

ECOLOGICAL DISTRICT REPORT 03

Biodiversity values of significant native habitats

# **BRYANT ECOLOGICAL DISTRICT REPORT**







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ECOLOGICAL DISTRICT REPORTS  
BIODIVERSITY VALUES OF  
SIGNIFICANT NATIVE HABITATS

# REPORT 03: BRYANT ECOLOGICAL DISTRICT

October 2020

This report presents the results of ecological surveys undertaken in the Bryant 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 25 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.

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

# EXECUTIVE SUMMARY

The Tasman District Council portion of Bryant Ecological District, covering 62,153 ha (69.4%) of its 89,586 ha total area, was surveyed by Tasman District Council between July 2012 and November 2013 for sites of ecological value.

The survey determined areas of ecological 'significance', in the sense of its meaning and purpose under section 6(c) of the Resource Management Act 1991. Such areas are designated by Tasman District Council as 'Significant Native Habitats' (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.

68 % of landowners approached within Tasman District agreed to participate in the project. A total of 67 sites were identified as SNHs, including sites that lay on council land.

Significant Native Habitats cover 1585.5 ha of indigenous forest and treeland, 90 ha of low serpentine vegetation and 1 ha of freshwater wetland. Within the Tasman District portion of the ecological district these areas constitute 4.2 % of remaining forest and treeland,

14.3 % of low serpentine/melange vegetation and rockland, and 50 % of remaining freshwater wetland.

SNHs largely encompass hill-slope forests dominated by beech, podocarp and mixed broadleaved species. Minor areas of alluvial forest, wetlands and mineral belt tussock-shrublands are also present.

Threats to these areas include climate change, pest plants and animals, grazing and forestry haul road construction through native remnants.

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; extending weed control in important forest areas, particularly targeting old man's beard within the Wairoa River catchment.



## 1. INTRODUCTION

This report provides an ecological summary of the Significant Native Habitats (SNHs) within the Bryant 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.





The ecological district is characterised by extensive protected hillcountry forests, with scattered private lowland remnants along the valleys

## 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. BACKGROUND

### 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.
- 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.

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.



## 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.

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 method of 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 observed.

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.

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 of 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



### 3. SURVEY AND ASSESSMENT METHOD

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. 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 Bryant Ecological District ran from July 2012 to November 2013.

## 4. ECOLOGICAL DISTRICT DESCRIPTION

### 4.1 LOCATION

Bryant Ecological District spans 89,586 ha, a figure which excludes the largely intertidal Nelson Haven that for convenience is mapped within it (*Figure 1*). The district runs from Drumduan (just north of the Glen) in the north, to the northern margins of the upper Wairau River in the south. It encompasses all the hills east of the Waimea/Wai-iti riverplain up to the skyline, and the hills to the ridgeline east of Tasman Bay as far north as Drumduan. It also includes the headwaters of the Motueka River. The area includes the Bryant Range, Barnicoat Range and Gordon Range, offshoots of the Richmond Range, and the Richmond Range itself at its southern end (including the western portion of the Red Hills). The main river valleys that dissect the hills are (from the north) the Wakapuaka, Maitai, Roding, Lee, Wairoa and upper Motueka. These generally run westward to north-westward. The main peaks include (from the north) Dun Mountain, Mt. Starveall, Mt. Rintoul, Purple Top, Ben Nevis and Red Hill. These all lie along the eastern boundary of the ecological district.

Note that the detailed ecological boundaries have been refined at 1:50000 by Shannel Courtney (Department of Conservation) in 2014 (unpublished), derived from the national-scale boundaries.

### 4.2 GEOLOGY AND LANDFORM

(Ref: McEwen 1987, Rattenbury 1998)

Most of the district is steep hill-country with deeply-incised valleys and minor areas of river flats and terraces, and on the ridgelines gentle summit shoulders and occasional steep mountain summits (*Figure 2*). A short section of coastline lies within the ecological district, running from Nelson City northward to McKay Bluff a distance of 15km. This includes the Boulder Bank that encloses Nelson Haven, as well as flats at the head of the haven.

The geology is notable for the Dun Mountain Ophiolite Belt (the 'mineral belt') that runs discontinuously the length of the district, most extensively expressed in the Red Hills. This is an early Permian formation of Dun Mountain Ultramafics, and Lee formation basalt and gabbro. Associated with this is a shear-zone known as the Patuki Melange, dating from the late Permian/early Triassic, being a mix of sedimentary, ultramafic and volcanic rocks set in a serpentine matrix. To the west of this is a broad band of Permian sedimentaries,

largely of Maitai Group sandstone, siltstone and mudstone, but including minor areas of limestone. This is the most extensive broad geology of the district. West of this again, in the north of the district (ie eastern Tasman Bay) lies a broad band of Permian Volcanics, largely Brook St Volcanics. The northern end of the district includes a minor coastal area of Tasman Intrusives granodiorite, from which the Boulder Bank is derived. North of Nelson city lie Jurassic non-marine sediments, and around and south of the city a range of Eocene/Oligocene/Miocene sedimentaries. Along the central western flanks lies a band of Triassic marine sediments, in places highly fossiliferous. East of the mineral belt in the southern half of the district (and largely in the upland to alpine zone) lies Late Permian indurated sandstone and siltstone that is increasingly metamorphosed toward the east into schists (Marlborough Schist Zone).

Twelve geopreservation sites of at least regional importance, with two of international importance are present in the ecological district (Hayward et al 1999) one of which is the Nelson Boulder Bank.

Soils on basic intrusive rocks in the north-east of the ecological district have clayey moderately deep subsoils, medium natural fertility and are droughty in summer. Soils on ultramafic dunite and serpentine rocks of the Dun Mountain area have low natural fertility with toxic levels of magnesium, chromium and nickel. Calcareous rocks on hilly and steep country have moderately deep fertile soils (rendzinas and related soils) with clayey sub-soils. Steepland soils on greywacke, argillite, and sub-schist near the coast are shallow and stony with yellowish brown friable subsoils with a moderate to low natural fertility. At higher altitudes and areas of higher rainfall, soils are very strongly leached to podzolised with low natural fertility (McEwen, 1987).

### 4.3 ALTITUDE AND CLIMATE

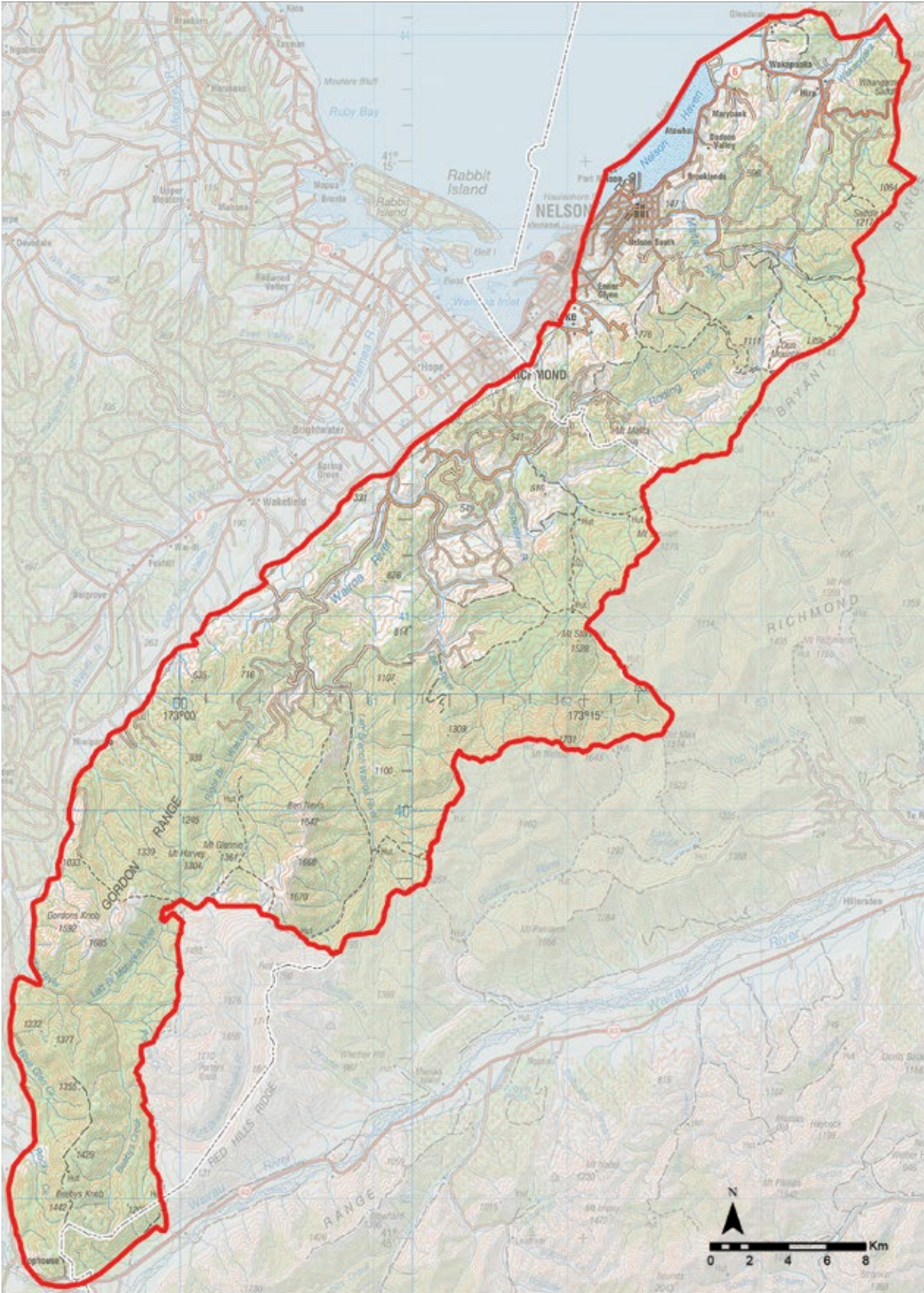
The ecological district lies between 0 – 1731 m asl, with the highest point at Mt Rintoul. Steep hill-sides fall to river flats and terraces that range from 150m asl at their uppermost extent, down to sea-level.

The climate (McEwen, 1987) in the north-west is sunny and sheltered, with very warm summers and mild winters. It is cooler and wetter to the south and at higher altitudes. Rainfall ranges from 1200 – 2000mm per annum (*Figure 3*).



# 4. ECOLOGICAL DISTRICT DESCRIPTION

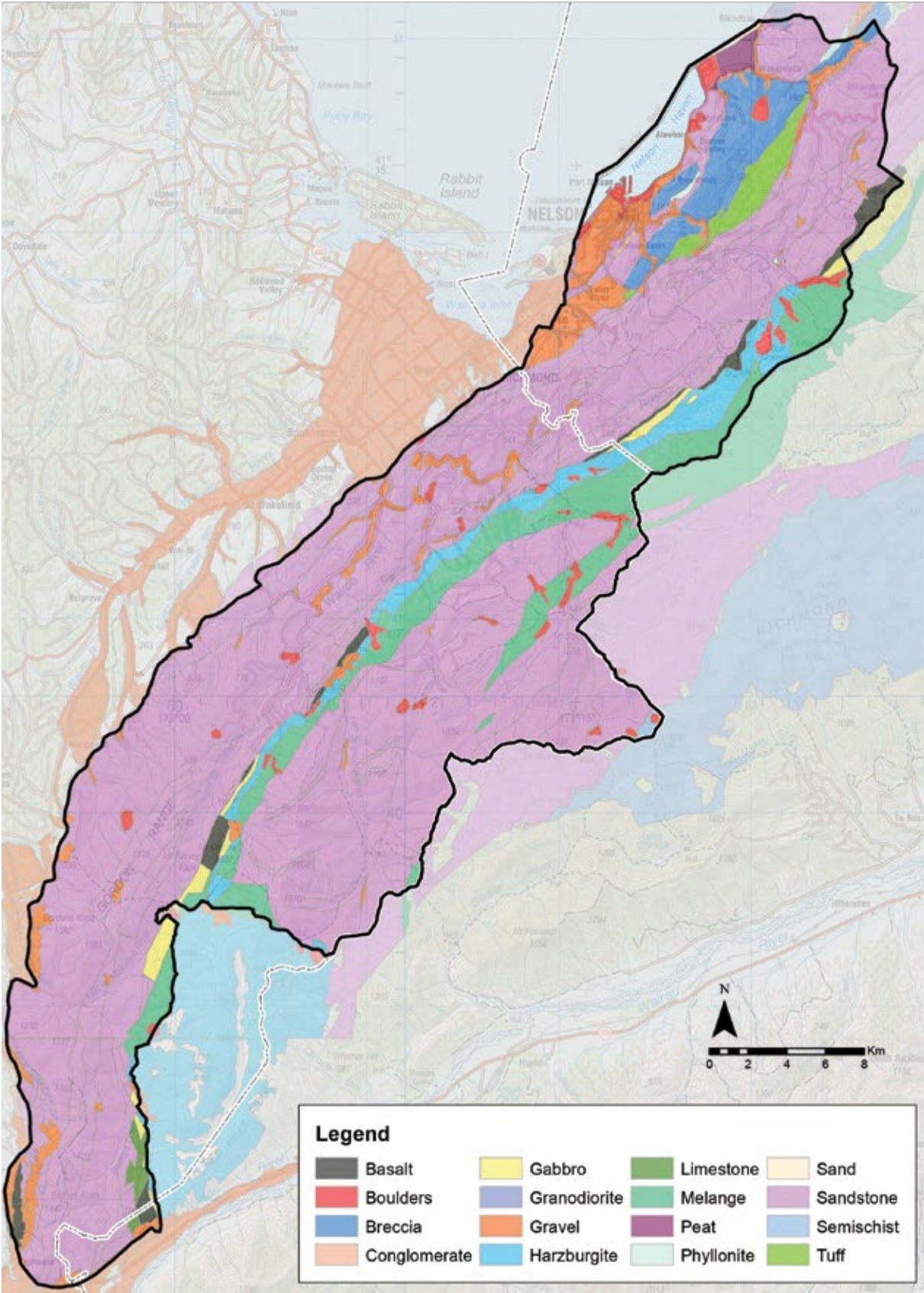
Figure 1: Bryant Ecological District





# 4. ECOLOGICAL DISTRICT DESCRIPTION

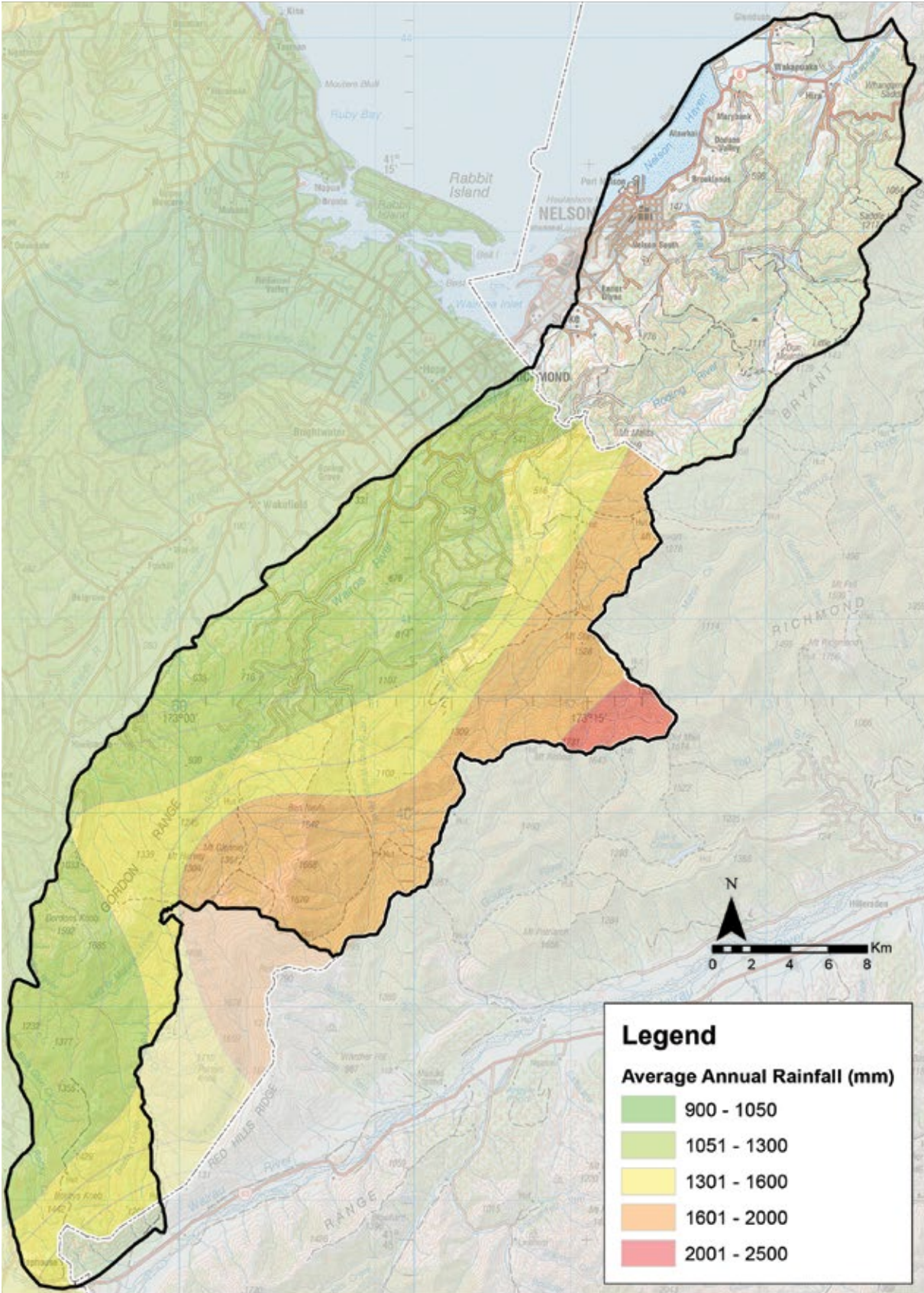
Figure 2: Bryant Ecological District – QMap geology





# 4. ECOLOGICAL DISTRICT DESCRIPTION

Figure 3: Bryant Ecological District – Rainfall







Rintoul (1731m) the highest peak in the ecological district

## 4.4 ORIGINAL INDIGENOUS ECOSYSTEMS

### FOREST

Tall forests originally dominated much of the ecological district below the treeline outside the mineral belt. Forests were dominated by beech and podocarp species.

Upland forests were largely of mountain beech at the treeline, with red and silver beech in mid to upper slopes. Black beech forest, commonly in association with red beech, and hard beech occurred on mid to lower elevations on hill-slopes. Red and silver beech also occurred along river margins and cold gullies. Rimu was common in many sections of lower to mid altitude hill-slope forest amongst black, hard and red beech to c800m asl forming a distinctive beech-rimu assemblage. Matai was present amongst black beech up to mid-slope. Lower slopes were of mixed beech-podocarp-broadleaved forest, constituents varying considerably with aspect and distance inland.

Lowland gullies largely supported podocarp-broadleaved forest, featuring abundant matai, lowland totara at the lowest elevations, titoki, pukatea in the

northern half in the lower gullies, and in warmer gully locations, tawa. Valley floors were dominated by podocarp-broadleaved-beech forest of matai, lowland totara, black beech and locally silver beech, titoki and tarata, and in the south red beech. Kahikatea was very locally common where drainage was impaired. Pukatea, black maire, broadleaf and tanekaha had a distinctive canopy-defining presence very locally.

Coastal slope forest was confined to the hills in the Atawhai, Glen and Port Hills areas, and were likely a mix of beech, podocarp and broadleaved species. These areas lie outside Tasman District.

Poorly drained sections of forested melange, largely in the uplands supported kaikawaka, pink pine, and toatoa with mountain totara and mountain beech present at better-drained sites. Southern rata and tanekaha were also a distinctive feature locally of better-drained melange at mid to lower elevations amongst hard beech and in places, podocarps.

Limestone forest is restricted and featured much southern rata, matai and broadleaf in places, with beech forest in others (dependent upon aspect, landform and altitude).



## 4. ECOLOGICAL DISTRICT DESCRIPTION

### MINERAL BELT – LOW STATURE VEGETATION

Low-growing ultramafic vegetation stretched in a continuous wide band from Mt Starveall northward to Dun Mountain, spanning valley bottoms to alpine tops, with the majority below the treeline. Scrub and shrubland, and vegetation of tor rocklands are widespread but scattered below the treeline on melange (sheer zone) geology, grading into forest in complex mosaics, depending on the degree of mineral expression and soil development.

Alpine/sub-alpine vegetation featured tussockland, shrubland and rockland, with mineral belt tussock, *Carex devia*, and much rockland substrate with scattered herbs. Lower altitudes have likely been extensively burnt and were probably originally dominated by mineral belt tussock, wharariki flax, manuka, low southern rata, *Ozothamnus vauvilliersii* and *Dracophyllum urvilleanum*.

Mineral belt seeps were found in localised areas, with a distinctive pakihi-like assemblage in the lowlands, and an impoverished range of herbs and sedges in the uplands.

### ALPINE (NON-MINERAL BELT)

The main sub-alpine and alpine areas away from the mineral belt are those around the Gordon Range, Ben Nevis Range, Purple Top, Mt Rintoul, Old Man, Slaty Peak, and Hacket Peaks. These comprised rockland, herbfield, fellfield, tussockland, shrubland and scrub. The geology is not fertile, and assemblages were not particularly diverse. The most diverse genera were (and are) *Hebe*, *Epilobium* and *Celmisia*, with several species of *Acaena*, *Anisotome*, *Aciphylla*, *Cardamine*, *Raoulia* and *Ranunculus*. Common species included mid-ribbed snow tussock, carpet grass, shrubs such as *Dracophyllum filifolium*, *D. uniflorum*, *Hebe venustula*, *H. anomala*, *Aristotelia fruticosa*, *Brachyglottis adamsii*, *Ozothamnus vauvilliersii*, and a range as *Celmisia* species such as *C. sessiliflora*, *C. spectabilis*, *C. monroi* and *C. incana*.

These mountains are an important mixing zone for North Island and South Island alpine flora, with several species reaching their southern or northern limits here. North Island edelweiss and the scree buttercup are respective examples.

### WETLANDS AND TARNs

Lowland freshwater wetlands formed only a very small proportion of the district. Kahikatea swamp forests were very localised on some poorly-draining river terrace. The only wetland of any extent lay outside Tasman District at the head of Nelsons Haven. This was described as a harakeke flax swamp (Wastney, 1977). It formerly held forest as evidenced by the abundant logs and tree roots in the peat that impeded its destruction through drainage.

As found today, tarns occurred at Dew Lakes at 950m asl beside Maungatapu, and 3km SSW of Purple Top at 930m asl, with none known above the treeline. The Dew Lake tarns sat in cushion bog vegetation.

Wetlands that occurred in the upland to montane zone were uncommon, confined to small seeps on shoulder slopes and perched terrain on hillsides, and saddle bogs on ridgeline flats where drainage is impeded.

### ESTUARY

Saltmarshes all lie outside Tasman District and were largely confined to Nelson Haven, most extensively at its head. This would have included herbfields of glasswort and sea primrose, backing up into oioi and sea rush, saltmarsh ribbonwood, and vegetation gradients into the freshwater swamp above. Estuary tussock was common around the upper margins.

### BOULDERFIELD

Outside Tasman District a 12km boulderbank encloses Nelson Haven. Originally it would have supported a degree of salt and windswept coastal scrub at its upper end, of such species as ngaio and kanuka. Otherwise low scrub/shrublands on the crest and inner slope were dominated by scrambling pohuehue and *Melicytus crassifolius*. Open herbfields and lichenfields otherwise prevailed amongst the boulders, with species such as shore bindweed.

### FAUNA

The ecosystems described above provided habitat for a huge range of fauna the extent of which can now only be guessed. A diverse avifauna, herpetofauna and invertebrate fauna was present in densities and diversities difficult to imagine today. Unfortunately, sub-fossil faunal remains have not been found (with a near-absence of caves) from which to gain an understanding of these past faunal assemblages.

## 4. ECOLOGICAL DISTRICT DESCRIPTION

### 4.5 PRESENT DAY ECOSYSTEMS

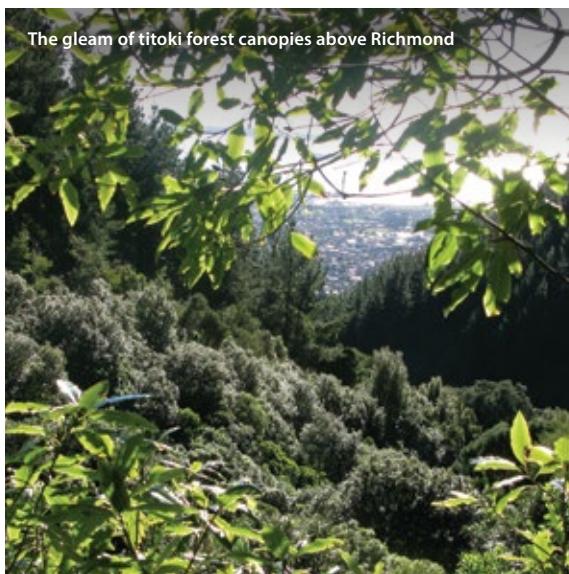
Other than for lowland swamps, it seems likely that at least in broad terms examples of most if not all of the original ecosystems survive in one form or another.

#### LOWLAND FOREST AND TREELAND

Lowland forest persists but in much reduced area and much impoverished condition. The most extensive areas in the ecological district lie in the waterworks reserves of the Maitai and Roding catchments, and in the upper valleys of the Lee and Wairoa Rivers, on public conservation land. All these areas are heavily affected by red deer and feral goat browse, and in many areas, pig rooting, but forest canopies (see section 4.4) are largely intact. Remnants outside these areas are mostly modified primary and mature secondary forests, with the majority of them protected from stock and wild ungulate browse for the last 25-30 years, after free stock access for over a century. Such forests are dominated by a diverse mix of broadleaved species such as mahoe, titoki, tarata, broadleaf, black maire, putaputaweta and in places akeake. Also present are matai, and in some areas lowland totara and kanuka, and in the northern gullies, tawa. Some extensive kanuka forest stands are present at the northern and southern ends of the district and in the Wairoa River catchment. Kahikatea and tanekaha are localised.

#### UPLAND FOREST

Much of the original upland forest survives, but almost all of it is heavily browsed out by red deer and feral goat, so that although canopy composition remains largely unchanged, the understories are enormously altered. Perhaps the biggest change is in the huge decline of broadleaf. Quite extensive tracts of mature kanuka forest occur in the southern end of the district,



straddling the lowland/upland altitude zones. Losses are mostly due to fires and subsequent grazing, areas now largely occupied by plantation forests.

#### MINERAL BELT VEGETATION

The extent of mineral belt vegetation remains unchanged in upland areas. However extensive and repeated fires have caused changes in species composition and a reduction in the extent of this vegetation at lower altitudes. This has also confused the picture of the distribution of this naturally low-statured vegetation. Fires simplified the vegetation and likely favoured manuka and mountain flax. In the Wairoa catchment, quite extensive lowland areas are now afforested in pines. However a degree of modified mineral belt vegetation persists in some areas due to poor growth of pines on this geology.

#### SUB-ALPINE AND ALPINE VEGETATION

This vegetation still occupies all its original area, but red deer, feral goat, possum and hare have altered plant associations and species distributions, to an unknown extent.

#### FRESHWATER WETLANDS

In the lowlands small areas of sedgeland with toetoe and locally ti kouka occur on cleared river terraces in the upper Lee, Wairoa and Wai-iti rivers, on what were formerly kahikatea-rich swamp forest/moist forests. Swamp forest now only survives as tiny pockets of a fraction of a hectare on several forested alluvial terraces.

In the uplands all areas originally present probably remain.

Artificial wetlands are very few, with most of the ecological district lying on sloping ground. They comprise the Maitai Dam, Wakapuaka Sewage Treatment Ponds, a small pond on the Wakapuaka Flats caused by an embankment, an induced wetland caused by the damming of a hill-side creek for a forestry detention pond in the Maitai catchment, and recently excavated ponds at the Glen Recreational Reserve. There are no irrigation or farm dams. Rush Pool, on the Dew Lakes track was dammed by Maori to provide water for splitting heated argillite.

## 4. ECOLOGICAL DISTRICT DESCRIPTION

### BOULDERFIELD

Vegetation is still partially intact on the Nelson Boulder Bank (outside Tasman District) with native assemblages still present in many areas where it originally occurred, although with an abundance of weeds.

### RIPARIAN VEGETATION

Downriver of the forested ranges large tracts of riverbank vegetation are now significantly altered by the presence of exotic herbs, sedges, grasses and shrubs. However, a strong indigenous element persists as riparian slopes tend to be steep and excluded from grazing.

### HABITAT FOR INDIGENOUS FAUNA

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

Remaining native forests provide habitat for what are now devastated bird populations with many former species extinct. Korimako/bellbird are by far the most numerous today, with hauhou/silvereye common and with tui and piwakawaka/fantail in moderate numbers. Present in moderately-low to low numbers are pipipi/brown creeper, riroriro/grey warbler, pipiwharau/roa/shining cuckoo, koekoea/longtailed cuckoo, kotare/kingfisher, toutouwai/South Island robin, miromiro/South Island tomtit, weka, and karearea/falcon. Kea, kaka and yellow-crowned kakariki are all very rare in the ecological district. Whio/blue duck have only just become extinct in the district, last reported in the mid-2000s in the Wairoa River. Kawau/black shag is occasional along the main river systems.

Outside Tasman District the original saltmarshes are largely destroyed, although there are recent reports of mioweka/banded rail just south of Monaco. Coastal shore-birds along the short section coast are well represented. Nelson Haven supports a range of shorebirds, including torea-pango/variable oystercatcher, torea/pied oystercatcher, tuturiwhatu/banded dotterel, kuaka/bar-tailed godwit, as well as kotuku-nutupapa /royal spoonbill, matuku-moana /white-faced heron and in winter kotare/kingfisher. Shorebird numbers are moderate to low compared to the larger populations seasonally recorded within the nearby Waimea Inlet. Nevertheless, it is considered to be an important feeding area for waders and the

upper reaches are important roost sites. Tara/white-fronted tern and karoro/black-backed gull breed on the Boulder Bank. Along the shore, tarapunga /red-billed gull, parekareka/spotted shag, kawau paka/little shag and kawau/pied shag are also present, with shag breeding at Queens Gardens (little shag) and Haulashore Island (pied shag).

Pekapeka/long-tailed bat have been occasionally recorded from the Maitai Caves area, and most recently (2013) around lights at the Nelmac Nursery in the Wood. These are likely to be wanderers from the small Pelorus Bridge population (Brian Lloyd, pers.comm.).

A small number of lizard species are present (Whitaker and Gaze, 1999), mainly coastal. The coastline margin provides habitat for common gecko, Marlborough 'mini' gecko, spotted skink and northern grass skink. Common gecko and northern grass skink found throughout the district in open areas below the treeline. Native forests may still support low numbers of forest gecko and Nelson green gecko but there are no records within the last 20 years.

Invertebrate knowledge of the ecological district is scant. The distribution of the giant land snail *Powelliphanta hochstetteri consobrina* includes three areas within the central to northern Bryant Range (Walker, 2003).

Indigenous freshwater fish species recorded within the Tasman District Council section of the ecological district (Kroos and James, 2007 & 2011) are koaro, upland bully, redfin bully, banded kokopu, longfin eel and shortfin eel. The Nelson City Council section of the ecological district also supports inanga, giant kokopu, giant bully, torrentfish, and common bully.







Plantation forestry struggling to grow on the mineral belt geology

## 4.6 EXTENT OF ECOSYSTEM DEPLETION

Walls and Simpson (2004) have estimated indigenous ecosystem loss for each of the ecological districts within Tasman District. Within the Bryant Ecological District they show that lowland ecosystem losses have been very high (*Table 1*). The current survey report does not cover the whole ecological district as a large proportion of it lies within public conservation land, so figures from the survey are not directly comparable. The breakdown of ecosystem types used by Walls and Simpson has not been repeated by this survey in its analysis of loss (*Tables 2 & 3*), with lowland forest considered as either hill-slope or alluvial rather than by broad canopy dominance by podocarp, beech or broadleaved species. To calculate forest loss in such detail by such categories from the survey data is not possible.

### FOREST

Upland (>600m asl) beech forest has lost an estimated 10% of its original extent (author's estimate), certainly not the 70% that Walls and Simpson (2004) suggest. Their estimates of lowland (<600m asl) beech depletion of 85%, lowland mixed forest of 95%, lowland broadleaved forest >95% and lowland podocarp 99% seem reasonable. Ultra-lowland (<300m asl) forest of all types have lost about 95% of its original extent (author's estimate), most particularly in and around the Nelson City area, and along river valleys and lower slopes.

Forest canopies area also much altered in lowland areas, with heavy logging of accessible matai, rimu and lowland totara resulting in the dominance of beech or broadleaved species. The exception are parts of the Wairoa catchment where fires are the likely cause of the near absence of beech species in the middle to lower reaches of the Wairoa, Lee and Roding rivers, which are currently broadleaved-dominated, or podocarp-dominated on the lowest slopes.

### FRESHWATER WETLANDS

The few wetlands that originally existed probably survived intact until European settlement. The only recorded large wetland was the 300ha swamp at the head of Nelson Haven that merged into about 100ha of saltmarsh. Its destruction during the 1840s-1900s is well documented (Wastney, 1977). It is likely that small freshwater wetlands merging into saltmarsh once occurred around the Maitai River delta, as well as at the mouth of other small streams. There may have been minor wetland areas along all the river valleys. However, river flats and terraces of impeded drainage were more likely supported kahikatea swamp forest or moist forest (see 'Forest' above). There are no valley floor freshwater wetlands surviving in their original form in the district. The few small existing sedgeland-dominated wetlands likely once comprised kahikatea swamp/moist forest prior to logging.

Lowland mineral belt wetlands are known from steep slopes below Dun Mountain in the Maitai catchment, and one small gently-falling wetland at 500m asl in the Lee catchment. They are localised and are best categorised as seeps, with perhaps elements of fen and swamp in places.

Montane wetlands remain intact but occupy only very small areas of impeded drainage on or close to ridgelines and on upper slopes. These are largely seeps/flushes, with rare tarns on flat ground.

### SALTMARSH

Saltmarsh lies outside the Tasman District portion of the ecological district. Little remains of the largest areas that once occurred in Nelson Haven.

### MONTANE

Subalpine and alpine areas are largely intact.

### MINERAL BELT

Large areas of tussocklands and shrublands associated with the mineral belt have been burned in the past, no doubt repeatedly in some areas, resulting in a much-simplified vegetation.

## 4. ECOLOGICAL DISTRICT DESCRIPTION

Table 1: Indigenous Ecosystems – Bryant 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	–	–	–	–
Fertile lowland swamp and pond	<1	<5	<2	<20
Infertile peat bog	–	–	–	–
Upland tarn	<1	100	100	100
Lake	–	–	–	–
River, stream and riparian	1	40	?	?
Lowland podocarp forest	5	1	<1	70
Lowland broadleaved forest	2	<5	<1	20
Lowland mixed forest	20	5	2	40
Lowland beech forest	25	15	8	50
Upland beech forest	35	30	25	80
Subalpine forest	2	70	70	100
Lowland shrubland	1	<10	<5	50
Upland/subalpine shrubland	2	70	70	100
Frost flat communities	–	–	–	–
Tussock grassland	3	100	100	100
Alpine herbfield and fellfield	2	100	100	100

[From Walls and Simpson (2004)]



## 4. ECOLOGICAL DISTRICT DESCRIPTION

Table 2: Ecosystem Depletion and Protection (Entire Ecological District)

ECOSYSTEM	ORIGINAL AREA (HA)	PRESENT AREA (HA)	REMAINING %	PROTECTED AREA (HA) <sup>1</sup>	% REMAINING PROTECTED <sup>1</sup>
Alpine (excl. mineralbelt)	3032 ha	3032 ha <sup>2</sup>	100 %	3032 ha	100 %
Ultramafic rockland, herbfield, fellfield, tussockland, shrubland, scrub (all altitudes)	c3500 ha <sup>3</sup>	c2760 ha <sup>2</sup>	c78.9 %	?	?
Hill country forest	81434 ha <sup>4</sup>	49346 ha	60.6 %	?	?
Alluvial forest	1170 ha <sup>3</sup>	c30 ha <sup>5</sup>	2.8 %	c10 ha <sup>5</sup>	33 %
– inc. swamp forest	Likely <10 ha	c0.5 ha	c5 %	0 ha	0 %
Freshwater wetland	c350 ha <sup>6</sup>	2	c0.6 %	0 ha	0 %
Sandspit, sandfield	none originally?	c1 ha created @ Tahunanui	n/a	n/a	n/a
Boulderfield	c100 ha	90 ha	90 % <sup>7</sup>	87 ha	96 % <sup>8</sup>
Saltmarsh	c150 ha <sup>9</sup>	15 ha <sup>10</sup>	c10 %	0 ha <sup>10</sup>	0 %

1. See Section 4.7: includes Scenic Reserves, Wildlife Reserves, Local Purpose and Recreational Reserves, Tasman Accord forests, QEII and DOC covenants

2. Areas crudely calculated using TopoftheSouth Maps area calculation facility

3. Best estimate based on existing area using TopoftheSouth Maps area calculation facility plus area (c740ha) of struggling pine forestry on likely former serpentine scrub/shrublands

4. Ecological District area less area of all other original ecosystems above MHW

5. Includes estimate of small terraces within Mt Richmond Forest Park

6. Estimate extrapolated from the former c300ha wetland at Wakapuaka and assumes at least a small area was likely around the mouth of the Maitai River and the few streams south of there where the coastline falls within the ecological district

7. On the assumption that 10% of the vegetation and habitat has been destroyed by tracklaying, weeds, infrastructure

8. c3ha of the Boulderbank lies on NCC grazing lease land and unprotected NCC land

9. Using TopoftheSouth Maps area calculation facility

10. Excludes Wakapuaka Sandflats reserves (DOC & NCC) as daily tidal ingress no longer occurs, with remaining vegetation no longer functional as 'saltmarsh'

? Denotes hectares that cannot be calculated without detailed mapping beyond the scope of this review – (partly due to the complex reservation status of the NCC waterworks reserves)

## 4. ECOLOGICAL DISTRICT DESCRIPTION

Table 3: Ecosystem Depletion and Protection (TDC section of the Ecological District)

ECOSYSTEM	ORIGINAL AREA (HA)	PRESENT AREA (HA)	REMAINING %	PROTECTED AREA (HA) <sup>1</sup>	% REMAINING PROTECTED <sup>1</sup>
Alpine (excl. mineralbelt)	3032 ha	3032 ha <sup>3</sup>	100 %	3032 ha	100 %
Ultramafic rockland, herbfield, fellfield, tussockland, shrubland, scrub (all altitudes)	c1370 ha <sup>2</sup>	627 ha <sup>3</sup>	45.8 %	507 ha	80.1 %
Hill country forest	57300 ha <sup>4</sup>	37843 ha	66%	34112 ha	90.1 %
Alluvial forest	450 <sup>2</sup>	21 ha <sup>5</sup>	4.7 %	c10 ha <sup>5</sup>	47.6 %
– inc. swamp forest	probably <5 ha <sup>6</sup>	c0.5 ha	c10%	c0.5 ha	100 %
Freshwater wetland	probably <5 ha <sup>6</sup>	1 ha	c20 %	0 ha	0 %
Sandspit, sandfield	0	0	–	–	–
Boulderfield	0	0	–	–	–
Saltmarsh	0	0	–	–	–

1. See Section 4.7: includes Scenic Reserves, Wildlife Reserves, Local Purpose and Recreational Reserves, Tasman Accord forests, QEII and DOC covenants

2. Areas crudely calculated using TopoftheSouth Maps area calculation facility

3. Best estimate based on existing area using TopoftheSouth Maps area calculation facility plus area (c740ha) of struggling pine forestry on likely former serpentine scrub/shrublands

4. Ecological District area less area of all other original ecosystems above MHW

5. Includes estimate of small terraces within Mt Richmond Forest Park

6. Difficult to determine, however from observations few terraces are likely to have been sufficiently poorly drained to sustain wetland/swamp forest



## 4. ECOLOGICAL DISTRICT DESCRIPTION

### 4.7 EXTENT, SIZE AND GENERAL CHARACTERISTICS OF EXISTING PROTECTED AREAS

#### SCENIC RESERVES

A number of such reserves occur within the ecological district, administered by the Department of Conservation unless otherwise indicated below. These are (by name with hectares of native vegetation or habitat), Whangamoia (a 90 ha portion of it comprising lowland hill country forest), Boulder Bank (86.8 ha of boulderfield), Aniseed Valley (83.4 ha of lowland hill country forest), Little Ben (22.6 ha of lowland hill country forest), and Titoki (4.7 ha of coastal forest administered by NCC). (Note that the 13.3 ha Grampians Scenic Reserve within the greater NCC Grampians Reserve supports no native vegetation). Of these 287.3 ha of native vegetation or habitat, 106 ha falls with Tasman District.

#### QEII AND DOC COVENANTS

Fifteen registered or approved QEII covenants (as at February 2016) totalling 187.8 ha of native vegetation are present in the ecological district, (using refined ecological district boundaries determined by Shannel Courtney, December 2013, unpublished) with eight of these (76.6 ha) within Tasman District. Four Private Protected Land (PPL) covenants, a Department of Conservation administered designation cover 218.4 ha, of which 157 ha lie within Tasman District.

#### OTHER RESERVES WITH LOWER LEVELS OF PROTECTION

##### 1) Tasman District Council administered

A number of small Esplanade, Recreation and Local Purpose reserves include areas of native vegetation. These are (by name with hectares of native forest or scrub), Meads Bridge (0.7 ha), Meads (0.2), Firestones (0.6 ha), Wairoa Gorge proposed Scenic Reserve (c2 ha), Wairoa Gorge (Garden Valley Stream) (0.3 ha). (Note that the native forest areas within Jimmy Lee Creek (7.9 ha), Reservoir Creek (12 ha) and White Gates Reserve (0.25 ha) have no reserve status and lack formal protection).

##### 2) Nelson City Council administered

A very large tract of continuous land incorporating Brook Waterworks, Maitai, Roding, Venner and Marsden Valley local purpose reserves and freehold land totals 10177 ha. Of this area 7401 ha lies within the protection of Local Purpose (Waterworks, Water Conservation, Water Supply, Esplanade) Reserve, of which c7116ha is native vegetation or habitat (the remainder being mostly in conifer plantation). 2776ha therefore remains freehold without any formal protection, most of which is native vegetation or habitat. (Note that The Grampians Reserve includes 31.70 ha of Recreation Reserve but it protects no native vegetation). Wakapuaka Sandflats Esplanade Reserve includes 26 ha of heavily modified saltmarsh vegetation. Pukatea Recreation Reserve is 0.45 ha of coastal forest. Three small coastal forest recreation/local purpose reserves in the Marybank, Atawhai and Bay View localities total 2ha.

##### 3) Department of Conservation administered

The portion of the Mount Richmond Forest Park within the ecological district totals 38,676 ha (Forest Park designation has no legal status over and above being stewardship land). Other lower-status reserves are (by name and hectares of native vegetation or habitat) Wakapuaka Raupo Swamp Government Purpose Reserve (45.9 ha of heavily modified saltmarsh and an induced wetland of c0.4 ha), Aniseed Valley Recreation Reserve (<1 ha), Hackett stewardship land (302.9 ha), Eighty-Eight Valley stewardship land (361.4 ha), Wairoa Gorge Recreation Reserve (0.2 ha), Blue Glen Creek stewardship land (434 ha of 448.1 ha lies within the ecological district), Korere-Tophouse Rd stewardship land (443 ha of 464 ha lies within the ecological district) and Tophouse Rd stewardship land (7 ha of 21 ha lies within the ecological district). Other reserves without native vegetation or habitat are not listed here.

All protected areas are tabulated above in Section 4.6

##### 4) Forestry Accords and Covenants

Two Crown Forest Licence Covenants totalling 48.6 ha lie within the NCC section of the ecological district in the Sharland Creek and Teal River catchments.

## 4. ECOLOGICAL DISTRICT DESCRIPTION

### 5) Council covenants

Tasman District Council does not keep an inventory of council covenants that protect indigenous vegetation on private land. It could not be determined during the preparation of this report whether any lie within the ecological district. Nelson City Council has not established any such covenants.

### 4.8 LAND ENVIRONMENTS PRESENT WITHIN ED (AND THREAT STATUS)

Seven of the 20 LENZ Level 1 environments that occur nationally are present within the Bryant Ecological District (*Figure 4*). Environment E- Central Mountains occupies about  $\frac{3}{4}$  of the district, with Environment E- Central Dry Foothills occupying much of the remainder.

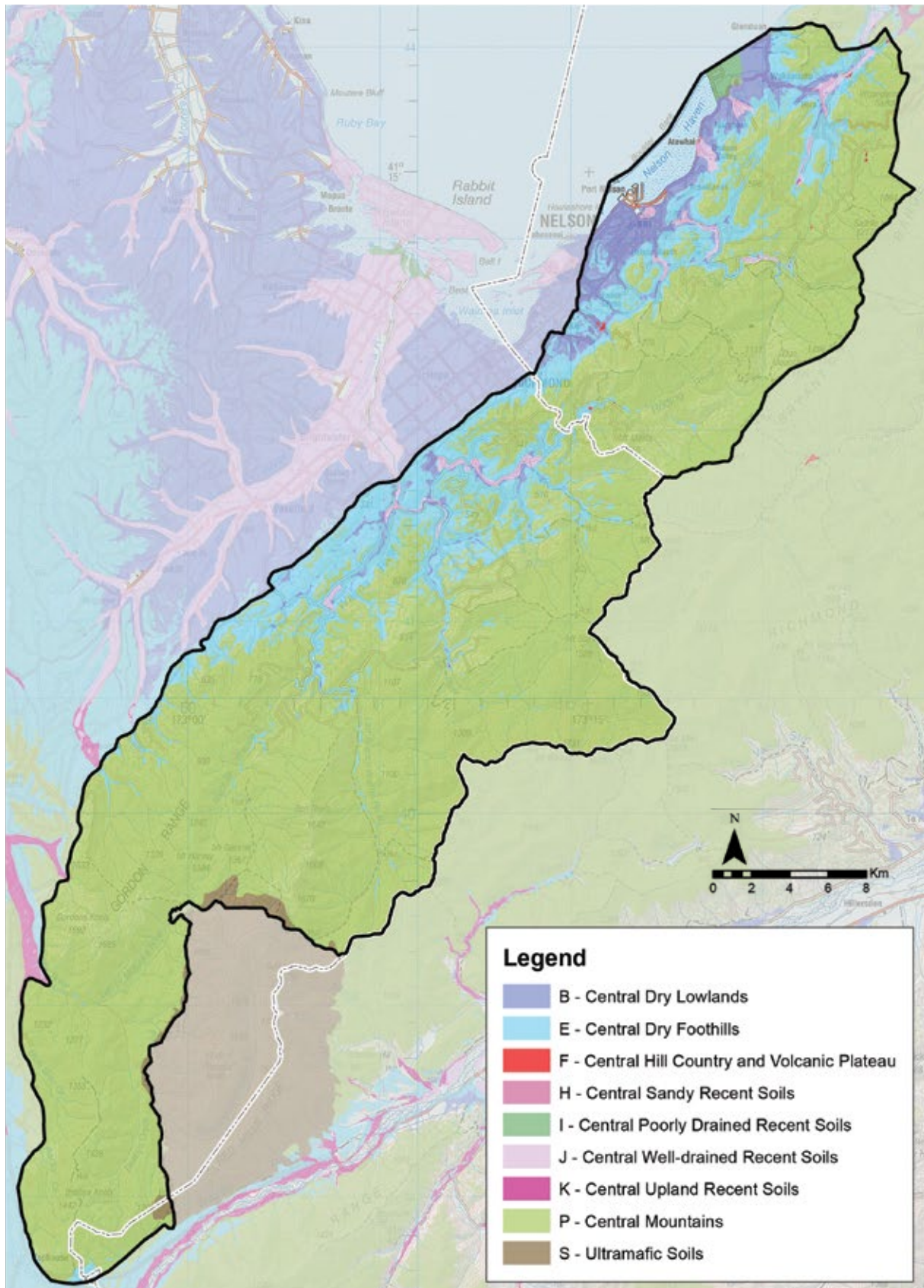
The extent to which indigenous vegetation has been depleted in LENZ Level IV Land Environments has been calculated and mapped by Walker et. al. (2006) and Cieraad et. al. (2015) (*Figure 5*). About 20% of the ecological district lies within 'threatened' or 'at risk' environments. Flats and foothills in the vicinity of Nelson City comprise much of the 'Acutely Threatened' environments (<10% indigenous vegetation remaining nationally) of the district, with the valley floors of the Wairoa, Lee and Roding River catchments making up much of the rest of this class. 'Chronically Threatened' environments (10 – 20% remaining) are scattered as small areas across lower slopes and valleys throughout the northern 2/3 of the district. 'At Risk' environments (20 – 30% cover remaining), lie upslope of much of the 'Acutely Threatened' environments and extend further up the valleys. The tidally-deprived Wakapuaka sandflats, although induced, are classed as 'Critically Underprotected' with >30% indigenous vegetation cover remaining nationally but <10% protected.





## 4. ECOLOGICAL DISTRICT DESCRIPTION

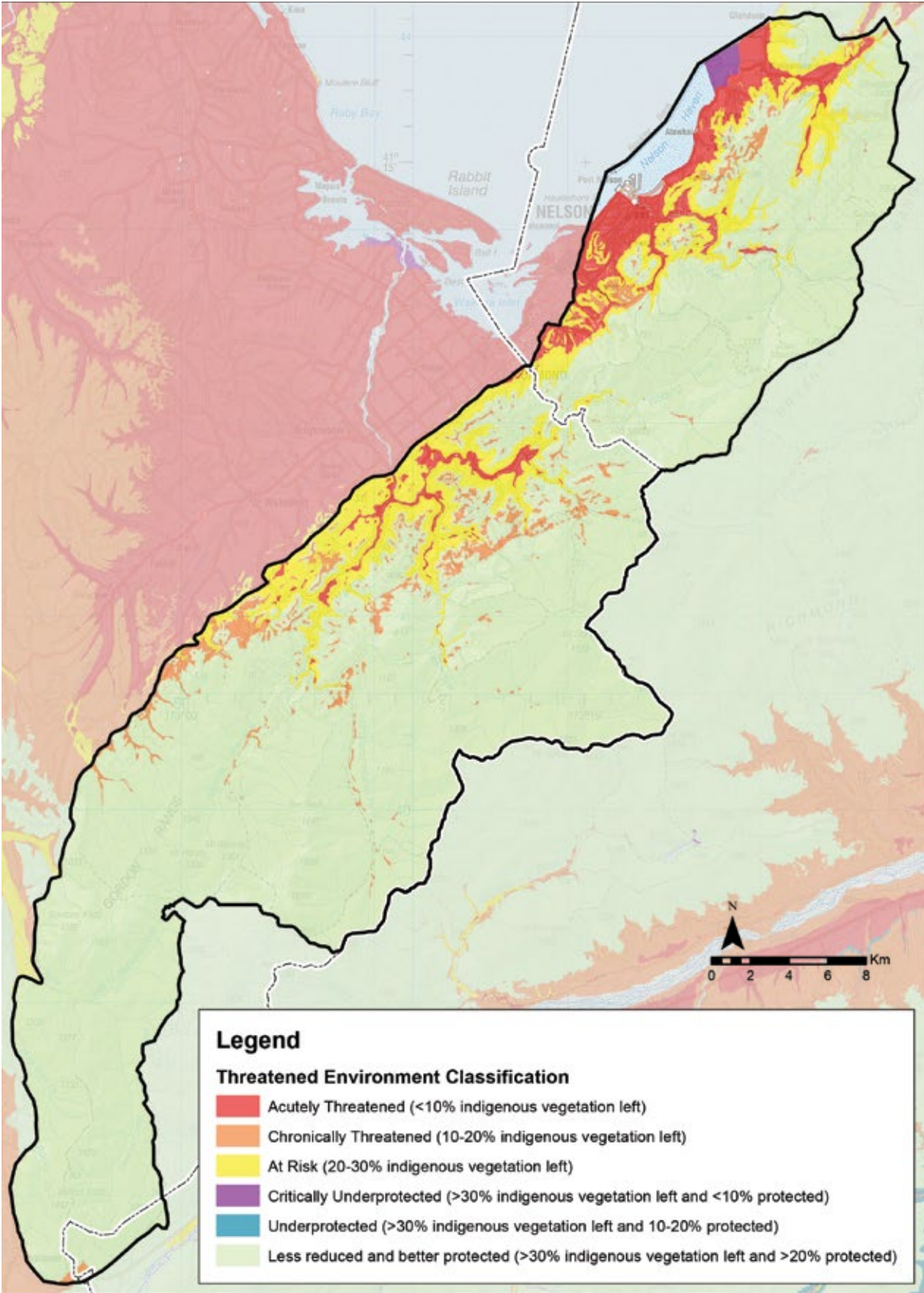
Figure 4: Bryant Ecological District – LENZ Environments Level I





# 4. ECOLOGICAL DISTRICT DESCRIPTION

Figure 5: Bryant Ecological District – Threatened Environments LENZ Level IV



## 5. SIGNIFICANT NATIVE HABITATS (SNHs)

The Bryant Ecological District lies largely within both Nelson City Council and Tasman District Council jurisdiction (Figure 1), with 70% within Tasman District. A small part at the southern end lies within Marlborough District. Sites of potential significance have been evaluated in the Nelson City Council area under a separate survey process and are not reported upon here.

### 5.1 LANDOWNER AND SURVEY DETAILS OF SNHs

Most SNHs are located within the Wairoa River and to a lesser extent, Lee River catchments. Other SNHs lie within the Roding River catchment, along the foothills that face the Waimea/Wai-iti valley, and further south in or near the headwaters of the Wai-iti River.

Table 4: Landowner and survey details of SNHs

	NUMBER	
Participating Landowners	25	
Non-Participating Landowners <sup>1</sup>	12	
Proportion participating	68 %	
Sites Surveyed	69	
Sites Not Surveyed (or part thereof)	21	
Identified SNHs <sup>2</sup>	67	
	HECTARES	SIZE RANGE SNHs
SNH total area	1676.5	-
Average size SNHs	25.0	0.2 – 196 ha
– forest & treeland	25.0	0.2 – 196 ha
– freshwater wetland (2 areas within above forests)	0.5	0.4 – 0.6 ha
– serpentine vegetation	90	one site only

1. Permission declined (5), landowners not traced (7)

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

# 6. BIODIVERSITY VALUES OF SNHS

## 6.1 VEGETATION

### 6.1.1 Indigenous Vegetation Represented within SNHs

#### FOREST

##### Hillslope forest (61 sites, at least in part)

##### **Black beech forest and black beech-mixed broadleaved forest on hill-slopes**

Black beech-rich forest is the commonest broad forest type within SNHs. It occupies all slope aspects, gradients and landforms from valley floor up to around 700m. It is most common within SNHs below c400m asl, other than for the lower reaches of the Wairoa Gorge area which almost lacks beech (presumably due to catastrophic fires in the recent past, and the poor ability of beech species to spread back from seed).

Pure black beech forest is not common, as typically canopies are open due to senescence or premature dieback. Where ungulate browse pressure is low there is poor beech regeneration partly due to competition from broadleaved species. Many black beech forest stands are trending toward mixed broadleaved forest with kanuka present locally. Hard beech has a minor presence. Black beech forest generally supports a diverse and well-developed understorey of broadleaved species including mapou, kanono, heketara, broadleaf, fivefinger and mahoe and yellow-wood. Kanono is particularly abundant at some moister sites. Pole and sapling rimu, and strong matai regeneration feature at some sites. Recent beech regeneration is typically sparse or absent. Scrub coprosma and mingimingi are typically common with *Helichrysum lanceolatum* locally so. Prickly mingimingi and *Coprosma microcarpa* are also present. Ground cover species are fairly sparse, perhaps due to heavy overhead shading, and include crown fern, lowland shield fern, shining spleenwort, houndstongue fern and inkberry.

Black beech- mixed broadleaved forest is typically associated with a declining black beech canopy and a parallel ascendancy of species such as fivefinger, heketara, putaputaweta, lancewood, kanuka, tarata, mahoe, matai, and more locally akeake, fuchsia, kohuhu and pigeonwood. Beech regeneration is noticeably absent. Rangiora, kanono, ponga and shining coprosma are typically present if not locally common,

and matai regeneration and thick-leaved coprosma are often present. Hound's tongue fern is usually common to abundant, with lowland shield fern and shining spleenwort featuring strongly at some sites. *Libertia ixioides* and *Uncinia scabra* are characteristic species. Heavy overhead shading precludes much ground cover in some areas.

##### **Hard beech forest on hill-slopes**

Surprisingly only six sites support hard beech forest or hard beech-rich forest, considering how ubiquitous this forest community is through lower mid-altitude forests of the ecological district. This may be due to the scarcity of SNHs in the 400–600m altitude range. There is typically a minor black beech component that is locally co-dominant. Red and silver beech were noted at the one site where it transitions with altitude into red-silver beech forest. Kamahi is locally common at one site. Associates vary considerably, depending on the closed or open nature of the canopy and susceptibility of the site to drought. Dry spurs with closed canopies tend to support sparse understories of hardy species such as mingimingi and prickly mingimingi, and occasional ferns like *Grammitis billardierii* and *Hymenophyllum bivalve*. Typically, there is also a degree of low scattered broadleaved regeneration of species such as mapou, shining coprosma and lancewood. Areas of open hard beech canopies (spaced trees) and less drought-prone terrain support tall broadleaved species such as heketara, tarata, mahoe, heketara and kanono. Ponga is locally common. Ferns noted include houndstongue fern, lowland shield fern, crown fern and shining spleenwort.







Secondary podocarp-broadleaved forests are extensive along the lower reaches of the Wairoa River

### **Mountain beech forest on upland hill-slopes and ridgelines**

Three SNHs rise to sufficient elevations to support mountain beech forest. As is typical with all such areas in the ecological district these have experienced a long history of feral ungulate browse. Silver and red beech, and pole mountain totara feature locally. Forest understories are sparse, with shrubs comprising small-leaved species such as *Coprosma microcarpa*, *C. colensoi*, *C. pseudocuneata*, *C. tayloriae*, *Aristotelia fruticosa*, mountain toatoa, prickly mingimingi and mingimingi. Broadleaf and pokaka occur at lower elevations where mountain beech merges into red and silver beech forest. Ground cover species are almost absent.

### **Red beech and red beech-silver beech forest on hill-slopes**

These forests occur within SNHs between 550–1000 asl, with no obvious topographic features determining whether red beech occurs with or without silver beech. At the higher altitudes in this range a mix of both species is typical. All but one site is heavily impacted by browsing ungulates. Scarcity or absence of rimu certainly relates to past timber extraction at many of these sites. This is highlighted by one site adjoining the forest park where canopy rimu is common within the park right up to the shared title boundary, but scarce within the site. Mountain totara, kamahi and broadleaf are scattered through most sites in the canopy or sub-canopy. Miro and rimu feature uncommonly, and matai

occurs rarely at the lower elevations. Southern rata is a feature of the higher slopes, and pokaka has a minor canopy presence. Beech regeneration is typically good at all sites. Tall understorey trees also include mahoe, heketara and yellow-wood. Bush lawyer is thinly scattered. There is a variable presence of small-leaved shrubs including mingimingi, prickly mingimingi, scrub *coprosma*, *Coprosma microphylla*, *Coprosma dumosa*, and at the higher elevations *Coprosma pseudocuneata* and stinkwood. Mountain horopito is present locally on concave slopes. Ground cover plants are variably sparse to abundant, in particular reflecting the abundance of crown fern. In moister areas ponga, *Blechnum procerum*, *Uncinia uncinata* and locally *Uncinia clavata* are present.

One SNH was heavily impacted by windthrow some years ago where makomako regeneration is locally dense.

The one apparently ungulate-free site at the lower altitude range supports a moderately light to dense understorey, comprising much kanono and red beech regeneration locally, with rangiora, broadleaf, yellow-wood, *Helichrysum lanceolatum*, with more occasional fivefinger, mahoe, putaputaweta, mapou, mingimingi, and heketara. Common bush lawyer and common native clematis are occasional. Ground cover is light, with houndstongue fern and crown fern, occasional hanging spleenwort, and scattered *Corybas trilobus* beds present.

## 6. BIODIVERSITY VALUES OF SNHs

### Red beech- black beech forest on hill-slopes

Typically, this forest association occurs around 400–700m asl, but is present almost to the valley bottoms (toward Mt Richmond Forest Park) both inland and in the south of the ecological district. Matai is quite common particularly on concave slopes, with a minor canopy presence of silver beech, rimu, broadleaf, pokaka and miro. A broadleaved understorey includes mahoe, putaputaweta, lancewood and broadleaf. Shrubs of *Helichrysum lanceolatum*, mingimingi, and scrub coprosma are characteristic of better-drained slopes and ponga is typical of concave slopes. Ground cover is generally sparse and includes *Libertia ixioides*, lowland shield fern, hanging spleenwort and leather leaf fern.

### Mixed broadleaved forest on broad hill-slopes (21 sites include such areas)

These lowland communities are diverse between and within sites, and most are probably induced as they lack a strong podocarp or beech component. Many have likely regenerated since earlier forest clearance. Some sites are very mature with large specimens of certain species, particularly broadleaf. Depending on location, canopies commonly include mahoe and to some extent titoki, with broadleaf, kanuka and putaputaweta, and more locally, tarata, heketara, mapou and kaikomako. A minor matai, lowland totara and black beech component is present locally at some sites. A number of sites in the south of the district are heavily impacted by browsing feral ungulates, and several are stock-grazed. Otherwise they tend to have well-developed understories unless beneath a dense mahoe canopy. Understories include canopy species regeneration and rangiora. Ferns include hen and chickens fern, velvet fern, lowland shield fern, shining spleenwort, and houndstongue fern. Limestone rata drapes from trunks at some sites and white rata vine is locally common. Substrates are typically rubbly.

Two sites that lie high above the Wairoa valley around 700–800m asl include stands of induced broadleaf-yellow wood-putaputaweta forest with scattered emergent red beech. They are heavily browsed by feral ungulates. Beds of dense prickly shield fern are common. One lies on limestone with scattered limestone spleenwort present, either browsed to stumps or flourishing where out of ungulate reach.



Two sites that have had a long history of stock grazing include extensive mixed broadleaved forest, with forest interiors heavily eaten out. Among the diverse canopy species are ngaio and kaikomako.

### Mixed broadleaved + -matai gully forest

Most sites include areas of broadleaved gully forest with about 25 sites featuring emergent podocarps, mostly matai, with lowland totara and kahikatea more locally. A few sites support a near continuous ribbon of matai. One site supports eight emergent kahikatea between 90cm–2m dbh along a steep gully bottom. Black beech and rimu are generally absent or rare.

Broadleaved species most commonly include titoki and mahoe, with pigeonwood more locally common. Other species are putaputaweta, tarata, kaikomako, and rarely pokaka and hinau. Mahoe generally dominates gully heads. Supplejack is common, white rata vine is locally common, with native passionvine more localised. Understories comprise much kanono, with makomako, fuchsia, rangiora, wheki-ponga, ponga and wheki also present. Where canopies are low, all these broadleaved species may form a part of the canopy. Kawakawa is locally common at warmer sites. Ground cover vegetation is sparse in deeply-shaded areas. Elsewhere, abundant shining spleenwort, velvet fern and ground covering white rata vine are typical, with *Asplenium hookerianum* present at some sites. Seasonally moist areas and creek margins support much hen and chickens fern, with *Blechnum chambersii*, *Leptopteris hymenophylloides* and gully fern also present. In the north of the Tasman District on slopes above Richmond, tawa, nikau and kiekie occur in gullies, where lance fern and jointed fern are locally common.





Mature mixed broadleaved forests with lush understories are typical of the valleys of the greater Wairoa catchment

#### **Matai- black beech- mixed broadleaved forest on lower slopes**

This community is present on the lowest slopes of the valleys west of Mt Richmond Forest Park, and those riparian margins that are not dominated by kanuka. Canopy podocarps mostly comprise matai, with some rimu, lowland totara and occasional miro. Black beech is common, with silver beech and hard beech more occasional. The scarcity of rimu at most sites almost certainly dates from past timber extraction. Only rarely does matai form a dominant canopy. Hybrid kowhai is typically present at or near the riparian forest margins and kanuka is not uncommon. Broadleaved species include mahoe, putaputaweta and tarata, with some kohuhu, lancewood, broadleaf and kaikomako. Understories typically feature much broadleaved canopy regeneration. Ground cover includes shining spleenwort, houndstongue fern, lowland shield fern, *Uncinia uncinata*, *Uncinia scabra* and *Astelia fragrans*. Rubbly slopes close to valley bottoms include fuchsia and prickly shield fern at some sites.

Red beech occurs in the more inland sites, with broadleaved species typically limited to mahoe, makomako and kamahi. Ponga is scattered and lowland totara is absent. Low shrubs comprise scrub coprosma, *Coprosma microphylla* and rohutu. Scattered broadleaved canopy regeneration is present. Rubbly ground locally supports much white rata vine. Crown fern is locally common, with *Astelia fragrans* more scattered.

#### **Matai- lowland totara- mixed broadleaved forest on lower slopes and riparian margins**

In the lower reaches of the Wairoa, Lee and Roding rivers just above where each of these converge,

forests are diverse with a range of podocarps and mixed broadleaved species. Beech species are absent, presumably as a result of catastrophic fires in the recent past. These sites are largely mature secondary forests, with pockets of possible primary forest where large mature podocarps persist. These stands are rich with lowland totara and matai, with occasional kahikatea, and diverse broadleaved species including tarata, putaputaweta, pigeonwood, broadleaf, black maire, mahoe, titoki, kowhai, akeake, mapou, akeake and locally ngaio and narrow-leaved lacebark. Forest understories include diverse canopy regeneration that typically includes abundant black maire. Shrubs typically comprise rangiora, kawakawa and rohutu. Ground cover vegetation is generally abundant, dominated by shining spleenwort and houndstongue fern. Bamboo rice grass is localised. These forests are locally present along riparian margins.

#### **Tanekaha- matai forest on mineral belt margin slope**

One small site on a toe-slope and colluvial landform along the mineral belt contact, locally supports young secondary tanekaha-matai forest, with a minor presence of black beech and lowland totara. The canopy also includes kahikatea, kanuka, rimu, and rare pokaka. The low understorey is diverse, partly due to the scarcity of heavily shading mahoe and kanono regeneration. Woody regeneration to 3–4m comprises mapou, rohutu, raukawa and poataniwha, with lower regeneration locally comprising tanekaha, white maire and pokaka. Occasional low fivefinger, mahoe, matai, miro and lowland totara are also present. Ground cover vegetation mostly comprises ferns, including much houndstongue fern, with lowland shield fern, shining spleenwort and hanging spleenwort. A range of filmy



## 6. BIODIVERSITY VALUES OF SNHs

ferns are locally present including *Hymenophyllum flexuosum* and *H. sanguinolentum*. One patch of crown fern was noted. Other species include *Uncinia uncinata*, bush rice grass and *Astelia fragrans*.

### **Kanuka hill-slope forest (35 sites, at least in part)**

Many sites include at least a small area of secondary kanuka forest. Extensive tracts on private land are almost entirely confined to the southern section of the ecological district (the exception being one c50 ha area in the Wairoa River catchment). All the large areas in the south are impacted by feral ungulate browse, whilst browse is almost absent in the remainder of the sites.

Most unbrowsed sites comprise tall or mature kanuka over strong broadleaved regeneration up to 5m in height (but generally lower). Concave slopes typically support much mahoe regeneration almost without exception. Locally common species comprise mapou, karamu, fivefinger, rangiora and ponga. Ground cover species include houndstongue fern, shining spleenwort, *Pellaea rotundifolia* and lowland shield fern. On broad or convex slopes which are typically drought prone, there is little low broadleaved regeneration other than for shining coprosma at some sites. Typically, there is a range of small leaved shrubs forming open to dense low thickets comprising scrub coprosma, *Hebe stenophylla*, *Helichrysum lanceolatum*, prickly mingimingi and mingimingi, with more locally occurring lancewood, Himalayan honeysuckle, gorse and thick-leaved coprosma. Douglas fir and radiata pine seedlings and saplings are thinly scattered through some sites. Ground cover species typically comprise much houndstongue fern, with *Pellaea rotundifolia* and lowland shield fern both ubiquitous. Other species generally present are *Lycopodium volubile*, leather leaf fern, hanging spleenwort, wall lettuce, *Dichlachne crinita*, *Acaena juvenca*, and *Rytidosperma* species. Both native jasmine species are locally common at some sites. Matai and lowland totara regeneration is moderately common at some sites close to seed sources.

By contrast ungulate-browsed sites in the south generally support dense thickets of small-leaved shrubs up to 4m tall comprising yellow-wood, prickly mingimingi, mingimingi, scrub coprosma, lancewood, and *Helichrysum lanceolatum*. Young rimu are occasional. Ground cover vegetation comprises



Hill-slope kanuka forest is quite extensive in the south of the ecological district

broadleaved seedlings <10cm tall, mostly of mahoe and mapou. Scattered ferns include *Blechnum procerum*, crown fern and *Lycopodium volubile*. Other species include occasional young ponga, mountain flax, bush lawyer, *Nertera depressa* and *Nertera villosa* and foxglove.

At the highest altitudes surveyed (700–800m asl) young red beech is common in the forest canopy. As well as the small-leaved shrub species listed above, there is a minor presence of *Hebe vernicosa/canterburiensis*, seedling broadleaf, wharariki flax and *Olearia avicenniifolia*.

Kanuka-mixed broadleaved forest is not uncommon where forest communities merge or where broadleaves are emerging through kanuka. A few sites support very large canopy lancewood amongst mature kanuka. Another site features extensive kanuka-akeake forest.

### **Alluvial forest (25 sites include at least some alluvial forest)**

#### **Matai- lowland totara + - kahikatea forest**

Short and narrow terraces are a common feature of the confined river valleys, typically lying 5–15m above the current river level. Forested terraces beside rivers downstream of Mt Richmond Forest Park are generally dominated by lowland totara and matai with more localised kahikatea, some kanuka and black beech, scarce silver beech and narrow-leaved lacebark, and rare black maire, white maire, kowhai and titoki. A few stands are lowland totara-dominated, and one is matai-dominated. These are all probably mature secondary stands with a consistent lack of large diameter trees suggestive of post-logging recovery. Typically, these sites are well drained. Most are free of feral ungulate or stock browse with well-developed understories.

Tall understorey to sub-canopy mahoe is characteristic of long-undisturbed sites. Regenerating broadleaved species includes pigeonwood, kanono, titoki,

## 6. BIODIVERSITY VALUES OF SNHs

fivefinger, putaputaweta, kaikomako, mahoe and mapou. Low regeneration of matai and lowland totara is typical. Shrubs generally include much rohtu, with thick-leaved coprosma and scrub coprosma and occasional poataniwha. Swamp mahoe is locally common where moist conditions prevail. Young vines of native jasmine (*Parsonsia heterophylla*) are common. Ground cover tends to be well developed, with houndstongue fern and shining spleenwort common. Beds of bamboo rice grass occur at some sites. Sites at upper reaches also include miro, wheki-ponga and the herb *Australina pusilla*.

Several nationally threatened/at risk species are present at a few sites, including shovelmint, climbing groundsel, *Coprosma obconica* and fierce lancewood.

A number of very well drained terraces supporting lowland totara- matai forest have been recently retired from grazing. These sites support open low woody understories, typically of less palatable small-leaved shrubs such as scrub coprosma, with recent mahoe regeneration. Ground cover species typically include *Uncinia scabra*, *Uncinia uncinata*, *Pellaea rotundifolia*, lowland shield fern, bamboo rice grass locally and seedlings of barberry.

### **Kahikatea forest**

Several sites support very minor areas (small fractions of a hectare) of young kahikatea forest on damp or wet alluvial terraces. Supplejack is typically common and the resultant canopy shading is heavy. Rare canopy black beech, red beech, black maire and kaikomako are variably present. Understories are sparse, with scattered regeneration of broadleaved species and kahikatea, with swamp mahoe present locally. Ground cover species comprise kiokio, hen and chickens fern



Black maire is a distinctive feature of the forests of the lower Wairoa River valley where it is locally common



Alluvial beech forest occupies river terraces at their most southern and inland extent

and (rarely) swamp kiokio, as well as *Uncinia uncinata* and occasionally *Carex lambertiana* and *Carex dissita*.

### **Black beech-red beech-silver beech forest associations + - matai**

Beech species become increasingly dominant on alluvial terraces inland and toward the south of the ecological district. Such forests support a variable but occasionally appreciable matai presence. All such sites are heavily impacted by browsing ungulates with resultant open or simplified understories. Canopy rimu, kahikatea and miro are also rarely present. Relative abundance of beech species varies considerably but does not appear to be associated with any obvious environmental factors. Tall understories (which comprise the canopy in beech gaps) include mahoe, putaputaweta, makomako and kaikomako. Also present are katote, wheki, ponga and wheki ponga. Low woody understories typically include makomako, matai and mountain totara regeneration, round-leaved coprosma and scrub coprosma, and occasional kahikatea regeneration. Ground cover ranges from sparse through to dense, comprising beds of crown fern, beds of the spider orchid *Corybas macranthus*, *Urtica incisa*, *Blechnum fluviatile*, *Uncinia uncinata*, *Australina pusilla*, bush rice grass and *Nertera villosa*.

Two sites of black beech-rich terrace forest located well down their respective valleys are likely induced, having probably once supported beech-podocarp forest.

### **Titoki-mahoe forest**

One minor tributary of Pig Valley Stream supports a stand of alluvial titoki forest. Canopy pole lowland totara are scattered, and pigeonwood and kaikomako are rare. Understories are dominated by kawakawa, with moderate lowland totara and matai regeneration, and moderate to light regeneration of pigeonwood, kaikomako, titoki and black maire. Ground cover is dense with *Lastreopsis glabella*, hen and chickens fern, with more minor shining spleenwort and locally dense *Microsorium scandens*.





Floodzone bedrock supports very distinctive communities of herbfield and shrubland

## Riparian Non-forest Vegetation

### Floodzone scrub, shrublands and turfs

Numerous sites include a riparian margin to the major rivers with an associated band of flood-prone vegetation. This usually comprises mosses and herbs closest to the river, with open low shrublands and herbfield up-slope, grading into scrub at the forest margins. These are largely formed on bedrock but occasionally amongst riparian boulderfields.

Moss and herb turfs form where river abrasion is not high, being particularly well formed where backwaters run against the prevailing flow. Species include *Epilobium brunnescens*, *Lagenifera pumila*, *Pratia angulata*, *Leptinella mediana*, *Hydrocotyle moschata*, *H. heteromeria*, *Blechnum penna-marina*, *Ctenopteris heterophylla*, self heal, common daisy, creeping buttercup and lotus. Less common are *Parahebe lyallii*, *Craspedia minor*, and *Anaphaloides trinervia*. At inland sites *Oreomyrrhis colensoi*, *Nertera depressa*, *Viola cunninghamii* and *Hydrocotyle sulcata* are also recorded.

Above this zone open low shrubs are present, including common native broom, seedling or pruned tutu and karamu, *Libertia ixioides*, wharariki flax, and occasional scented broom, *Olearia avicenniifolia*, depauperate toetoe and *Chionochoa conspicua*, and where more sheltered, kiokio. The field layer includes maidenhair fern, bush rice grass and *Blechnum chambersii*. Up-slope woody vegetation dominates, in particular tutu, karamu and *Hebe stenophylla*, with some gorse

and barberry as well as occasional flood-pruned young rohutu and kowhai. Where boulders comprise the substrate, tall fescue and gorse are typically present if not common amongst tutu. Montbretia is rare.

### Riparian bluffs

Sections of riverine rockland rising to 60m above the current river level are present along river margins, in particular beside the Wairoa River. These bluffs are almost exclusively Permian sandstones, siltstones and mudstones. Scattered low and open *Hebe stenophylla*, kanuka, barberry, cotoneaster, European broom, akeake, tutu and common native broom are typically present. Fissures and pockets in the bedrock support *Asplenium appendiculatum*, leather leaf fern, blue tussock and occasional *Earina mucronata* and *Asplenium polyodon*. Where slopes are shady or moist, white rata vine, houndstongue fern and scattered regeneration of species such as fivefinger, karamu, kowhai, and hybrid kowhai occur.



Steep bedrock above rivers is a feature of the river valleys supporting a distinctive assemblage of species



## 6. BIODIVERSITY VALUES OF SNHs

### Freshwater Wetlands (2 sites)

Two very small sedgeland-dominated swamps comprise minor parts of larger forested sites.

One terrace swamp supports locally common ti kouka over mixed sedges of *Carex geminata*, *Carex virgata* and *Carex secta*, as well as toetoe. Manuka, *Coprosma propinqua* and *Hydrocotyle novae-zelandiae* are occasional.

The second site unusually comprises a gently-sloping swamp on melange geology high above the valley floor. It is variably dominated by manuka, *Baumea rubiginosa* and *Carex coriacea* with more minor associates including *Carex secta*, wharariki flax, toetoe, *Olearia virgata* and weeping matipo.

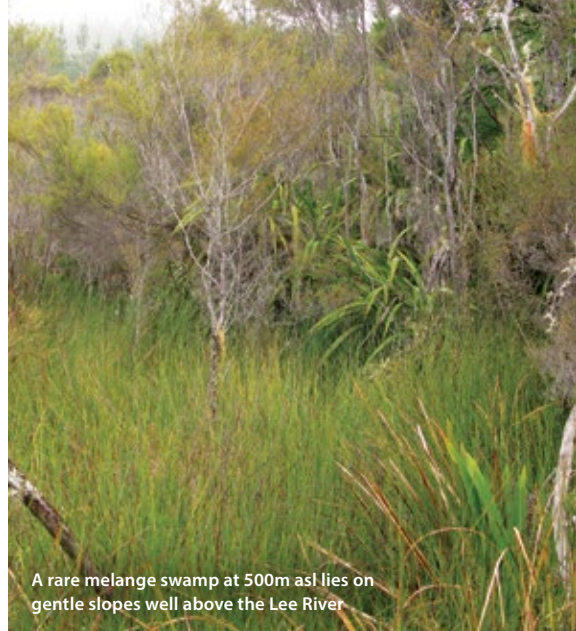
Tiny areas of wet kahikatea forest were noted at a number of sites, but these are dealt with under the alluvial forest section above.

### Mineral Belt vegetation (1 site)

The site comprises scrub, shrubland and tussock, with minor sedgeland. The higher elevations support mineral belt tussock and wharariki flax amongst open manuka and inaka. Other species include occasional *Gentianella stellata*, *Melicytus alpinus*, weeping matipo and *Carex devia*. Minor drainage depressions are dominated by *Baumea tenax*, with *Schoenus pauciflorus*, *Isolepis aucklandica*, *Carex traversii*, and at the lowest elevations *Baumea rubiginosa*. Extensive manuka scrub dominates the lower elevations, and also more locally dominates along a summit ridge. The more common associates are *Olearia serpentina*, *Coprosma tayloriae*, blue tussock and *Uncinia fusco-vaginata*. Sparsely-vegetated ultramafic rocklands are few, with a variable range of species including *Melicytus alpinus*, akeake, *Earina mucronata*, blue tussock, wharariki flax and *Leucopogon fraseri*.



Only one extensive tract of mineral belt vegetation occurs on private land



A rare melange swamp at 500m asl lies on gentle slopes well above the Lee River

## 6.2 FLORA

### 6.2.1 Overview

The survey was confined to vascular plants. 314 native plant species were recorded within SNHs. This includes 116 species of tree and shrub, 22 species of liane, 44 species of dicotyledonous herbs, 20 species of monocotyledonous herbs, 45 species of grasses, sedges and rushes, and 67 species of ferns. A small number of species may have been overlooked due to their similarity to other species, and grasses are under-recorded.

This survey is confined to private land within the Tasman District part of the ecological district. The Nelson City administered part has also been surveyed by the author, and there is a good knowledge of species on public conservation land to inform this section of the report. Threat rankings are from de Lange et. al. (2017).

### NATIONALLY 'THREATENED'

Shovelmint is ranked as 'nationally critical'. It was recorded at two SNHs, with up to 30 sites known for the species, all within Nelson and western Marlborough.

### NATIONALLY 'AT RISK'

'At risk, declining' species present within surveyed sites are *Coprosma obconica* (1 reported), *Coprosma virescens* (1 site), native germander (2 sites), and climbing groundsel (1 site). *Coprosma obconica* is known from only a small number of locations in the region, usually of one to several plants at any one site. *Coprosma virescens* is known from only one other site in the region (comprising one plant). The NZ Plant Conservation Network database has eleven records for native germander within Tasman District with two within the ecological district. Climbing groundsel is known elsewhere in the region in only a handful of locations.

## 6. BIODIVERSITY VALUES OF SNHs

'At risk, naturally uncommon' species present within surveyed sites are fierce lancewood (2 sites), coral mistletoe *Korthalsella clavata* (1 reported), limestone kowhai (undetermined number due to apparent extensive hybridisation in the mid Wairoa River catchment), and the mineral belt species *Carex devia*, *Carex traversii*, *Chionochloa defracta*, and *Gentianella stellata*, all recorded at the one site surveyed on this geology.

Fierce lancewood is only known in the ecological region from the two surveyed Wairoa Gorge sites. The coral mistletoe is easily overlooked and occurs very sporadically in the region.

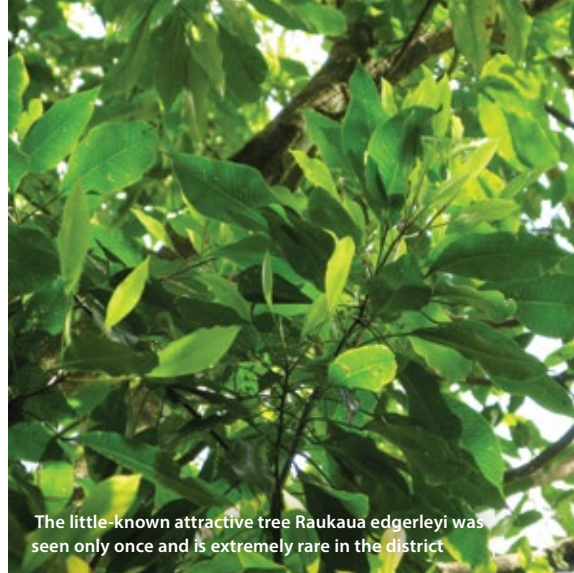
### DATA DEFICIENT

*Melicytus aff. alpinus* "Brockei" (1 site). This species is confined to the mineral belt at lower elevations. An unnamed grass species, now tagged as *Lachnagrostis* "serpentine" was found at the one surveyed mineral belt site. This is currently its only known location. Curiously its existence had been overlooked in the national plant database until this rediscovery prompted the recognition that Tony Druce had recorded it decades ago in the Wairoa catchment. Because of this, it has yet to be classified by threat status, but 'data deficient' is probably appropriate at present.

### REGIONALLY RARE (ECOLOGICAL REGION)

Regionally rare species present within SNHs are (numbers of sites in brackets):

Ti kouka/cabbage tree (21), *Coprosma rubra* (1 reported), matagouri (1), *Fuchsia excorticata x perscandens* (3), narrow-leaved lacebark (18), poataniwha (10), mahoe wao/narrow-leaved mahoe (1), swamp mahoe (12), *Melicytus* 'Waipapa' (1), black



maire (24), white maire (4), *Raukaua edgerleyi* (1), scented broom (not accurately recorded, a handful), leafless lawyer (3), *Calystegia tugoriorum* (2), the herb *Australina pusilla* (7), the pennywort *Hydrocotyle novae-zelandiae* (1), the perching orchid *Drymoanthus adversus* (1), the alluvial hookgrass *Uncinia laxiflora* (1), *Uncinia leptostachya* (2), bamboo rice grass (15), and the five ferns *Cheilanthes sieberi* (1), *Hymenophyllum flexuosum* (3), *Leptolepia novae-zelandiae* (2), *Polystichum silvaticum* (4), parsley fern (1) and *Rumohra adiantiformis* (1).

Where the number of sites recorded above seems comparatively high, numbers of plants were very low at all or most of them, other than for black maire, where young regeneration was often common. It is included on this list as in the Nelson region it is entirely confined to the greater Wairoa catchment.

Ti kouka/cabbage tree is rare at all forest sites where it occurs. Its imperilled state is largely due to wetland habitat loss and more recently, cabbage tree 'decline'. *Coprosma rubra* is known from just one alluvial podocarp forest SNH. Matagouri is known from at least five sites along the dry, grazed west-facing hill-slopes east of the Waimea Plain. It is not known what its original habitat comprised in the ecological region. *Fuchsia perscandens* is not known from the ecological region, yet its hybrid with tree fuchsia occurs sporadically. Narrow-leaved lacebark is rare at most sites where it occurs, often lacking recent regeneration. The destruction of alluvial forests has reduced its numbers considerably. Poataniwha and swamp mahoe are fertile alluvial forest specialists that have similarly been impacted regionally. Narrow-leaved mahoe has only been recorded once in the ecological district at the Maitai Dam outside Tasman District. It has a disjunct distribution in Nelson/Marlborough. *Melicytus* 'Waipapa' is also sporadic, often only represented at a site by one or two plants. White maire is very rare in the district, being recorded from the Roding catchment





## 6. BIODIVERSITY VALUES OF SNHs

and one tree in Garden Valley, as well as being reported in the Lee Valley. One tree of *Raukaua edgerleyi* was found at 550m. It is highly palatable to ungulates and mainly propagates itself by seeding onto treefern trunks. Remaining species listed above all appear to be naturally rare in the ecological region. Leafless lawyer is remarkably abundant at one small Eighty-Eight Valley site and reaches inland a little way up the Wairoa River.

### RARE OR HIGHLY LOCALISED IN THE ECOLOGICAL DISTRICT

A number of species noted have a restricted range in the district. These include *Pittosporum rigidum*, native passionvine, tanekaha (although it can be very locally common where it does occur), and *Carex solandri*.

### LARGE TREES

A number of large trees were noted from SNHs. Two kahikatea are 2.1 – 2.2m diameter at breast height (dbh) and one is 1.8m dbh. Other large trees are several matai at 1.3 – 1.5m dbh, two lowland totara of 1.8 – 1.9m dbh and three of 1.5m dbh, all within forest settings at different sites. No particularly large rimu or miro were recorded. One buttressed red beech is about 2m dbh. One gully holds eight kahikatea close to or over 1m dbh. Other large trees noted were (dbh) kanuka 65cm, black maire 90cm (several) in the lower Wairoa Gorge, lancewood 55cm, pigeonwood 50 cm, and akeake 40cm. A few sites had quite a collection of large kanuka or lancewood of 40cm dbh or more.



Nikau palm reaches its southern limit in the ecological district at Reservoir Creek



Large kahikatea are very rare, with only two trees noted over 2m dbh

### SOUTHERN AND INLAND DISTRIBUTION LIMITS

A considerable number of plants reach their regional distribution limits within SNHs in the Tasman District part of the ecological district. Nikau, kiekie, *Collospermum hastatum*, and puka occur as far south as Reservoir Creek in a council reserve above Richmond but are absent from the greater Wairoa catchment. A tawa stand occurs well up the Wairoa River, otherwise, its inland range only just extends into the northern margins of the lower Roding catchment. Ongaonga occurs inland as far as the Wairoa River just upstream of the forks, but it is rare in the Tasman District section other than from north of the lower Roding River. Akiraho/coastal tree daisy occurs as far south as Reservoir Creek. Other warmth-loving species such as ngaio, kawakawa, akeake, and native passionvine penetrate farther south and inland up the river valleys, as far as the Wairoa Forks (or thereabouts). The inland limit for thin-leaved coprosma lies in the Wairoa River catchment almost south to Pig Valley. The white rata vine/*Metrosideros perforata* was recorded as being noted once in the Wairoa Gorge, but this requires confirmation, as it was not otherwise noted in the Tasman District part of the ecological district.

Jointed fern, *Microsorium scandens* and climbing hard fern extend to just south of the Pig Valley-Wairoa River confluence. Lance fern almost extends as far south as the Wairoa Forks and was noted at an Eighty-Eight Valley hill-slope forest.

A range of other species are surprisingly rare in SNHs in the Tasman District part of the ecological district, most notably hinau, pokaka and turepo. Pukatea does not reach into the Tasman District part of the ecological district, with its southern limit being at Marsden Valley just south of Nelson City.



Weka and old man's beard

## 6.3 FAUNA

Faunal observations within SNHs were almost entirely confined to indigenous avifauna and were of incidental observations rather than the subject of direct survey. [Where not the common usage, Maori bird names are only shown once in each section of this report.]

### 6.3.1 Indigenous bird and other animal species present within SNHs

Of the avian species recorded or reported from SNHs the following have a national threat ranking (Robertson et.al. 2016):

- Nationally Vulnerable: karearea/bush falcon
- At Risk, Naturally Uncommon: kawau/black shag

Of the 65 surveyed sites, all but one are entirely or mainly in forest. Tui, korimako/bellbird and piwakawaka/fantail were most consistently recorded as being present (at nearly all sites) with riroriro/grey warbler and tahou/silvereve recorded a little less often. Korimako were usually recorded in greater number than other species. One or two sites surveyed in winter held large numbers of tui. Kereru/pigeon were noted at a third of sites and were likely present at most of them. Weka, pipipi/brown creeper and miromiro/pied tit were more sporadically recorded, at around a dozen or so sites each. Kotare and karearea were noted from seven sites (in the case of karearea always detected by overheard calls). Toutoutwai/robin and a kakariki/parakeet species were noted at only one (upland) site. Kawau/black shag and putangitangi/paradise shelduck were seen very occasionally on the Wairoa River beside riparian forest sites. Kahu/harrier were seen overhead on most field days.

No herptofauna were noted. Whitaker and Gaze (1999) list common gecko, Nelson green gecko, Marlborough 'mini' gecko, forest gecko, northern spotted skink, and northern grass skink as being present in the ecological

district. It is possible that many of these species occur within SNHs.

Pekapeka/native bats were not surveyed. Pekapeka have been recorded recently within the ecological district around the Maitai cave area, probably a vagrant from the Pelorus Bridge population (Brian Lloyd pers. comm.). Surveys in 2009 in the vicinity of the proposed Lee Dam failed to detect any bat presence. Much of the ecological district remains unsurveyed, but if long-tailed bats are present they are likely to be vagrants from the known Pelorus catchment population outside the ecological district.

### 6.3.2 Faunal Habitat within SNHs

No SNHs were specifically identified for their faunal habitat values. All identified vegetation SNHs by definition offer habitat to fauna.

## 6.4 OTHER ECOLOGICAL VALUES

### 6.4.1 Connectivity and Buffering

Most surveyed sites either adjoin indigenous vegetation on neighbouring titles or are embedded within plantation forestry. Consequently, many sites are well buffered. Connectivity between indigenous vegetation is provided to some degree by plantation forestry that facilitates faunal movement between sites for those species that avoid open country. Connectivity (when viewed by title) is obviously high where indigenous vegetation straddles title boundaries.

### 6.4.2 Ecosystem Services

Many SNHs lie on steep valley sides, providing erosion control and flood mitigation services. As the total SNH area is only around 1600ha, this is a tiny proportion of the district, where vegetation cover outside SNHs is of far greater importance in this regard. On a local scale, sites have a valuable role to play in slowing water run-off and in holding the land.



# 7. THREATS TO SNHs

## 7.1 PLANT PESTS

25 plant species noted within SNHs could be considered important ecological weeds in the region. The most immediate current threats are from the spread of a small number of species, comprising tree-smothering vines, rapidly invading tree species, and some forest-floor species.

Old man's beard was noted at most SNHs and is the most widespread of the weeds of highest threat. It is abundant in forest SNHs on lower slopes in the mid Roding, Lee and Wairoa rivers. By contrast in the upper reaches of the Roding and Wairoa rivers, downriver of public conservation land, it occurs as only thinly scattered infestations within SNHs. It is also very locally common in forested gully SNHs on the front-country slopes. It was recorded as far south as the headwaters of the Wai-iti near Hiwipango. In the Wairoa River catchment it occurs beside the river as far as 6km upstream of the main Wairoa forks.

Banana passionfruit is almost entirely confined to the front-country slopes, and apart from two records in Pig Valley is otherwise absent from any of the valleys. It is rare south of Richmond with its known southern limit in the ecological district at the southern end of the Mt Heslington 'range' and in Pig Valley. Where it occurs behind Richmond, infestations are locally heavy.

Aulstromeria is a little-known climber that has only been recorded from the margins of the native forest in upper Reservoir Creek, where it is abundant, cloaking low forest margins. Blackberry was recorded from sites with riparian margins and forest areas with a recent past history of grazing, being problematic only in some small open areas. No Japanese honeysuckle, ivy, or bindweed was recorded. Wilding radiata pine and Douglas fir are the most concerning and widespread of the invasive tree species each being present in around half of the SNHs. In some sites they are moderately common locally. Japanese cedar is invasive at two adjacent sites beside the Wairoa River. Cotoneaster species (at least two) are moderately common locally along riparian margins of some forest SNHs, where crack willow and gorse are scattered to locally common, and broom more occasional. Broom occurs at quite a number of sites on dry open slopes, where barberry is occasional to common. Barberry is the most widespread and competitive of all the deciduous woody weeds,

and in some secondary forest sites is slowing native regeneration considerably. In some instances, it is outcompeting native regeneration due to ungulate browse and drought impacts on native vegetation. Himalayan honeysuckle is scattered to occasional at many sites. Sycamore, ash, a cherry species, strawberry dogwood and holly were each recorded within one SNH respectively, where they were rare.

Of the ground-smothering species only five species were rarely to occasionally noted in valley floor sites, these being African clubmoss, wandering willy, montbretia, periwinkle and male fern. All infestations are small. Montbretia was noted on two riparian margins at the very beginning of its infestation curve.

Balm of Gilead is very locally abundant on one river terrace, seasonally partly smothering low native understories.

Outside SNHs, a small number of concerning weeds were noted. The only buddleia recorded was seen on steep slopes above the Wairoa River.

The Tasman-Nelson Regional Pest Management Strategy for 2012-2017 (Tasman District Council, 2012) lists the following plant pests in the ecological district: Total control: African feather grass, boxthorn, cathedral bells, Madiera vine, saffron thistle, boneseed. Progressive control: Chinese pennisetum, nasella tussock, variegated thistle, white-edged nightshade. None were noted within SNHs.



This image records the very arrival of banana passionfruit at a newly colonised Wairoa catchment site



Wild pig rooting is a considerable problem in the lowland forests of the ecological district

## 7.2 ANIMAL PESTS

Most SNHs show no sign of recent feral goat or deer browse, a remarkable situation considering that many of these sites are connected by blanket pine forestry to the extensive public conservation land forests of Mt Richmond Forest Park whose understories are heavily eaten out. Browsing becomes evident in the survey area at higher altitudes and in native forest areas continuous with the forest park. In the lower reaches of the Wairoa Valley one landowner allows feral goats to go uncontrolled, and these are beginning to spill over into adjoining native forest SNHs.

Pig rooting is locally common at many sites, but rarely is it extensive. A reasonable minority of sites showed no sign of pig rooting. Pigs were flushed on a number of occasions.

Possum numbers in the survey area are not controlled by either TBFree or DOC, with limited control confined to a few private titles. Spoor or bark scratching was noted at most sites but there were only a few sites where these were common or where foliar browse was seen. Levels of vegetation damage are not possible to assess with the quick walkthrough method employed by this survey, and faunal impacts are unknown. Possum sign was generally rare where present and possum were flushed on several occasions, but this level of detection certainly underestimates their actual abundance.

Common wasps are known to decimate invertebrate populations, but their impact in the ecological district or SNHs is not specifically known.

Mustelids (stoat, weasel, ferret), rodents (ship rat, brown rat, house mouse), feral cats and hedgehogs

are all likely to be taking a heavy toll on native fauna. All are believed to be common and widespread throughout the ecological district. There is considerable evidence of the impact of such pest species on New Zealand's indigenous avifauna and on larger invertebrates. In the ecological district all forest and wetland bird species, where present are likely to be affected.

The Tasman-Nelson Regional Pest Management Strategy for 2012-2017 (Tasman District Council, 2012) does not list any animal pests as occurring in the Tasman District part of the ecological district.

## 7.3 OTHER THREATS

SNHs are vulnerable to a range of potential other threats with some directly impacted by human activities.

### GRAZING AND STOCK FENCING

Ten SNHs out of a total of 65 are impacted to at least some degree by stock. Six have free stock access, at least to parts of the site. One site was being fenced from stock at the time of writing, being a newly established QEII covenant. Stock breaches into two further sites were noted. Stock grazing is disastrous for forest and treeland sites in the longer term as lack of regeneration caused canopy collapse.

### EDGE EFFECTS

Surviving native forest remnants comprise individual stands fragmented from one another by clearance of the intervening forest. Such fragments have large boundary to area ratios, with associated edge effects that penetrate into the forest to varying degrees.



## 7. THREATS TO SNHs

Edges are vulnerable to weed invasion, and those sites outside exotic forestry are subject to seasonally desiccating air moving through them, impacting on successful regeneration of sensitive plant species and more generally on species distribution and abundance.

### DROUGHT AND DISEASE

Black beech decline is widespread throughout much of the Tasman District part of the ecological district that may be due to recent drought episodes and associated vulnerability to disease. Regeneration failure in recent decades of black beech is also noticeable at many sites where it occurs.

Cabbage tree decline has probably reduced populations of ti kouka and the disease appears to be present at the one site with a large ti kouka population.

### FIRE

Quite a number of native forest SNHs are located within extensive pine plantation. They are vulnerable to burning in the rare chance of catastrophic fire 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.) At some sites, damage is considerable, including damaging or destroying emerging podocarps. Recent haul roads have also been constructed through a number of forest SNHs for pine harvesting access. These typically result in the loss of a c30m wide swathe of 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. This includes a number of nationally 'threatened/at risk' species that occur in very low numbers and are at risk of being lost.

### SEA LEVEL RISE AND CLIMATE CHANGE

The greatest threat to SNHs in the medium to long term is climate change that is now 'locked in' for decades due to increased carbon dioxide levels in the atmosphere from human activity. Predictions amongst the international climate science community project a rise of 2.6-4.8 oC average air temperature within a century (IPCC, 2013). Modelling of the likely impacts of warming in New Zealand suggest some compositional change of biomes but surprisingly little distributional change this century (McGlone & Walker, 2011). For terrestrial native ecosystems, the modelling predicts that the next 50 years of climate change should have an insignificant impact when put alongside the other anthropogenic drivers.

### DAMMING

The development of the Lee Valley Dam threatens the loss of 26.6 ha of indigenous woody vegetation (mostly native forest) within the dam footprint, and potential changes to flood regimes downstream that may impact on the ecology of riparian vegetation (Simpson, 2006). Losses will include 10% of all alluvial forest in the ecological district including a significant proportion of the remaining alluvial kahikatea forest, and significant populations of the 'nationally critical' shovelmint. (See future opportunities 8.4). These areas have approval for survey but other issues have prevented this from taking place.

# 8. MANAGEMENT OF BIODIVERSITY VALUES OF SNHs

## 8.1 MANAGEMENT ISSUES

The most important management issues relate to pest plant and animals, and direct and indirect disturbance from human activities.

### PEST PLANTS AND ANIMALS

Exotic species put considerable pressure on indigenous species and ecosystems. From the surveys it is clear which are the key weed species threats in the ecological district within SNHs and these have been outlined in the threats section. In the general sense, most pest animal impacts on native fauna and flora are well known. The issue on private land is one of landowner awareness and interest, available time and resources, and encouragement and support from the community or local and national agencies.

Pest plant invasion of the Tasman District part of the ecological district is inexorable, with no species of major concern anywhere near its limit of potential spread. A strategy of site-based, catchment-based and species-based control would be required to at least contain such species, but even that would be a considerable undertaking. While riparian weed control and the benefit of catchment-based control is recognised by the 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.

Weed management is undertaken at a very small proportion of forest sites. The SNHs administered by the council are managed for biodiversity (among other) interests that largely comprises weed control.

As of September 2013, Forest Stewardship Council (FSC) regulations have come into effect governing the management and protection of indigenous forests owned by forestry companies under FSC certification. Over time this places greater responsibility on the owners or managers of highly depleted native forests ecosystems and of sites that support nationally threatened species. In the ecological district this will potentially mean pest and weed control being initiated at a small number of lowland forest sites that have to date been entirely neglected.

The forest SNHs of the ecological district that are not continuous with the forest park are largely free of deer and goat impacts. Why this should be so is not obvious, but it is to be greatly welcomed. It may be due to a combination of factors. There has been extensive logging and goat culling within the extensive plantation pine forests, where generally high levels of activity and shooting have reduced numbers or dispersed animals to higher remoter ground within Mt Richmond Forest Park. (Goats browse newly planted pines so there is considerable financial incentive to control them.) Extensive pine plantation between many lowland sites and Mt Richmond Forest Park may also deter colonisation of these sites from the ranges. Some large private landowners in the Wairoa River catchment have also actively culled feral goats. Recreational deer hunting is common in the ecological district, and landowners also report that poaching is rife. The consequence of all these factors is that in recent years at least, many native forest sites have largely been protected from ungulate browse or have such low levels that healthy regeneration is still possible.

No Animal Health Board (now TBFree NZ) nor Department of Conservation possum control programmes have been undertaken in the ecological district. It is not known to what extent commercial possum cullers operate in the ecological district.

Pig control was undertaken at the time of survey at one large SNH in the Wairoa River catchment. Elsewhere recreational hunting of pigs is common, but insufficient to save many forest sites from at least locally heavy rooting.

Systematic control of small pest mammals (rodents, mustelids, possums, feral cats and hedgehogs) was being undertaken at the time of survey at one SNH.

### GRAZING AND STOCK FENCING

Canopy regeneration of forests and treelands browsed and grazed by stock is problematic. The future of such sites hinges on landowner interest in restoration through stock removal and/or fencing, and in the case of treelands, planting into gaps to ensure succession. Fenced sites are vulnerable to palatable weed species such as old man's beard that would otherwise have been browsed by stock. Unless such weeds are controlled, fencing gains can be offset by the impacts of weed invasion.





Alstromeria and banana passionvine smothering forest margins in Reservoir Creek

Several wetlands are vulnerable to stock access, that would benefit from fencing. The council offers fencing assistance in such instances.

### SPECIES EXTINCTION

A number of plant species are rare or absent from the survey area, either due to the present rarity of appropriate habitat, or for being originally naturally uncommon in the ecological district. Tree species include hinau, pokaka, raukawa, narrow-leaved lacebark, manatu, ti kouka and white maire among others. These should be key species to include in forest revegetation projects where appropriate.

A number of nationally 'threatened' or 'at risk' plant species are absent from the ecological district or are in such low numbers that without propagation it is likely that some of them will be lost. Several of the larger mistletoe species could be established through the ecological district where suitable host trees are present, in areas where possums are managed. Shovelmint, fierce lancewood and native germander could be propagated from local seed and planted into suitable sites.

### ECOSYSTEM FRAGMENTATION AND RIPARIAN PLANTING

Heavy depletion of lowland ecosystems in the ecological district has resulted in the current fragmentation of natural areas that lack strong ecological connections. Riparian margins provide the best opportunity for restoring connectivity as river corridors span landscapes and because river banks are generally not in intensive use. Large sections of the Wairoa River have retained a native riparian corridor, but the Lee and Roding rivers have considerable lengths of bank with little or no native forest that could be replanted.

## 8.2 PRIORITIES FOR MANAGEMENT OF SNHs

Management priorities have been grouped below into a number of key themes, that focus on both species and ecosystems:

### 1) Restoring the most depleted ecosystems: wetlands, alluvial forest (especially those with riparian communities), and hill-slope forest rich in podocarps.

Issues include:

- Fencing of the few grazed forest remnants would allow for natural regeneration
- Weed control is needed, notably old man's beard in alluvial forest areas and blackberry in the few existing freshwater wetlands.

### 2) Control of the most potentially damaging pest plants at the beginning of their infestation curve.

Priorities species are:

- Banana passionfruit which has just reached into the margins of the greater Wairoa catchment at Pig Valley and on the Aniseed Valley road summit
- Willow species along the main river stems
- Old man's beard in the upper sections of the Wairoa River from the forest park boundary down river to just short of the Pig Valley confluence
- Climbing alstromeria at Reservoir Creek
- White poplar, African clubmoss, wandering willy, periwinkle and buddleia (one or two sites each) beside or within SNHs along the Wairoa River margins. These species could be readily eliminated from SNHs.





Wilding pine control is well underway on this mineral belt shrub-tussockland site

### 3) Protect and manage the best SNH examples of the ecosystems in the ecological district.

The survey has identified SNHs that are likely to be among the best examples of their type in the ecological district.

Issues include:

- Encouragement and incentives for owners to better manage key sites
- Encourage formal protection such as under a QEII National Trust conservation covenant.

### 4) Manage nationally and regionally threatened species.

Managing rare species within SNHs is important to halt further declines and improve population viability by increasing numbers.

These include:

- Nationally 'threatened' species within SNHs: shovel mint and bush falcon. Shovel mint should be introduced to alluvial forest sites where conditions are suitable
- Nationally 'at risk' plant species recorded in SNHs: fierce lancewood, *Brachyglottis sciadophila*, *Coprosma obconica*, *Coprosma virescens*, and native germander. Propagation and planting of such species into suitable sites should be encouraged
- Regionally rare species recorded within SNHs include *Coprosma rubra*, white maire and leafless lawyer. These species would benefit from propagation and planting into suitable sites.

## 8.3 EXISTING MANAGEMENT INITIATIVES

A number of projects are already underway in the Tasman District sector of the ecological district within SNHs. These are generally stand-alone initiatives focussing on one site.

They include:

- Pest control programmes at two SNHs were known at the time of survey, one targeting rats, stoats and possums in the Roding catchment, and the other focused on pigs, possums and stoats in the upper Wairoa catchment.
- Extensive old man's beard control at several valley forest sites undertaken by landowners along the Wairoa and Roding river valleys, that include several QEIIIs.
- Annual weed control undertaken by the Nelson Botanical Society within the single most important alluvial forest remnant in the ecological district, mostly targeting old man's beard.
- Biodiversity management undertaken by TDC at a number of forest sites that they administer, most prominently at Reservoir Creek, Jimmy Lee Creek, and Mead Bridge Reserve. Such work has entailed control of old man's beard, banana passionfruit and at the first of these sites, climbing alstromeria.
- Wilding conifer control undertaken by a forestry company owner of the only tract of intact mineral belt shrubland/tussockland within an SNH, under certification obligations of the Forest Stewardship Council.
- Goat culling programmes within plantation forest areas that benefit numerous SNHs embedded within plantation.



## 8. MANAGEMENT OF BIODIVERSITY VALUES OF SNHs

Other activities within the entire ecological district outside SNHs include:

- The two larger forestry companies in the district take an interest in the bush falcons present on their estates, recording sightings of birds, taking care around nest sites or avoiding nest site areas when actively logging.
- Wilding pine control is undertaken by the Department of Conservation around the Hackett River-Mt Starveall area, and in conjunction with Nelson Forests Ltd in the Gordons Knob area. Nelson City Council undertake systematic wilding pine control within the large areas of mineral belt vegetation within their water catchment reserves.
- An 715ha predator-fenced 'Brook Waimarama Sanctuary' has been established within the headwaters of the Brook Stream on Nelson City Council land that will be restored with faunal species introductions.
- Nelson City Council runs an active programme of goat culling and old man's beard control within their 10,000 ha waterworks reserves. Weed management is also undertaken within their smaller reserves.
- Three community pest trapping groups operate within the foothills of the Bryant Range, in native forest areas at the Grampians, Marsden Valley, and Jimmy Lee Creek.

### 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 each other's forest or wetland areas, where the prospect of working alone is too daunting or uninteresting. This would make considerable sense in the Wairoa Gorge in the section where quite a number of adjoining SNHs are in private ownership and the weed issues cross boundaries.

Should the proposed Lee Valley Dam go ahead, the associated mitigation package could potentially result in some level of biodiversity management of some SNH sites in the greater Wairoa catchment (see 7.9).

New Zealand standards for Forest Stewardship Certification of commercial forestry operations have been recently approved (Forest Stewardship Council, 2013). Among other environmental responsibilities, certified parties are required to manage sites for conservation where nationally threatened species and poorly represented ecosystems occur. The latter refers to those vegetation communities (referred to as 'habitat type') reduced to less than <5% in an ecological district. This should eventually see the conservation management of some forestry-owned SNHs in the ecological district.

# 9. PROTECTION OF SNHs

## 9.1 EXISTING PROTECTION

SNHs represent 3.1% of remaining forest and treeland, 100% of remaining freshwater wetland, and 2.7% of serpentine vegetation (*Table 5*). The comparatively low figure for forest/treeland is mainly due to the very extensive forested conservation land that falls outside the scope of the survey.

The level of protection of remaining forest/treeland SNHs is 22 %, for freshwater wetlands 0% and for serpentine vegetation 0%.

Since the NHT survey, two landowners of SNHs have subsequently protected large parts of their properties with QEII National Trust covenants as a direct result of the survey, with figures from these incorporated below.

## 9.2 PRIORITIES FOR PROTECTION

There are few SNHs on Council land within the ecological district. Some are not reserved, and one is recommended to have its reserve status upgraded:

- Native forests owned by Tasman District Council within Jimmy Lee Creek and Reservoir Creek, both in gullies above Richmond, have no reserve status, falling within the PF Olsen-managed Kingsland Forest. Their ecological values are high and are deserving of Scenic Reserve status.
- A section of esplanade reserve along the Wairoa River margins has been proposed as Scenic Reserve within Tasman District Council’s Waimea-Moutere Reserve Management Plan (Tasman District Council (2000) section 5.26.6). This has yet to be enacted.
- White Gates Reserve has not been formally reserved, despite being administered by Council since 1995.

**Table 5: SNH Area and Proportion of SNHs Protected**

ECOSYSTEM	AREA REMAINING IN BRYANT ECOLOGICAL DISTRICT	AREA REMAINING WITHIN TDC PART OF BRYANT ED	REMAINING AREA ON PRIVATE LAND IN TDC	AREA SNH <sup>1</sup> (HA)	REMAINING AREA AS SNH IN TDC PART OF BRYANT ED	AREA SNH PROTECTED (HA) <sup>2</sup>	% SNH AREA PROTECTED
Forest & treeland	49376 ha	37843 ha	2638.7 ha	1585.5 ha	4.2 %	335 ha	22.1%
– inc. alluvial	30 ha	21 ha	16 ha	13.6 ha	64.8%	2 ha	14.7%
Freshwater Wetland	2 ha	1 ha	1 ha	1 ha	50 %	0 ha	0%
Serpentine tussockland, shrubland and scrub inc. alpine	c2760 ha	c627 ha	123ha	90 ha	14.3 %	0 ha	0%

1. DOC administered land falls outside SNHs.

2. See Section 4.0.7; includes QEII covenants, Tasman Accord Forests, and (off DOC-administered land) Scenic Reserves, Local Purpose and Esplanade Reserves.



## 10. BIODIVERSITY 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. 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 and independent auditing would be needed to maintain consistency. Ideally, monitoring would be done by a small team to achieve consistency with participation by landowners.



# 11. APPENDICES

## 11.1 SCIENTIFIC AND COMMON NAMES OF SPECIES IN TEXT

COMMON NAME	SPECIES NAME
<b>INDIGENOUS PLANTS</b>	
<b>i) Trees and Shrubs</b>	
akeaeke	<i>Dodonaea viscosa</i>
akiraho	<i>Olearia paniculata</i>
beech coprosma	<i>Coprosma microcarpa</i>
black beech; tawhairauriki	<i>Fuscospora solandri</i>
black maire	<i>Nestegis cunninghamii</i>
broadleaf; kapuka	<i>Griselinia littoralis</i>
coral mistletoe	<i>Korthalsella clavata</i>
fierce lancewood	<i>Pseudopanax ferox</i>
fivefinger; whauwhaupaku	<i>Pseudopanax arboreus</i>
fuchsia; kotukutuku	<i>Fuchsia excorticata</i>
hard beech; hututawhai	<i>Fuscospora truncata</i>
heketara	<i>Olearia rani</i>
hinau	<i>Elaeocarpus dentatus</i>
horopito; pepper wood	<i>Pseudowintera colorata</i>
hybrid kowhai	<i>Sophora microphylla x longicarinata</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kaikomako	<i>Pennantia corymbosa</i>
kamahi	<i>Weinmannia racemosa</i>
kanono; large leaved coprosma	<i>Coprosma grandifolia</i>
kanuka	<i>Kunzea ericoides</i>
karamu	<i>Coprosma robusta</i>
kawakawa	<i>Macropiper excelsum</i>
kohuhu	<i>Pittosporum tenuifolium</i>
kowhai (South Island)	<i>Sophora microphylla</i>
lancewood; horoeka	<i>Pseudopanax crassifolius</i>
limestone kowhai	<i>Sophora longicarinata</i>
lowland totara	<i>Podocarpus totara</i>
mahoe wao; narrow-leaved mahoe	<i>Melicytus lanceolatus</i>



## 11. APPENDICES

COMMON NAME	SPECIES NAME
mahoe, whiteywood	<i>Melicytus ramiflorus</i>
makomako; wineberry	<i>Aristotelia serrata</i>
manatu; lowland ribbonwood	<i>Plagianthus regius</i>
manuka	<i>Leptospermum scoparium</i>
mapou, red matipo	<i>Myrsine australis</i>
matai	<i>Prumnopitys taxifolia</i>
matagouri	<i>Discaria toumatou</i>
mingimingi	<i>Leucopogon fasciculatus</i>
miro	<i>Prumnopitys ferruginea</i>
mountain akeake; shrub daisy	<i>Olearia avicenniifolia</i>
mountain beech	<i>Fuscospora cliffortioides</i>
mountain toatoa	<i>Phyllocladus alpinus</i>
mountain totara	<i>Podocarpus laetus</i>
mountain wineberry	<i>Aristotelia fruticosa</i>
narrow-leaved lacebark/ n-l houhere	<i>Hoheria angustifolia</i>
native or common broom	<i>Carmichaelia australis</i>
native germander	<i>Teucrium parvifolium</i>
ngaio	<i>Myoporum laetum</i>
nikau	<i>Rhopalostylis sapida</i>
niniaio	<i>Helichrysum lanceolatum</i>
ongaonga, tree nettle	<i>Urtica ferox</i>
pate	<i>Schefflera digitata</i>
pepperwood/mountain horopito	<i>Pseudowintera colensoi</i>
pigeonwood; porokaiwhiri	<i>Hedycarya arborea</i>
poataniwha	<i>Melicope simplex</i>
pokaka	<i>Elaeocarpus hookerianus</i>
prickly mingimingi	<i>Leptecophylla juniperina</i>
puka	<i>Griselinia lucida</i>
pukatea	<i>Laurelia novae-zelandiae</i>
putaputaweta; marbleleaf	<i>Carpodetus serratus</i>

## 11. APPENDICES

COMMON NAME	SPECIES NAME
rangiora	<i>Brachyglottis repanda</i>
raukawa	<i>Raukaua anomalus</i>
red beech; tawhairaunui	<i>Fuscospora fusca</i>
rimu	<i>Dacrydium cupressinum</i>
rohutu; NZ myrtle	<i>Lophomyrtus obcordata</i>
round-leaved coprosma	<i>Coprosma rotundifolia</i>
saltmarsh ribbonwood	<i>Plagianthus divaricatus</i>
scented broom	<i>Carmichaelia odorata</i>
scrambling pohuehue	<i>Meuhlenbeckia complexa</i>
scrub coprosma	<i>Coprosma rhamnoides</i>
shining coprosma	<i>Coprosma lucida</i>
shovelmint	<i>Scutellaria novae-zelandiae</i>
silver beech; tawhai	<i>Lophozonia menziesii</i>
southern rata	<i>Metrosideros umbellata</i>
stinkwood	<i>Coprosma foetidissima</i>
swamp mahoe	<i>Melicytus micranthus</i>
tanekaha	<i>Phyllocladus trichomanoides</i>
tarata; lemonwood	<i>Pittosporum eugeniioides</i>
tawa	<i>Beilschmiedia tawa</i>
thick leaved coprosma	<i>Coprosma crassifolia</i>
ti kouka; cabbage tree	<i>Cordyline australis</i>
titoki	<i>Alectryon excelsus</i>
tutu	<i>Coriaria arborea</i>
turepo; small leaved milkwood	<i>Streblus heterophyllus</i>
weeping matipo	<i>Myrsine divaricata</i>
white maire	<i>Nestegis lanceolata</i>
yellow-wood	<i>Coprosma linariifolia</i>
	<i>Aristolelia fruticosa</i>
	<i>Brachyglottis adamsii</i>
	<i>Coprosma colensoi</i>



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COMMON NAME	SPECIES NAME
	<i>Coprosma obconica</i>
	<i>Coprosma pseudocuneata</i>
	<i>Coprosma propinqua</i>
	<i>Coprosma rigida</i>
	<i>Coprosma rubra</i>
	<i>Coprosma dumosa</i>
	<i>Coprosma virescens</i>
	<i>Dracophyllum filifolium</i>
	<i>Dracophyllum uniflorum</i>
	<i>Dracophyllum urvilleanum</i>
	<i>Fuchsia excorticata x perscandens</i>
	<i>Hebe canterburyensis</i>
	<i>Hebe vernicosa</i>
	<i>Hebe stenophylla</i>
	<i>Leucopogon fraseri</i>
	<i>Melicytus crassifolius</i>
	<i>Melicytus alpinus</i>
	<i>Melicytus aff alpinus "Brockei"</i>
	<i>Melicytus "Waipapa"</i>
	<i>Olearia serpentina</i>
	<i>Ozothamnus vauvilliensis</i>
	<i>Pittosporum rigidum</i>
	<i>Raukaua edgerleyi</i>
<b>ii) Lianes</b>	
bush lawyer	<i>Rubus cissoides</i>
kiekie	<i>Freycinetia banksii</i>
leafless lawyer	<i>Rubus squarrosus</i>
limestone rata vine	<i>Metrosideros colensoi</i>
native bindweed sp.	<i>Calystegia tugoriorum</i>
native clematis	<i>Clematis paniculata</i>

## 11. APPENDICES

COMMON NAME	SPECIES NAME
native jasmine	<i>Parsonsia heterophylla</i>
native passionvine	<i>Passiflora tetrandra</i>
supplejack	<i>Ripogonum scandens</i>
white rata vine	<i>Metrosideros diffusa</i>
<b>iii) Dicotyledonous Herbs</b>	
australina	<i>Australina pusilla</i>
climbing groundsel	<i>Brachyglottis sciadophila</i>
glasswort	<i>Sarcocornia quinquefolia</i>
native nettle sp.	<i>Urtica incisa</i>
North Island edelweiss	<i>Leucogenes leontopodium</i>
scree buttercup	<i>Ranunculus crithmifolius</i>
sea primrose	<i>Samolus repens</i>
	<i>Acaena juvenca</i>
	<i>Anaphalioides trinervia</i>
	<i>Celmisia incana</i>
	<i>Celmisia monroi</i>
	<i>Celmisia sessiliflora</i>
	<i>Celmisia spectabilis</i>
	<i>Craspedia minor</i>
	<i>Epilobium brunnescens</i>
	<i>Gentianella stellata</i>
	<i>Hydrocotyle heteromeria</i>
	<i>Hydrocotyle moschata</i>
	<i>Hydrocotyle novae-zelandiae</i>
	<i>Hydrocotyle sulcata</i>
	<i>Lagenifera pumila</i>
	<i>Leptinella mediana</i>
	<i>Nertera depressa</i>
	<i>Nertera villosa</i>
	<i>Oreomyrrhis colensoi</i>



## 11. APPENDICES

COMMON NAME	SPECIES NAME
	<i>Parahebe lyallii</i>
	<i>Pratia angulata</i>
	<i>Viola cunninghamii</i>
<b>iv) Monocotyledonous Herbs</b>	
ground lily	<i>Astelia fragrans</i>
harakeke, swamp flax	<i>Phormium tenax</i>
inkberry	<i>Dianella nigra</i>
native iris	<i>Libertia ixioides</i>
perching orchid sp.	<i>Drymoanthus adversus</i>
raupo	<i>Typha orientalis</i>
spider orchid	<i>Corybas trilobus agg.</i>
wharariki flax	<i>Phormium cookianum</i>
	<i>Collospermum hastatum</i>
<b>v) Grasses Sedges Rushes</b>	
bamboo rice grass	<i>Microlaena polynoda</i>
blue tussock	<i>Poa colensoi</i>
bush rice grass	<i>Microlaena avenacea</i>
mid-ribbed snow tussock	<i>Chionochloa pallens</i>
carpet grass	<i>Chionochloa australis</i>
estuary tussock	<i>Austrostipa stipoides</i>
hook grass sp.	<i>Uncinia clavata</i>
hook grass sp.	<i>Uncinia fusco-vaginata</i>
hook grass sp.	<i>Uncinia laxiflora</i>
hook grass sp.	<i>Uncinia leptostachya</i>
hook grass sp.	<i>Uncinia scabra</i>
hook grass sp.	<i>Uncinia uncinata</i>
mid-ribbed snow tussock	<i>Chionochloa pallens</i>
oioi	<i>Apodasmia similis</i>
pukio	<i>Carex virgata</i>
purei	<i>Carex secta</i>

## 11. APPENDICES

COMMON NAME	SPECIES NAME
rautahi	<i>Carex geminata</i>
sea rush	<i>Juncus kraussii</i>
sedge sp.	<i>Baumea rubiginosa</i>
sedge sp.	<i>Baumea tenax</i>
sedge sp.	<i>Carex coriacea</i>
sedge sp.	<i>Carex devia</i>
sedge sp.	<i>Carex dissita</i>
sedge sp.	<i>Carex traversii</i>
sedge sp.	<i>Carex lambertiana</i>
sedge sp.	<i>Carex solandri</i>
toetoe	<i>Cortaderia richardii</i>
	<i>Chionochloa conspicua</i>
	<i>Chionochloa defracta</i>
	<i>Dichlachne crinita</i>
	<i>Isolepis aucklandica</i>
	<i>Lachnagrostis "serpentine"</i>
	<i>Rytidosperma sp.</i>
	<i>Schoenus pauciflorus</i>
<b>vi) Ferns</b>	
beech hard fern	<i>Blechnum procerum</i>
button fern	<i>Pellaea rotundifolia</i>
crown fern	<i>Blechnum discolor</i>
filmy fern sp.	<i>Hymenophyllum bivalve</i>
filmy fern sp.	<i>Hymenophyllum flexuosum</i>
filmy fern sp.	<i>Hymenophyllum sanguinolentum</i>
gully fern	<i>Pneumatopteris pennigera</i>
hanging spleenwort	<i>Asplenium flaccidum</i>
hen and chickens fern	<i>Asplenium bulbiferum</i>
houndstongue fern	<i>Microsorium pustulatum</i>
jointed fern	<i>Arthropteris tenella</i>



## 11. APPENDICES

COMMON NAME	SPECIES NAME
katote, soft tree fern	<i>Cyathea smithii</i>
kiokio	<i>Blechnum novae-zelandiae</i>
leather leaf fern	<i>Pyrrhosia eleagnifolia</i>
lowland shield fern	<i>Polystichum neozelandicum</i>
maidenhair fern	<i>Adiantum cunninghamii</i>
parsley fern	<i>Botrychium biforme</i>
ponga, silver fern	<i>Cyathea dealbata</i>
prickly shield fern	<i>Polystichum vestitum</i>
shield fern sp.	<i>Polystichum silvaticum</i>
shining spleenwort	<i>Asplenium oblongifolium</i>
sickle spleenwort	<i>Asplenium polyodon</i>
strap fern sp.	<i>Grammitis billardiarei</i>
terrace hard fern	<i>Blechnum fluviatile</i>
velvet fern	<i>Lastreopsis velutina</i>
waewaekoukou	<i>Lycopodium volubile</i>
wheki ponga	<i>Dicksonia fibrosa</i>
wheki, rough tree fern	<i>Dicksonia squarrosa</i>
	<i>Asplenium appendiculatum</i>
	<i>Asplenium hookerianum</i>
	<i>Blechnum chambersii</i>
	<i>Blechnum fluviatile</i>
	<i>Lastreopsis glabella</i>
	<i>Leptolepia novae-zelandiae</i>
	<i>Leptopteris hymenophylloides</i>
	<i>Microsorium scandens</i>
	<i>Rumhora adiantiformis</i>
<b>INDIGENOUS BIRDS</b>	
Australasian harrier/kahu	<i>Circus approximans</i>
banded dotterel/tuturiwhatu	<i>Charadrius bicinctus</i>
bellbird/korimako	<i>Anthornis melanura melanura</i>

## 11. APPENDICES

COMMON NAME	SPECIES NAME
black shag/kawau	<i>Phalacrocorax carbo novaehollandiae</i>
bush falcon/karearea	<i>Falco novaeseelandiae</i>
eastern bar-tailed godwit/kuaka	<i>Limosa lapponica</i>
grey warbler/riroriro	<i>Gerygone igata</i>
kingfisher/kotare	<i>Halcyon sancta</i>
kaka	<i>Nestor meridionalis</i>
yellow crowned kakariki	<i>Cyanoramphus auriceps</i>
kea	<i>Nestor notabilis</i>
little shag/kawaupaka	<i>Phalacrocorax melanoleucos brevirostris</i>
long tailed cuckoo/koekoea	<i>Eudynamys taitensis</i>
New Zealand pigeon/kereru	<i>Hemiphaga novaeseelandiae novaeseelandiae</i>
paradise duck/putangitangi	<i>Tadorna variegata</i>
parakeet/kakariki spp.	<i>Cyanoramphus spp.</i>
pied shag	<i>Phalacrocorax varius</i>
pukeko	<i>Porphyrio porphyrio</i>
red-billed gull/tarapunga	<i>Larus novaehollandiae</i>
royal spoonbill/kotuku-ngutupapa	<i>Platalea regia</i>
shining cuckoo/pipiwharauoa	<i>Chrysococcyx lucidas</i>
silveryeye/tauhou	<i>Zosterops lateralis</i>
South Island fantail/piwakawaka	<i>Rhipidura fuliginosa fuliginosa</i>
South Island kaka	<i>Nestor meridionalis meridionalis</i>
South Island pied oystercatcher/torea	<i>Haematopus ostralegus finschi</i>
South Island robin/toutouwai	<i>Petroica australis australis</i>
South Island tomtit/miromiro	<i>Petroica macrocephala macrocephala</i>
southern black-backed gull/karoro	<i>Larus dominicanus dominicanus</i>
spotted shag	<i>Stictocarbo punctatus</i>
tui	<i>Prothemadera novaeseelandiae novaeseelandiae</i>
variable oystercatcher/torea-pango	<i>Haematopus ostralegus</i>
western weka	<i>Gallirallus australis australis</i>
whio/blue duck	<i>Hymenolaimus malacorhynchos</i>



## 11. APPENDICES

COMMON NAME	SPECIES NAME
white-fronted tern/tara	<i>Sterna striata</i>
white-faced heron	<i>Ardea novaehollandiae novaehollandiae</i>
<b>INDIGENOUS MAMMALS</b>	
long-tailed bat/pekapeka	<i>Chalinolobus tuberculatus</i>
<b>INDIGENOUS LIZARDS</b>	
common gecko	<i>Woodworthia maculata</i>
forest gecko	<i>Mokopirirakau granulatus</i>
Marlborough 'mini' gecko	<i>Woodworthia "Marlborough mini"</i>
Nelson green gecko	<i>Naultinus stellatus</i>
northern spotted skink	<i>Oligosoma kokowai</i>
northern grass skink	<i>Oligosoma polychroma</i>
<b>INDIGENOUS FRESHWATER FISH</b>	
banded kokopu	<i>Galaxias fasciatus</i>
common bully	<i>Gobiomorphus cotidianus</i>
inanga	<i>Galaxias maculatus</i>
koaro	<i>Galaxias brevipinnis</i>
longfin eel	<i>Anguilla dieffenbachii</i>
redfin bully	<i>Gobiomorphus huttoni</i>
shortfin eel	<i>Anguilla australis</i>
upland bully	<i>Gobiomorphus breviceps</i>
<b>INTRODUCED PLANTS</b>	
African clubmoss	<i>Selaginella krausiana</i>
African feather grass	<i>Pennisetum macrourum</i>
alstromeria	<i>Bomarea multiflora</i>
ash	<i>Fraxinus excelsior</i>
balm of Gilead	<i>Cedronella canariensis</i>
banana passionfruit	<i>Passiflora mixta/mollissima</i>
barberry (European)	<i>Berberis vulgaris</i>
bindweed	<i>Calystegia silvatica</i>
blackberry	<i>Rubus fruticosus agg.</i>

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COMMON NAME	SPECIES NAME
boneseed	<i>Chrysanthemoides monilifera</i>
boxthorn	<i>Lycium ferocissimum</i>
broom (European)	<i>Cytisus scoparius</i>
buddleia	<i>Buddleia davidii</i>
cathedral bells	<i>Cobaea scandens</i>
cherry sp.	<i>Prunus sp.</i>
Chinese pennisetum	<i>Pennisetum alpecuroides</i>
cotoneaster	<i>Cotoneaster simonsii</i>
crack willow	<i>Salix fragilis</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
foxglove	<i>Digitalis purpurea</i>
gorse	<i>Ulex europaeus</i>
Himalayan honeysuckle	<i>Leycesteria formosa</i>
holly	<i>Ilex aquifolium</i>
ivy	<i>Hedera helix</i>
Japanese cedar	<i>Cryptomeria japonica</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Madeira vine	<i>Anrederia cordifolia</i>
male fern	<i>Dryopteris felix-mas</i>
montbretia	<i>Crocasmia x crocosmiifolia</i>
old man's beard	<i>Clematis vitalba</i>
periwinkle	<i>Vinca major</i>
radiata pine	<i>Pinus radiata</i>
saffron thistle	<i>Carthamus lanatus</i>
strawberry dogwood	<i>Dendrobenthamia capitata</i>
sycamore	<i>Acer pseudoplatanus</i>
tall fescue	<i>Schedonorus phoenix</i>
variegated thistle	<i>Silybum marianum</i>
wall lettuce	<i>Mycelus muralis</i>
wandering willy	<i>Tradescantia fluminensis</i>



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COMMON NAME	SPECIES NAME
white poplar	<i>Populus alba</i>
white-edged nightshade	<i>Solanum marginatum</i>
<b>INTRODUCED ANIMALS</b>	
brush-tailed possum	<i>Trichosurus vulpecula</i>
common wasp	<i>Vespula vulgaris</i>
European brown hare	<i>Lepus europaeus</i>
feral goat	<i>Capra hircus</i>
feral pig	<i>Sus scrofa</i>
ferret	<i>Mustela putorius furo</i>
house mouse	<i>Mus musculus</i>
red deer	<i>Cervus elaphus</i>
ship rat	<i>Rattus rattus</i>
stoat	<i>Mustela erminea</i>
weasel	<i>Mustela nivalis</i>

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