tasman district council

Native Habitats Tasman

ECOLOGICAL DISTRICT REPORT 02A

BIODIVERSITY VALUES OF SIGNIFICANT NATIVE HABITATS

Moutere Ecological District – Northern Sector

ECOLOGICAL DISTRICT REPORTS
BIODIVERSITY VALUES OF SIGNIFICANT NATIVE HABITATS

Report **02A:** Moutere Ecological District – Northern Sector

December 2015

This report presents the results of ecological surveys undertaken in the Moutere 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 the 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.

Report prepared by: Michael North, ecologist
Report reviewed by: Martin Heine
Report approved for release by: Rob Smith, Environmental Information Manager, Tasman District Council
Front Cover Image: John Gully, *Wangapeka Valley* 1886, watercolour on paper 482 x 756 mm, collection of The Suter Art Gallery Te Aratoi o Whakatū: presented by Mrs J.H. Cock in 1922

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Michael North
Todd Bush Rd
RD1 Nelson
totara@ts.co.nz

Lindsay Vaughan
Tasman District Council
Private Bag 5
Richmond
lindsay.vaughan@tasman.govt.nz

Executive Summary

The northern sector of the Moutere Ecological District from the Stanley Brook catchment northward, covering 73,910 ha (55.5 % of the ecological district), was surveyed by Tasman District Council between October 2008 and May 2012 for sites of ecological value. Several additional sites have since been surveyed as opportunities have arisen. 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' (SNHs). The survey covered private and council lands, but excluded Department of Conservation (DOC) – administered public conservation land. Landowner participation in the survey was by voluntary consent.

The survey of the Moutere Ecological District is far from finished. This report of the northern half is published at this time because survey completion of the ecological district is some years away and there is a need to have the survey information gathered to date to be available in this form. The delineation of a northern and southern sector only reflects survey progress to date

74% of landowners approached agreed to participate in the project. A total of 211 sites were identified as SNHs, including sites on council land and in the coastal margins of the 'common marine and coastal area'.

Significant Native Habitats cover 951 ha of indigenous forest and treeland, 30 ha of upper saltmarsh and 48 ha of freshwater wetland. These areas constitute 43% of remaining forest and/or treeland, 85% of remaining upper saltmarsh and 71% of remaining freshwater wetland in the northern sector of 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 39% of the remaining forest is protected (under QEII covenants or Reserves Act 1977 reserves) with nearly 27% of freshwater wetlands and 0% of saltmarsh protected.

The ecological values of SNHs encompass regionally significant valley floor forests, lowland hill-country forests, coastal gully freshwater wetlands and minor saltmarshes. 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. Within the public arena, the Waimea Inlet section of the ecological district offers a number of opportunities around the upper 'common marine area' for saltmarsh restoration running back into coastal forest.

Acknowledgements

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

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, Department of Conservation 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, Mike Harding has provided strategic advice and Martin Heine has reviewed the report.

Contents

1. Introduction

This report provides an ecological summary of the Significant Native Habitats (SNHs) within the northern half of the Moutere 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 (TDC) 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.

2.3 Why an ecological district report?

Ecological district summary reports provide an overview of the values of Significant Native Habitats (SNHs) 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.
- Walls, G. (1985) Native Bush Remnants of the Moutere Gravels, Nelson.
- 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.

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.

Walls (1985) surveyed the indigenous forest remnants of the Moutere Gravels north of the Buller River and scored them for relative ecological value.

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.

Vast areas of Moutere Depression hillsides were originally burnt for farming but now support an exotic forestry industry with many embedded indigenous forest remnants

3. Survey and Assessment Method

3.1 Identification of potential Significant Natural 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.

Longfin eel and other native fish were not surveyed, as streams and rivers fall outside of the programme's scope

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, organised by Trevor James, resource scientist at Tasman District Council.

3.2 Landowner contact

Initial contact with owners of potential Significant Native Habitat 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.

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 northern half of the Moutere Ecological District ran from October 2008 to May 2012, concurrent with the survey of the Motueka Ecological District. Occasional additional sites have subsequently been surveyed where the opportunity has arisen.

4. Ecological District Description

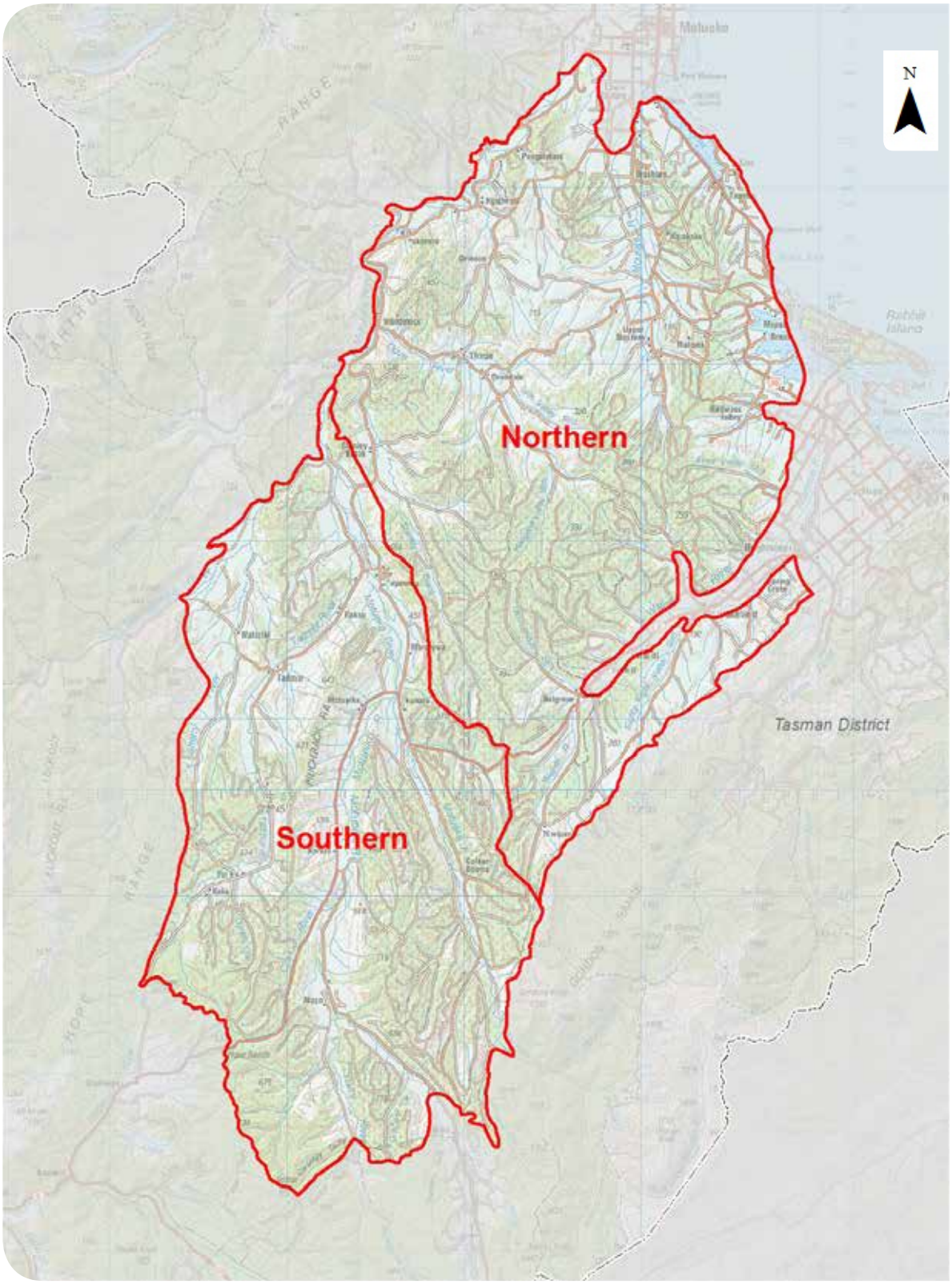
4.1 Location

The Moutere Ecological District occupies 133,174 ha, extending from the margins of Tasman Bay in the north to the margins of the Buller River catchment in the south that includes the highest point of Big Bush (Figure 1). It is bound to the west by the North-West Nelson Ranges, and to the east by the Waimea/Wai-iti valley floor. It is broadly oblong in shape, running some 60 km north/south and variably 20-30 km east/west.

The northern sector, to which this survey relates, encompasses 73,910 ha (55.5 % of the ecological district). It extends from the Stanley Brook catchment northward including the valleys of the Dove, Waiwhero, Orinoco and Moutere Rivers, as well as the coastal slopes of Tasman Bay between the Motueka and Waimea plains. The area also extends westward to include the Motueka River flats from the Stanley Brook confluence as far north as the edge of the delta plain, as well as the western slopes of the Waimea/Wai-iti catchment north of Spooner Saddle and the valley floors south of Belgrove. The division of the ecological district into a northern and southern sector simply reflects survey progress to date, and has no other significance.

This ecological district falls within the wider Nelson Ecological Region, in common with the Motueka, Bryant and Red Hills Ecological Districts.

The lower Motueka Valley forms much of the western boundary to the Moutere Ecological District



Moutere Ecological District with the northern sector indicating the area of survey completion to date

Figure 1: Moutere Ecological District

4.2 Geology and landform

(ref. Rattenbury et. al., 1998; Basher, 2003)

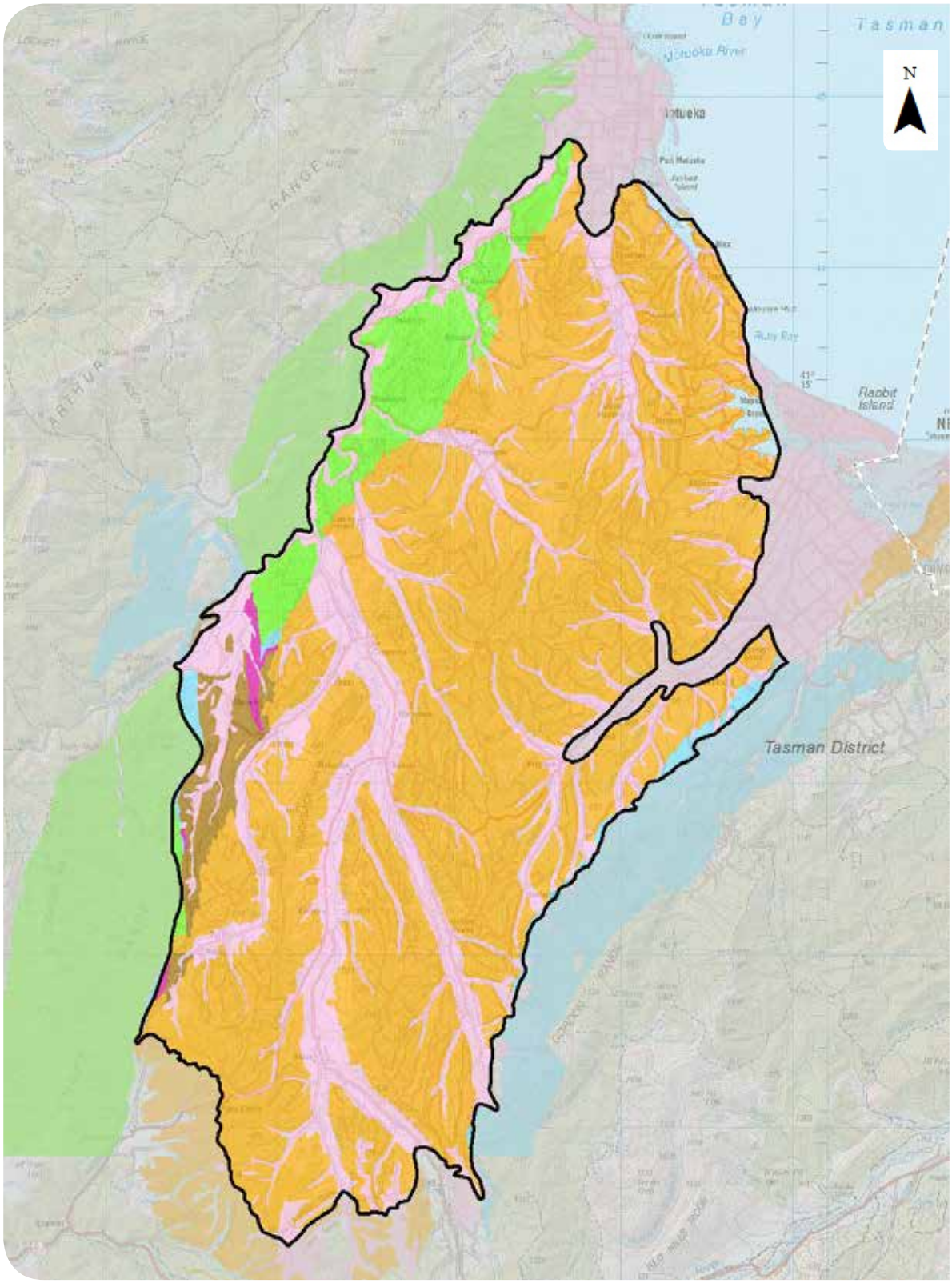
The northern sector of the Moutere Ecological District is overwhelmingly defined by the Moutere Gravels that as a landform is known as the Moutere Depression (Figure 2). This is geologically very recent, dating from the late Pliocene and early Pleistocene some 1-2 million years ago. The Gravels comprise an extensive area of uniform yellow-brown, clay-bound gravel, with deeply weathered clasts almost entirely of Torlesse (greywacke) derived sandstone and semi-schist. Deposits up to 700 m deep are present. This was formed by a flood of fluvio-glacial outwash gravel that extended west and northwest as a result of rapid uplift of the Southern Alps and Spencer Mountains. Linear valleys and ridges with regularly-spaced tributaries typify the Moutere Depression.

Alluvial gravels of late Quaternary age form the terraces and floodplains of all the major valleys. A series of aggradation surfaces up to 100 m above current river levels and dating back several hundred thousand years are present in the more inland valleys.

The western flanks of the northern sector of the district that rise above the Motueka River, comprise Cretaceous Separation Point Suite granite – of equigranular hornblende-biotite, granodiorite and diorite, and of equigranular biotite-granite, depending on location.

Soils of the floodplains and low terraces are formed from recent alluvium, with fertility ranging from moderate to low. These are originally well drained except for the northern-most end of the district where extensive swamps were present prior to draining. Soils of intermediate and high terraces are formed from older alluvium, now leached and of moderately-low to low fertility. Those of the hill-slopes on both the gravels and the granites are generally of low fertility. They are well drained on the granites, but many soils on the gravels have slow sub-soil drainage.

Fossilized tree trunk embedded within Moutere Gravels exposed along the Kina coast cliffs



Legend

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

Figure 2: Moutere Ecological District – QMap geology

4.3 Altitude and climate

(ref McEwan, 1987; Basher, 2003)

The northern sector of the ecological district ranges from sea-level in the north to 582 m above sea level in the south-east. The climate tends to be sunny and mild. It features very warm summers, and mild winters that are cooler inland with valley floors frost-prone. The district is reasonably sheltered by the surrounding mountain ranges to the west, south and east. Mean annual rainfall spans from 900 mm to 2250 mm, with nearly all areas within the 900 mm to 1500 mm range. The driest section runs in a central band from the coastline southward to Dovedale (Figure 3). Occasional snowfalls occur inland.

4.4 Original indigenous ecosystems

Forests are believed to have originally dominated much of the northern sector of the ecological district, with areas of swamp particularly in the Moutere River catchment, and as estuarine wetlands grading into coastal saltmarsh. A scrub or low forest margin is likely to have otherwise occurred along the littoral margin.

Hill-slopes are the dominant landform and were originally almost entirely clad in beech-dominated forest. Broadly speaking, dominant species transitioned from black beech and hard beech nearer the coast to hard beech inland, with silver and red beech locally dominant toward the southern margins of the northern sector. Silver beech was a minor component in near-coastal areas, with an increasing presence inland. Rimu was scattered commonly throughout, with lower slopes nearer valley floors also supporting an appreciable amount of matai and lowland totara. Gullies commonly held kahikatea.

Forest cover in the valley floors was dominated by podocarps with beech increasingly common inland and locally dominant. In general terms, lowland totara, matai, rimu and more locally kahikatea dominated, particularly on more recent surfaces, with black beech common and silver beech common in the south, particularly on more elevated depleted terraces. Other canopy/sub-canopy species included red beech inland, and hardwoods such as South Island kowhai, manatu/lowland ribbonwood, narrow-leaved lacebark, pokaka, tarata/lemonwood and hinau, and in the north-east corner, tawa. Pukatea may also have featured in more coastal areas. The extent of original kahikatea-dominated swamp forest or wet forest is unknown, but significant areas are likely to have occurred. Much of the alluvial forest however is likely to have been a moist to dry matai-lowland totara-black beech assemblage with rimu at least locally common.

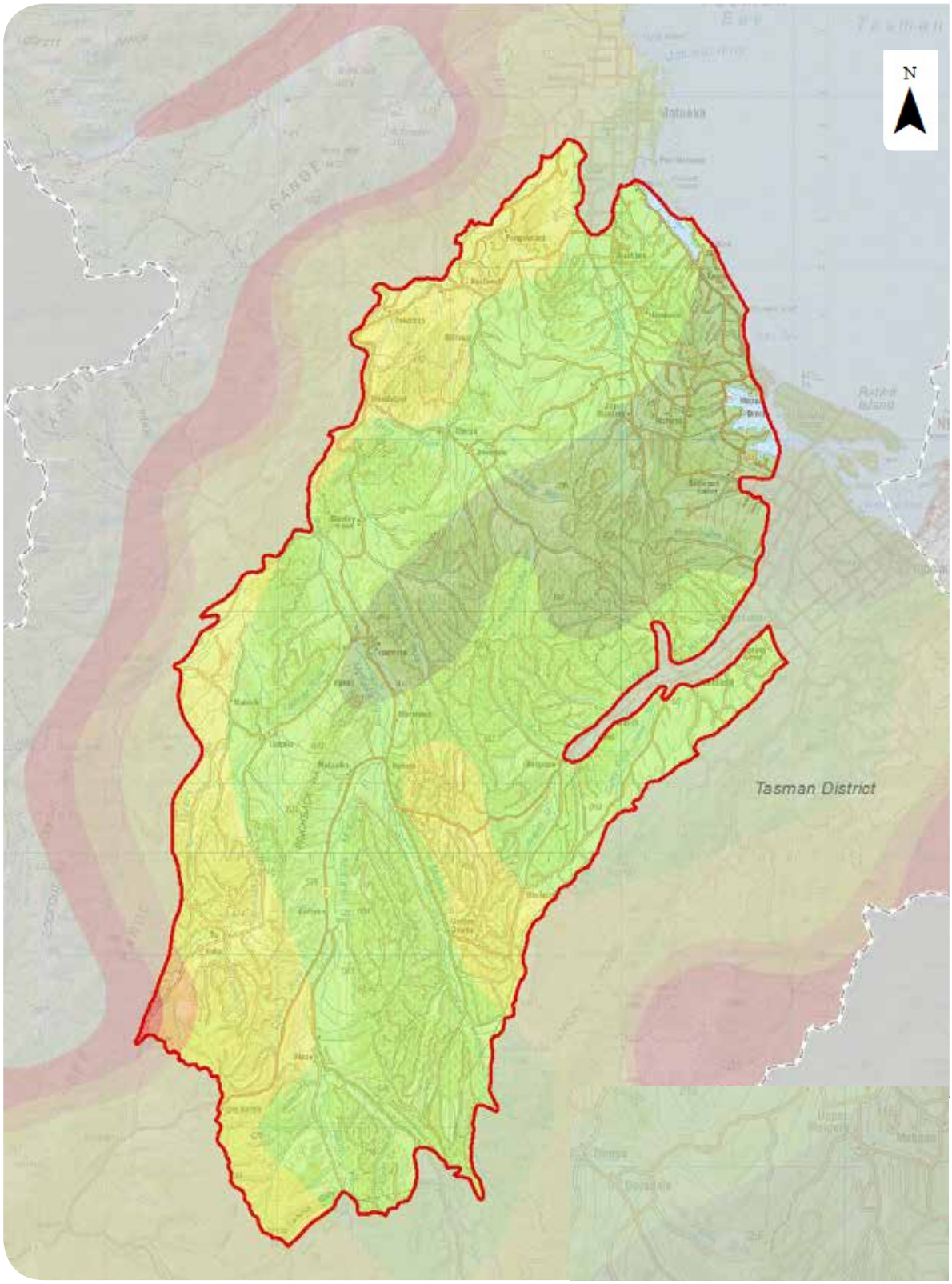
The extent of valley floor swamp is likely to have been relatively small other than in the Moutere River catchment and the smaller coastal catchments such as the Tasman Stream (where there is historic documentation alluding to this). The placenames of Flaxmore and Harakeke in the Moutere Valley are also indicative (there is a reference to a 19th century flaxmill on the Moutere Highway near Gardner Valley Rd in The Colonist (Volume LV, Issue 13698, 14 April 1913).

Harakeke, raupo, and purei/*Carex secta* would have dominated freshwater wetlands, with ti kouka, manuka and kahikatea probably common in places, the latter forming locally extensive swamp forest.

Saltmarshes of the southern Moutere Inlet and northern Waimea Inlet (the areas that fall within the ecological district) were characterised 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, *Coprosma propinqua* and ngaio, and with saltmarsh ribbonwood extensive at the head of saltmarshes.

The larger rivers, particularly the lower Motueka River 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 successionary 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 diversity unimaginable today. The geology and landform precludes the preservation of sub-fossil faunal remains from which to glimpse these past vertebrate assemblages.



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Average Annual Rainfall (mm)

900 – 1050 | 1051 – 1250 | 1251 – 1500 | 1501 – 1750 | 1751 – 2250

Figure 3: Moutere Ecological District – Rainfall

4.5 Present-day ecosystems

It seems likely that at least in broad terms, examples of all of the original ecosystems survive in one form or another but on a much-diminished scale, within the northern sector of the ecological district.

Hill-slope forest

The majority of surviving indigenous forest remnants lie on hill-slopes that are moderately steep. Generally they are dominated by black and hard beech, with silver beech increasingly common south from the true left of the Dove River. Red beech is common in the head of Stanley Brook, the most southerly and most elevated of the surveyed areas of hill-slope forests as well as on slopes above the Motueka River from Ngatimoti southward. Rimu is typically scattered thinly through beech remnants (and no doubt much depleted from selective logging). Mid to lower gullies may support canopy matai and rimu with more occasional miro, kahikatea and lowland totara. Virtually all areas that still support adult podocarps have almost certainly been selectively logged. Only two tracts of very mature hill-slope podocarp forest are known.

Mature secondary forests are not extensive. On occasion they are dominated by podocarps on hill-slopes, with a few sites rich with matai and lowland totara, and rarely, rimu. Secondary mixed broadleaved forest and kanuka forest are scarce, with most kanuka forest occurring in the Orinoco catchment. Such communities are generally confined to small areas.

A typically steep example of hill-slope beech forest, in this instance dominated by red beech, above the Motueka Valley

Alluvial forest and treeland

Most catchments support remnants of alluvial forest. The most coastal alluvial forest occurs within the Moutere River catchment (other than for one or two very minor secondary forest areas nearer the coast). These are all podocarp-dominated with very small sections of beech-rich river terrace. These are largely dominated by lowland totara, with matai typically common to co-dominant. Black beech is scattered and becoming increasingly rare due to dieback and regeneration failure, and kahikatea, where present are dying out in some sites, seemingly due to lowered water tables. Silver beech, pokaka, kowhai, tarata, manatu and narrow-leaved lacebark are all scarce or rare, as is rimu other than at one site.

Black beech becomes increasingly common southward amongst alluvial podocarps- as in the Wai-iti and Dove Valleys and the Motueka Valley. From the southern side of the Dove catchment southward, silver beech becomes common as well. Red beech features amongst alluvial podocarps within the Motueka Valley from Ngatimoti southward, and Stanley Brook.

Beech-dominated alluvial forest is common from the southern (true left) side of the Dove Valley southward but is largely absent north of there. Due to past logging it is not clear to what extent podocarp species originally dominated or were common in such areas, compared to beech species. Surviving Lower Stanley Brook remnants are both of podocarp-dominated and beech-dominated forests.

A few kahikatea-rich stands are present in some valley bottoms, all of which are small. Kahikatea swamp-forest is very rare and in total confined to a fraction of a hectare.

Riparian alluvial forest is rare, with few sites remaining where watercourses run through mature forest.

Secondary kanuka forest and treeland, and mixed broadleaved forest are very rare on alluvium.

Coastal forest

Forest of the coastal fringe is exceedingly rare with very few small secondary remnants existing. These mostly cling to moderate to steep faces, with only tiny areas of coastal

Alluvial podocarp forest remnants are most common in the Moutere River catchment amongst intensive land use

Coastal margin forest is best represented in the ecological district along the Ruby Bay coast

flats supporting forest cover. Titoki is often common to dominant, with black beech and hard beech occasionally or locally present. Ngaio, kanuka and mahoe are otherwise common in the canopy.

Freshwater wetlands

Quite a number of gully swamps are present. Most run off coastal-facing slopes, with the remainder occurring in inland valleys toward catchment heads. Some are dominated by raupo and harakeke. More typically there is a mosaic of communities and species, most notably comprising harakeke, purei, kiokio, swamp coprosma, karamu and manuka. Where fertility is lower, harakeke is depauperate and species diversity is higher.

The few coastal freshwater wetlands are very small and are associated with upper margins of some saltmarshes. These are largely dominated by raupo, harakeke and rautahi, with manuka locally.

Saltmarsh

Saltmarshes are small compared to those in the adjoining Motueka Ecological District. The Moutere Ecological District only includes the upper reaches of the Moutere and Waimea Inlets where they run against the hills. The saltmarshes comprise mosaics of oioi, sea rush and saltmarsh ribbonwood with sea rush by far the most extensive, often forming pure stands. On the seaward side of these are lawns of glasswort.

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 and estuaries below mean high water are outside the scope of the survey).

Several shorebird roost sites are known – around the western sector of the Waimea Inlet (within the ecological district) and along the Ruby Bay shoreline. Most notably,

Nearly all remaining swamps within the northern sector occur within narrow gullies but the largest spans a small valley

Upper saltmarshes are numerous but generally small, with the largest at the mouth of Stringer Creek

these include kuaka/eastern bar-tailed godwit, torea/South Island pied oystercatcher, and kotuku-ngutupapa/royal spoonbill. Exotic conifers offer one breeding site for kawau/black shag and kawaupaka/little shag. Shorebird breeding sites are few and small.

Freshwater fish habitat within the survey's scope (waterways themselves are excluded but not their banks) is confined to breeding sites for inanga. Surveys outside the SNH process have been undertaken in March 2012 and 2013.

Artificial waterbodies are very numerous particularly nearer the coast with a small number holding regionally important numbers of moulting putangitangi/paradise shelduck. Many others support small numbers of breeding or loafing papango/New Zealand scaup, kuruwhengi/New Zealand shoveler, putangitangi/paradise shelduck and tete/grey teal.

Faunal habitat of significance is scarce within the ecological district; this is a black shag colony just inland from the Moutere Inlet

4.6 Extent of ecosystem depletion

Forest

Walls et al (2004) have estimated indigenous ecosystem loss for each of the ecological districts within Tasman District. Within the Moutere Ecological District they show that lowland ecosystem losses have been very high (Table 1). The current survey report does not cover the whole district so figures are not directly comparable. The breakdown of ecosystem types used by Walls and Simpson has not been repeated by this survey in its analysis, with lowland forest considered as either hill-slope or alluvial rather than by broad canopy dominance by podocarp, beech or broadleaves. To calculate forest loss by such categories from the survey data would be extremely onerous and has not been attempted.

Lowland forest loss within the northern sector of the ecological district (Table 2) has been very extensive with 3.0 % remaining, comprising a little over 2200 ha of the original 73,096 ha cover. Alluvial forest loss has been even higher with only 156.7 ha surviving, 1.7 % of the original cover. Most forest was cleared in the late 1800s and early 1900s by European colonists. It is not known to what extent coastal forests had already been lost to Maori land clearance. Losses have continued to the near-present, with one beech forest stand in the survey area having been chipped for export as recently as the late 1980s.

Clearance of forest for farming has been extensive with any remaining unfenced remnants eventually falling into ruin

Table 1: Ecosystem depletion and protection within the entire Moutere Ecological District estimated by Walls and Simpson (2004)

Indigenous Ecosystems – Moutere Ecological District				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remaining
Coastal sand dune and flat	–	–	–	–
Estuarine wetland	<1	30	?	?
Fertile lowland swamp and pond	1	<5	<2	<20
Infertile peat bog	–	–	–	–
Upland tarn	–	–	–	–
Lake	–	–	–	–
River, stream and riparian	1	40	?	?
Lowland podocarp forest	20	1	<1	50
Lowland broadleaved forest	1	<5	<5	100
Lowland mixed forest	5	<5	<5	50
Lowland beech forest	65	5	2	40
Upland beech forest	5	50	40	80
Subalpine forest	–	–	–	–
Lowland shrubland	<1	<5	<1	<10
Upland/subalpine shrubland	–	–	–	–
Frost flat communities	–	–	–	–
Tussock grassland	–	–	–	–
Alpine herbfield and fellfield	–	–	–	–

Freshwater wetlands

Wetlands survived intact until European settlement, with fairly extensive areas originally present. These were probably mostly drained by the early 1900s, but losses are likely to have continued throughout the 20th Century.

In a reference to the coastal slopes and valleys of the Moutere Gravels being converted to apples in the early 1900s, the Colonist [Volume LV, Issue 13698, 14 April 1913] stated,

The swamp lands lying in some of the valleys are at present growing flax luxuriantly, but drainage is a comparatively simple and inexpensive matter owing to the natural formation of the country, and these low places are now being turned into account.

According to Preece (2004) existing freshwater swamps in the whole of the ecological district total 56.6 ha (from aerial image surveys) of an original estimated area of 813.7 ha. Nearly all of this is likely to have been within the northern sector. This current survey of the northern sector identified 64.9 ha.

Saltmarsh

Saltmarshes including saltmarsh ribbonwood scrub (but excluding glasswort beds beyond taller salmarsh vegetation) total around 35 ha with 29.9 ha surveyed. Walls and Simpson estimated 30 % remains of the original extent for the ecological district. Robertson and Stevens (2009) suggest that the loss of saltmarsh area in the Moutere Inlet (largely within the ecological district) since 1947 amounts to 48 % (as interpreted from their graph p 23).

Table 2: Ecosystem depletion and protection in the northern sector of the ecological district

Ecosystem	Original area (ha)	Present area (ha)	Remaining (%)	Protected area (ha)1	Remaining protected1 (%)
Forest	73096.3	2214.5[2]	3.03 %	867.1	39.2%
– Hillslope forest	62997.6	2055.8	3.26 %	783.0	38.1%
– Alluvial forest	9285[3]	158.7	1.70 %	84.1	53.0%
Freshwater wetland	813.7[4]	67.4	8.3 %	18.1	26.9%
Saltmarsh	c100[5]	35[6]	35%	0[7]	0%

[1] includes scenic reserves, stewardship land, local purpose and recreational reserves, Tasman Accord forests, and QEII covenants as at May 2015 (see Section 4.0.7) but precludes all but one Tasman District Council covenant as most are not known to the author and no register is kept

[2] includes dense treeland

[3] assumes c700ha of original wetland was alluvial; area derived using coarsely mapped polygons from 'Top Of The South Maps' internet area calculation facility

[4] Preece (2004)

[5] Simpson & Walls (2004) estimate percentage remaining, from which the original area is calculated above

[6] excluding glasswort herbfield below upper saltmarsh areas

[7] saltmarsh largely falls within the 'common marine and coastal area' thus falling outside the scope of any formal protection measure

4.7 Extent, size and general characteristics of existing protected areas

Scenic and wildlife reserves

Fully protected areas within the northern sector of the ecological district are few. There are three scenic reserves. Eves Valley Scenic Reserve (20.4 ha) protects alluvial podocarp-broadleaved forest and hill-slope black/hard beech forest in a valley off the western margins of the Waimea Plain. Spooner Scenic Reserve (176.1 ha) protects mixed beech forest on hill-slope at the head of the Wai-iti River. McKee Memorial Scenic Reserve (5.9 ha) protects coastal slope titoki-(matai) forest.

QEII and Department of Conservation covenants

QEII registered and approved covenants protect 205.8 ha at 36 sites (QEII supplied figures). Adjusting for areas of native vegetation cover only (where known) this amounts to 170 ha. Of these:

Freshwater wetlands (swamps) total 4.6 ha at 6 sites. These lie mainly on the coastal slopes of the ecological district, but also within the Waiwhero catchment. Forest and scrub total 165.4 ha at 30 sites.

At nearly 450ha Pretty Bridge stewardship land is by far the largest tract of indigenous forest in the northern sector of the ecological district

No Department of Conservation covenants (known as Private Protected Land or PPLs) that protect native vegetation occur within the survey area.

Other reserves

Less securely protected areas are those where important indigenous vegetation or faunal habitat fall within Department of Conservation or Tasman District Council Local Purpose and Recreational Reserves and Department of Conservation Stewardship Land.

Tasman District Council administered

McIndoe Local Purpose Reserve includes 1.1 ha of young secondary broadleaved coastal margin hill-slope forest.

Pine Hill Heights Local Purpose Reserve includes 4.7 ha of titoki-mixed broadleaved forest along coastal gorges and coastal bluffs with cliff-top clusters of black beech.

(Note: Higgs 'Reserve' has yet to be formally reserved and is not listed here.)

Department of Conservation administered

Pretty Bridge stewardship land covers 447.6 ha of hard and black beech hill-slope forest and secondary broadleaved gullies, by far the largest protected area of land within the survey area.

Tasman Accord forests and Crown Forest Licence Covenants

Tasman Accord forests, protected under the Reserves Act total 55.5 ha, all under Nelson Forests Ltd management. These are largely of hill-slope hard and black beech.

There are no Crown Forest Licence Covenants in this area.

Further areas of Tasman District Council administered lands have no formal protection and are discussed in Section 9.2 Priorities for Protection.

4.8 Land Environments present within the Moutere Ecological District (and threat status)

Six of the 20 LENZ Level 1 environments that occur nationally are present within the northern sector of the Moutere Ecological District. Three of these dominate the north, central/western and southern parts of the northern sector the district- 'Central Dry Lowlands', 'Central Dry Foothills' and 'Central Mountains' (Figure 4). The mid to lower reaches of the valleys are occupied by 'Central Well-Drained Recent Soils' and the upper reaches by 'Central Upland Recent Soils'. The 'Central Hill Country and Volcanic Plateau' environment has a very minor presence near the western margins of the survey area.

The LENZ Technical Handbook (Leathwick et. al., 2002) describes these as follows:

Central Dry Lowlands (Environment B)

Environment B consists of dry hill-country and older alluvial soils in central New Zealand, mostly atlow elevations. It is most extensive in the east, extending from Gisborne and Hawke's Bay in the north 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 northwest by the volcanic cones of Taranaki and to a smaller extent the mountains of north-west Nelson. The terrain is generally flat to moderately sloping, with soils of low to moderate natural fertility formed on loess, alluvium, greywacke, sandstone, mudstone orlimestone.

Central Dry Foothills (Environment E)

Environment E consists of dry foothills and basin floors at mid-elevations in the eastern parts of both main islands, with the largest areas occurring in the South Island. It is most extensive in inland parts of Canterbury and Marlborough, with smaller areas in Tasman Bay. In the North Island it occurs only in inland Hawke's Bay. Environment E has a cool climate with high annual solar radiation and low average annual water deficit but high October vapour pressure deficits. The latter reflects its protection from prevailing westerly winds by mountain ranges – the Southern Alps, Kaikoura Ranges, and the mountains of northwest Nelson in the South Island, and the Tongariro volcanoes and Kaimanawa and Kaweka Ranges in the North Island. Slopes are generally rolling to moderate. Sedimentary rocks are the predominant soil parent material, with greywacke the most widespread followed by schist and softer Tertiary rocks. Gravels and/or loess from greywacke are widespread in Canterbury and Nelson, and andesitic tephra occurs in Hawke's Bay. Soils are generally well drained and of moderate natural fertility.

Central Mountains (Environment P)

Environment P is one of the most extensive and widely occurring Level I land environment, including the mountains of the central and southern North Island and the northern and eastern South Island. The climate of Environment P reflects both its high elevation and, in the south, its partial sheltering from prevailing southwesterly winds by the Southern Alps. Temperatures are cold, with high annual and moderate winter solar radiation. Rainfall deficits are only slight, the average monthly water balance ratio is moderate, and vapour pressure deficits are low. Landforms in Environment P mostly consist of mountains and steep, lower-elevation hills, along with the andesitic volcanic cones of Taranaki and the Tongariro National Park. Greywacke is by far the predominant soil parent material, but granite, schist, Tertiary mudstones and sandstones and gravels are also locally important. Extensive areas in the North Island are mantled with andesitic or rhyolitic tephra, and andesitic rocks are dominant on the volcanoes. Soils are mostly well-drained and of low natural fertility.

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 the northern and eastern South Island. It is most extensive in southern Hawkes 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, this is coarser textured 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.

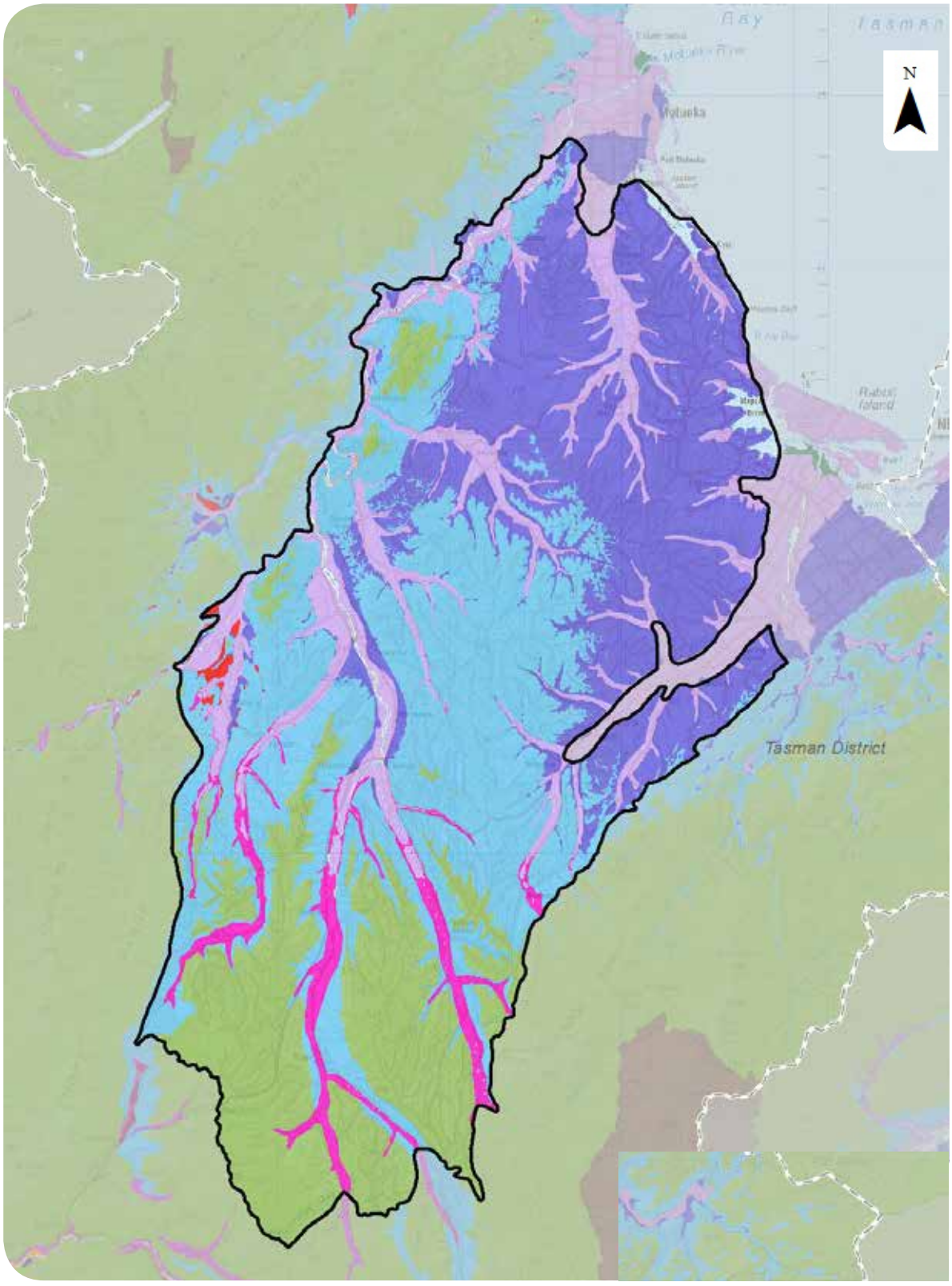
Central Upland Recent Soils (Environment K)

Environment K comprises areas of recent soils at moderate to high elevation in inland parts of both main islands where it generally occurs on flood plains along major river valleys. It is most extensive in inland parts of the eastern South Island. In the North Island it is restricted to high elevation sites on the ringplain surrounding the Tongariro volcanoes. The climate of Environment K is cool but with high solar radiation. Although annual water deficits are low on average, more eastern sites in the South Island receive substantially less rainfall than those exposed to the west or located close to the Southern Alps. Vapour pressure deficits are moderate. Alluvium, mostly from greywacke but some from schist, is the main soil parent material with varying mixes of gravel and finer material. Andesitic tephra is the dominant parent material around the Tongariro volcanoes. Slopes are generally gentle, and most soils are well-drained. Natural soil fertility is moderately high.

Central Hill Country and Volcanic Plateau (Environment F)

Environment F extends across large areas of low to mid-elevation hill country in central and southern North Island, extending along the western flanks of the Raukumara Range in the northeast to Taranaki in the west and to Wellington and Wairarapa in the south. In the South Island it occurs on the northern coastal hills of northwest Nelson, in the Marlborough Sounds, around Kaikoura and on Banks Peninsula. The climate of Environment F is mild, with high levels of annual solar radiation and moderate winter solar radiation. Although it has a low monthly water balance ratio, the even spread of rainfall throughout the year means that rainfall deficits are slight on average but with droughts in years with below-average rainfall, particularly in the east. A diverse range of soil parent materials include older Mesozoic greywacke and granite, younger Tertiary sandstones and mudstones, and a range of volcanic tephra, mostly rhyolitic in the central North Island but with more fertile andesitic tephra around the Tongariro volcanoes and Taranaki. Loess dominates on Banks Peninsula but with some protruding basaltic rock. Soils are generally well-drained and many are of low natural fertility.

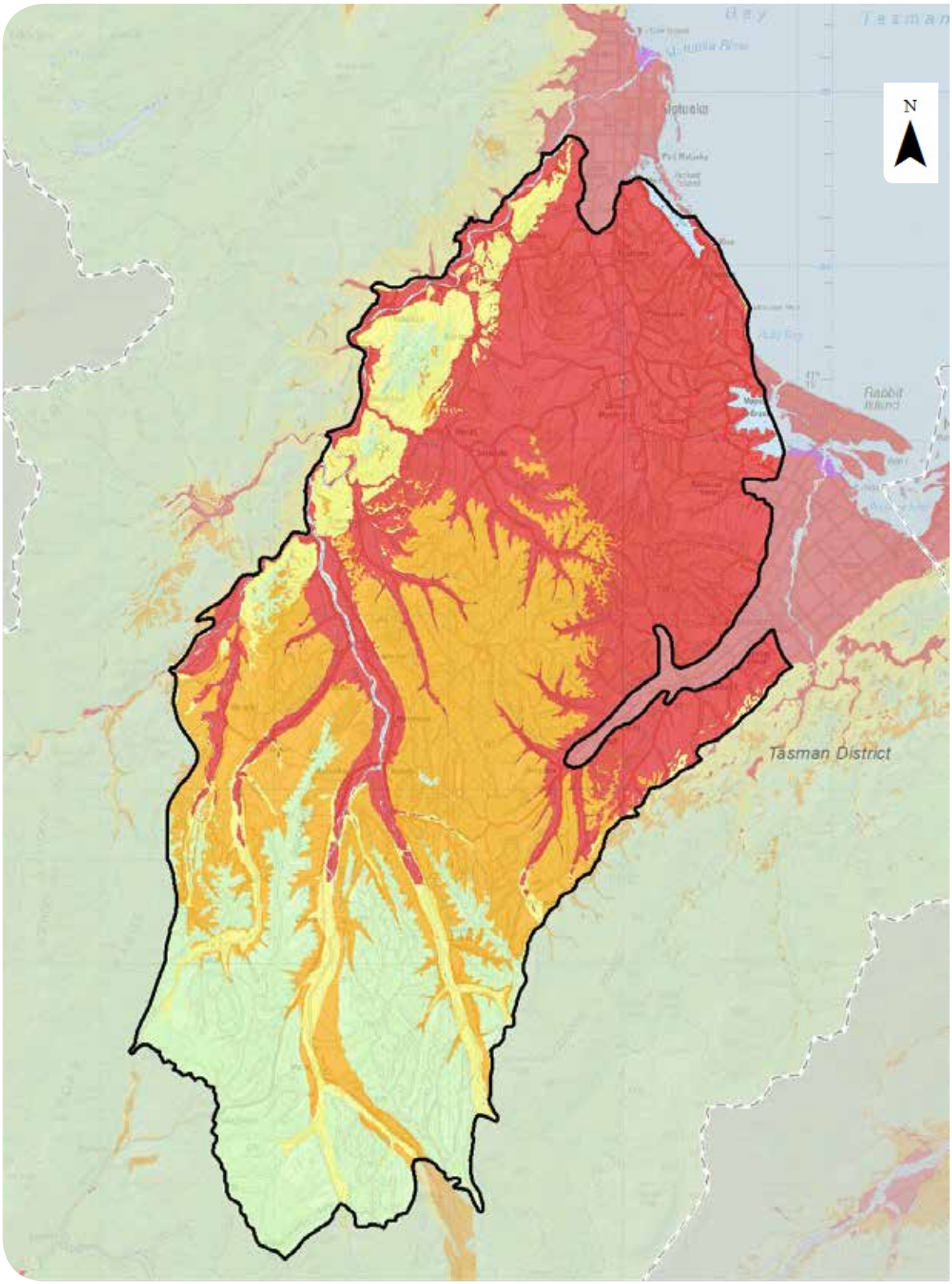
At the highest level of discrimination (LENZ Level 4), there are 500 environments. At this level, the degree of depletion of indigenous cover has been mapped (Figure 5). Most of the northern sector is either 'acutely threatened' with less than 10 % original vegetation cover remaining nationally or 'chronically threatened' with less than 10 % or 10-20 % original vegetation cover remaining nationally in these environments. The highest threat level covers most of the land from the Dove Valley northward, and around the Waimea/Wai-iti foothills and associated tributaries. The lower elevation granites and granodiorites in the west are largely 'at risk' (20-30 % remaining), with higher elevations not threatened.



Legend

- B – Central Dry Lowlands
- E – Central Dry Foothills
- F – Central Hill Country and Volcanic Plateau
- I – Central Poorly Drained Recent Soils
- J – Central Well-drained Recent Soils
- K – Central Upland Recent Soils
- N – Eastern South Island Plains
- P – Central Mountains

Figure 4: Moutere Ecological District – LENZ environments – Level 1



Legend

Threatened Environments Classification

- Acute Threatened (<10% indigenous vegetation left)
- Chronically Threatened (10–20% indigenous vegetation left)
- At Risk (20–30% indigenous vegetation left)
- Critically Underprotected (>30% indigenous vegetation left and <10% protected)
- Underprotected (>30% indigenous vegetation left and 10–20% protected)
- Less reduced and better protected (>30% indigenous vegetation left and >20% protected)

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

5. Significant Native Habitats (SNHs)

5.1 Landowner and survey details of Significant Native Habitats

SNHs are distributed throughout the northern sector of the Moutere Ecological District, with a wide and fairly even geographical spread. Most (204) surveyed sites were deemed significant with few (17) not (Table 3). This is largely attributable to the high level of habitat and vegetation depletion, with most plant communities represented by less than 5% of their original cover in the ecological district.

Table 3: Landowner and survey details of Significant Native Habitats

	Number	
Participating Landowners	148	
Non-Participating Landowners[1]	52	
Sites Surveyed	237 vegetation + 8 habitat	
Sites Not Surveyed (or part thereof)	53	
Identified SNHs[3]	211	
	Hectares	Size Range SNHs
SNH total area (excl habitat)[4]	998.7 excl habitat[3]	-
Average size SNHs	4.7	-
– forest & treeland	6.1	0.2 - 56
– freshwater wetland/stream margins	1.7	0.2 - 8.1
– saltmarsh/foreshore/coastal scrub	1.8	0.5 - 5.5

[1] Permission declined (40), landowners not traced (12)

[2] Some sites that span property boundaries were surveyed as one SNH; others were surveyed by title forming two or more SNHs

[3] Hectares for faunal habitat SNHs has not been calculated as some areas are not readily determined (for example linear foreshores for breeding shorebirds)

6. Biodiversity Values of Significant Native Habitats

6.1 Vegetation

6.1.1 Indigenous vegetation represented within Significant Native Habitats

Note: Vegetation descriptions are written to characterise the range of indigenous assemblages and have not included exotic plant species.

Alluvial forest and treeland (with minor colluvium)

Note: alluvial podocarp forest grades into alluvial beech forest on a broadly southerly gradient, and the descriptions presented below, of either podocarp-dominated or beech-dominated forest, is partly an artefact of the descriptive process. 73 of the 161 forest/treeland SNH sites are dominated by or include at least some alluvial forest/treeland. Of these 32 are exclusively alluvial.

Alluvial totara-matai +- black beech forest

This community is the commonest alluvial forest type in the northern sector of the Moutere Ecological District. Other canopy associates typically include titoki, rimu and black beech with more minor silver beech and kahikatea. Pokaka, kanuka, tarata and kaikomako are scarce. Red beech is recorded at a few more southerly sites. Only one site is rich in canopy rimu, probably reflecting past widespread timber extraction of this species elsewhere. The scarcity of black beech at many sites is indicative of recent dieback (which is still ongoing). Trees of all species generally do not exceed 50-80 cm dbh, presumably due to former logging of larger stems. In the understorey, mahoe is typically common to abundant. Other species include kanono, rohutu, ponga, wheki-ponga, wheki, putaputaweta, round-leaved coprosma, swamp mahoe, turepo, and occasional pigeonwood, fuchsia, miro, narrow-leaved lacebark, mapou, pate and tarata. Lowland ribbonwood, kowhai, hinau, tawa, white maire and narrow-leaved maire are very rare. Scarlet mistletoe is very localised. Lianes typically include native jasmine, supplejack, bush lawyer and climbing pohuehue, and more occasional *Metrosideros diffusa*/white rata vine. Native passionvine is rare. Ground cover where moist is typically lush with ferns, particularly hen and chickens fern, *Lastreopsis glabella*, with lowland shield fern and button fern. Bush rice grass and *Uncinia uncinata* also commonly feature. At more southern sites, crown fern and prickly shield fern may be locally prominent. Well drained/less fertile substrates are often sparsely vegetated with species such as *Uncinia banksii*, *Uncinia scabra*, houndstongue fern and crown fern.

Alluvial beech forest supports diverse understories where stock and feral ungulates are absent

Two SNH sites along the margins of western Wai-iti/Waimea Valley tributaries are of alluvial lowland totara forest, with few canopy associates.

Alluvial kahikatea forest

Only a handful of sites support kahikatea forest with the total area reaching only a few hectares. True kahikatea swamp forest is confined to tiny pockets within three of these. Swampy associates are ti kouka, *Carex dissita*, kiokio, karamu, swamp coprosma and purei. Moist ground typically supports a larger range of species, with canopy associates including lowland totara, matai, black beech, silver beech and rimu. Sub-canopy/tall understorey plants include mahoe, putaputaweta and kanono. Ground cover is typically lush with kiokio, bush rice grass, *Uncinia*

uncinata and ground lily. One or two sites with depressed water-tables support a sparse ground cover. Where young kahikatea dominate, trunks often pack deep with sparse associates.

Alluvial black beech-silver beech forest

Beech-dominated alluvium is a feature of the more southern alluvial forest sites (with a few exceptions) and of leached terraces that tend to occur in the upper sections of catchments along gently-falling gullies. Red beech and hard beech are generally rare. Canopy podocarps include occasional matai, miro, lowland totara and rimu. Canopy broadleaves include kamahi, kaikomako, kanuka and pokaka. The low presence of podocarps could reflect past logging in a number of cases.

Understories vary with drainage and fertility. More favourable sites include kanono, and putaputaweta, rohutu and round-leaved coprosma. Leached terraces favour broadleaf and lancewood regeneration, horopito, and small leaved shrubs such as *Coprosma rigida*, scrub coprosma, raukawa, *Coprosma tayloriae* and *Neomyrtus pedunculata*. Typically tree-ferns are scattered through including wheki, wheki-ponga and ponga. Other species include yellow-wood, mahoe, lancewood, makomako, and fuchsia in riparian areas. Scarlet mistletoe is occasional in silver beech. Lianes include bush lawyer and white rata vine.

Ground cover where moist is lush with (variably) hen and chickens fern, prickly shield fern, ground lily, and *Blechnum fluviatile*. Crown fern and *Blechnum procerum* are typical of leached terraces. Riparian margins include *Blechnum chambersii*, *Leptopteris hymenophylloides*, kiokio and gully fern. Steep shady banks may support *Blechnum colensoi*.

Alluvial secondary mixed broadleaved forest

Very small areas of only hundreds of square meters occur very rarely beside semi-coastal wetlands. Canopies include much putaputaweta with tarata, mahoe and fivefinger, and more occasional kohuhu and mapou. One site includes some pole kahikatea, lowland totara and matai. Understories are well developed with canopy regeneration and karamu standing over sedges, hookgrasses, swamp astelia, kiokio fern and hen and chickens fern.

Riparian forest on valley floors is very rare with few alluvial remnants surviving around water courses

The largest stand of kahikatea swamp forest remaining (in Eighty Eight Valley) is shown in its entirely in this image

Hillslope Forest

Hill-slope hard beech-black beech-rimu forest

Hard beech and/or black beech, with scattered rimu, and silver beech locally, cloak most hill-slope forest sites. Hard beech tends to dominate the less fertile/better drained spurs and associated slopes. Otherwise either species may (unpredictably) dominate. Rimu tend to be thinly scattered, and matai, miro and silver beech occasional. Other canopy species include occasional kanuka and rare pokaka.

Understories are generally moderately open with dense growth locally. Hard beech forest supports a sparser understorey than black beech overall. Spurs and upper slopes are quite open with mingimingi and prickly mingimingi characteristic, along with young lancewood, *Helichrysum lanceolatum*, raukawa, shining coprosma and scrub coprosma, and at some sites young broadleaf, over very sparse ground cover of *Uncinia scabra*, *Uncinia rupestris*, *Grammitis billardierii* and *Blechnum procerum*. More fertile or less droughty slopes include much young broadleaf in the southern half of the survey area and some ponga and kanono, particularly where slopes are concave. Heavy shading typically precludes much ground cover. Regeneration of rimu and miro is usually lightly scattered.

Hard beech forest is characteristic of the Moutere Gravel hill-slopes

Where beech dominates mid to lower slopes there tends to be a rich association of understorey mapou, ponga, kanono, shining coprosma, bush lawyer, fivefinger, mingimingi, heketara, and (in more southerly sites) much young broadleaf, over a moderate ground cover of species such as houndstongue fern, *Uncinia scabra*, inkberry and the filmy fern *Hymenophyllum demissum*. Pole to young matai and lowland totara occur at some sites.

Gullies are moist and usuall y support dense kanono, mahoe and putaputaweta, with some fuchsia and pate, and with supplejack common. Where light allows there is much hen and chickens fern, white rata vine in places, and along creek margins, *Blechnum chambersii*.

On the western granite and granodiorite, associates may also include kiekie in hollows, swamp cutty grass, and *Pimelea gnidia* and inaka on spurs. One such site also supports the only mountain totara-rich forest stand surveyed, in association with hard beech.

Recent regeneration of black and hard beech is typically sparse or lacking in more northern and eastern sites, otherwise forests tend to show a large range of cohort size/age.

Black beech-mixed broadleaved forest is a common feature of many sites due to premature dieback of black beech and poor recent regeneration, as well as being an otherwise natural association. With canopies opened up in this way, a broadleaved (and often lower statured) canopy component has become prominent that includes mahoe, heketara, fivefinger, tarata, lancewood and mapou among others. Many such areas are trending toward mixed broadleaved forest.

Hill-slope mixed beech forest

Silver beech and red beech are a strong feature of hill-slope forests in the southern and south-western parts of the sector with such forest rich in both species in the Stanley Brook catchment and the Motueka Valley south of Ngatimoti, in association with hard and black beech. Canopy rimu and to a lesser extent miro are typically scattered through. Sub-canopy kamahi occurs locally. Understories tend to be moderate to sparse, with small-leaved shrubs such as prickly mingimingi, mingimingi, scrub coprosma, raukawa, beech coprosma, and yellow-wood. Regeneration of broadleaf, lancewood, fivefinger, kanono and kamahi is variably present. In more favourable areas there is a diverse sub-canopy and understorey of ponga, mahoe, heketara, rangiora, large-leaved coprosma, native jasmine and bush lawyer, and nearer gullies or on concave slopes, supplejack, makomako, pate, wheki and fuchsia. Ground cover is highly variable, but includes *Blechnum vulcanicum*, crown fern, houndstongue fern, and the hookgrasses *Uncinia scabra*, *Uncinia banksii*, and *Uncinia rupestris*. Generally ground ferns in gullies abound and include kiokio, *Blechnum chambersii*, gully fern and *Leptopteris hymenophylloides*.

Hill-slope podocarp forest is very rare, and is characterised by matai and rimu as shown here, and lowland totara

Hill-slope lowland totara forest is very rare in the ecological district

Tawa forest in the ecological district is restricted to Eves Valley

Mature podocarp-rich hill-slope forest only occurs at a few sites in the northern sector

Hill-slope red beech forest

Several sites support stands of red beech forest, with a very minor presence of the other three lowland beech species, rimu and miro. Sub-canopy broadleaves are largely of kamahi and mahoe. Heketara and kanono are typically present and in places common. Supplejack and common bush lawyer are scattered and groves of mature ponga are not uncommon. Ground cover plants include *Blechnum procerum*, *Blechnum vulcanicum*, crown fern, *Uncinia rupestris* and the spider orchid *Corybas trilobus agg*.

Hill-slope podocarp forest

Only eight sites support podocarp-dominant forest across broad hill-slopes. Generally lowland totara dominates, but two sites support matai-dominated forest. There is one site where rimu, matai and red beech define the forest, and two small sites where secondary rimu-lowland totara dominate. Some hill-country lowland totara stands are likely to be a result of fortuitous successful establishment after logging, although in the Brightwater-Wakefield area at least, lower hill-slope lowland totara forest is likely to have also formed an original forest community.

Canopy associates of matai-dominant forest include rimu, lowland totara, black beech, silver beech, kanuka and mahoe. Other occasional canopy/sub-canopy trees are putaputaweta, lancewood, kaikomako, makomako, titoki and pokaka. Understories feature kanono, mapou, mahoe and rohutu. Lianes are scattered, including bush lawyer and climbing pohuehue. Ground cover varies, with ferns best represented in moister concave slopes, including hen and chickens fern, and where dryer, button fern, lowland shield fern, houndstongue fern, crown fern as well as *Uncinia scabra*.

Lowland totara forms fairly pure stands at a number of sites that were grazed in the recent past, with a consequent dense flush of regenerating mahoe since stock exclusion. Such sites are typically well-drained and support such ground cover as lowland shield fern and button fern. At other sites lowland totara forms more diverse forest with canopy associates including mahoe, black beech, silver beech and matai. Titoki, miro, kaikomako, lancewood and pokaka are occasional in

the canopy/sub-canopy. Understories usually feature podocarp regeneration, and may include mahoe, kanono, heketara, kohuhu, narrow-leaved lacebark, rohutu, mapou, lancewood, yellow-wood, mingimingi, scrub coprosma and round-leaved coprosma. Ground cover is moderate to sparse, featuring *Uncinia scabra*, houndstongue fern, hen and chickens fern, lowland shield fern and button fern.

A unique (in the ecological district) stand of rimu-matai-red beech forest on granodiorite near Ngatimoti includes many extremely large trees. It is remote and (perhaps uniquely in the survey area) is likely to be unlogged. These emergents stand over a lower canopy of kamahi, mahoe, heketara and pigeonwood. Canopy miro, lowland totara and hinau are rare. Supplejack is remarkably common. White rata vine is also moderately common. Ponga, rangiora and kanono make up much of the taller understorey. Ground cover is light on mid to upper slopes, but increases toward the gully, with hen and chickens fern locally common, shining spleenwort, and occasional sickle spleenwort, houndstongue fern, bush rice grass and *Uncinia uncinata*. In hollows, wheki and mamaku are locally present.

Two further small sites on granodiorite support diverse mixed podocarp-beech forest dominated by lowland totara, rimu, matai, black beech and red beech.

A number of additional forest SNHs feature podocarp forest along toe-slopes, with some continuous with alluvial podocarp forest.

Gully podocarp forest

Such associations in all cases finger up into hill-slope hard and black beech forest. They are only well represented at three sites, two of which are grazed. Minor gullies were noted at two further sites, with one grazed. At the sites on Moutere Gravels, canopies are often dominated by matai with rimu, miro and black beech, and more locally kahikatea and titoki. Pokaka and lowland totara are rare. Sub-canopy/understories variably feature kaikomako, makomako, mahoe, rohutu, round-leaved coprosma, putaputaweta, ponga and wheki-ponga, with narrow-leaved lacebark at one site. Ground cover is typically of *Lastreopsis glabella*, *Blechnum chambersii*, hen and chickens fern, variably with gully fern, *Urtica incisa*, prickly shield fern, *Leptopteris hymenophylloides* and at one site abundant *Australina pusilla*. Of these, the palatable ferns are rare where grazed.

The one site on granite is dominated by emergent rimu with scattered hard beech, black beech and kahikatea, and occasional miro and mountain totara. These stand over mixed low broadleaved trees and shrubs including kanono with putaputaweta, and more occasional lancewood, kamahi, pigeonwood, fuchsia, wineberry, heketara, pate, mahoe, and the treeferns wheki and ponga. Supplejack is common, with thickets locally, whilst white rata vine/ *Metrosideros diffusa* is more scattered. One area of gully head rimu-dominated forest occurs where canopy mountain totara is quite common.

Kanuka forest is rare in the northern sector of the ecological district

Hill-slope mixed broadleaved forest

Small areas are scattered across hill-slopes throughout SNHs in the survey area, often merging into black beech-mixed broadleaved forest, particularly with the dieback of black beech in drier areas. In most if not all cases they are secondary induced communities as a result of past disturbance such as logging, with concave slopes favouring their establishment. About 10 such areas were delineated within SNHs, mostly on the Moutere Gravels but with several on granodiorite. Mahoe is often a dominant species, along with titoki, fivefinger, putaputaweta, and kanono, and to a lesser extent fuchsia, pigeonwood, makomako, tarata, kohuhu, mapou, lancewood and kanuka. Matai also features at a number of sites. Lowland totara is occasional. Supplejack is common at some sites with climbing pohuehue often present. A few sites support native passionvine. Understories feature much canopy regeneration, as well as shining coprosma, round-leaved coprosma and rohutu. Ground cover is generally well developed, featuring shining spleenwort, ground lily, *Uncinia scabra*, hen and chickens fern and houndstongue fern among others.

One site on granodiorite is dominated by mature kamahi. Canopy broadleaf are locally present, heketara occasional, and one large hinau was noted. The understorey is moderately open, comprising kanono, rangiora and ponga, with heketara, pigeonwood and mahoe. Supplejack is common in places. Ground cover is sparse generally, with lowland shield fern and hen and chickens fern in moderate number.

One site in the north-east of the ecological district is unique in supporting a small stand of tawa-dominated forest on a colluvial fan. Scattered are lowland totara, matai, black beech and kaikomako. A moderate understorey of up to four metres tall mahoe also includes sapling podocarps and occasional tall ponga. Low young broadleaved regeneration includes titoki, mahoe, pigeonwood, and mapou with occasional turepo and kaikomako. Hen and chickens fern and lowland shield fern form much of the scattered ground cover.

Gully broadleaved forest

Such associations are scattered commonly throughout the survey area, but only at some 20 sites are they sufficiently large or defined as to be described separately from the surrounding slope forest. Undoubtedly the lack of podocarps at some sites is a result of past logging. Mahoe is usually dominant, but otherwise it usually features commonly amongst putaputaweta, kanono, pigeonwood, and mamaku, and more locally titoki and kohuhu. Some gully heads are probably naturally in mahoe forest (a common feature of the ecological region). Scattered podocarps occasionally present include all five lowland species. Beech species generally do not occur down into gully bottoms. Such sites are generally deeply incised and wet or moist, with makomako, pate, fuchsia and kanono over ferns associated with steep faces and water margins, that typically include *Blechnum chambersii*, *Hymenophyllum demissum*, kiokio, hen and chickens fern, *Lastreopsis glabella*, gully fern, and more locally crown fern, *Lastreopsis hispida* and *Leptolepia novae-zelandiae*. Bush rice grass and *Uncinia uncinata* are locally common. Lianes typically include much supplejack, and rarely, kiekie. Treeferns abound locally, most commonly mamaku, wheki and more locally wheki-ponga. Katote is scarce.

Hill-slope kanuka forest

Stands of secondary kanuka forest within SNHs are generally small, with kanuka more widespread as part of a community amongst black beech and mixed broadleaves. Typically stands are of pole to adult trees with large specimens rare. Usually there is a dense young understorey one to five metre tall of mahoe regeneration with some putaputaweta and fivefinger. In such cases lower tiers are depauperate due to shading. Other sites support more scattered broadleaved regeneration and much scrub coprosma and mingimingi, with prickly mingimingi and young lancewood. Where light allows, button fern, lowland shield fern, and *Uncinia scabra* are typical. Other species include necklace fern, *Rytidosperma spp.*, *Lycopodium volubile*, bracken and *Uncinia uncinata*. Native clematis is commonly present.

Coastal forest

Coastal margin forest SNHs are rare with only seven sites, most of which are very small. These are all highly modified, dominated by mixed broadleaves or more rarely titoki and there are several with scattered tiny pockets of hard or black beech.

Titoki forest

Two sites support abundant titoki in part, on Moutere Gravels lower gullies, coastal faces and minor coastal flats. Mahoe is co-dominant at one of these where canopy akeake, ngaio, fivefinger and kohuhu are rare. Understories are dominated by kawakawa and mahoe regeneration. Supplejack is sporadic where moist, pohuehue is occasional and mamaku is rare. Ground cover is generally sparse with rare to occasional shining spleenwort, lowland shield fern and *Pteris tremula*. Damp gully mouths support a more diverse understorey, with toe-slopes holding rangiora locally, and fern beds of *Lastreopsis glabella* and where seepy, *Blechnum chambersii*.

Mixed broadleaved forest

Such sites mostly line sections of the shore of the Waimea Inlet. Canopies are dominated by mahoe, kohuhu, and fivefinger, with more occasional mapou, titoki and ngaio. Understories are variable, ranging from sparse under dense shade or unfavourable substrate, to diverse with canopy regeneration, shining coprosma, karamu, mingimingi, manuka (where more open), ponga, kahikatea, lowland totara, and rimu, and rare sapling matai.

Coastal forest on the margins of estuaries has been almost entirely lost

Ground cover varies considerably from sparse to dense. Characteristic species are shining spleenwort, houndstongue fern, *Uncinia banksii*, and more occasionally *Blechnum procerum*, crown fern, ground lily and inkberry.

Three sites also include short coastal gullies that run inland. These are more mature and diverse and include secondary canopy mahoe, rimu, kamahi, kanuka, mamaku, tarata, kohuhu and fivefinger. Moist gully bottoms support little else where shading is deep, but elsewhere kawakawa is usually common, and ground cover includes shining spleenwort, *Blechnum procerum*, *Blechnum vulcanicum*, kiokio, inkberry, *Uncinia uncinata* and *Gahnia pauciflora*.

Beech forest and treeland

Four SNHs support coastal margin beech but only two of these include beech forest as such, tiny though the stands are. One is of black beech, the other of hard and black beech. Associates include low regeneration of mapou, kohuhu, shining coprosma, fivefinger, mingimingi, and mapou over scattered inkberry and shining spleenwort. Leather leaf fern is locally present.

Freshwater Wetlands

Most of the 29 freshwater wetland SNHs lie along coastal running gullies within several km of the coast. A number occur farther inland, mainly in the Moutere catchment and Waiwhero area, mostly in gullies and along the foot of hill-slopes where they interface with flatter land. Several adjoin native forest. Tiny areas occur at the head of some saltmarshes. All are classed as swamps.

Freshwater swamps

Most swamps are defined by the presence of harakeke, raupo, purei and kiokio. Raupo is often dominant in the stands where it occurs. Swamp coprosma, manuka and karamu are also often common at many sites. Other species include *Carex maorica* and rautahi, *Baumea rubiginosa*, and less commonly ti kouka, koromiko, toetoe, *Baumea tenax* and swamp astelia. Kahikatea is rarely present at swamp wetlands (excepting kahikatea swamp forest – see above under forests). Sites with higher fertility are dominated by the first four species listed above with low overall diversity. At the least fertile end of the swamp spectrum, harakeke is depauperate and yellow-hued, with a greater diversity of plant species present and with none particularly dominant. Several sites are dominated

Swamps dominated by scrub are very rare; such sites are rich with swamp coprosma and manuka

A few saltmarshes merge into freshwater wetland at their heads but such areas are now very small

by swamp coprosma and manuka. Recently disturbed margins (largely from stock grazing and trampling) may support a range of low plants including *Gonocarpus micranthus*, common spike rush and slender spike rush. Several sites with variable water levels support *Gratiola sexdentata* very locally along their margins.

Estuary head wetlands

Very small areas of freshwater or slightly brackish wetland occur in narrow bands at the head of some estuary margins where characteristically freshwater wetland species are present. These include bands of raupo, harakeke, rautahi, and minor toetoe and manuka. Such areas tend to only occupy some tens of square metres.

Saltmarsh/Estuary Margins

Two saltmarsh systems partially lie within the Moutere Ecological District – those associated with the southern half of the Moutere Inlet and the most western sector of the Waimea Inlet.

Saltmarsh ribbonwood scrub

Saltmarsh ribbonwood is present at the head of almost every estuarine saltmarsh SNH, occurring as scattered bushes through to dense scrub. Dense narrow stands are typical at many sites along the foreshore where a near monoculture may prevail. Typical associates are sea rush and oioi, all of which form communities into which saltmarsh ribbonwood merges. Knobby clubrush and estuary tussock are also locally associated along foreshores.

Tall sedgeland/rushland associations – oioi, sea rush

Extensive and typically monoculture tracts of oioi and sea rush dominate many mid to upper areas of saltmarsh, merging in places into saltmarsh ribbonwood. Sea rush in particular merges into mixed herbfields at many sites.

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, *Isolepis cernua* are characteristic. Where brackish conditions occur, three-square in association with oioi may occur.

Sea rushland forms the most extensive areas of upper saltmarsh vegetation

Manuka scrub/shrubland

Such areas are very localised and largely confined to one islet where it forms dense thickets through to open stands. Open conditions allow for a dense ground cover, of tall fescue and knobby clubrush in places. Elsewhere, there is a diverse range of plants that also include *Senecio glomeratus*, *Lachnagrostis billardierii*, and some scrambling pohuehue.

Estuary tussockland

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

6.2 Flora

6.2.1 Overview

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

284 native plant species were recorded within SNHs in the northern Moutere Ecological District. This includes 93 species of tree and shrub, 15 species of liane, 52 species of dicotyledonous herbs, 16 species of monocotyledonous herbs, 60 species of grasses, sedges and rushes, and 68 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 very underepresented.

Species and community diversity and patterning

Most forest SNHs are either on hill-country or on alluvium, with very few that include both or which have colluvial interfaces. SNH sites that include more than minor areas of both, with associated gradients between number around 15. Most of these also include forested streams, unlike most purely alluvial sites. Only two forest sites merge into freshwater wetland. Typically on the northern Moutere Gravels, hill-country forest sites support 50-80 plant species as identified by rapid walkthrough surveys. Alluvial forest sites typically hold 35-50. The highest range of species occur at SNHs with both hill-slope and alluvium with typically 80-100 species and at hillslope forest sites on the wetter western granite/granodiorite. Plant species diversity is generally higher toward the south and west, all else being equal, presumably due to wetter climates.

Scarlet mistletoe was recorded at 25 sites, with the largest populations in the Dove Valley

6.2.2 Rare flora

Defining what is a 'rare' species in the ecological district is challenging, in the sense of deciding on the appropriate threshold. Of the species recorded in SNHs, 68 species can be considered very rare (found at up to ten sites and only then rare or occasional) or rare (found at ten to twenty sites and only then rare or occasional; or at only a handful of sites where they may be in moderate numbers). Of this total, five are nationally 'threatened' or 'at risk' and 21 species regionally rare. Species that were found to be rare in the northern sector of the ecological district, but believed to be, or known to be, more common in the remainder of the district have not been included. Some less obvious species that were missed or rarely seen may become more apparent with site protection, for example, by excluding browsing.

Nationally 'threatened' and 'at risk'

Scutteleria novae-zelandiae/shovel mint, a 'nationally critical' species has been noted (Nelson Botanical Society) at one of the SNHs prior to survey. It is confined to Nelson and western Marlborough with less than 30 remaining sites known. It was known until recently on foot-slopes west of Wakefield, and was undoubtedly formerly more widespread.

'At risk, declining' species noted within SNHs are (number of sites in brackets): yellow mistletoe (1), scarlet mistletoe (22), white mistletoe (4) and native germander (1). Scarlet mistletoe is by far the most commonly recorded of these

species with strongholds in the Dove Valley in particular, and to a lesser extent Stanley Brook. At one site it is recorded as common. The rare status of these mistletoes nationally and regionally is attributed to possum browse.

Saltbush ('nationally critical') has been successfully introduced to one saltmarsh SNH, but introductions of coastal peppercress ('nationally critical') to the same site have so far failed.

Regionally Rare (context: Ecological Region)

Regionally rare species recorded in SNHs are (numbers of sites in brackets): ti kouka (23), narrow-leaved lacebark (14), coral mistletoe *Korthalsella clavata* (1), poataniwha (9), mahoe wao (2), swamp mahoe (20), white maire (6), narrow-leaved maire (1), *Pimelea gnidia* (3), manatu (3), *Raukawa edgerleyi* (1 reported), *Australina pusilla* (8), *Chenopodium ambiguum* (3), *Gratiola sexdentata* (3), swamp buttercup (6), swamp astelia (12), *Drymoanthus adversus* (1), bamboo rice grass (1), *Carex dipsacea* (2), *Uncinia laxiflora* (3) and rasp fern (2).

Ti kouka is very rare at all forest and wetland sites where it occurs with the exception of one wetland where it is common. 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 almost entirely confined to the Moutere River catchment in the ecological district. Narrow-leaved maire is only known in the Nelson Region from the Brightwater area, where only eight naturally-occurring trees are known, four within the ecological district. Swamp mahoe and poataniwha are alluvial forest specialists. It is likely that the drying out of what alluvial forest remains (edge effects and/or lowered water tables) has not favoured them. *Ruakawa edgerleyi* has been reported (Nelson Botanical Society) from one SNH in the Orinoco catchment. The estuarine herb *Chenopodium ambiguum* was found at several adjoining embayments in the Moutere Inlet. Swamp astelia is more common in the ecological district than first thought being present in 12 SNHs but generally rare at most of these sites. Swamp buttercup and *Gratiola sexdentata* are small wetland herbs that readily succumb to shading from taller wetland plants. They seem to thrive best on swamp margins where there is some limited disturbance (the buttercup) or at wetlands with ephemeral water margins (*Gratiola*), at the SNHs where they were found. The perching orchid *Drymoanthus adversus* is rare at one Dove Valley forest site. The alluvial forest specialist *Uncinia laxiflora* is surprisingly rare considering the number of apparently suitable sites for it that remain. Bamboo rice grass has a very sporadic distribution in the Nelson Region. One plant was noted in the Dove Valley.

Rare in the Ecological District

With 68 native plant species considered 'rare in the ecological district' within SNHs, these will not all be listed here. Rather, a range of interesting examples are discussed.

Trees, Shrubs, Lianes

Tawa is confined to a small number of SNHs in Eves Valley, and remarkably at one site in the Orinoco Valley on granodiorite at its regional southern limit. Ngaio and akiraho were both noted at only one site each on the coast where they appear to be naturally occurring. Akeake is also rare coastally. The picture is confused by the extent of planting of these species in coastal areas. Ongaonga was noted at only one alluvial forest site in the Moutere River catchment. Thick-leaved coprosma, typically a dryland species, crops up in mid-lower Stanley Brook and on slopes in the Motueka Valley in the Ngatimoti/Woodstock area, a surprising occurrence. Apart from one further site in Eves Valley it is otherwise only known regionally in eastern Nelson where it is locally common. Native passionvine was recorded occasionally, occurring as far inland as the southern side of the Dove Valley (in common with titoki distribution). This is indicative of the inland extent of 'semi-coastal' influence. Kiekie was rarely noted, occurring in the Eves Valley/Redwood Valley area and on the western granites close to the Motueka Valley, but nowhere inbetween.

Herbs

Libertia species are extremely rare on the Moutere Gravels in the northern sector of the ecological district, with only six widely scattered sites noted for the native iris *Libertia ixioides*. Other notably rare species that are likely to be rare in the ecological district as a whole, not just the northern sector, are (number of sites located in brackets) *Myosotis forsteri* (1), *Geranium microphyllum agg.* (1), and *Pterostylis areolata* (1).

Grasses, Sedges, Rushes

A number of sedges are rare in the ecological district, with *Carex flagellifera*, *C.raoulii* and *C.testacea* being recorded from only a few locations each. Toetoe is remarkably rare, being absent from many wetlands and rare where it does occur. Swamp cutty grass was noted rarely on the granites above the Motueka Valley. Umbrella sedge is exceedingly rare around the coastline, confined to inlet margins.

Ferns & Allies

The tangle fern *Gleichenia dicarpa* was noted at one swamp at the lower end of the fertility spectrum, as well as once in coastal scrub/forest. The tangle fern *Gleichenia microphylla* was noted at a similarly impoverished wetland site in the Moutere Valley. Parsley fern was noted at four locations, although being visible only for a short season it is easily missed. Velvet fern and *Hypolepis distans* were noted only once. *Lastreopsis microsora* cloaks the floor of large parts of one alluvial forest site. Additionally, giant hypolepis has been recorded along the Kina Coast (Nelson Botanical Society) but was not noted at any SNHs.

6.2.3 Other species with interesting distributions and distribution limits

Broadleaf is rare north of the Dove Valley, becoming increasingly common southward and being abundant in the Upper Stanley Brook and Pretty Bridge Stream area. Considering its ability to withstand drought this is surprising, and may in some way relate to substrate in combination with climate. Tarata is also rather rare in the Moutere River catchment northward but increasingly common southward. Some species seem to shun the Moutere Gravels, such as *Olearia avicenniifolia* that only appears rarely in the upper Stanley Brook (this is a hard-rock species by preference). Toro occurs rarely at a few sites but is likely to be commoner further south. Species more confined to cooler inland forests in the region generally only start to occur in the survey area in the Stanley Brook catchment – such as weeping matipo and horopito. Only one site (along the coastal margin) supports naturally occurring *Olearia paniculata* with several plants present. It is possible that they have seeded from introduced plants. A preference for hard rock seems the likely explanation for its restricted distribution. The Separation Point Suite granite and granodiorite support species not noted on the Gravels, such as inaka, *Pimelea gnidia* and swamp cutty grass. Drought intolerant species such as kidney fern were only recorded in the SW of the survey area. There is a notable absence of pukatea from the ecological district, which is probably a consequence of land clearance. Other obvious absences are nikau and stinkwood. A few complete surprises include the sedge *Lepidosperma australe* and the tangle fern *Gleichenia dicarpa* found at the same coastal scrub SNH near Mapua but nowhere else in the northern sector. Both species are more normally associated with damp/wet, impoverished soils such as pakihi in the region. *Carex lambertiana* is remarkably common in forest SNHs in the Moutere River catchment, but by contrast, rare elsewhere. Only five species of filmy fern (*Hymenophyllum*) were recorded, all of which were rare in the northern sector (but certainly not in the ecological district as a whole), reflective of the dry nature of the climate.

Large podocarps within forest settings are very rare; this lowland totara is by far the largest

6.2.4 Large trees

Trees of exceptional girth were noted from a number of SNHs. By far the largest lowland totara at around 2.5 m diameter at breast height (dbh) occurs (remarkably) at 500 m above sea level, well above its usual altitudinal range in the district, on granodiorite. The same site also includes the largest surveyed rimu at around 1.8 m dbh and miro at 1 m dbh. Two sites include matai to 1.4-1.5 m dbh. One of these sites at Ngatimoti on granodiorite also includes a twin trunked pokaka of the order of 2 m at ground level, and a range of beech and podocarp species of about 1.5 m dbh, as well as native passionvine to 30 cm through. Black beech to 1.5 m dbh and miro to 1 m dbh occur at a few sites. Large kahikatea are confined to a treeland at Upper Moutere, where one specimen is 1.5-2 m dbh. Exceptional broadleaved tree diameters are rare. One Eves Valley site holds a kaikomako of 60 cm dbh and a turepo of 55 cm dbh. South Island kowhai to 80 cm dbh occurs at a Motueka Valley SNH. A kanuka of c70 cm dbh stands within a Kina Coast site. A bush lawyer vine at Ngatimoti is 30 cm diameter near its base. It is interesting to note how many of these size records are from sites in the vicinity of Ngatimoti off the Moutere Gravels. Generally the Moutere Gravels geology is not conducive to trees growing to exceptional diameters.

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 identified as significant vegetation were largely identified from information provided by other parties or surveys for example: inanga spawning sites (Tasman District Council surveys), shorebird roosting and breeding sites (Ornithological Society of New Zealand (OSNZ) pers. comm.) and waterfowl (Nelson-Marlborough Fish & Game pers. comm.).

(Note: Full names of some sub-species, for example South Island robin, are used once, and thereafter referred to by the species name, in this instance, robin. Maori names are also used only once in each section where not in common usage.)

Toutouwai are common in the Stanley Brook forest remnants, but become increasingly scarce northward

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 vulnerable: karearea/New Zealand falcon
- at risk, declining: matata/South Island fernbird
- at risk, recovering: torea-pango/variable oystercatcher
- at risk, relic: kareke/marsh crake
- at risk, naturally uncommon: pereru/banded rail, kawau/black shag, kawaupaka/little shag and kotuku-ngutupapa/royal spoonbill.

Forest and treeland SNHs support a range of indigenous birds, with piwakawaka, tui, and korimako the most frequently encountered. Kereru, tauhou/waxeye and riroriro/grey warbler were also often noted. Kotare/kingfisher, pipiwharauroa/shining cuckoo (during spring/summer) and kahu were noted fairly frequently. More occasional to rare were toutouwai/South Island robin (12 sites and reported at four others), miromiro/South Island tomtit (13 sites and reported at two others), pipipi/brown creeper (five sites), falcon (13 sites and reported at two others) and ruru/morepork (two sites and reported at four others). No western weka, kakariki, South Island kaka or koekoea/long-tailed cuckoo were reported or noted. (Two kaka were seen within Pretty Bridge stewardship land in 2008 (Steve Markham pers. comm.), the only recent record for the northern Moutere).

Robin and tomtit were mostly recorded from the southern/true-left side of the Dove Valley and southward from there. However low numbers of robin were recorded from four alluvial forest sites in the headwaters of Supplejack and Sunset Valleys in the Moutere catchment. One tomtit was also noted at one of these sites. Interestingly no nearby hill-slope forests held these species. The setting of these alluvial forest remnants within plantation pine forest seems to be a favourable environment for robin at least.

Falcon were recorded a surprisingly high number of times, being predominantly associated with large tracts of exotic pine forest whilst surveying native forest remnants within them. One nest site was encountered in cutover pine close to one of the beech forest SNHs. The population in the afforested part of the district would appear to be robust.

Presence and perceived abundance of native forest birds during survey visits was very dependent on time of year and fruiting/flowering of key species. Large congregations of korimako and to a lesser extent tui were noted at some sites outside the breeding season when birds are more mobile. Such congregations were usually associated with beech honeydew, but at least one related to winter-flowering fivefinger (tui). 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.

A small number of coastal saltmarsh SNHs support banded rail with footprints and/or spoor evident. Marsh crake sign has been reported in the 1980s from one of the saltmarsh SNHs. Other recorded species associated with saltmarshes were kingfisher and pukeko.

Fernbird were noted at two freshwater wetland SNHs, one just inland from the Moutere Inlet, the other in the Waiwhero area. They could well have been overlooked at other larger wetland sites, and may survive locally outside SNHs in low manuka associated with the granites.

Estuaries per se 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 tarapunga/red-billed gull and karoro/southern black-backed gull, matuku-moana/white-faced heron, poaka/pied stilt and torea-pango/variable oystercatcher.

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 NHT programme itself. Within wetland and forest SNHs, or at least within streams arising from or feeding into them, the following species are on record (Kroos et. al., 2007, 2011), with national threat status from Allibone et. al., 2010:

- 'at risk, declining': tuna/longfin eel, tuna/shortfin eel, lamprey, redfin bully, inanga, shortjaw kokopu, and giant kokopu.
- 'not threatened': common bully, upland bully, banded kokopu, and koura.

Additionally, koaro have been recorded from Supplejack Stream in the north of the district in more recent surveys.

No recent or historic records of mammals, i.e. 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). This species was noted at one estuarine islet SNH. No invertebrate surveys have been undertaken, at least not within the northern sector.

6.3.2 Faunal habitat within Significant Native Habitats

Eight SNHs were identified as significant habitat for indigenous fauna where such areas had not been deemed significant for their vegetation. These relate

Inanga habitat is rare in the ecological district confined to areas of ungrazed tall fescue

to shorebird roosts, a shag colony, inanga spawning sites and waterfowl moulting sites. Important shorebird habitat is limited within the ecological district. Three sites were identified as being significant. One site supports nationally important numbers of roosting variable oystercatcher. The others support important numbers of roosting bar-tailed godwit or royal spoonbill. One small shag nesting colony was noted, of black shag with little shag. Two significant spawning sites for inanga were located by an independent concurrent survey in March 2012, organised by Tasman District Council resource scientist Trevor James.

6.4 Other ecological values

6.4.1 Connectivity and buffering

Although the many SNH sites are distributed throughout the northern sector, there are certain areas with a particularly close clustering of sites (less than one km apart) that facilitates ecological connectivity and hence resilience. The largest cluster lies in the central Dove valley, mostly hill-slope forests. The other obvious cluster of hill-slope forests lies in the heads of the Moutere and Redwood Valleys. Sections of the Moutere Valley hold small clusters of alluvial forest, and in total there are some 16 alluvial forest/dense treeland sites dotted the length of this valley floor, in marked contrast to all other valleys in the ecological district. Other forest clusters lie around Ngatimoti and around Pangatotara in the Motueka Valley. Saltmarsh SNHs in the western part of the Waimea Inlet and southern half of the Moutere Inlet lie closely to one another, often with discontinuous saltmarsh vegetation between them.

Public conservation land forests in Pretty Bridge Valley and Eves Valley are buffered by adjoining SNHs, with these areas playing an important role in increasing the ecological viability of protected land.

A long strip of Crown riverbed/road reserve forest serves to link valley floor forest remnants along one section of the Motueka River

6.4.2 Ecosystem services

SNHs total over 1000 ha, protecting such land from erosion and mitigating water run-off. Steep hill-slope forests in particular play an important role in holding the land during heavy rain and slowing the release of water into catchments. With the largest such site being 56 ha this role is however limited in the wider context of catchments. The numerous gully wetlands with their long, linear shape serve to slow water flows into low-lying areas below them, helping to protect important horticultural or grazing land from flooding. A number of forest and wetland sites buffer streams from solar heating effects and pollution and sediment run-off from adjoining land use.

7. Threats to Significant Native Habitats

7.1 Plant pests

Some 60 or so plant species noted by this survey could be considered important ecological weeds in New Zealand, ranging from widespread in many SNHs through to occurring at just one SNH at the beginning of the infestation curve.

Pest plant invasion of the northern sector of the ecological district is inexorable, with no species of concern anywhere near their limit of spread. The most widespread high-impact plant is old man's beard that is found throughout the area. It is considerably more abundant than the late 1970s when Geoff Walls undertook his forest surveys of the Moutere Gravels (pers. comm.). At worst, some forest sites are heavily draped in the vine, at least in part and mature trees are succumbing to consequent light starvation and wind throw.

Banana passionfruit is established at 19 SNHs. Most of these are in the Moutere River catchment, with outliers at Hiwipango (the most inland site noted, far from known infestations) and along the coastal fringe. Most infestations were minor at the time of survey but its further spread is likely to be very rapid. Other highly threatening vines noted were Japanese honeysuckle (at 15 SNHs), ivy (10), hops (2), climbing asparagus (2) and climbing spindleberry (2). The latter species was destroyed by Tasman District Council biosecurity staff at the two sites. Blackberry occurs at nearly all surveyed sites.

Banana passionfruit is spreading rapidly through the Moutere River catchment

Of the trees and shrubs, the most widespread are barberry and hawthorn, having a presence at most forest sites. Sycamore is the most concerning of this group, noted at 16 SNHs. It readily colonises intact native forest. Black locust was noted at only one site but is being eliminated from there. Blackthorn forms a thicket along the margins of one SNH, the only site known to the surveyor in the region. Poplar and willow species are impacting heavily on some wetland SNHs. Most troublesome is grey willow, with a more minor presence of white willow, crack willow and pussy willow among others. Poplar (species undetermined) is highly invasive at just two wetland sites, with one of these being a huge population.

There are a number of very concerning groundcover plants recorded within SNHs: Wandering willy occurs at 10 forest sites with six where it is at least locally common. African clubmoss was noted at two forest sites. Giant Himalayan lily is rapidly colonising one Motueka valley forest SNH. Male fern was noted at only three sites but appears to be spreading widely in the region. Along the upper margins of saltmarshes tall fescue is often dominant.

The Tasman-Nelson Regional Pest Management Strategy for 2012-2017 (Tasman District Council, 2012, p 115 onward) maps the following weeds in the northern sector of the ecological district under 'Total Control Pests': African feather grass, boxthorn, climbing spindleberry, egeria, hornwort, saffron thistle, senegal tea; Progressive Control Pests: boneseed, purple loosetrife and variegated thistle. Of these only climbing spindleberry was noted, at two SNHs. Many of the others pose a considerable threat if their ranges expanded into SNHs, in particular the vines and the wetland plants.

Weed control options are varied, entailing foliar or trunk spraying, stump pasting/painting, and manual or mechanical cutting and/or grubbing. Biocontrol has been trialled in the region on broom, gorse, buddhleia and old man's beard, but only on buddhleia is this (reportedly) proving effective at this stage.

7.2 Animal Pests

Deer and feral goat impacts on SNHs are very low. Most forest sites show no sign of these animals. Deer numbers appear low in the northern sector of the ecological district. Small numbers of fallow deer occur within the Dove Valley and parts of the Motueka Valley. Red deer can be assumed to be throughout larger tracts of exotic forest and venturing into adjoining native forest. Goats sign was very rare at two SNHs and abundant at one Motueka Valley forest SNH, the only site to be heavily impacted by goats.

Feral pig sign is typically present at most SNHs from the Dove Valley southward and in the Motueka Valley south of Ngatimoti. Rooting is at least locally extensive at quite a number of these sites.

Brush-tailed possum numbers in much of the central/western/southern portions of the survey area are likely to be low due to a prolonged campaign by the Animal Health Board (AHB) at control. This has largely been terminated in most areas (2010-2012 depending on location) due to the success in reducing bovine Tb levels in cattle herds. Elsewhere numbers have remained unchecked other than by individual landowners. Damage to vegetation was not able to be assessed with the quick walkthrough survey technique undertaken by this survey programme, and neither was this possible with regard to faunal impacts. Possum sign was very rarely seen.

European brown hares occur throughout and European rabbits are present other than probably in the more intensively-managed horticultural areas. They are known to impact on forest margins on the interface with open country. The owner of one forest SNH reports heavy browse on beech seedlings by rabbits close to pasture. This is likely to be a widespread issue for both species.

The current pest animal threats to SNHs also include heavy impacts on native fauna. Common wasps decimate invertebrate populations, but their impact on SNHs is not specifically known.

Mustelids (stoat, weasel, ferret), rodents (ship rat, house mouse), feral cat and European hedgehog are all likely to be taking a heavy toll on native fauna. All are likely to be common and widespread throughout the ecological district. Nationally, impacts of these species on invertebrates are not well known, but by comparison there is considerable evidence of the impact of such pest species on indigenous avifauna. In the ecological district all forest and wetland bird species are likely to be affected. Breeding coastal and wetland species that are likely impacted are variable oystercatcher, banded rail, marsh crake and fernbird. Other coastal and wetland breeding species are probably large enough to fend off predators in most cases. There is no evidence of roosting shorebirds being impacted by pests.

The Tasman-Nelson Regional Pest Management Strategy for 2012-2017 (Tasman District Council, 2012, p 115 onward) maps the following animal pests in the northern sector of the ecological district: Progressive Control Pests –mosquito fish, koi carp, perch, tench and rudd. Department of Conservation-led campaigns have largely eliminated these species from the district, so it is unlikely that any of these fish species impact on the few water bodies within SNHs.

Rook is the only bird listed, apparently as a rare vagrant.

7.3 Other Threats

SNHs are being impacted by human activities and are vulnerable to a range of further potential threats that are discussed below.

Forest and treelands

Grazing and stock fencing

30 forest and treeland SNHs (out of a total of 161) are grazed as they lack a full or effective perimeter fence. Several other sites were being browsed out at the time of survey due to stock fence failures, and several other sites were grazed in part. Such land management is disastrous for forest/treeland sites in the longer term as lack of ensuing regeneration spells their eventual demise.

Hydrological changes, droughts and edge effects

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

Today many sites are small with huge boundary to area ratios and no buffering around their margins to protect them from sun-baked air heated in the surrounding pastoral/horticultural environments. Water tables have dropped through gravel extraction of riverbeds.

Black beech decline is also widespread throughout much of the northern sector of the ecological district that 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 black beech is also noticeable at many sites where it occurs (other than for the upper Stanley Brook and the Motueka Valley areas where rainfall is higher).

Disease

Cabbage tree decline has no doubt reduced populations of ti kouka. It is rare in all but one of the 30 or so SNHs (forests and wetlands) in which it occurs. Its poor capacity to regenerate in this locality is perplexing.

Fire

Losses to fire are likely to have been an ever-present threat up until recent decades, because of the practice of hill-slope burn-offs commonly practiced up until the 1970s, and for the lack of good aerial fire-fighting technology. Today SNHs are very unlikely to be damaged in this way, other than perhaps in pine plantations. Quite a number of native forest SNHs are located within extensive pine forest. They are vulnerable to the rare chance of catastrophic fire events engulfing such plantations.

Pine felling

Commercial felling of pines adjoining the margins of forest SNHs periodically opens up the margins to windthrow, sun scorch and the invasion of old man's beard. These are an unavoidable consequence of plantations being planted up to their margins. (Such impacts are arguably offset however by the beneficial buffering effects of indigenous forest being located within blanket pine forest.)

Species extinction

Due to the highly fragmented nature and small size of many of the remaining SNHs, populations of some plant and less mobile animal species are susceptible to local extinctions. This is particularly so at the more isolated sites where natural reintroduction, or augmentation of small populations is problematic. These includes a number of nationally 'threatened/at risk' species that occur in very low numbers and are at risk of being lost.

Forest clearance

No signs of very recent loss of native forest within the northern sector were noted. Only one c40ha area of native forest in the survey area that was documented in the 1980s (Walls 1985) is now lost, a presumed casualty of the beech chip export market that was closed by legislation in the early 1990s. No SNHs showed any sign of recent logging, and none are believed to be subject to an indigenous logging permit/plan.

Saltmarshes, estuaries and foreshores

Disturbance to indigenous fauna is the main threat to these coastal areas.

Walkways

A public walkway has been mooted for the western embayments of the Waimea Inlet between the Rabbit Island road and Mapua. Due to the hilly nature of the land adjoining the inlet this would likely be forced to run along the saltmarsh margins. These very margins are usually the only locations where banded rail nest (where they occur). The route would be likely to run so close to nest sites that birds would desert nests and render key saltmarshes unsuitable for breeding. The population within the Waimea Inlet is already tenuous at best, and such an impact on numbers would be grave.

Dogs

Dog exercising through saltmarshes on the margins of estuaries is not uncommon in the Waimea and Moutere Inlets, with potential adverse impacts on breeding or roosting shorebirds and saltmarsh birds. The actual impacts are not well known nor documented.

Recreation

Public use of foreshores for recreation renders such areas unsuitable to nesting shorebirds if the activity is moderate to high or particularly noisy. Coastal activity seems only to increase with time, with detrimental effects on shorebird roost SNHs. (No breeding shorebird SNHs were identified.)

Tidal gates and culverts

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

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- 82cm rise by the end of the century under current emissions trajectories and a rise of 2.6- 4.8 oC 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, their 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

Grazing and stock fencing

Three freshwater wetland SNHs are open to grazing, with two existing as ribbons of swamp within extensive pasture. One was heavily damaged by cattle, but the other two had only marginal impacts. Such stock access tramples native plants, increases fertility and favours weed invasion.

A number of swamp gully wetlands have recently had their surrounding land converted from pine forestry to grazing. This is likely to lead to increased eutrophication of these wetlands, favouring weed establishment and altering native vegetation patterns and composition.

Drainage and destruction

One swamp SNH, at the time of survey, had a newly dug drainage ditch along one upper flank. The water table was duly reinstated under discussion with the covenanting body.

(Note: A further swamp has experienced recent scrub loss from bulldozer activity, possibly out of ignorance that the scrub constituted wetland vegetation. As the landowner withdrew from the survey programme before completion this site is not treated as an SNH.)

Freshwater wetlands are vulnerable to destruction through drainage or damming, and it is likely that there has been a steady slow loss of potential SNH sites to this day that has gone undocumented.

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 the threats section, exotic species put considerable pressure on indigenous species and ecosystems. From the surveys it is clear what the key weed species are in the ecological district within SNHs and these have been outlined in the threats section.

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 or/and local agencies. Weed management of forest sites is undertaken at a minor percentage of them. The SNHs administered by Tasman District Council are mostly (all but one) managed for biodiversity (among other) interests. SNH landowner reports have the potential to enhance the prospects of restoration by informing and inspiring landowners. There is no doubt that this has been the case with a number of such reports. It would seem that a small number of QEII covenants are registered each year as a result of landowners participating in the survey.

Pest plant invasion of the northern sector of the ecological district is inexorable, with no species of major concern anywhere near their limit of spread. A strategy of site-based, catchment-based and species-based control would be required to at least contain the spread, but even that would be a considerable undertaking.

While riparian weed control and the benefit of catchment based control is recognised by Tasman District Council, there is little funding directed to its management. Such an approach has been taken in the Regional Pest Management Strategy with regard to gorse, broom and old man's beard in the upper Buller but funding constraints mean that this is not likely to be extended to other species or other areas. However exceptional circumstances have prevailed: Due to a highly motivated community in eastern Golden Bay, banana passionfruit has been declared a 'progressive control pest' in the district, which recognises that Tasman District Council has a role in supporting its control in that part of the district. Banana passionfruit occurs very sporadically in the ecological district in the Moutere River catchment and mid to upper Wai-iti catchment. Its control in these areas would require a similarly motivated group and the co-operation of many landowners (such as is occurring in Golden Bay).

Effective pest animal control has largely been confined to Animal Health Board possum control over large sections of the northern sector of the ecological district, at least until very recently. This has now almost ceased due to the success in fighting bovine Tb in cattle herds with this approach. It is now up to landowners to undertake such work themselves if they are to protect their remnants. This is of particular importance in the Dove Valley and Stanley Brook areas where the largest known concentration of scarlet mistletoe populations in the region is present, that to date have benefited greatly from Animal Health Board possum control.

Recreational pig hunting has had only localised and temporary impacts on numbers where they occur. Numbers are very high toward the southern half of the survey area and there is no obvious answer to this seemingly intractible problem, requiring a landscape scale initiative to deal with successfully. The popularity of pig hunting, hunter (re)introductions and a lack of inter-agency support for such a programme mean that the status quo prevails.

There is some occasional recreational deer hunting undertaken locally but animal numbers are in any case very low and there is no pressing need to target them, other than to keep their numbers at low levels. Any rise in numbers would spell disaster to the many forest remnants rich with understories palatable to browsing ungulates.

No feral goat culling has been undertaken as far as it known in the tiny area where they occur above the Motueka eastbank. This is perhaps the most important immediate conservation management issue in the northern sector of the ecological district. The Moutere Depression supports numerous native forest SNHs that are free of ungulate browse, and are often in magnificent condition. It is by far the largest tract of country with extensive indigenous forest remnants in the top of the

South Island mainland essentially almost free of goat and deer impacts. It should also be noted that goats are farmed in several locations within the survey area, with the risk of escapees forming feral populations.

Very limited control of the smaller pest animals (rodents, mustelids, feral cats and hedgehogs) is undertaken in the northern sector of the ecological district, at least in any systematic way. Only two such programmes are known of. The issue is one of what can be achieved when such species are essentially everywhere, as they requires control 'in perpetuity' to achieve meaningful outcomes. It is a huge challenge at it requires weekly long-term work to be successful. The key gains to be made are flourishing indigenous bird and invertebrate populations, healthy vegetation, and a reinstatement of a measure of the original ecological dynamics of local ecosystems.

Grazing and stock fencing

Without regeneration all the treelands and browsed-out forests are doomed in the longer term. The future of such sites hinges on landowner interest in restoration through stock removal/fencing and revegetation, or at least in the case of treelands, planting into gaps to retain them. Revegetating is not easily achieved on the free-draining and summer drought-prone floodplains, with summer watering often required in the early years. 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. Several wetlands are vulnerable to stock access, with fencing the obvious solution. The council offers fencing assistance in such instances.

Falling watertables, edge effects, drought

The drying of forest and treeland sites has been a continual process ever since forest fragmentation and drainage began. The issue here 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 opportunies that there might be for reinstating former water levels at now well-drained alluvial forest SNHs in the district without impacting on adjoining properties. With regard to the decline of forest canopy species such as kahikatea and black beech, the obvious response is to include these two key characterising 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.

A range of more sensitive plant species are likely to be absent from, or rare in existing remnants, where formerly they occurred throughout the ecological district, due to now dryer forest interiors caused by fragmentation and hydrological changes. Many fern species would fall into this group. Extending and sealing forest margins with deep restoration plantings would achieve some gains.

Species extinction

A large number of plant species are rare or absent, either due to the sheer rarity of habitat, or for being originally naturally uncommon in the ecological district and where the small remaining areas (by chance) support few of them. For tree species alone this includes hinau, pokaka, narrow-leaved maire west of Brightwater, South Island kowhai, raukawa, narrow-leaved lacebark, manatu, ti kouka and white maire among others. These should be key minor species to include in forest revegetation projects where appropriate. To some extent this is already taking place.

A number of nationally 'threatened' or 'at risk' plant species are in such low numbers that without propogation it is likely that at least some of them will be lost. Several mistletoe species could be readily spread around the ecological district where suitable host trees and shrubs are present, in areas where possums are managed. Shovel mint and native germander could be propogated from local seed and planted into suitable sites.

Ecosystem fragmentation

With such high ecosystem depletion in the ecological district, the resultant fragmentation of surviving SNH sites precludes meaningful ecological connections through spatial separation. For their longterm survival, systematic building of resilience by buffering and corridor development is required, to form an interconnected network. This would would help strengthen key ecological processes essential for healthy functioning ecosystems (Clarkson, 2013).

Riparian margins are an obvious conduit for restoring connectivity through the landscape. Fortunately such areas are being increasingly fenced from stock and planted with native species, with changing attitudes and an increasing awareness of the importance of water quality in streams and rivers and the impacts of stock on such values. The Council offers co-funding to landowners for such fencing, a welcome initiative that can only help catalyse riparian protection. 'At risk' freshwater fish species such as longfin eel and giant kokopu that occur in waterways within a few SNHs will benefit from such initiatives.

Natural regeneration

Recent emergence of secondary forest within the northern sector is rare, but there are slopes where this is occurring, through benign neglect, deliberate non-intervention, and locally through active management. Kanuka and mixed broadleaved forest appearing through slopes of bracken and gorse is a strong feature of parts of the Ngatimoti and lower Orinoco landscapes. Some areas remain uncleared for farmland because of the game habitat they provide, principally feral pigs.

Direct human disturbance

This is only really a serious issue along the coastline, with minor management issues at some Tasman District Council SNH reserves inland.

Dogs

Bylaws exist for areas 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 key shorebird roosting and breeding sites, there would be considerable benefits for these species. Transgressions of bylaws are very 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 would be helpful at a number of SNHs located within estuaries, beaches and sandbanks where bird disturbance from recreational activities is likely to be an issue. Some research is required in this area.

Infilling

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

Subdivision

Currently there are no rules or guidelines within the district plan that discourage subdivision within SNHs or other natural areas. The result is that sites that were once within 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.

Subdivision does also offer opportunities. Council has a policy of asking for covenants and in some cases management plans on natural areas where the title is subject to a subdivision application. (Section 8.3).

Sea level rise and climate change

Climate stabilisation achieved through drastic cuts in CO2 emissions is outside the scope of this report, but it is clearly critical to avoid this international ecological calamity 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.

Education and Planning

Good management outcomes can only be achieved through a sympathetic landowning community, and an interested i.e. educated broader community that get directly involved in conservation work. 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, Ornithological Society of New Zealand estuary trapping programmes and the 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 of SNHs

Management for the protection of key biodiversity values should be both issue- and site-led. Conservation management at the key sites on crown or local body owned lands should be undertaken (if not underway already) and encouraged on privately owned sites (if not underway already). There are other issues that affect large numbers of sites for which a more general management approach would be appropriate (eg certain pest plants). The focus should be on a number of aspects that include:

1) the most depleted ecosystems in the ecological district
2) the most potentially damaging pest plants and animals at the beginning of their infestation curve
3) the best examples of each ecosystem in the ecological district
4) key pest plants that are geographically restricted by their habitat requirements making elimination feasible
5) nationally threatened and at-risk species
6) coastal faunal habitat.

The highest priorities for each of these are:

1) The most depleted ecosystems are upper saltmarsh, freshwater wetlands, coastal fringe forest, and alluvial forest especially those with riparian communities.

   Issues include:

   - Fencing of grazed alluvial forest and alluvial treeland SNHs from stock, and revegetating, to allow native forest to regenerate will help ensure these areas will survive long-term
   - Controlling pest animals in and around all saltmarsh and foreshore SNHs with identified faunal values threatened by pests would make substantial gains for threatened coastal wetland species
   - Fencing of the three identified wetland SNHs where stock access and damage is an ongoing issue
   - Weed control, in particular old man's beard in alluvial and coastal margin forest and willow species in freshwater wetlands

2) The most potentially damaging pest plants and animals at the beginning of their infestation curve.

   Priorities are:

   - The range of feral goats could be determined within the northern Moutere Gravels with a view to determining control and elimination strategies. This would require the full co-operation of the relevant landowners.
   - The extent of banana passionfruit in the Moutere River catchment could be determined, with the hope that it is still possible to eliminate it. This would require a co-ordinating body to undertake this and any subseqent control work in co-operation with quite a number of landowners.
   - Other highly invasive pest plants occur at only one or two SNHs, such as giant Himalayan lily and blackthorn or are only just establishing at some sites such as African clubmoss. These could be eliminated as soon as practicable if landowners are willing.

3) The best SNH examples of the ecosystems in the ecological district.

   The survey has identified SNHs that are likely to be the best examples in the northern sector of the ecological district of their type (not all sites were surveyed with a c70% survey participation by landowners). Management issues include (for example):

   - Old man's beard at the largest alluvial forest remnant in the ecological district is rampant requiring a huge work programme to get under control
   - Willow and poplar species at by far the largest freshwater wetland are inundating the wetland vegetation on a vast scale
   - One of only two very mature podocarp forest stands (trees to 2.5m dbh) on hillslope is inundated with old man's beard

4) Key pest plants that are ecologically restricted by their habitat requirements making elimination feasible.

   - The main species relevant here are grey willow (and to a lesser extent pussy and white willow, and a poplar species) that are present at many freshwater wetlands SNHs but generally absent otherwise from the greater landscape; a programme of eliminating grey willow is feasible and was indeed championed by freshwater ecologist John Preece in the late 1990s for the Moutere wetlands.

5) Nationally threatened species.

   Managing nationally 'threatened' and 'at risk' species within SNHs is important to increase populations and improve population viability, or at the least halt further declines.

   These include:

   - Species known to be nationally 'threatened' within SNHs are shovelmint and falcon. Falcon numbers appear healthy, at least in afforested areas (See Section 8.3). Shovelmint could be introduced to alluvial forest sites where conditions seem suitable.
   - Nationally 'at risk' plant species recorded in SNHs are three mistletoe species and native germander. Propogation of such species could be encouraged.
   - Nationally 'at risk' fish species include a wide range, but most notably shortjaw kokopu and giant kokopu. SNHs where the latter two species occur should be carefully managed to benefit them. Allowance for better fish passage through coastal flapgates at the rear of saltmarsh SNHs without compromising flooding and salinity issues upstream would assist many 'at risk' fish species.
   - Nationally 'at risk' bird species recorded in SNHs are all wetland species or coastal species. Pest control programmes targetting ship rats and stoats in such areas where they breed are important for low-nesting species.

6) Coastal faunal habitat SNHs

   Such areas are given prominence here due to the critically small area that they occupy. They include inanga spawning sites, wader roosting sites and a shag breeding colony.

   Priorities include:

   - Inanga spawning sites (all are now likely to have been identified) are carefully retained so that the exotic vegetation on which they rely (tall fescue, creeping bent on stream banks) is not shaded or sprayed out (even with well-meaning riparian plantings)
   - Future walkways and cycleways should be designed to avoid the proximity of shorebird roosts and breeding sites of rails and crakes.

8.3 Existing Management Initiatives

A large range of projects are already underway in the ecological district within SNHs. These are generally stand-alone initiatives focussing on one site, rather than strategic in the sense of working on the more important sites or issues per se. They include:

- Trapping programmes are operating at one 60 ha forest SNH – targeting possums, rats and mustelids and around one saltmarsh SNH in the Moutere Ecological District section of the Waimea Inlet – targeting stoats. Ornithological Society of New Zealand and Plant Right Now members have been trapping mustelids around parts of the Waimea Inlet for some years to protect banded rail and fernbird and other saltmarsh species. Within the ecological district this includes the important Stringer saltmarsh SNH.
- 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. Six projects that include weed control have been part financed by the Biodiversity Fund at the time of writing.

- 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.
- One of the largest alluvial forest remnants in the region, near Upper Moutere, has been adopted by the Nelson/Tasman Weedbusters as one of their sites, with a 'bust' every c8 months. Several other forest SNHs have also been taken on by this group in the district.
- Tasman District Council manages several of its reserves for biodiversity that are SNHs, these being Faulkner Bush, Higgs Reserve, McIndoe Reserve and Pine Hill Reserve. Further, the non-reserved Tunnicliffe Forest SNH within the council's forestry estate is being increasingly targeted for old man's beard control.
- Department of Conservation have two plant introduction programmes on SNHs. Coastal peppercress and saltbush have been introduced to at least one SNH site.
- Narrow-leaved maire has been planted in a number of SNHs to help secure its future in the ecological district.
- Cord grass has been controlled by Tasman District Council almost to the point of extinction within the saltmarshes of the Waimea Inlet.
- $40,000 has been made available (from 2011) for saltmarsh restoration in the Moutere Inlet by way of compensation for saltmarsh loss within the inlet caused by the widening of a section of State Highway 60. This is currently funding the restoration of five upper saltmarsh/land interface areas at the southern end of the inlet by way of weed control and native restoration plantings.
- A mistletoe propogation workshop was held in c2006 in the Dove Valley for interested members of the public. This focused on scarlet, yellow and white mistletoe and resulted in widespread propogation of these 'at risk' species in the district. It would be timely to repeat such a workshop considering the growth of citizen-led conservation initiatives since then and to encourage propogation within forest SNHs with appropriate host trees.
- Council has a policy of asking for covenants and in some cases management plans on natural areas where the title is subject to a subdivision application. This has particularly impacted on several wetlands that are now subject to management (or will be) where previously they were in decline due to weeds and animal pests.
- The Tasman Environment Trust in conjunction with Titoki Nurseries has for some time now been running a programme of propogating certain regionally rare plant species and planting them out in suitable locations. There is a move to expand this programme.

Other activities outside SNHs include:

- The two larger forestry companies in the district take pride in the number of falcons living on their estates, logging sightings of birds and taking care around nest sites, or avoid nest site areas altogether when actively logging.
- Department of Conservation reserves: McKee Memorial Scenic Reserve has been actively managed for weeds for many years, and extensive restoration plantings were undertaken up until the mid 2000s. Eves Valley Scenic Reserve has had an active old man's beard control programme running for many years, and narrow-leaved maire have been planted. By contrast the large forest areas of Spooner Scenic Reserve and Pretty Bridge stewardship land have enjoyed no conservation management at all.
- Tasman District Council have an active fish barrier programme, identifying all culverts and flap-gates that are an issue, and facilitating their improvement.
- Plant Right Now restoration group under the umbrella of the Waimea Inlet Forum focuses on the Waimea Inlet and within the ecological district have begun restoratation at the rear of Stringer saltmarsh on Department of Conservation and council land.

8.4 Future Opportunities

Within SNHs, future opportunities lie largely with the landowners themselves who are most private individuals and forestry companies. Opportunities for outside groups to assist 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. This has been mooted for the Moutere Valley for example.

Quite a number of wetlands have recently been acquired by property developers in the wake of Carter Holt Harvey Properties divesting themselves of valuable land nearer the coast (as a result of the introduction of the Rural 3 zoning). Subdivision consents are being approved that include a management component for such wetlands as a condition of approval. This could be extended to include native forest sites in future.

The Waimea Inlet Forum, a community forum for those working for a regenerative future for the Waimea Inlet have begun implementing many of of its founding aims to restore the inlet. Future opportunities are numerous and include the native restoration of further key areas of the saltmarshes and the lowest reaches of feeder creeks within the ecological district (i.e. the NW sector of the inlet).

Tasman District Council have recently purchased over 5 ha of formerly grazed land inland of Higgs Reserve along Dominion Stream, with huge scope for coastal forest restoration, and the potential for the future inland retreat of saltmarsh as sea-levels rise.

Dominion Flat is now being restored to alluvial coastal forest and estuary edge vegetation after being acquired by Tasman District Council

9. Protection of Significant Native Habitats

9.1 Existing protection

SNHs represent 42.7 % of remaining forest and treeland, 69.3 % of remaining freshwater wetlands, and 85.4 % of upper saltmarsh (Table 4). The comparatively low figure for forest/treeland is as much due to the presence 650 ha of forested conservation land that falls outside the scope of the survey, as to the degree of landowner participation. Sites failing to reach significance are only a very minor proportion.

The level of protection of remaining forest/treeland SNHs is 19.8%, for freshwater wetlands 17.7 % and for saltmarsh 0 % (being almost entirely 'common marine and coastal area'). Note that not all QEII covenants were surveyed (permission declined in some cases).

Table 4: SNH area and proportion of SNHs protected

Ecosystem	Remaining Area (ha)	Area SNH (ha)	% Remaining Area as SNH[1]	Area SNH Protected (ha)[2]	% SNH Area Protected
Forest/treeland	2214.5	950.7	42.9 %	182.9	19.2%
Freshwater Wetland	67.4	48.0	71.2 %	13.1	27.3%
Saltmarsh[3]	c35	29.9	85.4 %	0	0%

[1] Department of Conservation administered land falls outside SNHs

[2] See Section 4.0.7; includes QEII covenants, Tasman Accord forests, scenic reserves, local purpose and esplanade reserves

[3] excluding glasswort herbfield below upper saltmarsh areas; all areas of upper saltmarsh are considered significant but small fragments were not surveyed for assessment

Since the NHT survey began in October 2008 there have been 12 approved or registered QEII covenants of SNHs after they have been surveyed (at the time of writing).

9.2 Priorities for protection

There are four SNHs that are Council land within the northern sector of the ecological district. Two are reserved, and two are not. Of these:

- Higgs 'Reserve' include 1 ha of young secondary broadleaved coastal margin hill-slope forest, and freshwater wetland merging into saltmarsh. Having been gifted to the former Waimea County Council as a reserve by Miss Constance Higgs, it has still yet to be legally protected as a reserve some 25 or more years later. This is despite the recommendation raised 13 years ago under Tasman District Council's Moutere-Waimea Ward Reserves Management Plan (2000), (see section 5.26.4.).
- Pine Hill Heights Local Purpose Reserve is recommended for reservation as Scenic Reserve under Tasman District Council's Moutere-Waimea Ward Reserves Management Plan (2000) but this has yet to be undertaken.
- Tunnicliffe Forest is a 11 ha tract of secondary lowland totara- mixed forest on hill-slope that lies within exotic forest managed on behalf of Tasman District Council. It has no reserve status. Such a forest type, although to some extent induced, is very rare and this is a very notable remnant deserving of a level of formal protection status.

Tasman District Council's Higgs Reserve lacks any formal protection

10. Biodiversity Monitoring

10.1 Future monitoring

Monitoring of SNHs is important to measure and record changes in indigenous biodiversity and to assess the effectiveness of management activities and Council policies. Monitoring of selected SNHs is needed but will depend on resources and the primary requirements of the Native Habitats Tasman survey. Landcare Research is contracted to undertake a comprehensive review of monitoring for regional councils and unitary authorities, and have identified a substantial number of measures. This would allow consistent national reporting by linking with the measures now being used by Department of Conservation. It is possible that landowners could undertake assessment of some measures of assessment, but training would be needed and some independent auditing to maintain consistency. Ideally, monitoring would be done by a small team to achieve consistency with participation by landowners.

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

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12. Appendix 1: Names of Species Cited

12. Names of Species Cited

Flora

Trees and shrubs

Common Name	Species Name
akeaeke	*Dodonaea viscosa*
akiraho	*Olearia paniculata*
beech coprosma	*Coprosma microcarpa*
black beech; tawhairauriki	*Nothofagus solandri*
broadleaf; kapuka	*Griselinia littoralis*
coral mistletoe sp.	*Korthalsella clavata*
fivefinger; whauwhaupaku	*Pseudopanax arboreus*
fuchsia; kotukutuku	*Fuchsia excorticata*
hard beech; hututawhai	*Nothofagus truncata*
heketara	*Olearia rani*
hinau	*Elaeocarpus dentatus*
horopito; pepper wood	*Pseudowintera colorata*
inaka	*Dracophyllum filifolium*
kahikatea	*Dacrycarpus dacrydioides*
kaikomako	*Pennantia corymbosa*
kamahi	*Weinmannia racemosa*
kanono; large-leaved coprosma	*Coprosma grandifolia*
kanuka	*Kunzea ericoides*
karamu	*Coprosma robusta*
kawakawa	*Macropiper excelsum*
kohuhu	*Pittosporum tenuifolium*
korimiko	*Hebe salicifolia*
lancewood; horoeka	*Pseudopanax crassifolius*
lowland totara	*Podocarpus totara*
mahoe wao; narrow-leaved mahoe	*Melicytus lanceolatus*
mahoe, whiteywood	*Melicytus ramiflorus*
makomako; wineberry	*Aristotelia serrata*
manatu; lowland ribbonwood	*Plagianthus regius*
manuka	*Leptospermum scoparium*
mapou, red matipo	*Myrsine australis*
matai	*Prumnopitys taxifolia*
mingimingi	*Leucopogon fasciculatus*
miro	*Stachypitys ferruginea*
mountain akeake	*Olearia avicenniifolia*
mountain totara	*Podocarpus cunninghamii*
narrow-leaved maire	*Nestegis montana*
narrow-leaved lacebark; n-l houhere	*Hoheria angustifolia*
native germander	*Teucridium parvifolium*
ngaio	*Myoporum laetum*

nikau	*Rhopalostylis sapida*
niniao	*Helichrysum lanceolatum*
ongaonga; tree nettle	*Urtica ferox*
pate	*Schefflera digitata*
pigeonwood; porokaiwhiri	*Hedycarya arborea*
poataniwha	*Melicope simplex*
pokaka	*Elaeocarpus hookerianus*
prickly mingimingi	*Leptecophylla juniperina*
pukatea	*Laurelia novae-zelandiae*
putaputaweta; marbleleaf	*Carpodetus serratus*
rangiora	*Brachyglottis repanda*
raukawa	*Raukaua edgerleyi*
red beech; tawhairaunui	*Nothofagus fusca*
rimu	*Dacrydium cupressinum*
rohutu; NZ myrtle	*Lophomyrtus obcordata*
round-leaved coprosma	*Coprosma rotundifolia*
saltmarsh ribbonwood; makaka	*Plagianthus divaricatus*
scarlet mistletoe	*Peraxilla colensoi*
scrambling pohuehue	*Meuhlenbeckia axillaris*
scrub coprosma	*Coprosma rhamnoides*
shining coprosma	*Coprosma lucida*
shovel mint; New Zealand skullcap	*Scutellaria novae-zelandiae*
silver beech; tawhai	*Nothofagus menziesii*
South Island kowhai	*Sophora microphylla*
stinkwood	*Coprosma foetidissima*
swamp coprosma	*Coprosma tenuicaulis*
swamp mahoe	*Melicytus micranthus*
tarata; lemonwood	*Pittosporum eugenioides*
tawa	*Beilschmiedia tawa*
thick-leaved coprosma	*Coprosma crassifolia*
ti kouka; cabbage tree	*Cordyline australis*
titoki	*Alectryon excelsus*
toro	*Myrsine salicina*
turepo; small leaved milkwood	*Streblus heterophyllus*
weeping matipo	*Myrsine divaricata*
white maire	*Nestegis lanceolata*
white mistletoe; pirita	*Tupeia antarctica*
yellow mistletoe	*Alepis flavida*
yellow-wood	*Coprosma linariifolia*
	Neomyrtus pedunculata
	Pimelea gnidia
	Raukaua anomolus
	Coprosma rigida
	Coprosma tayloriae

Lianes

Common Name	Species name
climbing pohuehue, meuhlenbeckia, blackvine	*Muehlenbeckia australis*
bush lawyer	*Rubus cissoides*
kiekie	*Freycinetia banksii*
native clematis	*Clematis paniculata*
native jasmine	*Parsonsia heterophylla*
native passionvine	*Passiflora tetrandra*
supplejack; karaeo	*Ripogonum scandens*
white rata vine	*Metrosideros diffusa*
Dicotyledonous herbs	
australina	*Australina pusilla*
coastal peppercress	*Lepidium banksii*
glasswort	*Sarcocornia quinquefolia*
native nettle sp.	*Urtica incisa*
native ragwort sp.	*Senecio glomeratus*
remuremu	*Selliera radicans*
saltbush	*Atriplex cinerea*
sea primrose	*Samolus repens*
shore cotula	*Leptinella dioica*
shovel mint; New Zealand skullcap	*Scuttelaria novae-zelandiae*
swamp buttercup	*Ranunculus macropus*
	Chenopodium ambiguum
	Gonocarpus micranthus
	Gratiola sexdentata

Monocotyledonous herbs

Common Name	Species name
greenhood orchid sp.	*Pterostylis areolata*
ground lily	*Astelia fragrans*
harakeke; swamp flax	*Phormium tenax*
inkberry	*Dianella nigra*
native iris sp.	*Libertia ixioides*
perching orchid sp.	*Drymoanthus adversus*
raupo	*Typha australis*
spider orchid sp.	*Corybas trilobus agg.*
swamp astelia	*Astelia grandis*

Grasses sedges rushes

Common Name	Species name
bamboo rice grass	*Microlaena polynoda*
bush rice grass	*Microlaena avenacea*
club rush sp.	*Eleocharis gracilis*
common spike rush	*Eleocharis acuta*
cutty grass sp.	*Gahnia pauciflora*
estuary tussock	*Austrostipa stipoides*
hook grass sp.	*Uncinia banksii*
hook grass sp.	*Uncinia rupestris*
hook grass sp.	*Uncinia laxiflora*
hook grass sp.	*Uncinia scabra*
hook grass sp.	*Uncinia uncinata*
knobby clubrush; wiwi	*Ficinia nodosa*
lake clubrush; kuawa	*Schoenoplectus tabernaemontani*
oioi	*Apodasmia similis*
pukio	*Carex virgata*
purei	*Carex secta*
rautahi	*Carex geminata*
sea rush	*Juncus kraussii*
sedge sp.	*Baumea rubiginosa*
sedge sp.	*Baumea tenax*
sedge sp.	*Carex dipsacea*
sedge sp.	*Carex dissita*
sedge sp.	*Carex raoulii*
sedge sp.	*Carex testacea*
sedge sp.	*Carex flagellifera*
sedge sp.	*Carex lambertiana*
sedge sp.	*Carex maorica*
sedge sp.	*Lepidosperma australe*
spike rush sp.	*Isolepis cernua*
swamp cutty grass	*Gahnia xanthocarpa*
three square	*Schoenoplectus pungens*
toetoe	*Cortaderia richardii*
umbrella sedge	*Cyperus ustulatus*
	Lachnagrostis billardierei

Ferns

Common Name	Species name
beech hard fern	*Blechnum procerum*
bracken	*Pteridium esculentum*
button fern	*Pellaea rotundifolia*
crown fern	*Blechnum discolor*
filmy fern sp.	*Hymenophyllum demissum*
giant hypolepis	*Hypolepis dicksonioides*
gully fern	*Pneumatopteris pennigera*
hen and chickens fern	*Asplenium bulbiferum*
houndstongue fern	*Microsorum pustulatum*
katote; soft tree fern	*Cyathea smithii*
kidney fern	*Trichomanes reniforme*
kiokio	*Blechnum novae-zelandiae*
leather leaf fern	*Pyrrhosia eleagnifolia*
lowland shield fern	*Polystichum neozelandicum*
mamaku	*Cyathea medullaris*
necklace fern	*Asplenium flabellifolium*
parsley fern	*Botrychium biforme*
ponga; silver fern	*Cyathea dealbata*
prickly shield fern	*Polystichum vestitum*
rasp fern	*Doodia media*
shield fern sp.	*Polystichum silvaticum*
shining spleenwort	*Asplenium oblongifolium*
sickle spleenwort	*Asplenium polyodon*
strap fern sp.	*Grammitis billardierei*
tangle fern sp.	*Gleichenia dicarpa*
tangle fern sp.	*Gleichenia microphylla*
terrace hard fern	*Blechnum fluviatile*
velvet fern	*Lastreopsis velutina*
waewaekoukou	*Lycopodium volubile*
wheki ponga	*Dicksonia fibrosa*
wheki; rough tree fern	*Dicksonia squarrosa*
	Blechnum chambersii
	Blechnum colensoi
	Blechnum vulcanicum
	Lastreopsis glabella
	Lastreopsis hispida
	Lastreopsis microsora
	Leptolepia novae-zelandiae
	Leptopteris hymenophylloides
	Pteris tremula

Pest Plants

Common Name	Species name
African clubmoss	*Selaginella krausii*
African feather grass	*Pennisetum macrourum*
banana passionfruit	*Passiflora mixta/mollisima*
barberry	*Berberis vulgaris*
black locust	*Robinia pseudoacacia*
blackberry	*Rubus fruticosus agg.*
blackthorn	*Prunus spinosa*
boneseed	*Chrysanthemoides monilifera*
boxthorn	*Lycium ferocissimum*
broom	*Cytisus scoparius*
buck's horn plantain	*Plantago coronopifolius*
buddhleia	*Buddleja davidii*
climbing asparagus	*Asparagus scandens*
climbing spindleberry	*Celastrus orbiculatus*
climbing spindleberry	*Celastrus orbiculatus*
cord grass	*Spartina anglica*
crack willow	*Salix fragilis*
egeria	*Egeria densa*
European gorse	*Ulex europaeus*
foxglove	*Digitalis purpurea*
giant Himalayan lily	*Cardiocrinum giganteum*
grey willow	*Salix cinerea*
hawthorn	*Crataegus monogyna*
hops	*Humulus lupulus*
hornwort	*Ceratophyllum demersum*
ivy	*Hedera helix*
Japanese honeysuckle	*Lonicera japonica*
male fern	*Dryopteris felix-mas*
old man's beard	*Clematis vitalba*
poplar sp.	*Populus sp.*
purple loosetrife	*Lythrum salicaria*
pussy willow	*Salix xreichardtii*
saffron thistle	*Carthamus lanatus*
sellaginella	*Sellaginella kraussiana*
senegal tea	*Gymnocoronis spilanthoides*
sycamore	*Acer pseudoplatanus*
tall fescue	*Schedonerus phoenix*
variegated thistle	*Silybum marianum*
wall lettuce	*Mycelus muralis*
wandering willy	*Tradescantia fluminensis*
white willow	*Salix alba*
	Atriplex hastata

Fauna

Birds

Common Name	Species name
Australasian harrier; kahu	*Circus approximans*
banded rail; pereru	*Rallus philippensis assimilis*
bellbird; korimako	*Anthornis melanura melanura*
black shag; kawau	*Phalcrocorax carbo novaehollandiae*
brown creeper; pipipi	*Mohoua novaeseelandiae*
eastern bar-tailed godwit; kuaka	*Limosa lapponica*
grey teal; tete	*Anas gracilis*
grey warbler; riroriro	*Gerygone igata*
kingfisher; kotare	*Halcyon sancta*
little shag; kawaupaka	*Phalacrocorax melanoleucos brevirostris*
long tailed cuckoo; koekoea	*Eudynamys taitensis*
marsh crake; kiotareke; kareke	*Porzana pusilla assimilis*
morepork; ruru	*Ninox novaeseelandiae*
New Zealand pigeon; kereru	*Hemiphaga novaeseelandiae novaeseelandiae*
New Zealand falcon; karearea	*Falco novaeseelandiae*
New Zealand scaup; papango	*Aythya novaeseelandiae*
New Zealand shoveler; kuruwhengi	*Anas rhynchotis variegata*
paradise duck; putangitangi	*Tadorna variegata*
Parakeet; kakariki spp.	*Cyanoramphus spp.*
South Island pied oystercatcher; torea	*Haematopus ostralegus finschi*
pied stilt; poaka	*Himantopus himantopus*
pukeko	*Porphyrio porphyrio*
red-billed gull; tarapunga	*Larus novaehollandiae*
royal spoonbill; kotuku-ngutupapa	*Platalea regia*
shining cuckoo; pipiwharauroa	*Chrysococcyx lucidas*
South Island fantail; piwakawaka	*Rhipidura fuliginosa fuliginosa*
South Island fernbird; matata	*Bowdleria punctata punctata*
South Island kaka	*Nestor meridionalis meridionalis*
South Island pied oystercatcher; torea	*Haematopus ostralegus*
South Island robin; toutouwai	*Petroica australis australis*
South Island tomtit; miromiro	*Petroica macrocephala macrocephala*
southern black-backed gull; karoro	*Larus dominicanus dominicanus*
tui	*Prosthemadera novaeseelandiae novaeseelandiae*
variable oystercatcher; torea-pango	*Haematopus ostralegus*
waxeye; tauhou	*Zosterops lateralis*
western weka	*Gallirallus australis australis*
white-faced heron	*Ardea novaehollandiae novaehollandiae*

Mammals

Common Name	Species name
native bat spp.; pekapeka	*Chalinolobus and Mystacina spp.*
New Zealand fur seal; kekeno	*Arctocephalus forsteri*

Lizards

Common Name	Species name
common skink	*Oligosoma polychroma*

Freshwater fish and aquatic invertebrates

Common Name	Species name
banded kokopu	*Galaxias fasciatus*
common bully	*Gobiomorphus cotidianus*
giant kokopu	*Galaxias argenteus*
inanga	*Galaxias maculatus*
koura	*Paranephrops planifrons*
lamprey	*Geotria australis*
longfin eel	*Anguilla dieffenbachii*
redfin bully	*Gobiomorphus huttoni*
shortfin eel	*Anguilla australis*
shortjaw kokopu	*Galaxias postvectus*
upland bully	*Gobiomorphus breviceps*

Pest animals

Common Name	Species name
brush-tailed possum	*Trichosurus vulpecula*
common wasp	*Vespula vulgaris*
European brown hare	*Lepus europaeus*
European hedgehog	*Erinaceus europaeus*
European rabbit	*Oryctolagus cuniculus*
fallow deer	*Dama dama*
feral goat	*Capra hircus*
feral pig	*Sus scrofa*
feral cat	*Felis catus*
ferret	*Mustela putorius furo*
house mouse	*Mus musculus*
koi carp	*Cyprinus carpio*
mosquito fish	*Gambusia affinis*
perch	*Perca fluviatilis*
red deer	*Cervus elaphus*
rook	*Corvus frugilegus*
rudd	*Scardinius erythrophthalmus*
ship rat	*Rattus rattus*
stoat	*Mustela erminea*
tench	*Tinca tinca*
weasel	*Mustela nirvalis*

9309 HotHouse Communications

Feel free to contact us:

tasman district council

Tasman District Council
Email info@tasman.govt.nz
Website www.tasman.govt.nz
24 hour assistance

Richmond
189 Queen Street
Private Bag 4
Richmond 7050
New Zealand
Phone 03 543 8400
Fax 03 543 9524

Murchison
92 Fairfax Street
Murchison 7007
New Zealand
Phone 03 523 1013
Fax 03 523 1012

Motueka
7 Hickmott Place
PO Box 123
Motueka 7143
New Zealand
Phone 03 528 2022
Fax 03 528 9751

Takaka
14 Junction Street
PO Box 74
Takaka 7142
New Zealand
Phone 03 525 0020
Fax 03 525 9972

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