF SIGNIFICANT NATIVE HABITATS

# Report 01:

# Motueka Ecological District

April 2014

This report presents the results of ecological surveys undertaken in the Motueka Ecological District as part of the Native Habitats Tasman programme. It covers the natural areas on private land, where the landowner granted access, and on Crown land outside the conservation estate. A total of 64 properties were surveyed, and all landowners were provided with a comprehensive ecological report. The information from these properties has been incorporated into this report and Tasman District Council is grateful for the participation of the landowners. The report outlines the survey and assessment methods, biodiversity values, threats, management issues and priorities, and opportunities for restoration.

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**Report reviewed by:** Mike Harding, environmental consultant

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**Cover image:** John Gully *'The Waimea Plains and cultivated country near Nelson'* (1875), reproduced by kind permission of the National Library of New Zealand.

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# Executive Summary

The Motueka Ecological District, covering 17,600 ha, was surveyed by Tasman District Council between October 2008 and May 2012 for sites of ecological value. The survey determined areas of ecological 'significance', in the sense of its meaning and purpose under section 6(c) of the Resource Management Act 1991. Such areas are designated by Tasman District Council as 'Significant Native Habitats'. The survey covered private and Council land, but excluded Department of Conservation (DOC)-administered public conservation land. Landowner participation in the survey was by voluntary consent.

About 60% of landowners approached agreed to participate in the project. A total of 71 sites were identified as SNHs, including sites that lay on council land and in the coastal margins of the 'common marine and coastal area'.

Significant Native Habitats cover 40 ha of indigenous forest and treeland, 186.6 ha of upper saltmarsh and 3.2 ha of freshwater wetland. These areas constitute 70% of remaining forest and/or treeland, 93% of remaining upper saltmarsh and 87% of remaining freshwater wetland in the ecological district. Fifteen further areas of faunal habitat in the ecological district are considered 'significant' that had not otherwise been identified as being important for vegetation. The areas are primarily roosting and breeding sites for shorebirds and spawning sites for inanga.

Approximately half of the remaining forest is protected (under QEII covenants or Reserves Act 1977 reserves) with nearly 29% of freshwater wetlands and 3.4% of saltmarsh protected.

The ecological values of Significant Native Habitats encompass nationally significant shorebird roosts, regionally significant valley floor forests, extensive saltmarshes and minor areas of barrier island forest and fen that are unique in the region.

Threats to these areas include sea-level rise, climate change, pest plants and animals, grazing and human disturbance particularly from coastal recreation.

The opportunities are boundless for restoration and enhanced protection of these areas. Many projects are well under way. Key priorities to consider are giving a greater level of protection to some reserves (by elevating them to Scenic Reserve), investigating whether some unreserved council lands could be reserved, and extending weed control at important forest areas and pest control in and around saltmarshes.

# Acknowledgements

Tasman District Council acknowledges assistance with funding for the Native Habitats project from the Biodiversity Advice Fund administered by the Department of Conservation (DOC).

The Council acknowledges the valuable contribution made by members of the organisations who have been involved since 2007 with the Technical Working Group and the Project Oversight Group – Forest and Bird, Federated Farmers, Fish and Game, DOC and QEII National Trust. Steve Markham (Tasman District Council) has chaired the Project Oversight Group, Lindsay Vaughan (Tasman District Council) has managed the project, Michael North has undertaken the surveys and prepared the report and Mike Harding has provided strategic advice and reviewed the report.

# Contents

## Executive Summary

## Acknowledgements

<b>1. Introduction</b>	<b>3</b>
<b>2. Background</b>	<b>5</b>
2.1 Resource Management Act section 6(c) obligations, district plan and working party agreement	
2.2 Native Habitats Tasman programme	
2.3 Why an ecological district report?	
2.4 Prior reports	
<b>3. Survey and Assessment Method</b>	<b>9</b>
3.1 Identification of potential Significant Native Habitats	
3.2 Landowner contact	
3.3 Site survey method	
3.4 Assessment framework and significance criteria	
3.5 Reporting procedure	
3.6 Data storage protocols	
3.7 Survey period	
<b>4. Ecological District Description</b>	<b>13</b>
4.1 Location	
4.2 Geology and landform	
4.3 Altitude and climate	
4.4 Original indigenous ecosystems	
4.5 Present-day ecosystems	
4.6 Extent of ecosystem depletion	
4.7 Extent, size and general characteristics of existing protected areas	
4.8 Land environments present within ED (and threat status)	
<b>5. Significant Native Habitats</b>	<b>31</b>
5.1 Landowner and survey details of Significant Native Habitats	

<b>6. Biodiversity Values of Significant Native Habitats</b>	<b>33</b>
6.1 Vegetation	34
6.2 Flora	42
6.3 Fauna	45
6.4 Other ecological values	48
<b>7. Threats to Significant Native Habitat</b>	<b>49</b>
7.1 Plant pests	50
7.2 Animal pests	51
7.3 Other threats	52
<b>8. Management of Biodiversity Values of Significant Native Habitats</b>	<b>55</b>
8.1 Management issues	56
8.2 Priorities for management	60
8.3 Existing management initiatives	61
8.4 Future opportunities	62
<b>9. Protection of Significant Native Habitats</b>	<b>63</b>
9.1 Existing protection	64
9.2 Priorities for protection	65
<b>10. Biodiversity Monitoring</b>	<b>67</b>
10.1 Future monitoring	
<b>11. References and Further Reading</b>	<b>69</b>
11.1 References cited	70
11.2 Further reading	
<b>12. Appendix 1: Scientific Names of Species Cited in the Text</b>	<b>73</b>



# 1. Introduction

This report provides an ecological summary of the Significant Native Habitats (SNHs) within the Motueka Ecological District from information recorded by surveys of natural areas under Tasman District Council's Significant Native Habitats programme. It describes the rationale for the survey and its methods. For the ecological district as a whole, a description of the original and present-day vegetation is also provided. Sites deemed ecologically 'significant' are described in broad terms by vegetation, habitat, fauna and flora. Threats to these values are discussed and management recommendations and opportunities for protection are explored.





# 2. Background

## 2.1 Resource Management Act 1991 section 6(c) obligations, district plan and working party agreement

This project has been initiated in response to the requirements of the Resource Management Act 1991, which under section 6(c) requires Tasman District Council (the Council) to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. An initial attempt was made in 1995 to identify such areas. The areas were mapped under the draft Tasman Resource Management Plan and put out for public submission, but subsequently largely withdrawn (QEII covenants were retained). Further submissions on the plan resulted in appeals to the Environment Court in 2000 to provide for section 6(c) requirements. These appeals were resolved in mediation during 2007, with a working party signing a 'memorandum of understanding'. As well as refining the district plan rules regarding vegetation protection, it was agreed that Tasman District Council would undertake a survey programme to identify significant

natural areas across the region. This was the impetus for the development of the Tasman District Council Native Habitats Tasman (NHT) programme.

## 2.2 Native Habitats Tasman programme

The NHT programme surveys natural areas on private land and on public land outside Department of Conservation (DOC)-administered public conservation land. It aims to survey the ecological values of indigenous-dominated vegetation and habitat for indigenous fauna, and to determine if such areas are 'significant' under section 6(c) of the Resource Management Act 1991, using the significance criteria drawn up by the Technical Working Group of the NHT (see Section 3.4).

This set of criteria was developed over an 18-month period for the NHT programme. The criteria and their application were developed by a technical working group comprising local stakeholders, Council staff and ecological advisors.



**Extensive saltmarsh occurs at the mouth of the Motueka River delta.**

## 2.3 Why an ecological district report?

Ecological district summary reports provide an overview of the values of Significant Native Habitats within each ecological district, making this important information available for the Council and interested members of the public. These reports serve to focus attention on the important ecological issues prevailing within each ecological district – the values, threats and need for management and protection. Individual privately owned sites are not identified in the reports. It is hoped the reports will encourage greater community awareness and appreciation of the biodiversity and natural values of private land and increase support for positive management and protection. This information will also be available for use by the Council when making long-term planning decisions or undertaking biodiversity monitoring.

## 2.4 Prior reports

This report draws not only on surveyed site information but on relevant previously published overviews of all or part of the ecological district and ecological region. The main publications are:

- Park, G. and Walls, G. (1978) Inventory of Tall Forest Stands of Lowland Plains and Terraces in Nelson and Marlborough Land Districts.
- Walker, K. (1987) Wildlife in the Nelson Region.
- Preece, J. (2000) An Overview of the Freshwater Wetlands of Tasman District.
- Walls, G. and Simpson, P. (2004) Tasman District Biodiversity Overview– Review of Indigenous Ecosystems on Private Land and Opportunities for Protection.
- Butler, D. (2008) Tasman District Biodiversity Overview – Indigenous Terrestrial Vertebrates and Invertebrates.
- Robertson, BM., and Stevens, LM. (2012) Tasman Coast: Waimea Inlet to Kahurangi Point. Habitat Mapping, Ecological Risk Assessment and Monitoring Recommendations.

Parks and Walls (1978) mapped and gave a numerical ecological value score for all tall forest stands on alluvium and alluvial terraces in the then Nelson–Marlborough region and important sites are listed in their report.



**An ancient kahikatea at Brightwater.**

Walker (1987) identified all sites of at least potential ecological value within the then Nelson region, listing them as being either outstanding, high value, moderate–high value, moderate value or potential value. Sites are categorised as either forest, freshwater wetland or coastal and estuarine.

Preece (2000) described freshwater wetland types within Tasman District, their distribution and their levels of depletion at the ecological district scale. Data is analysed in a number of ways.

Walls and Simpson (2004) described the indigenous vegetation in Tasman District by ecological district. Levels of depletion and protection for broad ecosystem types are given for each ecological district. Opportunities for protection are canvassed.

Butler (2008) described the known faunal values of Tasman District by animal groups and species.

Robertson and Stevens (2012) provided information on the ecological risks to coastal and estuarine habitats, including climate change, drainage and reclamation, invasive species, shoreline armouring, duneland removal, grazing and vehicles.



# 3. Survey and Assessment Method

### 3.1 Identification of potential Significant Native Habitats

Potentially significant sites were identified in several ways. The primary resource was the Department of Conservation's inventory (unpublished) that was compiled under contract to Tasman District Council during the mid-1990s for the initial identification of significant natural areas. This was based on Kath Walker's identification of sites in her report *Wildlife in the Nelson Region* (1987). The next step was to fill in any gaps through the systematic perusal of aerial ortho-photo coverage of the district using the publicly-accessible 'Top of the South Maps' portal on the internet. Some ground-truthing of ambiguous sites was undertaken in the field, where visible from public roads. Any further additions were by way of incidental field identification whilst travelling through the district. The survey was confined to terrestrial and wetland systems and excluded waterways (but included their banks). It extended out into upper saltmarsh vegetation, although this is strictly outside the ecological district boundaries.

Potentially significant faunal habitat that fell outside areas surveyed for vegetation was identified by local information and from emerging survey work. Significant shorebird roosts and breeding sites were identified and mapped following discussions with Ornithological Society of New Zealand (OSNZ) members Willie Cook and David Melville. Spawning sites for inanga were identified by surveys in March 2012 and 2013, organised by Trevor James, resource scientist at Tasman District Council.

### 3.2 Landowner contact

Initial contact with owners of potential Significant Native Habitat (SNH) sites was initiated with a letter and pamphlet describing the survey, its values and implications. This was followed up two weeks later with phone contact to seek approval for a site visit. If approval was granted, the survey was undertaken within three months. Toward the end of the survey, ownership of sites where a visit had been declined was checked for ownership changes.

### 3.3 Site survey method

The methodology of the field survey was to map native vegetation and habitat at a broad community level, to describe each community and/or habitat identified and to list all native species and important exotic species encountered.

Vegetation, habitats, species and features were recorded. Before each site visit, an aerial ortho-photo was printed of the site to enable mapping of site boundaries, vegetation communities and habitats. A species checklist was filled in at the end of the visit, with species abundance noted. Digital photo-images were taken to illustrate the variety of species, communities and habitats present, and any other features of interest. These were generally of 900 KB size, but for some sites, 6 MB images were taken.

Communities were delineated from one another by dominance of canopy plant species at a level that was achievable and ecologically meaningful from a visit of usually between 1–5 hours (duration dependent on site size and complexity). As there is no national vegetation classification at this level, the ecologist's judgement played a large part or what constituted a community, based on vegetation and landform. The community was described using the 'Atkinson' methodology (Atkinson, 1985), which is based on the percentage of cover (greater than 50%, 20–50%, 10–20% and less than 10%) of plant species in different height tiers. In some instances, communities could not be mapped separately due to time constraints and complex vegetation patterns, in which case a 'mosaic thereof' sufficed.

Sites were surveyed by title of ownership so that if a natural area straddled two or more properties they would be surveyed and assessed as two separate units. In some instances, with the agreement of landowners, a natural area in multiple ownership was surveyed as one unit, as this was considered more ecologically meaningful.

### 3.4 Assessment framework and significance criteria

The assessment of ecological significance of indigenous vegetation and habitats of indigenous fauna is an important part of a territorial local authority's responsibility to recognise and provide for protection under section 6(c) of the Resource Management Act 1991. A set of criteria has been developed for Tasman District Council for the assessment of ecological significance as part of the

Council's Native Habitats Tasman programme. Trial application of these criteria in the Tasman District has produced a method that is robust, objective, repeatable and easily understood. The Native Habitats Tasman programme has resulted in the setting of a threshold for significance in the Tasman District. This will enable the Council to determine the actions required to meet its obligations under the Resource Management Act 1991 to provide for protection of significant indigenous vegetation and significant habitats of indigenous fauna.



Waimea River 1947 prior to stopbanking.



Five ecological criteria have been adopted to evaluate site significance, with each being scored on a five-point scale (low through to high). Three of these are grouped as primary criteria and evaluated in such a way that high or moderately high scores can in themselves qualify a site as being significant. The two secondary criteria are supporting criteria. They can contribute to a site being deemed significant, where the primary criteria alone do not do so. The criteria are defined below.

### Primary criteria

- Representativeness: The extent to which the vegetation and/or habitat resembles that originally present and the extent to which the ecosystem and/or community is the best remaining example of its type in the ecological district.
- Rarity and distinctiveness: The presence of threatened or rare species or communities, the presence of locally endemic species or species at regional or national distributional limits and the presence of distinctive species or communities.
- Diversity and pattern: The number of indigenous communities at a site (community diversity), the number of indigenous species at a site (species richness) and a change in communities or species composition along environmental gradients.

### Secondary criteria

- Ecological context: Degree of connectivity between sites, degree of buffering of the site by the surrounding environment and the provision of critical resources for a species.
- Size and shape: The extent and compactness of the site.

A further criterion was also assessed that is outside the significance assessment and relates instead to the need for management of the site.

- Sustainability: Extent of threats, inherent fragility and/or robustness of the communities and degree of robustness inherent in the site's size, shape, connectivity and buffering.

## 3.5 Reporting procedure

A report was written for each site visited, with a draft version forwarded to the landowner for comment within a month of receipt of the draft. Comments, where relevant, were incorporated into a final report, copies of which were provided to the landowner and Tasman District Council. Landowners were able to withdraw from the survey at any point until final approval (taken as given if no further word was received within two weeks of their receipt of the final report). Withdrawal resulted in no site information being forwarded to the Council. This policy was modified part-way through the survey so that, although no report, maps or photo images were forwarded to the Council that would identify the site, species data was kept.

Reports included the following sections in this order: Ecological district description; location, geology and hydrology; vegetation description; botanical values; faunal values; plant and animal pests; other threats; general condition and other comments; landscape and historic values; criteria for assessment of ecological significance; site significance; management issues and suggestions; photographs; Appendix: technical assessment of site significance; species list; Land Environments of New Zealand (LENZ) (see Leathwick et al, 2002); national priorities for protecting biodiversity on private land; significance of LENZ and national priorities.

## 3.6 Data storage protocols

Electronic copies of the final reports are held by Tasman District Council. A meta database is being developed for reports that will summarise the key features of the report and include links to the full report. Access to this information is available through the staff member overseeing the project. A record that a survey has been undertaken and a report has been provided will be noted on the property file and relayed via a Land Information Memorandum, including whether the site is classified as being significant.

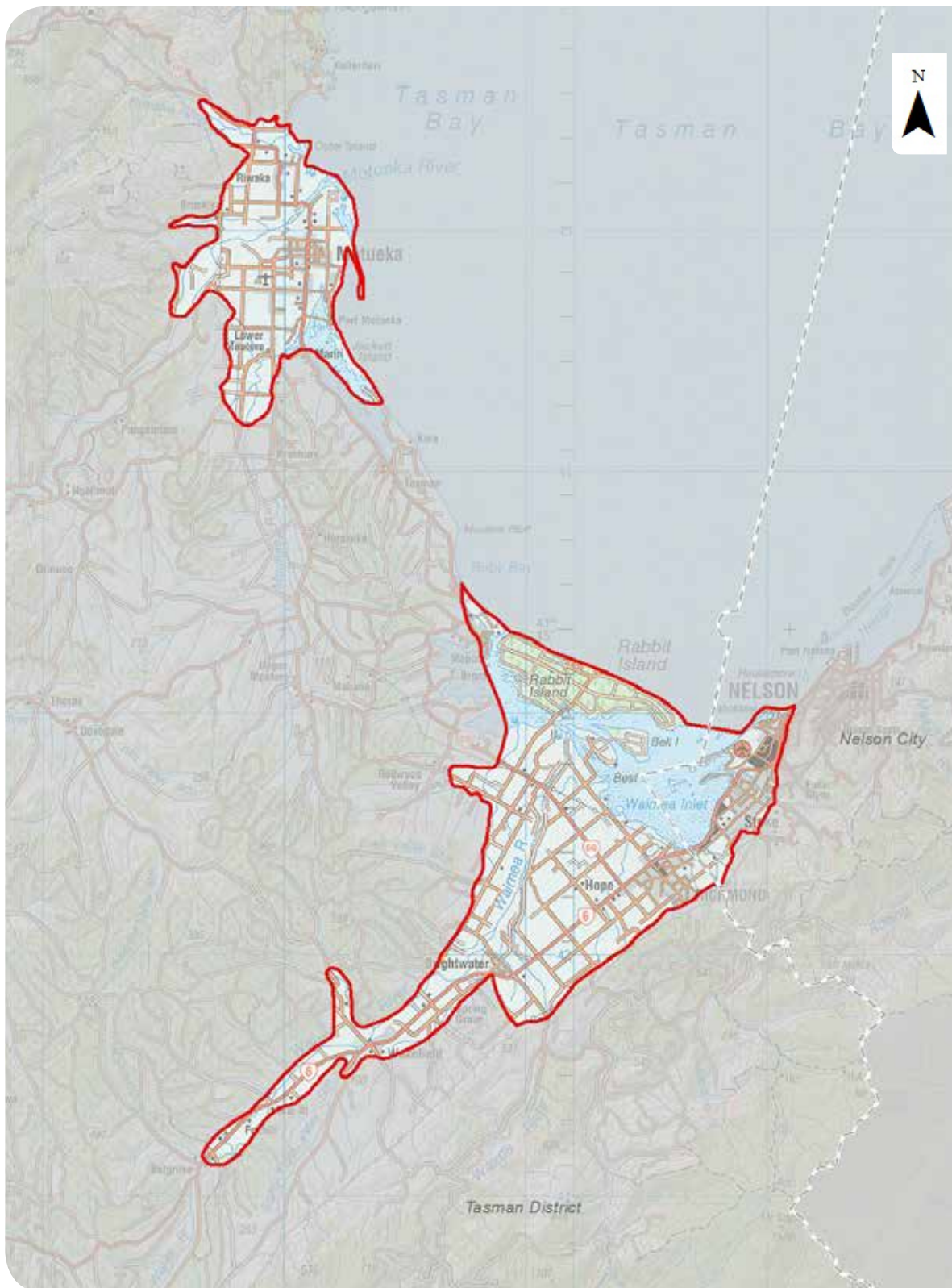
## 3.7 Survey period

The field survey of the Motueka Ecological District ran from October 2008 to May 2012, concurrent with the survey of the northern half of the Moutere Ecological District.

# 4. Ecological District Description

## 4.1 Location

The Motueka Ecological District is unusual in that it comprises two disjunct areas, namely the lower valley floors of both the Motueka and Wai-iti–Waimea rivers that issue into Tasman Bay (Figure 1). The northern end of the Moutere Ecological District separates these two areas. This ecological district falls within the wider Nelson Ecological Region, in common with the Moutere, Bryant and Red Hills Ecological Districts. The northern section of the ecological district covers 5,200 ha, and the southern section covers 12,400 ha, totalling 17,600 ha.



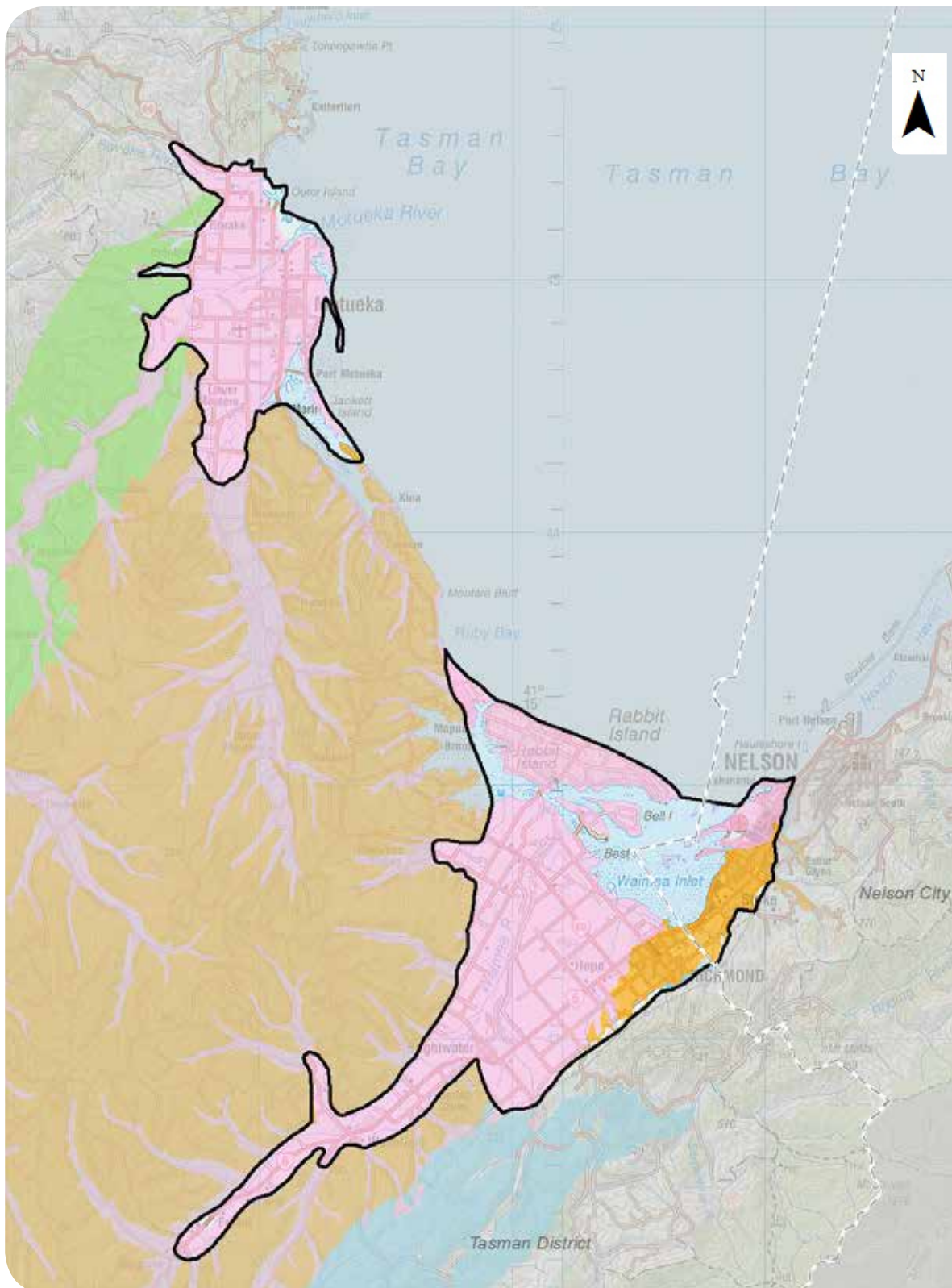
Note that for the convenience of mapping, the Moutere and Waimea Inlets have been mapped so as to be included within the ecological district boundaries – when in fact the true boundary of ecological districts along the coast lies at Mean High Water.

**Figure 1:** Motueka Ecological District

## 4.2 Geology and landform

The ecological district lies mainly on alluvium but also includes colluvium and beach deposits that, together, make up the modern-day floodplains, river terraces, fan gravels, deltas, and beach ridges and dunes (Figure 2). Relief is generally very flat to gently inclined, other than for steep terrace scarps. The Motueka section is dominated by the modern-day floodplain, with an appreciable area of low terrace landform (lowest aggradation surface). The river delta includes a significant area of beach deposits at its most seaward extent. The Waimea section is also dominated by floodplains, with appreciable areas of low terrace and very minor areas of higher terrace inland. Fan gravels form a broad band along the eastern margins, derived from the adjoining Barnicoat Range to the east. Barrier islands occur in both the Waimea Inlet and Moutere Inlet, composed of sandy deposits forming beach ridges and dunes.

Fertility of the ecological district is wide ranging, from modern alluvial surfaces of moderately high fertility, through to high terraces and beach deposits of low fertility. Soils are typically free-draining other than for the clay-rich section of Waimea River alluvium that lies between Appleby and Richmond. Most of the formerly extensive poorly draining swamp deposits have been modified so that they drain more freely.



#### Legend

 Sandstone	 Siltstone	 Gravels – Moutere/Glenhope Gravels
 Granite/Granodiorite	 Mudstone	 Gravels/Sand – Alluvial and Beach deposits

**Figure 2:** Motueka Ecological District – QMap geology

### 4.3 Altitude and climate

The ecological district ranges from 0–160 m above sea level in the Waimea section, and 0–20 m above sea level in the Motueka section. The climate is relatively sunny and sheltered, warm in summer with droughts the norm, and mild in winter with light to moderate inland frosts. Mean annual sunshine hours are around 2,400 hours per year. Average annual rainfall lies in the 900 mm to 1,250 mm band in the Waimea–Wai-iti River section, and in the 1,050 mm to 1,500 mm band in the Motueka River section (Figure 3).

### 4.4 Original indigenous ecosystems

Tall forests are believed to have originally dominated much of the ecological district, with areas of swamp and estuarine wetlands grading into saltmarsh. A band of coastal scrub is likely to have occurred along the littoral margin, and dune vegetation occurred locally.

Forests were dominated by podocarps with some beech and hardwoods. In general, lowland totara, matai and, more locally, kahikatea dominated, with black beech common and some silver beech present. Titoki was likely to have been a common canopy to sub-canopy tree. Other canopy or sub-canopy species included rimu and hardwoods, such as South Island kowhai, manatu, narrow-leaved houhere, pokaka, tarata and probably hinau. Tawa may have formed part of the forest canopy, at least along the north-eastern and north-western margins of the Waimea–Wai-iti River section. Pukatea may also have featured. The extent of original kahikatea-dominated swamp forest or moist forest is unknown, but significant areas are likely to have occurred. Much of the forest is likely to have been a moist to dry matai–lowland totara–black beech assemblage with lowland totara dominating. The barrier islands were probably clad mainly in lowland totara forest. (Refer to Appendix 1 for a list of all species cited in the text.)

The extent of inland swamp is likely to have been relatively limited and to have occurred along former channels and backwaters of the major rivers. In coastal and semi-coastal areas, swamps were extensive, grading into saltmarsh

along the coast. We know this from historical records, for example (as reported in Allan, 1965, pp 197–199, 213, relating to the 1840s):

On 22 March both parties embarked in boats, and proceeded up the old entrance of the Waimea River as far as Cottrell's Landing Place, about six miles upstream. Only with immense labour did Barnicoat and Thompson get all their paraphernalia across the arm of the river and through two miles of swamp to dry land.

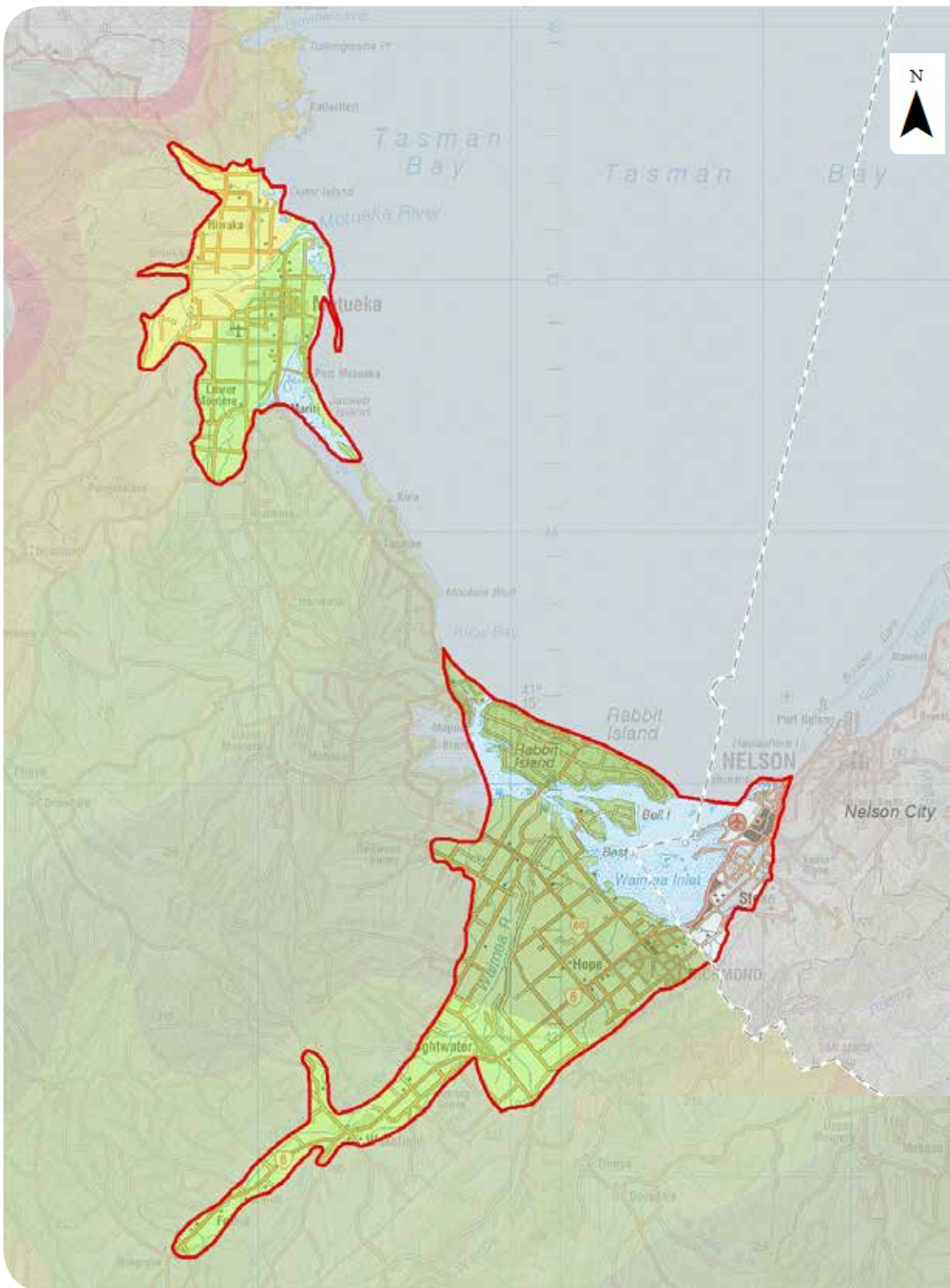
Until the Waimea road was formed, the usual way from the town to the Waimea Plain was by boat, which enabled travellers to avoid hours of tedious march through swamps.

Harakeke, raupo and the sedges purei (*Carex secta*) and rautahi (*Carex geminata*) would have dominated freshwater wetlands, with ti kouka, manuka and kahikatea probably common in places, particularly toward wetland margins.

Saltmarshes were dominated by sea rush, oioi and saltmarsh ribbonwood, grading into herbfield dominated by glasswort, sea primrose and remuremu. Coastal scrub was also a characteristic feature with species such as manuka and ngaio, and with saltmarsh ribbonwood extensive at the head of saltmarshes. Dune vegetation was likely confined to the outer margins of Rabbit Island and the Kumeras–Motueka Sandspit area, characterised by spinifex and pingao.

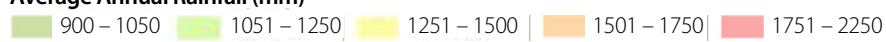
The large rivers that are such a feature of the ecological district were once free to meander and braid, to alter course and flood widely across the plains. Such a dynamic environment would have produced a mosaic of forest, scrub, shrublands, gravelfields, braids and wetlands, with gradients between them, and successional phases of renewed forest growth within the immediate riparian environs.

Such ecosystems described above provided habitat for a huge range of fauna that can now only be guessed at. A diverse avifauna, herpetofauna and invertebrate fauna seethed with life in these environments in densities and diversities unimaginable today. The geology and landform precludes the preservation of sub-fossil faunal remains from which to glimpse these past faunal assemblages.



**Legend**

**Average Annual Rainfall (mm)**



**Figure 3:** Motueka Ecological District – Rainfall



## 4.5 Present-day ecosystems

It seems likely that, at least in broad terms, examples of most (but not all) of the original ecosystems survive in one form or another but on a much diminished scale. However, transitions between them are now almost entirely lost.

### Forest and treeland

Most of the surviving forest and treeland areas lie on alluvium and are podocarp-dominated, mainly by lowland totara, with matai often common to co-dominant and titoki usually common. Black beech is becoming increasingly rare, due to dieback and regeneration failure, and kahikatea is dying out in some sites, seemingly due to lowered water tables. Silver beech, rimu, pokaka, kowhai,

tarata, manatu and narrow-leaved lacebark are all scarce or rare. One barrier island secondary forest is lowland totara-dominated. Kahikatea flood forest is very rare, and in the one remaining example, matai has a local presence. Riparian forest is almost completely lost, with no sites remaining where a watercourse runs through mature forest. Forest of any kind beside a stream is extremely rare. Secondary kanuka forest or treeland is very rare, with lowland totara, kowhai and manatu locally present.

### Coastal scrub and vineland

Coastal manuka scrub is rare but quite extensive at one barrier island site, where it is probably partly induced. Scrambling pohuehue forms extensive stands at one river delta site.



The most heavily wooded part of the ecological district lies in the Wakefield area.

### Coastal sandy margins

Dry coastal margins comprise sandy foreshores that are mainly exotic-dominated, but limited areas do occur of knobby clubrush, sand sedge, shore bindweed and rarely *Zoysia minima* grassland.

No dunes with prominent native elements exist.

### Freshwater wetlands

Coastal freshwater wetlands are associated with upper margins of some saltmarshes and along the lower-most margins of spring-fed streams, all of which transition into brackish and saline conditions. These stream-side areas tend to be dominated by raupo, lake clubrush/kapungawha and harakeke. The upper saltmarsh wetlands are swamps dominated by raupo, harakeke and rautahi, with manuka locally.

One barrier island fen exists on Rough Island, which is groundwater fed and partly dominated by forest and scrub of ti kouka and manuka with open areas of herbs and sedges that are largely exotic.

Swamps in inland areas no longer exist.

Extensive artificial wetlands have recently been and are being created beside both the Motueka and Waimea rivers in areas where river gravels have been extracted.

### Saltmarsh

Upper intertidal saltmarshes are strictly outside the ecological district and survey scope but were surveyed nevertheless due to their considerable ecological importance and vulnerability to human activity.

Saltmarshes are still reasonably extensive in places around the estuaries, in particular, the Waimea and Motueka river deltas, comprising mosaics of communities. Saltmarsh ribbonwood, oioi and sea rush often form pure stands, with some mixing more locally. Saltmarsh areas, dominated by three square, estuary tussock, estuary sedge and purua grass are more local. Low herbfields are extensive, particularly glasswort that forms large pure stands. Sea primrose and remuremu also cover extensive areas higher in the tidal sequence, with localised areas of marsh arrowgrass.



**All that remains of the once vast coastal swamps that fed into saltmarshes are tiny remnants such as this stand of raupo.**



**Saltmarsh dominated by sea rush and oioi.**

### Habitat for indigenous fauna

Estuary margins, coastal shorelines, coastal conifer stands and artificial water bodies constitute the existing faunal habitat outside of the native vegetation communities described above (water courses are outside the scope of the survey).

Major shorebird roost sites occur around the Waimea Inlet on barrier island shorelines and on the Motueka Sandspit. Most notably, this includes kuaka/eastern bar-tailed godwit, torea/South Island pied oystercatcher, torea-pango/variable oystercatcher, hauhou/red knot, ruddy turnstone, ngutuparore/wrybill and kotuku-ngutupapa/royal spoonbill. Shorebird breeding sites are scattered around the coastline, with the most important being shellbanks in the Waimea Inlet (taranui/Caspian tern), Rabbit Island foreshore (variable oystercatcher), Motueka Sandspit (variable oystercatcher and tuturiwhatu/banded dotterel), Motueka delta spit north of Raumanuka (variable oystercatcher) and

Kina Peninsula (banded dotterel). Exotic conifers offer breeding sites for karuhiruhi/pied shag and kawaupaka/little shag.

Uniquely among native fish species, spawning sites for inanga are within the scope of the survey, as they spawn on riverbanks above normal water levels during autumn king tides. Most streams and rivers that flow into the Moutere and Waimea Inlets hold spawning habitat on their banks that are used by inanga.

Artificial waterbodies are few, with the Bell Island and Motueka sewage treatment plants the most important. Regionally significant numbers of waterfowl have been recorded at the former site, most notably for putangitangi/paradise shelduck, kuruwheangi/New Zealand shoveler and tete/grey teal.

(For ease of reading, Maori bird names where not the common usage are only shown once in each section of this report.)



**Significant shorebird habitat is scattered in pockets along foreshores and within estuaries, that includes breeding habitat for variable oystercatcher.**

## 4.6 Extent of ecosystem depletion

Loss of native vegetation cover within the ecological district has been almost total.

### Forest

Forest and treeland dominated by original canopy species totals 52 ha, comprising 41.9 ha for the Waimea/Wai-iti River section and 8.2 ha for the Motueka River section. Overall, this is a loss of original tree cover of 99.7%. A further 4.7 ha of secondary kanuka forest and treeland was also recorded.

Preece (2000) estimated an original area of 895.8 ha of swamp forest for the ecological district, with 1.2 ha remaining, a loss of 99.9%.

Much of the forest loss in the Motueka section and the lower part of the Waimea section of the ecological district can be attributed to Māori settlement. Extensive forest on the Waimea Plains had been cleared almost as far inland as what is now Brightwater by the time of European settlement. Allan (1965) writing about the 1840s states:

The Suburban South district [of Nelson] and the Waimea Plain were well covered with fern and scrub, with patches of swamp, grass and bush. At the town end of Waimea East was a prodigious swamp extending from the mudflats up to Richmond. Behind the coastal bog, however, lay 'a kind of natural meadow land' with fine grasses and sow thistle, like a carpet where cattle could graze. Some of the higher ground on the eastern side was dry and stony, and some near the hills produced fern 'of enormous growth' [quotations from Barnicoat 1842]. Waimea West also had grass and fern, but it carried more bush, especially to the west and south. Waimea South was well wooded, from about a mile up the Wai-iti River from its junction with the Wairoa a mixed forest extended back up the Wai-iti valley and over to the hills on the west.

The Motueka Plains were already cleared of forest by this time other than for te Maatu, 'the Great Wood' of some 350 ha or so of podocarp-rich forest (Mitchell, 2004, map page 378), that ran south-west in a band from what is now Motueka to the Motueka River.

Most of the subsequent forest clearance occurred in the mid-to-late 1800s with European settlement.

**F**OR SALE, SECTIONS 96, 97, 162, and 164, Lower Moutere, 410 acres in all, situate on the main road from Nelson, 4 miles from the Moutere Landing-place, and 7 from the Post Office, Motueka.

The property has been much improved, and contains a large amount of first-class Timber and Flax, and is admirably adapted for a farm, with flax and saw-mill combined.

Part of the purchase money can remain unpaid at a low rate of interest.

For further particulars apply to—

RICHARD HYLAND,  
Lower Moutere,

Or to FELL AND ATKINSON,  
Solicitors, Nelson.

714

**Nelson Examiner & Chronicle**  
**27 November 1873.**

The podocarp-rich forest and treeland remnants that stand today probably constitute most of what still remained by the mid-1900s. Certainly, there has been no loss of forest or treeland since these remnants were mapped in the 1970s (Parks & Walls, 1978).

### Freshwater wetlands

Wetlands survived intact until European settlement, with extensive areas recorded in the 1840s, as noted above. These were probably mostly drained by the end of the 1800s, but further losses are likely to have continued throughout the 1900s. According to Preece (2000), existing freshwater swamps total 1.86 ha of an original estimated area of 1422 ha. This survey identified 5 ha including wetland margins of spring-fed creeks and river backwaters. This represents a loss of 99.6%.

### Saltmarsh

Saltmarshes including saltmarsh ribbonwood scrub (but excluding glasswort beds beyond taller saltmarsh vegetation), total around 200 ha with 180 ha surveyed. The saltmarshes have survived better than other ecosystems, probably because they required the work of infilling and/or stopbanking to destroy them.

Some development of new saltmarsh has also occurred from increased river-borne deposits caused by human activity, which has probably more than compensated for sea-level rise to date. Walls and Simpson (2004) estimated 30% remains of the original extent for the ecological district. This may be a considerable over-estimate. For example, Robertson et al (2003) reporting on the Motueka River delta (which at the time of writing has 36 ha of saltmarsh and saltmarsh ribbonwood scrub), states:

The total area of the estuary decreased by approximately 50 ha in the period 1947 to 1986. Since 1986, the area has altered very little. It is also noted that the 1947 aerial photograph suggested that prior to 1947 there had already been significant alteration of delta habitat, possibly in the order of 200–300 ha. The reduction in area has occurred primarily in the vegetated upper intertidal to supra-tidal margin around the estuary (rushland 28 ha loss and scrubland 20 ha loss).

The Waimea Inlet saltmarshes have probably fared little better, with extensive infilling and stopbanking, particularly of the Waimea River delta. Loss of saltmarsh has occurred as recently as 2007. Tuckey and Robertson (2003) document the loss of estuarine saltmarsh within the Waimea Inlet between 1946 and 1999. However, most of the larger losses occurred before this period.

Robertson and Stevens (2009) state that the loss of saltmarsh area in the Motueka delta, Moutere Inlet and Waimea Inlet since 1947 amounts to 40%, 48% and 27% respectively (as interpreted from their graph p 23).

**Table 1: Ecosystem depletion and protection**

Ecosystem	Original area (ha)	Present area <sup>1</sup> (ha)	Remaining %	Protected area (ha) <sup>2</sup>	% Present area protected <sup>2</sup>
Forest	16, 178 <sup>3</sup>	52.0	0.32%	29.3	56.3%
– including swamp forest	895.8	1.2	0.13%	1.2	100%
Freshwater Wetland <sup>4</sup>	1422	5	0.35%	0.5	10%
Sandspit, sandfield	?	?	?	43.2	?
Saltmarsh <sup>5</sup>	? 1000	200 (approx)	? 20%	0	0%

<sup>1</sup> Includes dense treeland; existing forest is defined here as comprising tree cover with original (primary) canopy species, with kanuka forest and treeland excluded from this figure.

<sup>2</sup> See Section 4.7 below; includes scenic reserves, wildlife reserves, local purpose and recreational reserves and QEII covenants

<sup>3</sup> Ecological district area less wetland area (saltmarshes not included in ecological district area; sandfield area unknown but not large)

<sup>4</sup> Includes swamp margins of spring-fed creeks; hectares from Preece (2000)

<sup>5</sup> Excluding glasswort herbfield below upper saltmarsh areas

## 4.7 Extent, size and general characteristics of existing protected areas

### Scenic and wildlife reserves

Fully protected areas within the ecological district are few. There are four podocarp-dominated alluvial/terrace forest and treeland remnants within scenic reserves that total 11.3 ha. One is administered by the Department of Conservation (DOC) (Snowdens Bush 4.5 ha) and three by Tasman District Council (Faulkner Bush, 2.8 ha of which lies within the ecological district, Edward Baigent Memorial Reserve 1 ha and Robsons Reserve 3 ha).

Motueka Sandspit Scenic Reserve (43.2 ha), administered by DOC, protects important numbers of breeding variable oystercatcher and banded dotterel, and nationally significant numbers of roosting shorebirds.

No Mans Island Nature Reserve (2 ha) within the Waimea Inlet, and administered by DOC, protects a nationally significant saltmarsh shorebird roost, as well as breeding shorebirds within the Waimea Inlet.

### QEII and Private Protected Land covenants

QEII covenants total 13.7 ha at seven sites, which comprise 11.4 ha alluvial/terrace podocarp-dominated forest and treeland (author's calculations) and 2.3 ha of revegetated riparian/wetland margins.

One DOC conservation covenant (Private Protected Land) of nearly 1 ha comprises a section of spring-fed creek and margins.

### Other reserves

Less securely protected areas are those where important indigenous vegetation or faunal habitat fall within DOC or Tasman District Council local purpose and recreational reserves. They protect 12.4 ha, which comprises 7.7 ha alluvial podocarp forest/treeland, 3.7 ha saltmarsh and 1.0 ha freshwater wetland creek margins, as well as an undetermined area of faunal habitat. These are detailed below.

#### 1) Tasman District Council administered

- Rough Island Recreation Reserve: includes Hunter Brown 'Reserve' (0.8 ha lowland totara forest)

- the seaward foreshore of Rabbit Island within Recreation Reserve (variable oystercatcher breeding habitat and high tide shorebird roost; hectares not determined).
- Wai-iti Recreation Reserve (Wai-iti Domain): 1 ha alluvial lowland totara–matai forest.
- Mapua Inlet margins (local purpose reserve): 0.5 ha saltmarsh herbfield.
- Genia Road Recreation Reserve: 0.4 ha lowland totara–matai treeland.
- Fearon's Bush Recreation Reserve: 1 ha kahikatea treeland.
- Thorp Bush Local Purpose (Recreation) Reserve: includes 4.5 ha of lowland totara–matai–titoki forest and treeland.
- Pearl Creek Local Purpose (Esplanade) Reserve: 1.1 ha saltmarsh.
- Unnamed Local Purpose (Water Conservation & River Control) Reserve at Motueka River Delta: 1.5 ha saltmarsh. Further areas of Tasman District Council or Nelson City Council administered lands have no reserve status of any kind and are discussed in Section 9.2 Priorities for protection.

#### 2) Department of Conservation administered

- Neiman Creek Local Purpose (Wildlife) Reserve: nearly 0.5 ha spring-fed creek wetland margins.
- O'Connor Creek Local Purpose (Esplanade) Reserve: nearly 0.1 ha saltmarsh.
- Pearl Creek Local Purpose (Esplanade) Reserve: nearly 0.5 ha saltmarsh and around 0.5 ha spring-fed creek wetland margins.

All saltmarsh reserves detailed above appear to now fall within the definition of the 'common marine and coastal area' (CMCA) as defined in section 11(3) of the Marine and Coastal Area (Takutai Moana) Act 2011, which states that 'the Crown and every local authority are divested of every title as owner, whether under any enactment or otherwise, of any part of the common marine and coastal area'.

The upper limit of the CMCA is the line of mean high-water springs, which would in theory include all saltmarsh areas including saltmarsh ribbonwood scrub. All of these protected areas listed above are included in Table 1 other than for saltmarsh areas that appear to no longer be under DOC or Tasman District Council jurisdiction.

## 4.8 Land environments present within the Motueka Ecological District (and threat status)

Land Environments of New Zealand (LENZ) is a national environmental classification system based on combinations of soil characteristics, climate and landform across geographical areas. These three factors combined are correlated to the distribution of native ecosystems and species. When LENZ is coupled with vegetation cover information, it is possible to identify those parts of the country (and those land environments) that have lost most of their indigenous cover. These tend to be fertile, flatter areas in coastal and lowland zones in the Tasman District.

Three of the 20 LENZ Level 1 environments that occur nationally are present within the Motueka Ecological District. Two of these dominate the district – ‘Central Dry Lowlands’ and ‘Central Well-Drained Recent Soils’ (Figure 4). A third environment, ‘Central Poorly Drained Recent Soils’, occupies the two main river deltas.

The LENZ technical guide (Leathwick et al, 2002) describes these as outlined below.

### **Central Dry Lowlands (Environment B)**

Environment B consists of dry hill country and older alluvial soils in central New Zealand, mostly at low elevations. It is most extensive in the east, extending from Gisborne and Hawke’s Bay in the north and to Marlborough and North Canterbury in the south, with smaller patches in Tasman Bay and on rolling hill country immediately inland from Wanganui.

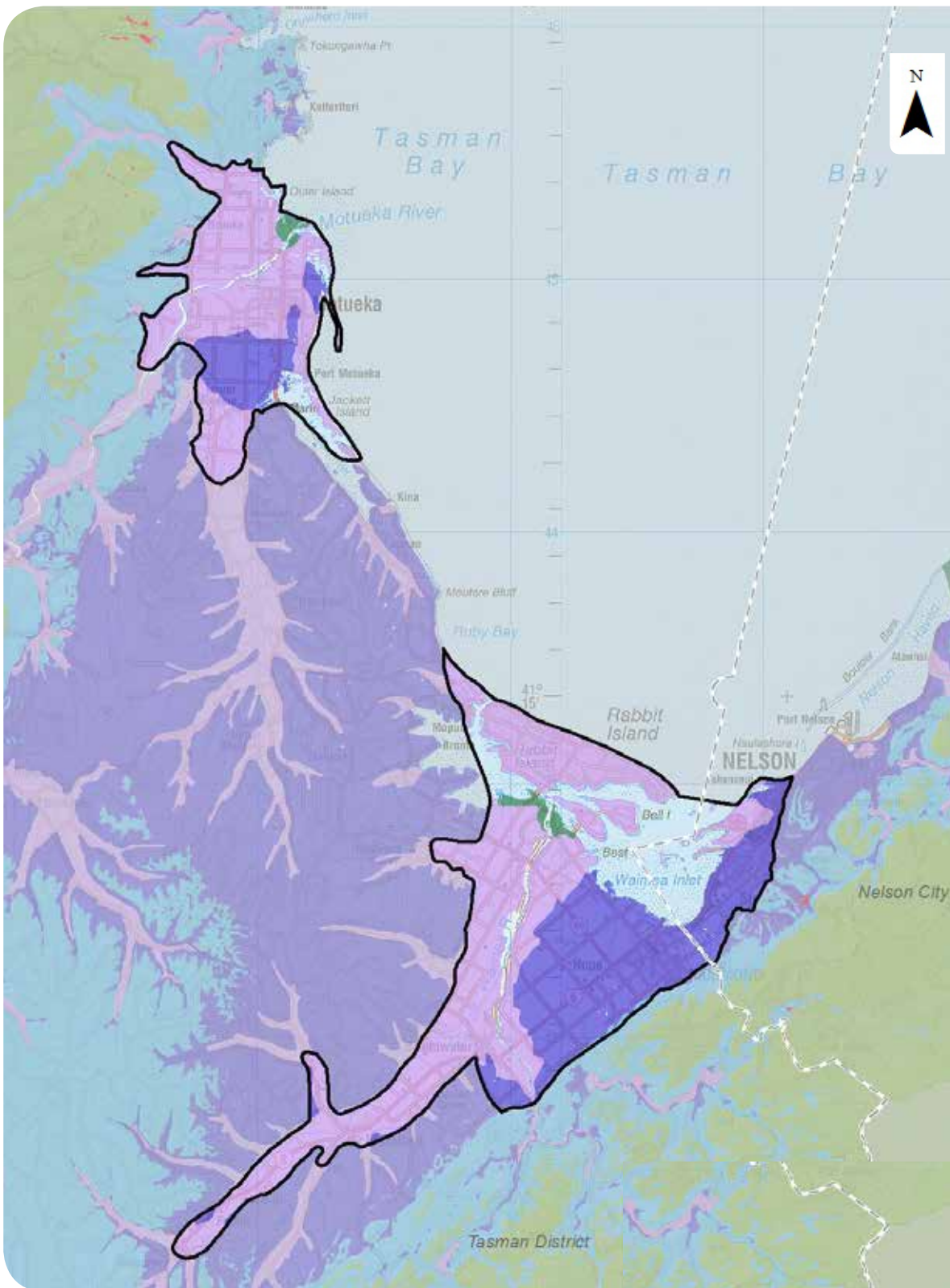
The climate of Environment B is dry and mild with high solar radiation, reflecting its protection from prevailing winds by mountain ranges to the west. Annual water deficits are moderate on average but may be severe in years with below-average rainfall. Vapour pressure deficits are high. The portion of Environment B located inland from Wanganui is partially protected from rain-bearing winds to the southwest and to the northwest by the volcanic cones of Taranaki and to a smaller extent the mountains of northwest Nelson. The terrain is generally flat to moderately sloping, with soils of low to moderate natural fertility formed on loess, alluvium, greywacke, sandstone, mudstone or limestone.

### **Central Poorly-drained Recent Soils (Environment I)**

Environment I consists of scattered pockets of poorly drained recent soils that occur mostly on coastal plains and river valleys in eastern New Zealand from Gisborne to mid-Canterbury. The climate is typified by warm temperatures, high annual solar radiation, moderate annual water deficits and high vapour pressure deficits. The terrain is generally flat and soils are poorly to imperfectly drained. Recent alluvium from a variety of sources is the dominant soil parent material with some loess. Soil fertility is moderate, with some saline soils, particularly on coastal sites.

### **Central Well-drained Recent Soils (Environment J)**

Environment J consists of areas of well-drained recent soils, mostly on flood plains and lower terraces along major lowland rivers in the southern North Island and northern and eastern South Island. It is most extensive in southern Hawke’s Bay, Manawatu and Wairarapa in the North Island and Nelson, Marlborough and Canterbury in the South Island. This environment is characterised by a mild, dry climate with high solar radiation. Moderate annual water deficits and high vapour pressure deficits reflect its lack of exposure to prevailing westerly winds. Alluvium is the dominant soil parent material, but in contrast to Environment I, is of a more coarse texture with a predominance of gravels and sands and with less finer material such as loess. Soils are mostly well drained and of moderately high natural fertility.



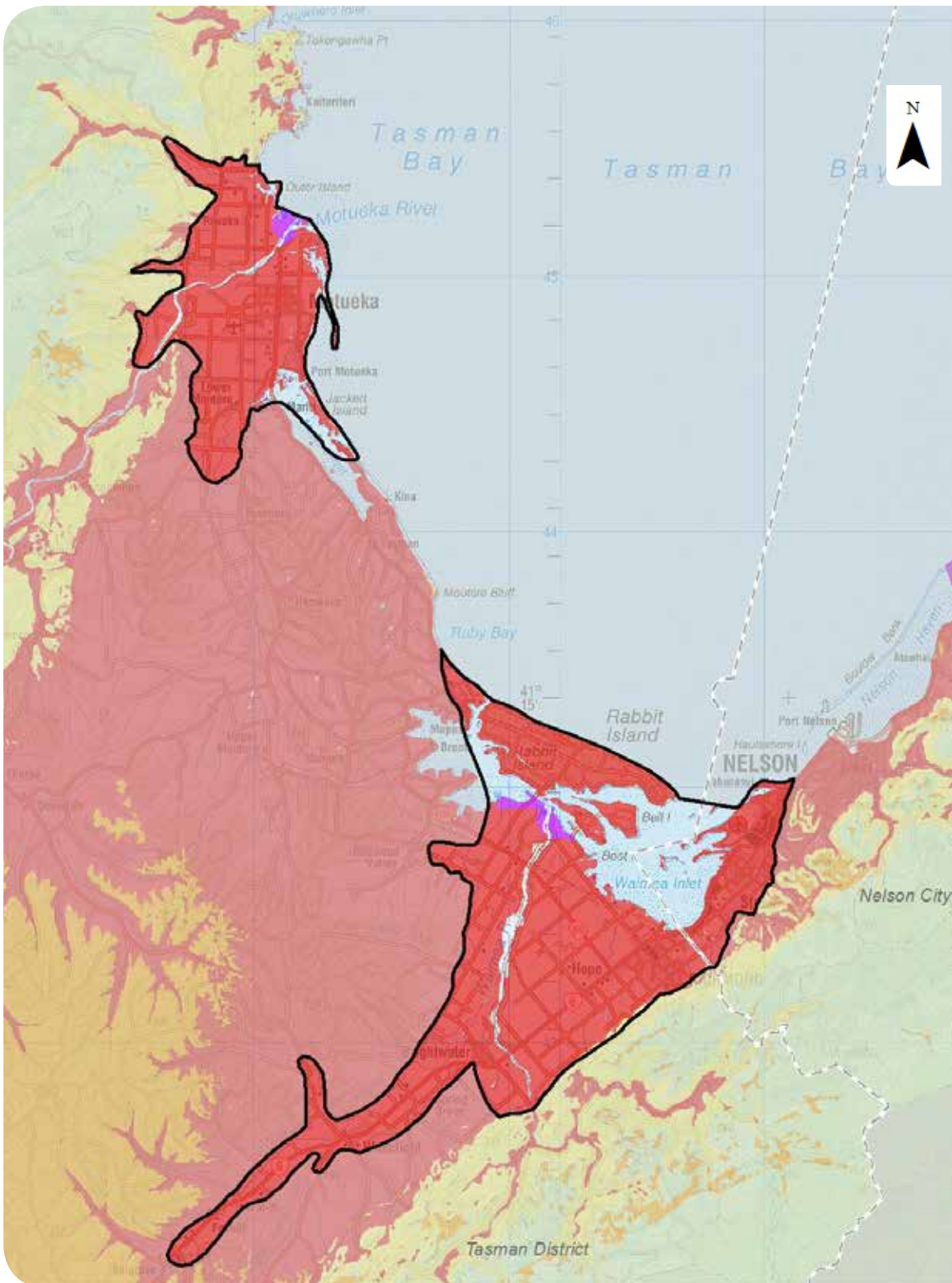
**Legend**

- |  |  |  |
|--|--|--|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #4a529d; border: 1px solid black; margin-right: 5px;"></span> B – Central Dry Lowlands                      | <span style="display: inline-block; width: 15px; height: 15px; background-color: #2e8b57; border: 1px solid black; margin-right: 5px;"></span> I – Central Poorly Drained Recent Soils | <span style="display: inline-block; width: 15px; height: 15px; background-color: #2c3e50; border: 1px solid black; margin-right: 5px;"></span> N – Eastern South Island Plains |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #6495ed; border: 1px solid black; margin-right: 5px;"></span> E – Central Dry Foothills                     | <span style="display: inline-block; width: 15px; height: 15px; background-color: #e67e22; border: 1px solid black; margin-right: 5px;"></span> J – Central Well-drained Recent Soils   | <span style="display: inline-block; width: 15px; height: 15px; background-color: #8bc34a; border: 1px solid black; margin-right: 5px;"></span> P – Central Mountains           |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #e74c3c; border: 1px solid black; margin-right: 5px;"></span> F – Central Hill Country and Volcanic Plateau | <span style="display: inline-block; width: 15px; height: 15px; background-color: #e91e63; border: 1px solid black; margin-right: 5px;"></span> K – Central Upland Recent Soils         |  |

**Figure 4:** Motueka Ecological District – LENZ environments – Level 1



At the highest level of discrimination (LENZ Level 4), there are 500 environments. At this level, the degree of depletion of indigenous cover has been mapped (Figure 5). Almost the entire ecological district is 'acutely threatened', with less than 10% indigenous vegetation cover remaining nationally of these environments. A minor band along the eastern foothill margins of the Barnicoat Range is 'at risk', with 20–30% cover remaining nationally. The deltas of the Motueka and Waimea rivers are classed as 'critically underprotected', with more than 30% indigenous vegetation cover but less than 10% protected.



**Legend**

**Threatened Environments Classification**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: red; border: 1px solid black; margin-right: 5px;"></span> Acute Threatened (&lt;10% indigenous vegetation left)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: orange; border: 1px solid black; margin-right: 5px;"></span> Chronically Threatened (10–20% indigenous vegetation left)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: yellow; border: 1px solid black; margin-right: 5px;"></span> At Risk (20–30% indigenous vegetation left)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: purple; border: 1px solid black; margin-right: 5px;"></span> Critically Underprotected (&gt;30% indigenous vegetation left and &lt;10% protected)</li> </ul> | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: teal; border: 1px solid black; margin-right: 5px;"></span> Underprotected (&gt;30% indigenous vegetation left and 10–20% protected)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: lightgreen; border: 1px solid black; margin-right: 5px;"></span> Less reduced and better protected (&gt;30% indigenous vegetation left and &gt;20% protected)</li> </ul> |
|---|--|

**Figure 5:** Motueka Ecological District – Threatened environments at LENZ Level 4



# 5. Significant Native Habitats

## Landowner and survey details of Significant Native Habitats

Most Significant Native Habitats are located along the coastline of both sectors of the ecological district where they are well distributed, and in the Wakefield and Brightwater areas. Few fall outside such locations. For example, other than for along the coastline there are only five SNHs in the Motueka River sector of the ecological district. There is only one SNH between the Brightwater area and the Waimea Inlet margins. Table 2 lists landowner and survey details for the SNHs in the ecological district.

**Table 2:** Landowner and survey details of Significant Native Habitats

	Number	
Participating Landowners	24	
Non-Participating Landowners <sup>1</sup>	20	
Sites Surveyed	56 vegetation + 15 habitat <sup>2</sup>	
Sites Not Surveyed (or part thereof)	20	
Identified SNHs <sup>3</sup>	56 vegetation + 15 habitat	
	Hectares	Size Range SNHs
SNH total area (excl habitat) <sup>4</sup>	229.8 ha	
Average size SNHs	3.9 ha average	0.5 - 34 ha
– forest & treeland	1.6 ha average	0.2 - 7 ha
– freshwater wetland/stream margins	1.2 ha average	0.1 - 2.9 ha
– saltmarsh/foreshore/coastal scrub	7.8 ha average	0.5 - 34 ha

<sup>1</sup> Permission declined (16), landowners not traced (4)

<sup>2</sup> Habitat where sites were not significant for vegetation

<sup>3</sup> Some sites that span property boundaries were surveyed as one SNH; other sites were surveyed by title forming two or more SNHs

<sup>4</sup> Habitat areas are not readily calculated accurately: for example beaches for breeding shorebirds and so are excluded here

# 6. Biodiversity Values of Significant Native Habitats

## 6.1 Vegetation

### 6.1.1 Indigenous vegetation represented within Significant Native Habitats

#### Forest and treeland

Twenty-four podocarp-dominated forest and treeland SNHs were identified in the ecological district of which 10 are forest or largely forest. These are generally dominated by lowland totara, often with much matai, and to some extent with titoki and kahikatea. One wet site is kahikatea-dominated, and another by ti kouka and manuka. Secondary forest and treelands of kanuka are rare, with three sites in existence. A further 10, mostly treeland sites, were not surveyed. Of a total of 35 sites, 29 occur within the Waimea section and six in the Motueka section. Further very open 'treeland' sites (essentially trees dotted in pasture) were not surveyed.

All surviving remnants are mature secondary or highly modified primary forest and treeland with all areas likely to have been subject to a long history of grazing. Forest areas have generally been fenced for at least 10 years and up to

30 years in some instances but all treelands are grazed or, in one instance, mown.

#### *Lowland totara–matai–titoki forest/treeland associations on alluvium and alluvial terraces*

Most podocarp-rich forest sites fall into this broad association. These occupy the modern-day floodplain and associated river terraces. The sites are well drained, although many were probably more moist in the past but are now affected by lowered water tables, lack of flooding and edge effects associated with human activity.

Black beech, silver beech and kahikatea are occasional other canopy trees, with rimu, kowhai, narrow-leaved lacebark, kanuka, tarata and manatu all rare. Several narrow-leaved maire also occur as canopy trees around Brightwater. Black beech and kahikatea were formerly more prominent, as evidenced by the number of fallen logs, spars and dieback, probably associated with drought-induced weakening and disease. Other than for lowland totara, and to some extent matai, regeneration of canopy species is generally poor or absent.

Sub-canopy trees often include mahoe, as well as occasional mapou, ti kouka, and rare kohuhu, tarata, putaputaweta and kaikomako. The understorey is typically dominated by dense mahoe regeneration, to the exclusion of many other species due to shading. Otherwise, there is a characteristic presence of rohutu, and thin-leaved coprosma, and regeneration of mapou and turepo/small-leaved milk tree.

Ground cover is typically sparse, particularly so on dry terraces. Button fern and lowland shield fern are the most common ferns, with necklace fern, *Hypolepis ambigua* and hen and chickens fern more locally present. Herbs are sparse, with *Hydrocotyle heteromeria* and the bittercress *Cardamine debilis* agg. occasionally present. *Microlaena stipoides* is locally common at some sites. Otherwise, there is an occasional presence of *Uncinia leptostachya*, *Carex virgata* and *Carex lambertiana*.

Pohuehue is by far the most widespread liane, with supplejack/kareao and native jasmine more occasionally present. Canopy tree epiphytes mostly feature leather-leaf fern, which is often common on lowland totara and titoki limbs, with green mistletoe locally common on lowland totara. Hanging spleenwort is occasional, and perching orchids (mostly *Earina mucronata*) rare.



**Alluvial podocarp forest and dense treeland is reduced to 52 ha in the ecological district.**

### *Lowland totara forest on barrier island deposits*

The barrier islands were probably originally dominated by lowland totara forest, and one tiny secondary remnant remains.

Young lowland totara trees dominate the remaining site. They are present either as a taller component of the canopy or as emergents. Adult to mature kanuka are also present. The broadleaved canopy or sub-canopy component is of kohuhu, fivefinger, mahoe and mapou. Young mapou regeneration is widespread. Regeneration of all these species other than fivefinger and kohuhu abounds. The understorey is variable. Some areas are dense with broadleaved regeneration, particularly mahoe and mapou. Others are more open, perhaps where the canopy is denser. The ground is largely covered in mossy litters, with generally very sparse vegetation. Some patches of hound's tongue fern occur locally. The sedge *Carex raoulii/testacea* and the hookgrass *Uncinia scabra* are very rare.

### *Kahikatea swamp forest on alluvium*

The single remaining area occurs at Faulkner Bush, occupying the modern-day floodplain at the foot of a high terrace.

Towering and densely packed kahikatea dominate the canopy in the western section of this community, with occasional lowland totara and matai. No sub-canopy is present, but the area has a 3–5 m tall understorey that is of open to moderately dense mahoe, with swamp mahoe, scattered round-leaved coprosma and young small-leaved milk tree, and with native jasmine vine common. Ground cover varies with moisture. Wet channels hold patches of the native buttercup *Ranunculus amphitrichus/glabrifolius*, *Isolepis* sp. and water starwort. Margins of such wet areas, where light is sufficient, are lush with sedges – notably *Carex virgata* with some *Carex dissita* and swamp kiokio. Remaining areas range from those bereft of ground cover to others where *Carex lambertiana*, *Carex forsteri*, *Uncinia uncinata*, and the ferns *Diplazium australe*, hen and chickens fern and *Lastreopsis glabella* are locally common. The eastern section of this community is far more modified with much more mature and spaced kahikatea trees over exotic grassland and scattered low, open broadleaved regeneration.



**Alluvial treelands are important relics of the former blanket forest cover of the valley plains.**



**The best surviving example of kahikatea swamp forest in the ecological region occurs at Faulkner Bush Scenic Reserve.**



**Kanuka forest/treeland on alluvium**

Three tiny secondary remnants were noted, near Brightwater, Lower Moutere and at Bullivant Island, these being respectively a treeland, a riparian alluvial forest ribbon and a coastal forest.

The riparian forest site is almost entirely dominated by kanuka, with several mature black beech and one lowland totara scattered along the stream bank. Mahoe is frequently present in the sub-canopy, forming the canopy where the kanuka canopy has disintegrated. Young mapou are occasional with rare young kohuhu, lowland totara and lancewood. Thin-leaved coprosma form locally dense thickets with young mahoe regeneration. Under

their deep shade there is little ground cover, other than for patches of necklace fern. Where it is more open, there are ferns such as *Hypolepis ambigua*, the grass *Microlaena stipoides* and wall lettuce. By contrast, where no understorey is present under the kanuka, rank cocksfoot grass dominates. On the riverbanks, bootstrap sedge is locally common with ferns including *Pellaea rotundifolia*, *Asplenium hookerianum* and lowland shield fern. One drain includes much *Carex lambertiana* with some *Carex virgata*.

Young pole kanuka dominate the treeland site, although the canopy is uneven, with grassy glades common in breaks in the canopy that is rarely dense enough to be closed. Dozens of young adult manatu are scattered unevenly through with concentrations in some places. The occasional tree reaches up to 35 cm diameter at breast height (dbh). Kowhai are scattered through as well, but in smaller numbers, with trees up to 45 cm dbh and clearly of some age. Occasional adult mahoe and ti kouka are also present. Some *Coprosma rigida* are present, and rarely round-leaved coprosma were noted. Several pole lowland totara may be natural. There has otherwise been no recent natural regeneration of native trees, with the dense exotic ground cover making regeneration highly problematic. Ground cover is largely exotic grasses and herbs. The small fenced section along the northern boundary includes the native sedge *Carex solandri*, a native pennywort *Hydrocotyle elongata* and, rarely, ferns such as lowland shield fern and *Pellaea rotundifolia*.

The coastal site comprises young kanuka forest and scrub with trees up to 12 cm dbh over a sparse understorey. Mingimingi is scattered and young lowland totara occasional. Bracken is scattered. Ground cover is largely of moss or areas of litter, with occasional native daisy *Lagenifera strangulata* and *Carex breviculmis*.



**Secondary kanuka forest is almost unknown in the ecological district where intensive landuse is the norm.**



**The only example of a natural waterway bound by riparian forest on both banks occurs along the lower Moutere River.**

***Manuka scrub on barrier island coastal margin***

Secondary (induced) manuka scrub occurs at one site, grading into probably naturally occurring saltmarsh–margin manuka scrub. It forms dense pure stands in large areas, but also occurs in association with gorse, with one area where gorse is co-dominant. Occasional ngaio saplings less than 2 m tall are present. Where the canopy is dense, there is little or no understorey. Under low light, species include occasional bootstrap sedge, scrambling pohuehue, *Juncus pallidus*, and shore lobelia. Water fern and common hypolepis are rare. In areas of dieback, unidentified grass species were noted.

**Freshwater wetlands**

All surviving naturally occurring freshwater wetland SNHs are associated with the coastal estuaries and margins of coastal spring-fed creeks and riverine delta backwaters. These comprise one freshwater wetland associated with the Waimea Inlet barrier islands and five margins of spring-fed streams and riverine backwaters at and just above saline influence. Waterways were not surveyed nor assessed other than for some minor sections of the margins of spring-fed creeks and riverine backwaters, where the distinction from freshwater wetland is unclear.



**Barrier island lowland totara forest is reduced to a tiny parcel on Rough Island.**



**Freshwater wetlands are largely confined to this unique barrier island fen on Rough Island.**



**Stream margin wetlands are rare, confined to small coastal spring-fed creeks and channels.**

### **Fens**

One fen was surveyed on Rough Island the only one known in the ecological district. It is a barrier island depression where much of the site is swamp forest/tall scrub comprising ti kouka and manuka. Where canopies are dense, lower vegetation is confined to a sparse to moderate cover of *Carex virgata* and *Coprosma propinqua*, with young ti kouka regeneration and scattered *Coprosma propinqua x robusta*. Some areas are dense with ti kouka leaf litter with little vegetation evident.

Elsewhere, open areas of low vegetation are largely dominated by variable associations of adventives. Indigenous species are more localised with patches of *Juncus australis*, scattered *Carex virgata*, *C. maorica*, *C. fascicularis* and *Baumea articulata*.

### **Stream margin wetland**

Five stream-side wetlands were surveyed, with four on the margins of spring-fed creeks, and one a riverine backwater. The distinction between a stream-bed wetland and a stream-fed wetland is blurred, with stream beds falling outside the survey's scope. Emergent vegetation within the stream-flow is variably dominated by raupo and lake clubrush. More marginal vegetation includes common spike rush, harakeke, marsh arrowgrass, *Carex secta*, *C. geminata*, tall fescue, *Isolepis prolifer*, watercress, narrow-leaved dock and water speedwell. Where a brackish influence is present, purua grass, and even oioi, may be present.

### **Estuary head wetlands**

Very small areas of freshwater or slightly brackish wetland, where characteristically freshwater wetland species are present, occur in narrow bands at the head of some estuary margins. These include raupo, harakeke, *Carex secta*, *C. geminata* and minor toetoe and manuka.

### Saltmarshes

Three broad saltmarsh systems exist within the Motueka section – those associated with the Riwaka, Motueka and Moutere river mouths; and one in the Waimea section, namely much of the Waimea Inlet

#### *Saltmarsh ribbonwood scrub*

Saltmarsh ribbonwood is present at the head of almost every estuarine saltmarsh that was surveyed, occurring as scattered bushes through to dense scrub. Dense stands are typical at many sites where a near monoculture may prevail. Typical associates are tall fescue, sea rush and oioi, all of which form communities into which saltmarsh ribbonwood merges.

#### *Tall sedgeland/rushland associations – oioi, sea rush, purua grass*

Extensive and often monoculture tracts of oioi and sea rush dominate many mid to upper areas of the saltmarshes, typically merging in places into saltmarsh ribbonwood. By contrast, extensive areas of diverse mixed associations are also present. Purua grass forms small, dense pure stands at a few sites. Sea rush in particular may merge into mixed herbfields. Lake clubrush occurs very locally, forming dense stands in the uppermost brackish zone of a number of spring-fed creeks and river backwaters.

#### *Saltmarsh herbfield with low sedges*

Herbfields in the mid to lower saltmarsh zone are generally dominated by glasswort, but in the mid-zone, a range of other species become common, most particularly sea primrose. In mid to upper areas, remuremu, shore cotula, slender clubrush and, where drier, buck's horn plantain are characteristic. Sea blite is locally common. Where brackish conditions occur, marsh arrowgrass may form extensive mats, often in association with three square and bachelor's buttons. Native musk occurs very locally. Around river deltas in the Motueka section, estuary sedge is locally common to abundant, but in the Waimea section is very scarce.



**Lake clubrush or kuawa occurs at the brackish mouth of the spring-fed Neiman Creek.**



**Estuary tussockland is best developed at the mouth of Neiman Creek.**



**Saltmarsh ribbonwood scrub is only extensive at the Motueka River delta.**



**Sandfield is confined to tiny areas in the Raumanuka area; the diminutive grass *Zoysia minima* is illustrated.**



**Scrambling pohuehue vineland is locally extensive in the Raumanuka area.**



**Diverse estuarine herbfield is best developed around the margins of the Motueka River delta.**

### ***Estuary tussockland***

Estuary tussock forms a distinctive community within localised areas of the ecological district, particularly the Waimea Inlet. The stands range from dense tussocks that exclude other plant species, to more open stands in association with sea rush, remuremu, glasswort and sea primrose.

### ***Sandfield***

Sandfields are rare and confined to sheltered areas within bays or estuaries and along the margins of some beaches where the sand is not blown too hard or frequently. In such areas, sand sedge is characteristic, forming small open pure stands or occurring in association with shore bindweed and, on its landward margins, knobby clubrush. One site supports areas of the tiny sand-binding grass *Zoysia minima*.

### ***Manuka scrub***

Two sites support what appears to be a natural saltmarsh margin of manuka scrub, both on the barrier islands (Rough Island and Bell Island). Under dense manuka, vegetation is sparse with areas of open litter, but generally there is a sward of tall fescue and other unidentified (probably exotic) grasses, with knobby clubrush locally common and, at one site, scattered pohuehue and mingimingi. Toward the seaward margins, dense stands of knobby clubrush dominate at one site.

Areas of dieback within the manuka thickets are severe in places (possibly drought or salt induced) so that parts are reverting to open low rushes, grasses and sedgeland.

## 6.2 Flora

### 6.2.1 Overview

Only vascular plants and ferns were noted, with no attention given to lower plants and fungi.

Within the SNHs, 182 native plant species were recorded. This includes 66 species of tree and shrub, nine species of liane, 30 species of dicotyledonous herbs, eight species of monocotyledonous herbs, 39 species of grasses, sedges and rushes, and 30 species of ferns. A small number of species may well have been overlooked due to their similarity to other species, and grasses are likely to be under-represented. This is a very low count



**Coastal margin manuka scrub on part of the Bell Island foreshore.**



**The most extensive upper saltmarsh vegetation in the ecological district occurs at the Waimea River delta.**

for an ecological district and attributable to the extreme levels of depletion of ecosystems. Podocarp-rich forest sites generally support 25–45 native plant species, other than Faulkner Bush, which is a special case as it includes swamp forest and adjoins hill-slope forest. The alluvial and terrace section (ie, Motueka Ecological District) of this site probably supports nearly 70 native plant species. Even the largest forest site (7 ha) supports only 45 species. Such low numbers are attributable to the uniformity of habitat and the extremely dry summer conditions, hugely exacerbated by forest fragmentation and associated edge effects, lowering of water tables, a long history of grazing and (other than perhaps for a few Wakefield sites) logging at all sites. Podocarp-rich treelands support between three and 13 species.

Out of a total of 28 forest and treeland sites, the following tree species were recorded at the most sites (number in brackets): lowland totara (25), matai (19), mahoe (16), titoki (15), kahikatea (13), turepo (11). All were recorded widely (where forest or treeland still occurs) in both sectors of the ecological district. All recorded tree species other than the two maire species could potentially have originally occurred throughout the ecological district where forest once stood.

Black beech was recorded naturally occurring at nine sites where it is occasional to rare. These include a number in

the Wakefield area as well as two at Lower Moutere, one at Motueka and one at Riwaka (a single 1 m+ dbh tree beside the Riwaka settlement saltmarsh). It is vanishing rapidly at a number of these sites, where fallen trunks, standing spars and canopy dieback of living trees bear testimony to its recent decline, probably attributable to drought stress and subsequent fungal infection. Silver beech occurs rarely at five sites, three at Wakefield and two at Lower Moutere. Both species would have once occurred throughout much of the ecological district, with black beech particularly common amongst matai and lowland totara, and silver beech perhaps more commonly confined to riparian areas.

## 6.2.2 Rare flora

Defining what is a 'rare' species in the ecological district is challenging, with so many species that are commonplace in surrounding districts but rare, very rare or absent from the ecological district, due to the sheer level of vegetation loss. This is particularly the case for forest and freshwater wetland species, where, with only around 63 ha between them, almost all species have a degree of rarity in an ecological district context. Eighty-one species can be considered very rare (found at up to five sites and only then rare or occasional) and a further 25 species rare (found at five to 10 sites and only then rare or occasional; or at only a few sites where they may be in moderate numbers locally at one of them). Twelve species could be considered regionally rare and eight nationally 'at risk'.

### Nationally 'at risk'

'At risk, declining' species present within SNHs are (number of sites in brackets): yellow mistletoe (2), scarlet mistletoe (1), white mistletoe (2), *Coprosma obconica* (1 reported), native germander (1) and estuary sedge (6). 'At risk, naturally uncommon' species are native musk (5) and *Atriplex buchananii* (2).

The three mistletoe species were all very rarely recorded. Their threatened status nationally is attributed to possum browse. *Coprosma obconica* and native germander both only occur at Faulkner Bush where they are very rare. Nationally, loss of habitat, and in the case of native germander, browse, are the prime factors in their decline.



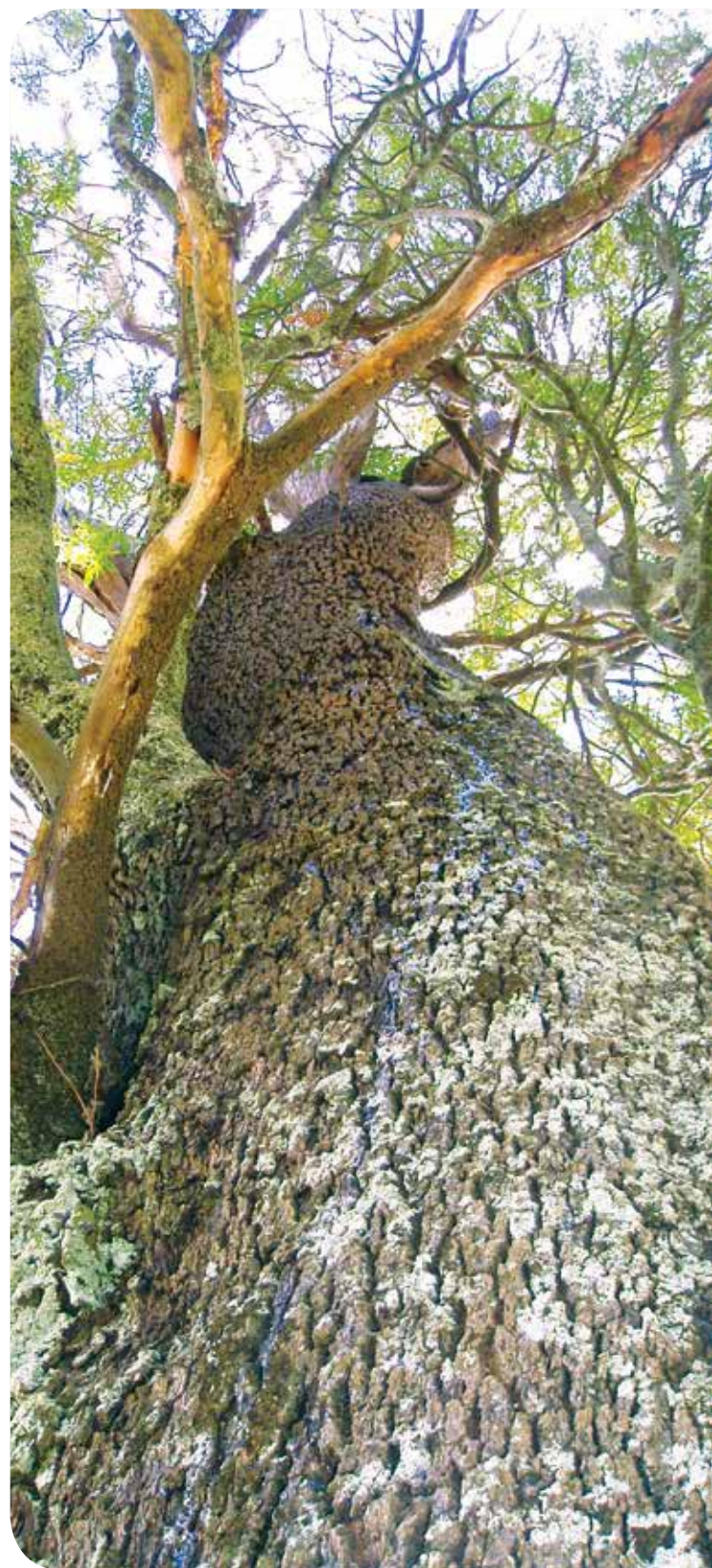
**Large podocarps within a forest setting are now vanishingly rare in the ecological district; this is a kahikatea in Edward Baigent Memorial Reserve.**

Estuary sedge is locally abundant in parts of the Motueka delta and Riwaka delta areas, but rare in the Waimea Inlet. Numbers are declining nationally due to habitat loss and degradation. Native musk is generally abundant in the tiny concentrated areas where it occurs. In a number of cases, it is present due to hydrological changes caused by stopbanks favouring its survival. It has exacting brackish water requirements that attribute for its natural scarcity. *Atriplex buchananii* was recorded from one site beside Bell Island and one beside Outer Island at Riwaka. Saltbush is naturally occurring at only one saltmarsh site that is not an SNH (being a Department of Conservation (DOC) reserve), however, the species has been introduced to a number of SNH sites.

### Regionally rare

Regionally rare species present within SNHs are (number of sites in brackets): ti kouka (10), narrow-leaved lacebark (6), poataniwha (1), swamp mahoe (4), white maire (1 reported), narrow-leaved maire (3), manatu (4), *Australina pusilla* (1), *Baumea articulata* (1 reported), *Carex fascicularis* (1 reported), bamboo rice grass (2), *Zoysia minima* (1) and *Uncinia leptostachya* (4).

Ti kouka/cabbage tree is rare at all forest sites where it occurs, but common at the one wetland where it is present. This latter population is possibly the largest known in the Nelson region. Its imperilled state is largely due to habitat loss and, more recently, cabbage tree 'decline'. Narrow-leaved lacebark and manatu are rare where they occur and have suffered greatly from forest clearance. White maire and narrow-leaved maire were probably both naturally scarce in the ecological district. White maire is reported from Thorp Bush. Narrow-leaved maire is only known in the Nelson region from the Brightwater area, where eight naturally occurring trees are known, with four of these in the ecological district. Swamp mahoe and poataniwha are alluvial forest specialists. It is likely that the 'drying out' of what alluvial forest remains has not favoured them. The forest herb *Australina pusilla* is locally abundant where it occurs at the one forest site near Wakefield. Drying effects may also be responsible for its restricted range. *Uncinia leptostachya* is at the western extent of its range, only just reaching the ecological district. Bamboo rice grass has a very sporadic distribution in the Nelson region for reasons that are not clear, as it can be abundant at some sites. The



**Only four narrow-leaved maire trees are known in the ecological district.**



sedges *Carex fascicularis* and *Baumea articulata* are reported only from the Rough Island wetland. The latter has been spread to a few nearby wetlands. These are more typically species of the North Island and this is their only South Island outpost. *Zoysia minima* is very locally common in a discrete area of the Raumanuka near Motueka. Its nearest other locations are Farewell Spit and the adjoining northwest coast, and the Marlborough Sounds.

### Rare in the ecological district

With 106 native plant species considered 'rare', these will not all be listed or described here. Rather, a range of interesting examples found within SNHs are discussed. Many species are surprisingly very rare or absent, and 46 species were recorded at only one site.

#### Trees, Shrubs, Lianas

South Island kowhai was noted at seven SNHs, all but one in the Brightwater to Wakefield area where at only two sites was it at all numerous. Three trees still stand close to Pearl Creek in pasture. One tree was known from the Raumanuka area (Tasman District Council, 1995), but there is no sign of it today. Ngaio are only likely to be naturally

occurring at one site, surprisingly at a Brightwater treeland where some ancient trees still stand. One white maire is reported from Thorp Bush in Motueka and is believed to be original. Pokaka was noted as rare at two sites, Robsons Reserve, Wakefield, and Thorp Bush, Motueka. The native broom *Carmichaelia australis* was only noted at the O'Connor Creek delta in the Waimea Inlet with just a few shrubs. Just one plant of swamp coprosma was noted at the Rough Island wetland. *Coprosma propinqua* was only recorded at two sites in the Waimea Inlet area, being common at the Rough Island wetland. Weeping matipo only just extends into the ecological district, with a shrub noted in a forest at Wakefield. It is largely confined to cold or frosty sites in the region.

*Metrosideros diffusa*/white rata vine and native passionfruit are both present at one Lower Moutere forest remnant.

#### Herbs

A number of herb species are surprisingly rare. Coastal herbs such as New Zealand spinach, native iceplant and shore bindweed were seen at only two SNHs, although they are known to occur outside surveyed sites along shorelines. Inkberry and the native iris *Libertia ixioides* were seen at only one and two sites respectively. Ground lily only occurs in the ecological district at Faulkner Bush. The only orchid records were of four sites for the perching orchid *Earina mucronata*, and one site for *Earina autumnalis*, generally found on mature kahikatea limbs.

#### Grasses, Sedges, Rushes

Fifteen *Carex* sedge species were noted or reported from SNHs with many of them at only one or two sites, for example, the wetland *Carex secta*, *C. maorica* and *C. dissita*, and the dryland *C. pumila*, *C. raoulii/testacea* and *C. flagellifera*. Remarkably, the most common *Carex* in the ecological district is the nationally 'at risk' estuary sedge. Hookgrass/*Uncinia* species were noted at very few sites. No toetoe were recorded as naturally occurring. Silver tussock was noted only once, on Bullivant Island.



The threatened native germander is known from only one site in the ecological district.

### *Ferns and allies*

Of the 30 fern species noted, 13 were recorded at only one or two SNHs. The only treefern recorded was ponga at three sites. The most commonly recorded (by number of sites) was leather-leaf fern, with button fern, lowland shield fern, *Hypolepis ambigua*, necklace fern, hanging spleenwort and hen and chickens fern moderately to commonly recorded from forest sites.

### *Large trees*

Very few large trees remain within forest and treeland SNHs. One or two kahikatea approaching 2 m dbh survive in Edward Baigent Memorial Reserve, but recently even larger specimens have died there. In the Wakefield area, there are also several kahikatea and lowland totara trees in treeland of the order of 1.8 m dbh, and black beech to 1.5 m dbh.

## 6.3 Fauna

Faunal observations were almost entirely confined to native avifauna and were of incidental observations rather than the subject of direct survey. Sites of significant habitat for fauna that were not otherwise identified as significant vegetation were identified from information provided by other parties or surveys, for example: inanga spawning sites (James, 2013 unpublished, Tasman District Council report), shorebird roosting and breeding sites (Ornithological Society of New Zealand (OSNZ) pers. comm.) and waterfowl (Fish & Game pers. comm.). No herpetofauna were noted, nor are any areas of important habitat known. (Note: For ease of reading, Maori bird names where not the common usage are only shown once in each section of this report. For the same reasons, some longer English names are used in full only once and shortened thereafter, for example, South Island fernbird is referred to as fernbird.)

### 6.3.1 Indigenous bird and other animal species present within Significant Native Habitats

Of the avian species recorded or reported from SNHs, the following have a national threat ranking (Miskelly et al, 2008):

- 'nationally endangered': matuku/Australasian bittern
- 'nationally vulnerable': tuturiwhatu/banded dotterel, taranui/Caspian tern, karuhiruhi/pied shag, ngutuparore/wrybill
- 'at risk, declining': matata/South Island fernbird, torea/South Island pied oystercatcher, tarapunga/red-billed gull, poaka/pied stilt
- 'at risk, recovering': torea-pango/variable oystercatcher
- 'at risk, naturally uncommon': pereru/banded rail, kawau/black shag, kawaupaka/little shag, kotuku-ngutupapa/royal spoonbill
- at risk, relic: kareke/marsh crake, puweto/spotless crake



**A number of significant inanga spawning sites have been recently located around the margins of the Waimea Inlet.**

Coastal saltmarsh SNHs support a suite of threatened indigenous birds that are restricted within the ecological district to these small areas, and that have a national threat ranking. These are (presence from local members of OSNZ): bittern, fernbird, marsh crake, spotless crake and banded rail. Numbers in the ecological district are not well known for any of these species, other than perhaps for banded rail. Recent surveys by OSNZ suggest that moderately low populations of banded rail are present in the greater Waimea River delta area (including O'Connor Creek and Pearl Creek), with low numbers in the Motueka River delta and Riwaka delta areas. No recent records are known within the ecological district section of the Moutere Inlet other than for prints of a presumed bird noted during the survey of the Moutere River delta. Bittern are irregularly recorded from one SNH and may be breeding in the Waimea Inlet with a possible resident population of three birds (Willy Cook, pers. comm.). Fernbird are occasionally recorded from one SNH but their status is uncertain. Marsh crake are resident at a number of saltmarsh SNHs, probably in very low numbers. Spotless crake have been recorded from one riparian wetland SNH during 2011. Other recorded species associated with saltmarshes and/or creeks and channels that run through them were royal spoonbill, pied shag, little shag, kotare/kingfisher and pukeko.

Faunal habitat SNHs and associated fauna, mostly relating to coastal avifauna, are discussed in section 6.3.2.

Estuaries as such were not part of the identification of significant vegetation other than for upper saltmarshes, but coastal margin birds were noted in the general vicinity during surveys. These included tarapiroe/black-fronted tern, tara/white-fronted tern, red-billed gull, karoro/southern black-backed gull, matuku-moana/white-faced heron, royal spoonbill, South Island pied oystercatcher, pied stilt and variable oystercatcher.

Forest and treeland SNHs supported a range of indigenous birds, namely (in order of decreasing site survey frequency): piwakawaka, tui, kereru, korimako, tauhou/waxeye, riroriro/grey warbler and pipiwharau/shining cuckoo. No ruru/morepork were noted (surveys were conducted during daylight hours) but the species could well be present. Kingfisher may also be present at times at some sites, particularly those near streams, rivers and estuaries. Such a suite of species is impoverished for the region. Species lacking that are typical of larger or more inland forests in the region are toutouwai/South Island robin, miromiro/South Island tomtit, kakariki species, South Island kaka, koekoea/long-tailed cuckoo, pipipi/brown creeper, weka and karearea/New Zealand falcon. As of 2008, kereru is no longer nationally listed as 'at risk'



**Banded rail are a special feature of the larger saltmarshes.**

(Miskelly et al, 2008), but this does not take account of local declines where pest control is not undertaken. It is not clear even anecdotally whether the kereru population is stable within the ecological district. It is possible that there are no resident breeding kereru within SNHs in the Motueka River section of the ecological district.

Presence and perceived abundance of native forest birds during survey visits was dependent on season, time of day and fruiting–flowering of key species. One forest site that was visited in spring held large numbers of tui (perhaps well over 100) during kowhai flowering, well after a survey of the site noted only moderate numbers – serving to highlight the seasonally important nature of forest sites that surveys may not record. Large congregations of korimako, and to some extent, kereru are also likely to occur at favoured seasonal food sources within SNHs. All podocarp-rich sites were deemed seasonally important (to a greater or lesser degree) for forest birds due to the attractiveness of mass autumn fruiting.

The Native Habitats Tasman programme does not survey for freshwater fauna as the survey does not include watercourses, although the distinction from wetlands is at times blurred. Data from prior freshwater surveys held by the Council was accessed to inform SNH values of wetland sites, with no such faunal surveys undertaken by the Native Habitats Tasman programme itself. Within wetland and forest SNHs, or at least within streams or rivers arising from or feeding into them, the following species are on record (Kroos et al, 2007 & 2011):

- ‘at risk, declining’: tuna/longfin eel, tuna/shortfin eel, lamprey, redfin bully, inanga, torrentfish, dwarf galaxias, and giant kokopu
- ‘not threatened’: common bully, upland bully, banded kokopu and koura.

No recent or historic records of mammals, that is, kekeno/fur seal and pekapeka/native bat species are known from SNHs. The only lizard species known to be present in the ecological district is the common skink (Rogers, 2009). No invertebrate surveys have been undertaken in the ecological district in the past, and no invertebrate observations (at least to species level) were undertaken during this survey.

### 6.3.2 Faunal habitat within Significant Native Habitats

Thirteen SNHs were identified as significant habitat for indigenous fauna that were not otherwise significant for vegetation. Most of these relate to avifauna in the coastal area above mean high water (MHW) or its immediate environs. Intertidal feeding areas, neap tide roosts and low tide roosts of shorebirds were not identified, because they fell outside the scope of the survey.

Nine sites were identified as significant roosting or breeding sites for shorebirds (data from Willy Cook and David Melville (OSNZ) pers. comm.; and Schuckard, 2002). These are all set on coastal sand, pebble and silt deposits that lack vegetation. They include two high-tide roosts used by the same group of birds, that seasonally support internationally significant numbers (regularly more than 1% of the total population) of variable oystercatcher and wrybill. Pied oystercatcher and kuaka/eastern bar-tailed godwit numbers in the Waimea Inlet are seasonally internationally significant, although no one roosting site reaches this level. Two high-tide roost sites support nationally important numbers of bar-tailed godwit. These roost sites also hold important numbers of banded dotterel, pied stilt, ruddy turnstone, hauhou/red knot and spoonbill. All nine sites were also identified as supporting important numbers of breeding variable oystercatcher and/or banded dotterel. A nationally significant Caspian tern colony occurs at one site with 60-plus pairs regularly breeding.

Two sites were identified as significant breeding colonies for pied and little pied shags – both set in conifer trees.

One significant site for waterfowl was recorded, Bell Island sewage ponds. Seasonally, it holds regionally important numbers of kuruwhengi/New Zealand shoveler and moulting putangitangi/paradise shelduck and locally important numbers of tete/grey teal (data from Nelson/Marlborough Fish and Game, pers. comm.).

Three significant spawning sites for inanga were identified using data from independent surveys conducted in autumn 2012 and 2013 (James 2013, unpublished, Tasman District Council document). The habitat is of exotic grasses, largely tall fescue but also creeping bent.

## 6.4 Other ecological values

### 6.4.1 Connectivity and buffering

Forest and treeland SNHs form three main clusters in the ecological district, at Wakefield, Brightwater and, in a minor sense, Lower Moutere. Non-protected SNHs form a network of sites amongst protected SNHs in the Wakefield area that are important in providing stepping stones (but not corridors or buffers) between protected and partially protected areas in this limited part of the ecological district. In the Brightwater area, almost all SNHs have a measure of protection that forms an important network of sites around and in close proximity to Snowdens Bush Scenic Reserve. Several sites in the Lower Moutere area constitute a local network of unprotected sites but with no protected areas anywhere near them.

The saltmarsh SNHs form semi-continuous networks around the Waimea Inlet, the ecological district section of the Moutere Inlet and the Motueka River and Riwaka River delta areas. Almost all areas are unprotected in the formal sense, with only tiny protected SNHs buffered by extensive areas of non-protected SNHs. Saltmarsh SNHs do, however, strongly buffer the mouths and/or the very lowest reaches of the Waimea, Moutere, Motueka and Riwaka rivers, and creeks such as O'Connor, Pearl and Neiman, helping to sustain instream values.

Forest SNHs buffer only around 100 m of one bank of the Moutere River, otherwise no other forest sites buffer any waterways other than the occasional drain.

### 6.4.2 Ecosystem services

Other than in the most minor and localised sense, no SNHs can be said to provide 'ecosystem services' such as flood mitigation or erosion control.

# 7. Threats to Significant Native Habitats

## 7.1 Plant pests

Some 41 or so plant species noted within Significant Native Habitats by this survey could be considered 'significant' ecological weeds in New Zealand. However, most are restricted in the ecological district and there are few surveyed sites where weed impacts are high. Major weed issues mainly occur outside surveyed areas along the riparian margins of the Mouteka and Wai-iti–Waimea rivers where native vegetation is generally absent. The small size of all sites, and the large perimeter to area ratios of several of these, favour weed colonisation and impacts, at least for the light-demanding plant pests.

Damage that has already been sustained in SNHs is limited to a few weed species. Tall fescue dominates or is common in many upper saltmarsh sites to the exclusion of native species. A number of aquatic stream and stream margin species, such as watercress, water speedwell and creeping bent, exclude native vegetation at one site (Pearl Creek). Oval sedge and lesser spearwort are abundant in the Rough Island wetland to the exclusion of other species. In 1985, cord grass covered 43.5 ha of the Waimea Inlet saltmarshes (Tuckey et al, 2003) to the exclusion of other species. Assiduous control by the Department of Conservation (DOC), Nelson City Council and Tasman District Council has reduced this to occasional finds in annual survey trawls (Robin Van Zoelen, pers. comm.).

The most immediate current threats are from the spread of a small number of species: smothering vines in forests, rapidly invading tree species, saltmarsh sedge, rush and herb species, and some forest-floor dominating species. Old man's beard was noted at 16 SNHs but is only well established at three forest sites in the Wakefield area, being occasional to rare elsewhere. Banana passionfruit (species undetermined) was noted at only one SNH in Lower Moutere where it is abundant and smothering a forest remnant. Japanese honeysuckle is confined to four sites, two in Lower Moutere, where it is moderately common, otherwise it is rare at the Motueka delta and moderately common at Wai-iti Recreation Reserve. Chocolate vine was noted at one Wakefield forest SNH where it is invading rapidly, spawned from the Wai-iti riverbanks where it is abundant in the area (Lindsay Grueber, pers. comm.) These

four vine species can spread rapidly and pose a severe threat to other sites in the ecological district as they can smother forest canopies sufficiently to kill them. These are the priority weeds to control. A further vine, bindweed, is also a concern being recorded at two SNHs. It is locally common in the DOC reserve along Neiman Creek invading saltmarsh ribbonwood scrub. Ivy occurs at five sites, and in moderate numbers at two of them.

Sycamore is locally common at two SNHs (near Wakefield and Brightwater) and rare at two others. At the Wakefield site, it is rapidly invading the forest. At Brightwater, it forms a stand beside a treeland remnant and is invading. Yew is rare at three sites, with heavy control undertaken at one of them, Faulkner Bush.

Jellybeans iceplant occurs at two saltmarsh SNHs, with large patches at one of them (although control initiated by Tasman District Council has since been undertaken). Saltmeadow rush and divided sedge occur at one saltmarsh site near Richmond where they form dense monoculture stands in small areas. The rush has the potential to smother vast areas of saltmarsh, as has occurred in Southland. Control is being informally undertaken by Tasman District Council biosecurity staff. Iceplant occurs at three saltmarsh sites, with large areas at two of them. It is widely distributed around the Waimea Inlet.

African clubmoss only occurs at one forest SNH where it is common throughout. Wandering willy is present at five sites with only two where it is at all common. These species are located at Wakefield, Brightwater and Lower Moutere.

The Tasman–Nelson Regional Pest Management Strategy for 2012–2017 (Tasman District Council, 2017, p 17) lists the following weeds in the ecological district as 'Total Control Pests': Bathurst bur, boxthorn, cathedral bells, climbing spindleberry, egeria, hornwort, madeira vine, saffron thistle, senegal tea; Progressive Control Pests: boneseed, purple loosestrife, variegated thistle, white-edged nightshade. None were noted at any SNHs, but many would pose a considerable threat if their ranges were to expand into SNHs, in particular the vines and wetland plants.

Weed control options are varied, but other than for extensive areas of tall fescue around saltmarshes, all significant weed issues could be dealt with at all SNHs without too much effort, as the total area is so small. It is entirely feasible to eliminate all such weed problems, provided that surveillance and maintenance is continued thereafter. The usual methods of chemical and manual control should be deployed.

## 7.2 Animal pests

The Motueka Ecological District is unique in the region for the lack of any observed feral pig, feral goat or red or fallow deer impacts on natural areas. Pest animals are confined to a suite of smaller animals.

No brush-tailed possum sign was noted within SNHs. The Animal Health Board (AHB) has been controlling possum numbers in a large proportion of the Motueka section of the ecological district. The last operation was in 2009/10, but no further operations will be planned if bovine tuberculosis remains undetected in the possum population (Josh King, pers. comm.). The entire Waimea–Wai-iti section of the ecological district has had no AHB control undertaken at all. Damage levels on vegetation are not possible to assess with the quick walk-through surveys undertaken by this survey programme, and possum impacts on fauna are undetectable with such a method. Regardless, possum impacts on avifauna and large invertebrates, and on the successful growth, flowering and seeding of some plants is likely to be high despite the lack of obvious sign of their presence (spoor, browse).

Hares occur in pastoral areas, and with rabbits in less disturbed coastal areas, but no impacts on indigenous flora within SNHs were noted. It is likely that there are browse impacts on seedlings in forest margins.

The current pest animal threats to SNHs are otherwise confined to native faunal impacts. Common wasps decimate invertebrate populations, but their impact in the ecological district or SNHs is not well known other than in the general sense.

Mustelids (ferret, stoat, weasel), rodents (house mouse, ship rat, brown rat), feral cats and hedgehogs are all likely to be taking a heavy toll on native fauna. Rodents are also

Photo: LSG – Tasman District Council



**Stoats are believed to be a key predator of wetland birds.**

likely to be heavily impacting on successful seeding of some plant species. Invertebrate impacts are not known, but there is considerable evidence of the impact of such pest species on New Zealand's indigenous avifauna. In SNHs within the ecological district, all forest species are likely to be affected by the presence of mustelids along with many breeding coastal species as well. Breeding coastal species that are likely impacted are variable oystercatcher, banded dotterel, banded rail, marsh crake and fernbird. Other breeding species are probably large enough to fend off predators, in most cases. It is unlikely roosting shorebirds being impacted by pests (David Melville pers.comm).

The Tasman–Nelson Regional Pest Management Strategy for 2012–2017 (Tasman District Council, 2012) lists the following animal pests in the Motueka Ecological District: Progressive Control Pests: mosquito fish, koi carp, rudd and tench. DOC-led campaigns have largely eliminated these species from the district, so it is unlikely any of these fish species impact on the few water bodies within SNHs.



## 7.3 Other threats

SNHs are vulnerable to a range of potential threats and are being impacted by direct threats that mainly relate to human activities.

### Forest and treelands

#### *Grazing and stock fencing*

Of the 13 treeland SNHs, six are grazed and one is mown. Such management precludes the establishment of a forest understorey and eventual return to forest. Remaining sites are struggling to establish an understorey presumably due to weed competition and summer droughts.



**Current watertable levels are well below historic levels and may explain the death of kahikatea at some forest sites.**

#### *Hydrological changes and edge effects*

Historic lowering of water tables due to water abstraction, drains, and canalising and stopbanking of main river stems through much of the ecological district has impacted on soil moisture levels at many sites. This has been exacerbated by forest fragmentation with associated edge effects, particularly drying effects.

At the time of writing, all forest SNHs are small with huge boundary to area ratios and no buffering around their margins from sun-baked air heated in the surrounding pastoral and/or horticultural environments. Water tables have dropped through gravel extraction from riverbeds.

The result has been a recent and ongoing loss of mature kahikatea in the Wakefield area. Black beech decline is also widespread throughout the ecological district (and the northern half of the Moutere Ecological District) and is partly attributable to lowered water tables, but due to its more widespread nature, may relate to recent drought episodes and disease. Regeneration failure in recent decades of certain forest species, such as black beech and kahikatea, is noticeable at many sites where they occur. This is likely to be attributable to the same issues as tree decline alluded to above but also to the lack of large-scale forest with associated phases of regeneration and maturing that occur through natural disturbance (such as drought, wind throw, river channel movement) and simultaneous canopy cohort aging and decline.

#### *Disease*

'Cabbage tree decline' has no doubt reduced populations of ti kouka, but to what degree is not clear as they are likely to have been scarce in any case. The only healthy population within an SNH is at Rough Island wetland, which shows little or no sign of decline.

#### *Vandalism*

A revegetation programme at Hunter Brown 'Reserve' SNH on Rough Island that extended the totara forest area was extensively damaged in 2011 by an off-road vehicle in an act of wanton vandalism. Such behaviour is becoming frequent throughout the district, although it has rarely impacted on ecological values to date.

***Species extinction***

Due to very low numbers of many plant species at particular sites and in the ecological district as a whole, there is a real threat of ongoing species loss. This is particularly so at the more isolated sites where natural reintroduction or augmentation of small populations is problematic. This includes a number of nationally 'threatened/at risk' species that occur in very low numbers and are at risk of being lost.

***Loss of treelands***

It is possible that some treeland SNHs are at risk of being felled due to land-use intensification, such as pivot irrigation or a change from grazing to horticulture.

**Saltmarshes, estuaries and foreshores**

Disturbance to indigenous fauna is the main threat to coastal SNHs.

***Regional cycle trail***

The route of the regional cycle trail runs around the saltmarsh margins of the eastern and central section of Waimea Inlet through or beside numerous SNHs. The sections through the Pearl Creek delta area and Rabbit Island foreshore have generated concern over the potential disturbance to bittern and nesting variable oystercatcher, banded rail and crane species. Negotiations with environmental groups and landowners have led to modifications to the route and screening of the portion where it crosses Pearl Creek.

***Dog and horse exercising***

Some saltmarsh SNHs are used for dog exercising, for example, the Riwaka delta where dogs roam in known banded rail habitat. The protection of native coastal birds would be enhanced by signs to discourage entry of dogs and horses to important areas. However, enforcement would be difficult.

***Recreation***

Human use of foreshores for recreation renders such areas unsuitable to nesting shorebirds if the activity is moderate to high or particularly noisy. Coastal activity is increasing with time, with detrimental effects on shorebirds.

***Infilling, pollution and stopbanking***

Infilling of saltmarsh is no longer permissible under local body rules, however, it has occurred as recently as 2007, when 0.5 ha of saltmarsh ribbonwood was smothered in an attempt at infilling estuary on a private title. Fortunately, this was stopped and the material removed, but the ribbonwood succumbed and there has been no restoration planting undertaken at the time of writing.

An area of Waimea Inlet saltmarsh that was infilled without consent in the 1990s was partially reinstated in 2008 as part of the agreement for retrospective permission for the site that now remains (the current Nelson Pine Industries site).

A further area of saltmarsh on private title is being infilled under a consent that pre-dates the Resource Management Act 1991.

Stopbanking of the Motueka River at the delta has isolated a large area of saltmarsh ribbonwood (an SNH) from tidal flow on unallocated Crown land. It is slowly being invaded by gorse and willows.

***Tidal gates and culverts***

Numerous tidal gates were noted across streams and ditches flowing into the rear of saltmarsh SNHs, installed to preclude saline intrusion into land upstream. These gates serve to block or severely limit native fish passage, which is of particular concern for migratory whitebait species that spawn at the autumn king tide salt wedge in riparian margin vegetation.

***Grazing***

One saltmarsh SNH is grazed, although this situation may alter under a mooted change of ownership.

***Vehicle access***

Vehicle access to estuaries is a concern in some areas. Saltmarsh vegetation has been damaged in the northern end of the Moutere Inlet in two places with one area of saltmarsh ribbonwood badly damaged. There are a number of vehicle access points to maimais set out in the estuaries, where tracking through saltmarsh vegetation occurs, such as at the Neiman Creek delta SNH. Members of the public drive out onto the Riwaka River delta SNH (and probably others) and exercise their dogs. Seabird

disturbance from helicopter training at low levels over the intertidal zone off Motueka still occurs, although less impacting than formerly due to a change of location.

### ***Sea level rise and climate change***

The greatest threat of all to SNHs in the medium to long term is climate change and the ongoing rise of sea levels that is now 'locked in' for decades due to increased carbon dioxide levels in the atmosphere that began to rise at the start of the industrial revolution. International emissions continue to rise inexorably. Current science (Blunden et al, 2013) puts annual sea-level rise in the range of 2.8–3.6 mm as a global average over the past two decades. Near consensus predictions amongst the international climate science community project a 45–82 cm rise by the end of the century under current emissions trajectories and a rise of 2.6–4.8°C average air temperature (IPCC, 2013). The drowning of all saltmarsh SNHs within one human lifetime is a virtual certainty – unless inland retreat on a large scale is planned for. Such a temperature rise corresponds to an eventual rise of 20–100 m of sea level (from palaeoclimatic data in Hansen (2008)). Modelling of the likely impacts of warming in New Zealand this century suggest some compositional change of biomes but surprisingly little distributional change (McGlone & Walker, 2011). From a strictly terrestrial native ecosystem point of view, the modelling predict that the next 50 or so years of climate change should have an insignificant impact when put alongside the other anthropogenic drivers.

### **Freshwater wetlands**

The few remaining freshwater wetland SNHs are at near sea level, with future sea level rise just as devastating as for saltmarshes (see above). There is potential for the largest and most significant wetland to be damaged during pine felling operations around it, with pines present up to its margins. Care will need to be taken to ensure trees are not felled into the wetland.

# 8. Management of Biodiversity Values of Significant Native Habitats

## 8.1 Management issues

The most important management issues relate to pest plant and animals, stock grazing and lack of fencing, and direct and indirect disturbance from human activities.

### Pest plants and animals

As indicated in Section 7, Threats to Significant Native Habitats (SNHs), exotic species put considerable pressure on indigenous species and ecosystems. However, the total area of indigenous habitat is so small in the Motueka Ecological District that it would be quite feasible to undertake adequate management measures at all SNHs, given sufficient landowner, community and local agency support.

From the surveys, it is clear what the key weed species are in the ecological district within SNHs, and these have been outlined in Section 7. As all sites are relatively small, and weed issues are generally not yet big at the time of writing, other than at a few sites, much could be achieved. The issue on private land is one of landowner awareness and interest, available time and resources, and encouragement and support from outside, whether it be the community and/or local agencies. Weed management of forest sites is undertaken at many of them. The SNHs administered by Tasman District Council are nearly all managed for biodiversity (among other) interests.

The weed issues outside SNHs could impact heavily on these areas in future or are just beginning to. The most serious weed infestations are along riparian margins of rivers and streams. As these areas fall largely under local government control but without associated funding to sustainably manage, they have become reservoirs of insidious weeds that can spread into adjoining SNHs. While riparian weed control and the benefit of catchment-based control is recognised by Tasman District Council, little funding is directed to its management. Chocolate vine is restricted in the ecological district to a stretch of the Wai-iti River and in one adjoining forest remnant. Banana passionfruit occurs sporadically in the ecological district in the lower Moutere River catchment and beside Neiman Creek. These devastating species could probably still be

successfully eliminated from such areas, but the window of opportunity is rapidly closing for relatively cheap control. A point will soon be reached when elimination will not even be feasible.

Pest animal control is more specifically site-based as all the species that are a problem at the time of writing are ubiquitous and not readily amenable to wider control with current technologies in a rural landscape, although this has been achieved elsewhere, for example, in central Golden Bay through the commitment of local landowners. Trapping programmes are unknown at SNHs other than at estuarine saltmarshes, where community and landowner stoat trapping is undertaken at the larger sites. The issue is one of what can be achieved when such species are essentially everywhere, as it requires control 'in perpetuity' to achieve meaningful outcomes. It is a huge challenge because it needs weekly long-term work to be successful. Poisoning programmes have not been undertaken, but there is scope for such on private land and at more remote Crown land sites. The key gains to be made are flourishing indigenous animal populations and a reinstating of a measure of the original ecological dynamics of local ecosystems.

### Grazing and stock fencing

Without regeneration, all the treeland SNHs are doomed in the longer term. One of the Council -owned sites is being progressively fenced off from sheep and revegetated. The remainder of the sites hinge on future landowner interest in restoration through stock removal and revegetation or, at least, replanting in gaps to retain treelands. This is not easily achieved on the free-draining and summer drought-prone floodplains, with summer watering often required in the early years of any new planting. Fenced sites are also vulnerable to stock-palatable weed invasion that would otherwise have been precluded, so there is this further dimension to consider in successfully making the transition from treeland to forest.

One saltmarsh SNH is partially grazed.

### Falling water tables, edge effects, drought

The drying of forest and treeland SNHs has been a continual process ever since forest fragmentation and



**Native treelands are an important feature of parts of the district, but have no long term future without being stock-fenced.**

drainage began. Various more sensitive plant species are likely to be absent from, or rare in, existing forest remnants where once they occurred throughout the ecological district, due to drier forest interiors caused by fragmentation and hydrological changes. Many fern species fall into this group. The issue is how can these effects be ameliorated? Extending and sealing forest margins with deep restoration plantings would achieve some gains. It is hard to conceive of any opportunities for reinstating former water levels at now dry forest sites without impacting on adjoining properties. An obvious response to the decline of forest canopy species such as kahikatea and black beech is to include these two key canopy forest species, and any other species with poor recent regeneration, in restoration planting efforts, both within existing sites and in the creation of new ones. One positive management action has been the installation of weirs on the Wai-iti River. These have acted to lift the bed level, elevating the adjacent water table with likely benefits to adjacent SNHs.

A semi-natural lagoon on the seaward side of the Motueka Wastewater Treatment Plant has been used for sewage water finishing/filtering for many years. Preparation for the upgrade of the plant planned to be completed by 2016 has involved investigation of options for onsite treatment with removal of solids and liquid discharge through land. Department of Conservation (DOC) and Fish and Game

staff have asked that habitat conditions for wetland birds be enhanced by maintaining a water flow through this lagoon adjoining the plant.

#### **Species extinction**

A large number of plant species are rare or absent within SNHs. This is either due to the sheer rarity of habitat or for being naturally uncommon in the ecological district such that the small remaining areas (by chance) support few or none of them. For tree species alone, this includes miro, hinau, pokaka, rimu, narrow-leaved maire, South Island kowhai, narrow-leaved lacebark, manatu, ti kouka, white maire, tarata and silver beech, among others. These should be key species for forest revegetation projects.

Several nationally 'at risk' and 'threatened' plant species are in such low numbers that, without management, it is likely at least some will be lost. Several mistletoe species could be readily spread around the ecological district where suitable host trees and shrubs are present. *Coprosma obconica* and native germander could be propagated from local seed and planted into suitable sites. Other 'at risk' species present at the time of writing are saltmarsh species with exacting environmental requirements that make population enhancement problematic. DOC has also been involved with the introduction of two rare coastal species (see Section 8.3).

### **Ecosystem fragmentation**

A huge issue with such high ecosystem depletion in the ecological district is the fragmentation of surviving SNH sites that preclude meaningful ecological connections due to spatial separation. Some forest SNHs lie far from any other such sites. Fortunately, 12 of the 26 forest SNHs lie within a 5 km x 1 km band to the southwest of Wakefield, with several unsurveyed treelands also present. One possibility is to encourage landowners in the zone between the SNHs to undertake restoration plantings, either linking existing SNHs or creating ecological 'stepping stones' between them.

### **Direct human disturbance**

This is only really a serious issue within coastline SNHs, with minor management issues at some Council SNH reserves inland.

#### ***Dogs***

Bylaws exist for where dogs can be exercised on council land, and where they are banned. If these were extended to include all estuarine SNHs where banded rail and marsh crake occur, and to important shorebird roosting and breeding sites, there would be considerable benefits for these species. Transgressions of bylaws are hard to police, and much relies on the goodwill of the public, so education is critical. For example, the initiation of the now popular Godwit Festival in Motueka has served to raise awareness of the vulnerability of shorebirds.

#### ***Recreation***

Prominent signage at access points is required at a number of SNHs located within estuaries, beaches and sandbanks where there is a significant risk to bird disturbance. This includes parts of Rabbit Island, the Pearl Creek area adjoining the regional cycle way, and Riwaka delta. This issue is difficult to resolve, but having remote sections of beach off-limits during the nesting season would greatly help.

#### ***Regional cycle way***

Traffic along the cycle way poses a potential risk of disturbance to estuarine birds that nest in the saltmarsh vegetation and on shorelines immediately adjoining it. This will need to be monitored and managed.

### ***Vehicle access***

The solution to some of the vehicle damage to saltmarsh SNHs is to close access points in the affected areas, with gates or vehicle barriers and explanatory signage.

Seabird disturbance from helicopter training at low levels over the intertidal zone in the Motueka area was a serious problem. Due to pressure from the local community over such activities in the vicinity of the Motueka Sandspit, this is now concentrated off the Motueka and Riwaka river deltas where lesser concentrations and numbers of shorebirds occur.

### ***Infilling***

There is always a risk of further indiscriminate infilling of estuaries, particularly if the area falls on private land. Education and vigilance are the only feasible ways to manage this issue.

### **Subdivision**

At the time of writing, no rules or guidelines exist within the district plan that discourage subdivision within SNHs or other natural areas. The result is that sites once on one title may end up falling into multiple ownership. This does not favour integrated thinking or management of such areas and may mitigate against effective future pest animal or pest plant control if one or more owners do not participate or refuse access. However, Council policies do seek to ensure good ecological outcomes for existing natural areas within new subdivisions. This has resulted in the protection of areas of high ecological value.

### **Tidal control issues**

#### ***Stop banking***

Without a culvert through the stopbank at the Motueka delta to allow tidal ingress into a large but now tidally isolated area of saltmarsh ribbonwood, it is likely to be overcome by weeds. A review of the situation would be desirable.

#### ***Tidal gates and culverts***

Options to partially open key tidal gates that block fish passage and some measure of tidal flow could be further explored. Trials of fish-friendly tidal gates are under way and are working well.



Tidal gates prevent the passage of whitebait and interfere with spawning.



### Sea level rise and climate change

Climate stabilisation achieved through drastic cuts in carbon dioxide emissions is outside the scope of this report, but it is clearly essential to avoid this international ecological crisis that will impact just as heavily at a local level.

If saltmarshes are to survive dramatic sea-level rises, a managed retreat of the coast has to be planned for that includes allowance for saltmarsh to move inland. This would require avoiding further zoning of the most low-lying coastal land adjoining existing saltmarshes for industrial or residential development to keep future options open.

### Education and Planning

Good management outcomes can only be achieved through a sympathetic landowning community and an interested and educated broader community that is directly active in conservation. A number of initiatives within the ecological district serve to illustrate an emerging sea-change in local thinking. For example, the community-based or citizen-driven restoration programmes in the Waimea–Motueka area to have emerged in recent years include the Waimea Inlet Forum, Plant Right Now estuary restoration group, Nelson/Tasman Weedbusters, Nelson Branch of Forest and Bird, Ornithological Society of New Zealand estuary trapping programmes and Faulkner Bush Restoration Society.

Good planning by local government and good policy and direction from central government play a critical part in ensuring that good biodiversity management outcomes are achieved.

## 8.2 Priorities for management

Management for the protection of important biodiversity values should be both issue and site led. Conservation management at the key SNHs on Crown- or local body-owned lands should be undertaken and encouraged on privately owned SNHs (if not under way already). For other issues that affect large numbers of sites, a more general management approach would be appropriate (eg, certain pest plants, vehicle access to estuaries).

The highest priorities are:

- For the most important unmanaged or under-managed sites, initiate or review and improve conservation management measures. This includes the following Council-owned and administered SNHs and common marine and coastal area SNHs: Rough Island wetland, Waimea River/Pearl Creek deltas, O'Connor Creek delta, Motueka River delta and Bell Island manuka scrub.
- The owners of the few important unmanaged forest SNHs on private land could be approached to determine if weed control can be undertaken, either by community groups, by QEII where covenants exist or through Biofund-assisted work.
- Fencing of the remaining treeland SNHs from stock, and revegetating to allow native forest to regenerate, should be encouraged as this is the only way these areas will survive long term.
- The control of pest animals in and around all saltmarsh and foreshore SNHs with identified faunal values threatened by pests would make substantial gains for threatened wetland species.
- Manage nationally 'threatened' and 'at risk' species within SNHs where needed to improve or increase populations and population viability.
- Monitor and, if necessary, manage key inanga spawning site SNHs.
- Allow for better fish passage through coastal flap-gates at the rear of saltmarsh SNHs without compromising flooding and salinity issues upstream.
- Target key weed species at the bottom of the infestation curve that also occur outside SNHs that are better managed at a catchment or ecological district level than at a site level.
- Identify opportunities to prevent vehicle access to saltmarsh SNHs where damage is occurring, and close such access points with barriers.
- Explore the feasibility of reinstating a measure of tidal ingress into a large area of tidally isolated saltmarsh ribbonwood at the mouth of the Motueka River as a means of restoring the natural ecological processes and controlling weed inundation.

Other sites outside SNHs include:

- Disturbance to shorebirds at the Motueka Sandspit is a serious issue, where improved policing and observance of the dog bylaws would be hugely beneficial for shorebirds that rely on this spit for breeding or roosting.

### 8.3 Existing management initiatives

Quite a number of landowners are engaged with controlling weeds on their SNHs. This is largely old man's beard management, but includes a suite of less threatening weeds. Of these, at least seven QEII landowners are undertaking revegetation and/or weed control work within their forest remnants.

- Faulkner Bush Restoration Society, in conjunction with Tasman District Council, manage this critically important forest remnant, part of which lies within the ecological district. Weed control and revegetation are the key activities.
- The largest alluvial forest remnant in the ecological district, near Wakefield, has been adopted by the Nelson/Tasman Weebusters as one of their sites, with a 'bust' every c8 months.
- Tasman District Council manages a number of its reserves for biodiversity that are SNHs including Hunter Brown Reserve, Pearl Creek (in conjunction with the O'Connor family, Tasman Environmental Trust and DOC), Wai-iti Domain, Faulkner Bush, Robsons Reserve, Edward Baigent Memorial Reserve and Thorp Bush.
- OSNZ members have been trapping mustelids in the wider Waimea River delta area for some years to protect banded rail and fernbird and other saltmarsh species.
- OSNZ have an active Caspian tern banding programme on shellbanks in the Waimea Inlet.
- DOC have two plant introduction programmes underway on SNHs. Coastal peppergrass has been introduced to the upper shores of Bell Island at one location, and grey saltbush has been introduced to a number of saltmarsh sites.



**Divided sedge has the capacity to swamp native saltmarsh vegetation.**

- Narrow-leaved maire has been planted in a number of SNHs to help secure its future in the ecological district, after the now famous initiative by Martin Conway of hanging a pollen-shedding limb in the canopy of a flowering female tree to ensure fruit set.
- Cord grass has been controlled by Tasman District Council almost to the point of eradication within the saltmarshes of the Waimea Inlet.
- Key estuarine weeds are being targeted informally at several SNH sites by Tasman District Council – jellybeans iceplant, divided sedge and black rush before they become widespread.

Other sites outside SNHs include:

- Snowdens Bush Scenic Reserve is of great ecological value and has had an active weed and revegetation programme running for many years by DOC and the local community.
- No Man's Island Wildlife Reserve is managed by DOC and OSNZ members, largely entailing weed and pest control.
- Plant Right Now restoration group focuses on the Waimea Inlet, where restoration programmes are underway at Bell Island and Stringer saltmarsh, with further areas awaiting successful funding.
- Mapua Wetland/Tane's Ark has been created by the Mapua community on the privately-owned land of David Mitchell and the Beere family and on the adjoining Aranui Park entailing extensive wetland plantings.
- Private gravel extraction along the margins of the Waimea and Motueka Rivers has resulted in a number of gravel-pits that have been, or are being, contoured and revegetated to form native wetlands on both public bermlands and private land.
- A section of the coast at the Raumanuka/Kumeras area has been planted up with coastal vegetation largely by the local branch of Forest and Bird, but also by DOC and Tasman District Council.
- Rabbit Island foreshore dunes have been restored to native dune vegetation along over 600m of shoreline by Tasman District Council.

- Rabbit Island Trapping Group traps for rodents, hedgehogs and possums.
- The Nelson Cycle Trails Trust is undertaking locally extensive native plantings along a section of the regional cycletrail where it runs around the eastern Waimea Inlet margins. This follows on from extensive council plantings in some areas of the trail nearer Richmond when this part was opened initially as a walkway. Some of these plantings border estuarine SNHs.

## 8.4 Future opportunities

Within SNHs, future opportunities lie largely with the landowners themselves. Opportunities for outside groups to help with restoration depend on landowner interest but this is likely to be high with such issues as weed and pest control. Landowners themselves could form local groups to work together on one another's forest or wetland areas, where the prospect of working alone is too daunting or uninteresting.

The Waimea Inlet is a special case in that nearly all of the many identified SNHs are within the 'common marine and coastal area', rather than private title. With such high ecological values in an area of rising human pressure, a spatial plan for the Waimea Inlet would be of great value. Most future opportunities outside SNHs can be anticipated to lie on Council-administered lands and public conservation land. However, most initiatives are likely to lie with the community and supported by these bodies rather than them undertaking the work themselves. These include the following areas outside SNHs.

- Bermlands of the Waimea River have been designated the 'Waimea River Park' and cover almost 400 ha between Brightwater and the Waimea Inlet on both banks. The opportunities for riparian restoration and management for wildlife of this Council-administered area are enormous.
- Dune restoration of the Rabbit Island foreshore could potentially be extended for several kilometres if resources and enthusiasm allowed.
- Neiman Creek Esplanade Reserve is DOC-administered, but there has been no management to date beside the highly significant lower Neiman Creek wetland/saltmarsh.

# 9. Protection of Significant Native Habitats

## 9.1 Existing protection

Significant Native Habitats within the Motueka Ecological District represent 70.5% of remaining forest and treeland, 100% of remaining freshwater wetlands and nearly 93% of saltmarsh. Such high levels reflect the paucity of remaining vegetation, so that nearly all areas warrant SNH status, and because the total area of land to which access was denied was small. The figure for forest would have been much higher were it not for Snowdens Bush being a Department of Conservation (DOC) reserve and therefore falling outside the survey scope. The level of protected area of forest and treeland SNHs is moderate, but very low for freshwater wetlands and zero for saltmarsh (being almost entirely 'common marine and coastal area'), see Table 3.

**Table 3:** Proportion of vegetation and habitat SNHs; Proportion of SNHs protected

Ecosystem	Remaining Area (ha)	Area SNH (ha)	% Remaining Area as SNH <sup>1</sup>	Area SNH Protected (ha) <sup>2</sup>	% SNH Area Protected
Forest/treeland	56.7	42.5	75%	23.3	54.8%
– including swamp forest	1.2	1.2	100%	1.2	100%
Freshwater Wetland <sup>3</sup>	5	5	100%	0.5	10%
Sandspit, sandfield	?	?	?	?	?
Saltmarsh <sup>4</sup>	200 (approx)	186.6	93% (approx)	0	0%
Faunal Habitat excl above	?	?	?	?	?

<sup>1</sup> DOC-administered land falls outside SNHs.

<sup>2</sup> See Section 4.7; includes scenic reserves, wildlife reserves, local purpose and recreational reserves and QEII covenants.

<sup>3</sup> Includes swamp margins of spring-fed creeks.

<sup>4</sup> Excluding glasswort herbfield below upper saltmarsh areas.

## 9.2 Priorities for protection

Only three forest SNHs lie outside the DOC, Tasman District Council or QEII protection. This does, however, include the largest remaining alluvial forest stand in the ecological district. A QEII or DOC conservation covenant would be the most appropriate avenue for protection if the landowners were willing.

In 2005, Tasman District Council gazetted parts of three of its reserves in the ecological district as scenic reserves under the Reserves Act 1977. These are parts of Faulkner Bush, Robsons Reserve and Edward Baigent Memorial Reserve, all in the immediate vicinity of Wakefield. This is to be commended as it gives such areas high legal protection for their biodiversity values. Further areas are administered by Tasman District Council (and one jointly owned with Nelson City Council) that have no reserve status at all or are designated esplanade, local purpose or recreation reserves that would be better designated scenic reserve, at least in part, because of their high ecological values as this affords them greater protection.

The areas are:

- Tasman District Council -owned land of 60.7 ha around the Motueka Sewage Treatment Plant, which includes significant areas of foreshore sandfield and coastal vineland that are deserving of formal protection but that, at the time of writing, have no reserve status (the large saltmarsh at this site has been divested from the Council, see below). If such reservation resulted in increased public access to this rarely visited area, however, the designation will have failed in its objective, as shy shorebirds that are highly prone to disturbance nest in this area.
- 'Rough Island wetland' lies within Plantation Reserve on Rough Island, which is managed by PF Olsen on behalf of Tasman District Council for commercial forestry. It is of such uniqueness in the ecological district and region that formal reservation, for example, as a scenic reserve would be appropriate. It is arguably the most important unprotected site in the Motueka Ecological District.
- Hunter Brown Reserve, a lowland totara forest remnant on the barrier islands, is unique in the ecological district and ecological region for existing on coastal deposits,



**Title to council-owned seabed has been extinguished under the Marine and Coastal Area Act (2011) which includes this large area at the Motueka Delta.**

and it is deserving of a higher level of reservation – as a scenic reserve. At the time of writing, it falls within a larger recreational reserve.

- Nelson Harbour Board Endowment Land at the Waimea River delta comprises nearly 13 ha of the most important saltmarsh complex in the ecological district. It has no formal protection status. This area appears, however, to fall under the definition of the 'common marine and coastal area' as defined in the Marine and Coastal Area (Takutai Moana) Act 2011, which states that 'the Crown and every local authority are divested of every title as owner, whether under any enactment or otherwise, of any part of the common marine and coastal area'. Its upper limit is the line of mean high-water springs, which would in theory include all saltmarsh areas including saltmarsh ribbonwood scrub.
- Bell Island is administered by the Nelson Regional Sewerage Business Unit, jointly owned by Nelson City Council and Tasman District Council. It includes the best example of coastal manuka scrub in the ecological district and ecological region and is deserving of formal protection. At the time of writing, it has no reserve status at all.



# 10. Biodiversity Monitoring



## 10.1 Future monitoring

Monitoring of Significant Native Habitats will be important for measuring and recording changes in indigenous biodiversity in the Motueka Ecological District and for assessing the effectiveness of management activities and Tasman District Council policies. Monitoring of selected SNHs is needed but will depend on resources and the primary requirements of the Native Habitat Tasman survey.

Landcare Research NZ Ltd is contracted to undertake a comprehensive review of monitoring for regional councils and unitary authorities and has identified a substantial number of measures. This would allow consistent national

reporting by linking with the measures now being used by the Department of Conservation (DOC). It is possible that landowners could undertake some measures of assessment, but training would be needed and independent auditing to maintain consistency. Ideally, to achieve consistency, monitoring would be done by a small team with participation by landowners.



**Future monitoring of selected significant native habitats is part of council responsibilities.**

# 11. References and Further Reading

## 11.1 References

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# **12.** Appendix 1: Names of Species Cited

## 12. Names of Species Cited

### Flora

#### Trees Shrubs

Common name	Species name
a native broom species	<i>Carmichaelia australis</i>
a small leaved coprosma species	<i>Coprosma obconica</i>
a small leaved coprosma species	<i>Coprosma rigida</i>
black beech/tawhairauriki	<i>Nothofagus solandri</i>
common coprosma	<i>Coprosma propinqua</i>
fivefinger/whauwhaupaku	<i>Pseudopanax arboreus</i>
green mistletoe	<i>Ileostylus micrantha</i>
hinau	<i>Elaeocarpus dentatus</i>
hybrid coprosma	<i>Coprosma propinqua x robusta</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kaikomako	<i>Pennantia corymbosa</i>
kanuka	<i>Kunzea ericoides</i>
karamu	<i>Coprosma robusta</i>
kohuhu	<i>Pittosporum tenuifolium</i>
South Island kowhai	<i>Sophora microphylla</i>
lancewood/horoeka	<i>Pseudopanax crassifolius</i>
lowland totara	<i>Podocarpus totara</i>
mahoe/whiteywood	<i>Melicytus ramiflorus</i>
manatu/lowland ribbonwood	<i>Plagianthus regius</i>
manuka	<i>Leptospermum scoparium</i>
mapou/red matipo	<i>Myrsine australis</i>
matai	<i>Prumnopitys taxifolia</i>
mingimingi	<i>Leucopogon fasciculatus</i>
miro	<i>Prumnopitys ferruginea</i>
narrow-leaved maire	<i>Nestegis montana</i>
narrow-leaved lacebark/ n-l houhere	<i>Hoheria angustifolia</i>

native germander	<i>Teucrium parvifolium</i>
ngaio	<i>Myoporum laetum</i>
poataniwha	<i>Melicope simplex</i>
pokaka	<i>Elaeocarpus hookerianus</i>
pukatea	<i>Laurelia novae-zelandiae</i>
putaputaweta	<i>Carpodetus serratus</i>
rimu	<i>Dacrydium cupressinum</i>
rohutu/New Zealand myrtle	<i>Lophomyrtus obcordata</i>
round-leaved coprosma	<i>Coprosma rotundifolia</i>
saltmarsh ribbonwood	<i>Plagianthus divaricatus</i>
scarlet mistletoe	<i>Peraxilla colensoi</i>
silver beech/tawhai	<i>Nothofagus menziesii</i>
swamp coprosma	<i>Coprosma tenuicaulis</i>
swamp mahoe	<i>Melicytus micranthus</i>
tarata/lemonwood	<i>Pittosporum eugenioides</i>
tawa	<i>Beilschmiedia tawa</i>
thin-leaved coprosma	<i>Coprosma areolata</i>
ti kouka/cabbage tree	<i>Cordyline australis</i>
titoki	<i>Alectryon excelsus</i>
turepo/small leaved milk tree	<i>Streblus heterophyllus</i>
weeping matipo	<i>Myrsine divaricata</i>
white maire	<i>Nestegis lanceolata</i>
white mistletoe/pirita	<i>Tupeia antarctica</i>
yellow mistletoe	<i>Alepis flavida</i>

## Lianes

Common name	Species name
native jasmine	<i>Parsonsia heterophylla</i>
native passionfruit	<i>Passiflora tetrandra</i>
pohuehue/meuhlenbeckia/blackvine	<i>Muehlenbeckia australis</i>
scrambling pohuehue	<i>Muehlenbeckia complexa</i>
supplejack/kareao	<i>Ripogonum scandens</i>
white rata vine	<i>Metrosideros diffusa</i>



**Dicot herbs**

<b>Common Name</b>	<b>Species name</b>
a native buttercup (species undetermined)	<i>Ranunculus amphitrichus/glabrifolius</i>
a pennywort species	<i>Hydrocotyle elongata</i>
a pennywort species	<i>Hydrocotyle heteromeria</i>
bachelor's buttons	<i>Cotula coronopifolia</i>
glasswort	<i>Sarcocornia quinquefolia</i>
marsh arrowgrass	<i>Triglochin striata</i>
native iceplant	<i>Dysphyma australe</i>
native musk	<i>Mimulus repens</i>
New Zealand bittercress; panapana	<i>Cardamine debilis agg</i>
New Zealand spinach	<i>Tetragonia tetragonoides</i>
parani ( a native daisy)	<i>Lagenifera strangulata</i>
remuremu	<i>Selliera radicans</i>
saltbush	<i>Atriplex cinerea</i>
sea blite	<i>Suaeda novae-zelandiae</i>
sea primrose	<i>Samolus repens</i>
shore bindweed	<i>Calystegia soldanella</i>
shore cotula	<i>Leptinella dioica</i>
shore lobelia	<i>Lobelia anceps</i>
	<i>Atriplex buechananii</i>
	<i>Australina pusilla</i>

**Monocot herbs**

<b>Common name</b>	<b>Species name</b>
a perching orchid species	<i>Earina autumnalis</i>
a perching orchid species	<i>Earina mucronata</i>
ground lily	<i>Astelia fragrans</i>
inkberry	<i>Dianella nigra</i>
native iris	<i>Libertia ixioides</i>
harakeke, swamp flax	<i>Phormium tenax</i>
raupo	<i>Typha australis</i>

## Grasses sedges rushes

Common Name	Species name
a clubrush species	<i>Isolepis prolifer</i>
a grass species	<i>Microlaena stipoides</i>
a grass species	<i>Zoysia minima</i>
a hook grass species	<i>Uncinia leptostachya</i>
a hookgrass species	<i>Uncinia scabra</i>
a hookgrass species	<i>Uncinia uncinata</i>
a rush species	<i>Juncus australis</i>
a rush species	<i>Juncus pallidus</i>
a sedge species	<i>Carex dissita</i>
a sedge species	<i>Carex fascicularis</i>
a sedge species	<i>Carex forsteri</i>
a sedge species	<i>Carex lambertiana</i>
a sedge species	<i>Carex maorica</i>
a sedge species	<i>Carex raoulii/testacea</i>
a sedge species	<i>Carex solandri</i>
bootstrap sedge	<i>Carex flagellifera</i>
common spike rush	<i>Eleocharis acuta</i>
estuary sedge	<i>Carex litorosa</i>
estuary tussock	<i>Austrostipa stipoides</i>
grassland sedge	<i>Carex breviculmis</i>
jointed twig sedge	<i>Baumea articulata</i>
knobby clubrush, wiwi	<i>Ficinia nodosa</i>
lake clubrush, kapungawha	<i>Schoenoplectus tabernaemontani</i>
oioi	<i>Apodasmia similis</i>
pingao	<i>Desmoschoenus spiralis</i>
pukio	<i>Carex virgata</i>
purei	<i>Carex secta</i>
purua grass	<i>Bolboschoenus caldwellii</i>
rautahi	<i>Carex geminata</i>
sand sedge	<i>Carex pumila</i>
sea rush	<i>Juncus kraussii</i>
silver tussock	<i>Poa cita</i>
slender clubrush	<i>Isolepis cernua</i>
spinifex	<i>Spinifex sericeus</i>
three square	<i>Schoenoplectus pungens</i>
toetoe	<i>Cortaderia richardii</i>

## Ferns

Common Name	Species Name
bracken	<i>Pteridium esculentum</i>
button fern	<i>Pellaea rotundifolia</i>
common hypolepis	<i>Hypolepis ambigua</i>
hanging spleenwort	<i>Asplenium flaccidum</i>
hen and chickens fern	<i>Asplenium bulbiferum</i>
Hooker's spleenwort	<i>Asplenium hookerianum</i>
hound's tongue fern	<i>Microsorium pustulatum</i>
leather-leaf fern	<i>Pyrrosia eleagnifolia</i>
lowland shield fern	<i>Polystichum neozelandicum</i>
necklace fern	<i>Asplenium flabellifolium</i>
ponga, silver fern	<i>Cyathea dealbata</i>
swamp kiokio	<i>Blechnum minus</i>
water fern	<i>Histiopteris incisa</i>
	<i>Lastreopsis glabella</i>
	<i>Diplazium australe</i>

## Pest plants

Common Name	Species Name
African clubmoss	<i>Selaginella krausii</i>
bamboo rice grass	<i>Microlaena polynoda</i>
banana passionfruit (species undetermined)	<i>Passiflora mixta/mollissima</i>
Bathurst bur	<i>Xanthium spinosum</i>
bindweed	<i>Calystegia silvatica</i>
boneseed	<i>Chrysanthemoides monilifera</i>
boxthorn	<i>Lycium ferocissimum</i>
buck's horn plantain	<i>Plantago coronopus</i>
cathedral bells	<i>Cobaea scandens</i>
chocolate vine	<i>Akebia quinata</i>
climbing spindleberry	<i>Celastrus orbiculatus</i>
cocksfoot grass	<i>Dactylis glomerata</i>
cord grass	<i>Spartina anglica</i>
creeping bent	<i>Agrostis stolonifera</i>
divided sedge	<i>Carex divisa</i>
egeria	<i>Egeria densa</i>
gorse	<i>Ulex europaeus</i>
hornwort	<i>Ceratophyllum demersum</i>
iceplant, hottentot fig	<i>Carpobrotus edulis</i>
ivy	<i>Hedera helix</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
jellybeans iceplant	<i>Disphyma clavellatum</i>
lesser spearwort	<i>Ranunculus flammula</i>
madeira vine	<i>Anredera cordifolia</i>
narrow-leaved dock	<i>Rumex crispus</i>
old man's beard	<i>Clematis vitalba</i>
oval sedge	<i>Carex ovalis</i>
purple loosestrife	<i>Lythrum salicaria</i>
saffron thistle	<i>Carthamus lanatus</i>
saltmeadow rush	<i>Juncus gerardii</i>
senegal tea	<i>Gymnocoronis spilanthoides</i>
sycamore	<i>Acer pseudoplatanus</i>
tall fescue	<i>Schedonorus phoenix</i>
variegated thistle	<i>Silybum marianum</i>
wall lettuce	<i>Mycelus muralis</i>
wandering willy	<i>Tradescantia flumenensis</i>
watercress	<i>Rorippa nasturtium-aquaticum</i>
water speedwell	<i>Veronica anagallis-aquatica</i>
water starwort	<i>Callitriche stagnalis</i>
white-edged nightshade	<i>Solanum marginatum</i>
yew	<i>Taxus buccata</i>

## Fauna

### Birds

Common Name	Species Name
Australasian bittern/matuku	<i>Botaurus poiciloptilus</i>
banded dotterel/tuturiwhatu	<i>Charadrius bicinctus bicinctus</i>
banded rail/pereru	<i>Rallus philippensis assimilis</i>
bellbird/korimako	<i>Anthornis melanura melanura</i>
black shag/kawau	<i>Phalacrocorax carbo</i>
black-fronted tern/tarapiroe	<i>Sterna albostrata</i>
brown creeper/pipipi	<i>Mohoua novaeseelandiae</i>
Caspian tern/taranui	<i>Sterna caspia</i>
eastern bar-tailed godwit/kuaka	<i>Limosa lapponica</i>
grey teal/tete	<i>Anas gracilis</i>
grey warbler/riroriro	<i>Gerygone igata</i>
kakariki/parakeet spp.	<i>Cyanoramphus spp.</i>
kingfisher/kotare	<i>Halcyon sancta</i>
little shag/kawaupaka	<i>Phalacrocorax melanoleucos brevirostris</i>
long-tailed cuckoo/koekoea	<i>Eudynamis taitensis</i>
marsh crake/kiotareke/kareke	<i>Porzana pusilla assimilis</i>
morepork/ruru	<i>Ninox novaeseelandiae</i>
New Zealand falcon/karearea	<i>Falco novaeseelandiae</i>
New Zealand pigeon/kereru	<i>Hemiphaga novaeseelandiae</i>
New Zealand shoveler/kuruwhengi	<i>Anas rhynchos variegatus</i>
paradise shelduck/putangitangi	<i>Tadorna variegata</i>
pied shag/karuhiruhi	<i>Phalacrocorax varius</i>
pied stilt/poaka	<i>Himantopus himantopus</i>
pukeko	<i>Porphyrio porphyrio</i>
red knot/hauhou	<i>Calidris canutus</i>
red-billed gull/tarapunga	<i>Larus novaehollandiae</i>
ruddy turnstone	<i>Arenaria interpres</i>
shining cuckoo/pipiwharaua	<i>Chrysococcyx lucidas</i>
South Island fantail/piwakawaka	<i>Rhipidura fuliginosa fuliginosa</i>

South Island fernbird/matata	<i>Bowdleria punctata punctata</i>
South Island kaka	<i>Nestor meridionalis meridionalis</i>
South Island pied oystercatcher/torea	<i>Haematopus ostralegus</i>
South Island robin/toutouwai	<i>Petroica australis australis</i>
South Island tomtit/miromiro	<i>Petroica macrocephala macrocephala</i>
southern black-backed gull/karoro	<i>Larus dominicanus dominicanus</i>
royal spoonbill/kotuku-ngutupapa	<i>Platalea regia</i>
spotless crane/puweto	<i>Porzana tabuensis</i>
tui	<i>Prothemadera novaeseelandiae novaeseelandiae</i>
variable oystercatcher/torea-pango	<i>Haematopus ostralegus</i>
waxeye/tauhou	<i>Zosterops lateralis</i>
weka	<i>Gallirallus australis</i>
white-faced heron/matuku-moana	<i>Ardea novaehollandiae novaehollandiae</i>
white-fronted tern/tara	<i>Sterna striata</i>
wrybill/ngutuparore	<i>Anarchynchus frontali</i>

### Mammals

Common Name	Species Name
fur seal/kekeno	<i>Arctocephalus forsteri</i>
native bat/pekapeka species	<i>Chalinolobus tuberculatus</i> (long-tailed bat) and <i>Mystacina tuberculata</i> (lesser short-tailed bat)

### Lizards

Common Name	Species Name
common skink	<i>Oligosoma nigriplantare polychroma</i>

## Fish & Aquatic Invertebrates

Common Name	Species Name
banded kokopu	<i>Galaxias fasciatus</i>
common bully	<i>Gobiomorphus cotidianus</i>
dwarf galaxias	<i>Galaxias divergens</i>
giant kokopu	<i>Galaxias argenteus</i>
inanga	<i>Galaxias maculatus</i>
koura	<i>Paranephrops planifrons</i>
lamprey	<i>Geotria australis</i>
redfin bully	<i>Gobiomorphus huttoni</i>
torrentfish	<i>Cheimarrichthys fosteri</i>
tuna/longfin eel	<i>Anguilla dieffenbachii</i>
tuna/shortfin eel	<i>Anguilla australis</i>
upland bully	<i>Gobiomorphus breviceps</i>

## Pest Animals

Common Name	Species Name
brown rat	<i>Rattus norvegicus</i>
brown hare	<i>Lepus europaeus</i>
brush-tailed possum	<i>Trichosurus vulpecula</i>
fallow deer	<i>Dama dama</i>
feral cat	<i>Felis domesticus</i>
feral goat	<i>Capra hircus</i>
feral pig	<i>Sus scrofa</i>
ferret	<i>Mustela putorius furo</i>
common wasp	<i>Vespula vulgaris</i>
hedgehog	<i>Erinaceus europaeus</i>
house mouse	<i>Mus musculus</i>
koi carp	<i>Cyprinus carpio</i>
mosquito fish	<i>Gambusia affinis</i>
rabbit (European)	<i>Oryctolagus cuniculus</i>
red deer	<i>Cervus elaphus</i>
rudd	<i>Scardinius erythrophthalmus</i>
ship rat	<i>Rattus rattus</i>
stoat	<i>Mustela erminea</i>
tench	<i>Tinca tinca</i>
weasel	<i>Mustela nivalis</i>

*Feel free to contact us:*



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