



NORTH MARLBOROUGH

SIGNIFICANT NATURAL AREAS PROJECT

A Summary of Results from an Ecological Survey
of Significant Natural Areas on Private Land in
Marlborough, North of the Wairau River



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■ ACKNOWLEDGEMENTS

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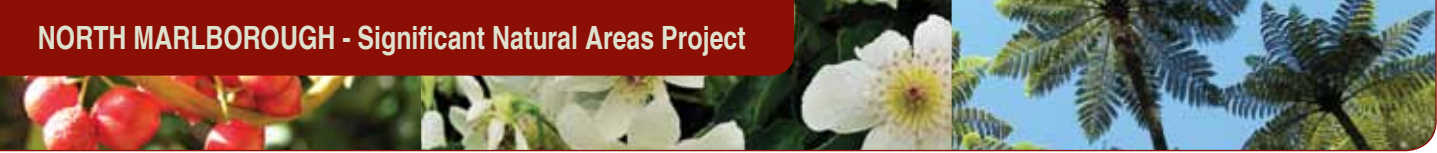
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■ INTRODUCTION

This report provides an overview of the ecological survey recently carried out to identify and encourage opportunities for the conservation of natural features on private land in North Marlborough, complementing a similar overview produced for South Marlborough (Marlborough District Council, 2005). It summarises information collected by the Marlborough District Council (MDC), in conjunction with landowners in the district, through its work of identifying significant natural areas under the Resource Management Act.

North Marlborough has an extensive network of formally protected areas (Mt Richmond Forest Park, numerous reserves and other tracts of conservation land). Therefore, little previous attention had been given to ecological attributes on privately owned land, and a perception had grown that not much more of special value remained. This report indicates that not only do many ecological gems remain on private land, but there are many practical opportunities for conservation and an energy and desire for ecological restoration.

The MDC has worked on the principle of a partnership approach with landowners to achieve improvements in the protection of remaining significant natural areas in the region. This approach has allowed for meaningful and detailed field-based surveys to be carried out in cooperation with landowners, rather than a desk-top type of approach using maps and aerial photography. It has also provided both landowners and MDC with opportunities to learn about existing ecological values and issues that need to be understood, to enable effective protection and enhancement of the more vulnerable of these areas.

A programme providing advice and financial assistance to landowners has been established by the MDC. Support from central government through the “Biodiversity Fund” has boosted the MDC initiative, as has the building of a strong relationship with the QEII National Trust, which assists landowners to protect areas of private land through covenanting.

Through a combination of these measures, landowners have already implemented a number of ecological protection and restoration projects in North Marlborough. The MDC intends to continue to promote this protection/restoration work in the long term.

■ THE SURVEY AREA – ECOLOGICAL DISTRICTS

For the purposes of this report, North Marlborough is defined as that part of the Marlborough District (MDC territorial area) that lies to the north of the Wairau River (apart from the Tuamarina-Rarangi locality in the south-east, which is included within the South Marlborough survey area).

Ecological Districts (McEwen, 1987) are the geographical units used as the basis for this survey. These were developed for New Zealand in the 1980s to provide a context within which the ecological significance of natural features could be identified. An Ecological District is defined as a local part of the country where the topographical, geological, climatic, soil and biological features, combined with the broad cultural pattern, produce a characteristic landscape and range of biological communities. The MDC territorial boundary, and all of the ecological districts within it, are shown on Map 1.

North Marlborough is covered by eight ecological districts: D’Urville, Cook Strait, Sounds, Pelorus, Para, Fishtail, Bryant and Red Hills. Of these, surveys were carried out in the first six. Surveys were not done in Bryant or Red Hills as the portions of these ecological districts within the MDC territorial area are relatively small and include little private land.

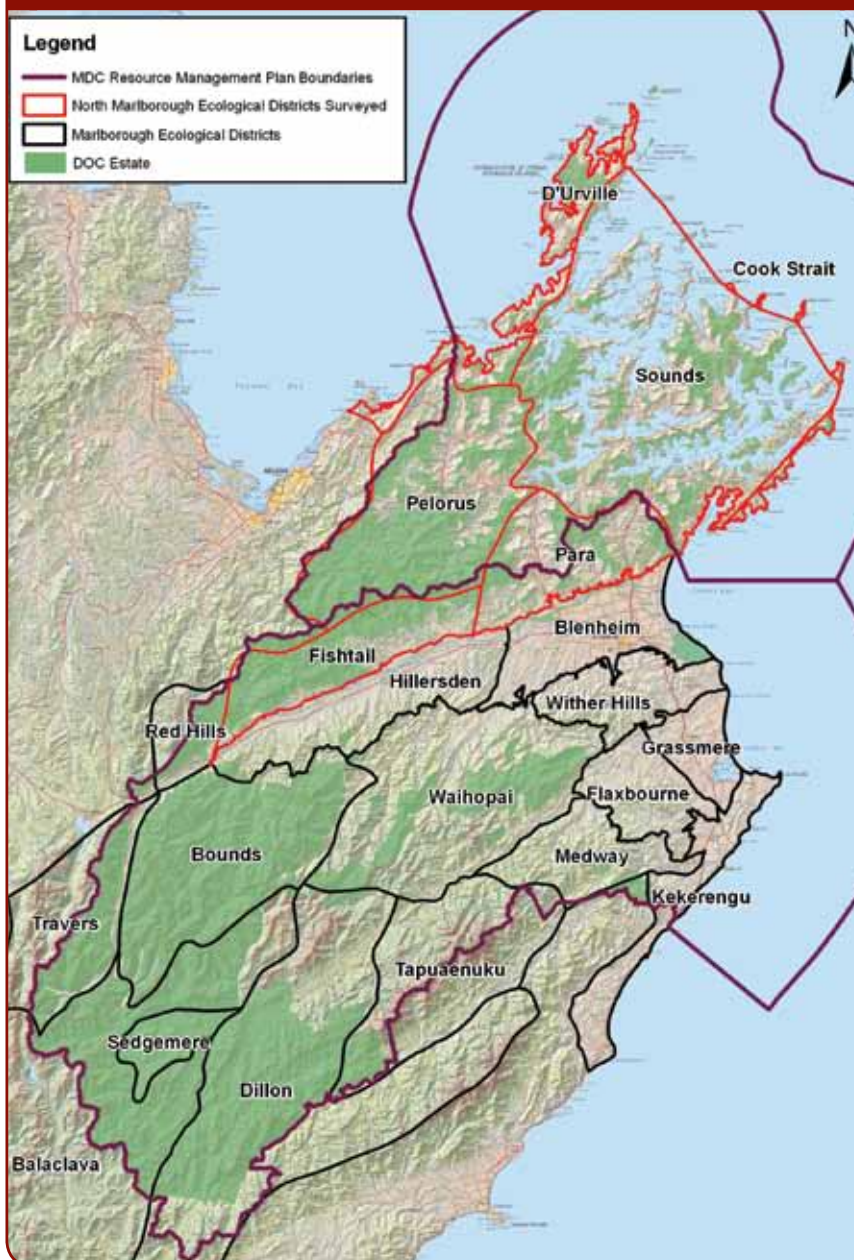
Each of the six ecological districts surveyed in North Marlborough, (shown in red outline on Map 1), are described in this report. For each, the following information is given:

- **OVERVIEW**

A description of the biogeography and history of the district.



MAP 1: THE MARLBOROUGH DISTRICT SHOWING ALL THE ECOLOGICAL DISTRICTS AND CONSERVATION LAND



- **SURVEY RESULTS**

A table showing the number of sites identified and total area of sites by ecosystem type. The data presented in tabulated form is a simplification, as sites frequently have more than one ecosystem type present.

- **ECOSYSTEMS FOUND**

Description of the main indigenous ecosystem types present.

- **SPECIAL FEATURES**

Rare and threatened flora and fauna, distribution limits, archaeologically significant plants, anomalies, etc.

- **PHOTO ESSAY**

A series of photos illustrating typical and distinctive habitats, flora and fauna.



THE FIELD SURVEY - METHOD

The North Marlborough ecological surveys followed on from and overlapped with those done in South Marlborough. Prior to the fieldwork getting underway (in early 2001 for South Marlborough, and in late 2002 for North Marlborough), preliminary consultation with landowners and relevant agencies took place. A working group was established by the MDC to help manage the project, and included landowner representatives as well as representatives from the MDC and the Department of Conservation (DOC). The working group designed the protocols to be followed by consensus and regularly reviewed the survey process. The key principle was that landowners were offered an obligation-free ecological survey, that their participation was voluntary and that surveys were only done with their consent.

The MDC employed a contract team of three for the surveys, under the supervision of Nicky Eade from the Environmental Science and Monitoring group. Following an introductory letter from the MDC, local environmental consultant Paul Millen made phone contact with individual landowners and then set up the programme for field survey. Freelance ecologists Geoff Walls and Philip Simpson carried out the surveys property-by-property, with Geoff Walls doing the majority. Most fieldwork was done on foot, with access aided by all terrain and four wheel drive vehicles. Some was done by boat, and water transport was needed to reach the main islands (D'Urville and Arapawa) and several remote Sounds properties. Landowners were given verbal feedback, and each received an individual written and illustrated report for their property.

The criteria used to identify and assess sites of ecological significance are closely based on those initially developed for the New Zealand Protected Natural Areas Programme and subsequently widely used for ecological assessment. They are set out in Appendix One.

Landowners involved have been subsequently contacted to find out whether or not they would be interested in following up any management suggestions made in the reports. A steady stream of protection initiatives is now underway as a result, including fencing, pest control, restoration planting, management partnerships and formal covenanting through the QEII National Trust. In addition, some landowners have requested assistance with ecological management of whole properties to merge production with the conservation of natural features, and guidelines have been developed for this purpose.

Table 1 summarises overall results of the ecological survey work done in North Marlborough so far. A total of 169 landowners were offered ecological surveys, of which 125 chose to participate, and 44 declined. A total of 365 sites were identified as ecologically significant through the survey work, having a combined area of 21,549 hectares and making up an average of 7.4% of the total land area. The more detailed analysis provided under each separate ecological district gives information about the main ecosystem types identified.

**TABLE 1 - OVERALL RESULTS OF MARLBOROUGH DISTRICT COUNCIL
ECOLOGICAL SURVEYS IN NORTH MARLBOROUGH**

Ecological Districts	No of Properties Surveyed	No of Properties Declined	No of Sites	Combined Area (ha)	SNA sites as a % of total private land area in ED	SNA sites as a % of total area of ED (DoC and private)	% of DoC land
D'Urville	20	9	46	3,582.0	16.5%	12.0%	27%
Cook Strait	2	0	6	695.0	16.8%	12.5%	24%
Sounds	61	16	182	11,479.0	16.0%	9.5%	39%
Pelorus	18	10	43	1,467.5	3.8%	1.4%	63%
Para	18	7	55	2,975.0	8.7%	6.2%	24%
Fishtail	6	2	33	1,350.5	9.0%	3.0%	55%
Totals	125 (73%)	44 (27%)	365	21,549.0	(Av = 12%)	(Av = 7.4%)	(Av = 38.5%)



■ THE ECOLOGY OF NORTH MARLBOROUGH

North Marlborough is distinctive, diverse and spectacular. It includes the rugged uplifted mass of the Richmond Range, its foothills, the boisterous Pelorus River, numerous streams, and the convoluted labyrinth of the Marlborough Sounds. There are mountains, hills, valleys, gullies, alluvial plains, sheltered waterways, wild exposed coasts, bays, islands and headlands. The geology is complex and interesting, featuring numerous faultlines, blocks of rocks that are tilted, crushed, uplifted and sunken, and deep deposits of alluvial and colluvial material. The geological structure follows a SW-NE axis, with parallel faults and blocks. The most distinctive is the band of ultramafic rocks (the Nelson Mineral Belt) that runs from the Red Hills to D'Urville Island. To the east the main sedimentary rocks become more schistose and in places are tilted to form gigantic slabs.

The climate is equally complex, but is predominantly sunny and reliably moist. In the mountains the summers are hot and the winters are sharp, whilst in the Sounds the temperatures are moderated by the sea. Cook Strait adds another dimension – powerful wind.

Together, the topography, geology and climate have created a great diversity of habitats, and this is reflected in the character of the native vegetation. The forests are mostly dominated by beeches, but include many podocarps (for instance, rimu, matai, miro, totara and kahikatea) and broadleaved trees. The composition varies widely but has distinct patterns, the most obvious being the abrupt changes in the beech species with altitude. In the outer Sounds a vibrant subtropical forest element is provided by kohekohe, nikau and pukatea. The upland forests feature silver beech, southern rata and Hall's totara and are stunted and festooned with mosses, lichens and orchids. The humid climate allows a proliferation of ferns, from the giant tree ferns of the Sounds to the filmy ferns of the cloud forests.

Other native vegetation types include ultramafic and subalpine shrublands, tussock grasslands and large areas of vegetation regenerating after past forest clearance. The towering forests of the valleys and coastal flats have largely gone, but on most slopes the regeneration process is leading to the eventual return of a forest cover resembling the original.

The native flora is typical of central New Zealand, but there are several species near the southern limits of their range (e.g. kohekohe, tanekaha, rewarewa, taupata, gully fern and swamp maire) and some notable absences (such as northern rata). There are plants endemic to the mineralised ultramafic soils, others endemic to the exposed Cook Strait coast (the most well known being Cook Strait kowhai) and an alpine daisy found only on the summit of Mt Stokes, the highest point of the Sounds at 1203 metres. In addition, there is a wealth of plants listed as nationally threatened.

Matching the flora is a diverse native fauna. Although depleted from its original richness, it includes birds of the bush, mountains, shore and sea, several lizard species (skinks and geckos), both tuatara species, Hamilton's and Maud Island frogs, bats, a range of freshwater fish and numerous invertebrates. Quite a few of these native animals are nationally threatened; several are endemic to North Marlborough (including King shag, the two frogs, Brothers Island tuatara, at least one gecko and three giant land snails). There are safe havens on several of the Sounds islands; otherwise the fauna faces a continual onslaught from exotic predators and competitors. On the predator-free islands, intense seabird activity is a reminder of a more widespread past phenomenon in the Sounds. Weka and kiwi are the last remnants of the former wealth of large ground-dwelling birds, and moa gizzard stones can still be found in many places.

Human impact has affected the North Marlborough ecology from the coast to the mountain tops. Several centuries of Maori settlement would have brought only small-scale localised forest clearance, but the impacts on the native fauna of hunting and the depredations by kiore (rats), and kuri (dogs), would have been widespread. These ecological effects were substantially heightened after European arrival. Much of the forest cover has been destroyed, particularly in the lowlands, although considerable tracts remain and native forest is now regenerating widely. Feral pigs, deer, goats, possums, mustelids, rodents, cats and hedgehogs are throughout, except on some islands. As a result, the native fauna on



most of the mainland is now just a shadow of its pre-human state. Many introduced plants have added further pressure on the natural ecosystems. Some, such as wilding pines and old man's beard, are widespread and highly invasive.

However, much remains to celebrate and nurture. The indigenous (native) ecosystems that remain provide a wealth of opportunities for protection and enhancement. Many landowners have strong bonds with the natural features on their land and a keen awareness of the management issues. There are already some outstanding conservation initiatives on private land in North Marlborough, including bush protection, wetland restoration, the retirement of tracts of land from farming to allow forest regeneration and the establishment of "mainland islands" where intensive pest eradication is done. There are plenty more opportunities.

■ ECOSYSTEMS OF NORTH MARLBOROUGH

The main ecosystem types recognised through the ecological survey work are described in this section, grouped under headings. They form the basis for the tabulations of ecological district survey results in the report (Tables 2-7 and 9). While the focus is on ecosystems on private land, the coastal and riparian sites generally include both private and public land, due to the existence of public land strips such as esplanade and other reserves. Some ecosystems described here are not listed in the tabulated survey results, either because they occur on public land only (tussock grasslands and other alpine ecosystems), or are areas that provide an important habitat within wider ecosystem types but have not been identified as specific sites through the significant natural area surveys (waterways, inland rock outcrop and cliff communities and swamp forest). In both cases, these ecosystem types are integral parts of the landscape as a whole.

The Significant Natural Areas survey did not cover every property in North Marlborough with natural values, but rather focussed on larger properties, areas of high value native vegetation or areas with special features such as wetlands, coastal habitats and so on. Many smaller properties that have not been individually ecologically surveyed will contain natural values common to large parts of the North Marlborough area. Generally these properties will have regenerating native vegetation present and the descriptions below under the "Lowland shrubland and bracken fernland communities", "Mixed broadleaved-tree fern communities" or "Kanuka forest" headings are likely to be most relevant.

COASTAL ECOSYSTEMS

Coastal dune and beach communities

Dunes and sand beaches are rare in North Marlborough. They occur only on western D'Urville Island and in Port Underwood. The vegetation is mostly highly modified and dominated by marram grass, although there are tiny remnants of spinifex, matai, ngaio, manuka and kanuka to provide reminders of the natural cover. There are also small populations of coastal mat daisy (*Raoulia aff. hookeri*), a nationally rare community. In the past, the foredunes would have supported pingao, shore milkweed and sand tussock (all nationally threatened), and behind would have been tight shrubland rising back into forest. There are usually accumulations of driftwood, valuable habitat for native shore birds (dotterels, oystercatchers and penguins), lizards and invertebrates. Some dunes have deposits of small stones (gravel). This may be there because of tsunamis, but is more likely to have accumulated over millennia through sea lion activity (disgorging material used as ballast). Bones of extinct birds and reptiles have been found in dunes also.

There are many gravel or shingle beaches throughout the Sounds. Mostly the vegetation has been heavily modified, but bush runs right down to the water's edge in places and there are rare examples of fringes of shore milkweed, wharariki (coastal flax), kiekie, cabbage trees and akiraho. Driftwood is usually a feature, as with sand beaches.

Coastal rock and stonefield communities

Rocky shores are peppered with numerous rock outcrops (often forming stacks, or tiny islets). They are routinely used by coastal birds (gulls, terns, herons and shags) for roosting and nesting, and frequently have low-growing native vegetation (such as iceplant, taupata and small herbs and grasses) nurtured by the bird guano and nesting material. Boulderfields and stonefields of rounded water-worn rocks occur on very exposed shores, and form an elongated “boulder bank” at Greville Harbour on D’Urville Island. The vegetation is usually sparse but features taupata, iceplant, shore convolvulus and wharariki. Driftwood is also usually present, forming a distinct habitat.

Coastal rocky scarp and cliff communities

Most North Marlborough coastlines are rocky, steep and erosion-prone, the result of the sinking of the land and the constant gnawing of the sea. Sheltered shores have small scarps, fringed in many places by a distinct vegetation of wharariki, akiraho, taupata, silver tussock and various small-leaved shrubs and small native coastal herbs. Shag colonies occur sporadically, both in trees (pied, little and black shags) and on rock ledges (spotted shags). Little blue penguins nest in holes and under wharariki bushes. Karaka and rengarenga (renga lily) occur in places, as they also do on exposed shores, and owe their presence to former Maori settlement in the vicinity.

Exposed shores have larger scarps, forming towering cliffs where facing the prevailing westerlies or the gales of Cook Strait. Turfs of salt-tolerant plants (iceplant, glasswort, *Selliera radicans* and *Samolus repens*, normally found in estuaries), with silver tussock and small shrubs, grace headlands and faces frequently lashed by salt spray. Rock faces and cliffs are sparsely clad in tough shrubs (including Cook Strait kowhai, Cook Strait porcupine shrub, taupata, akiraho and tauhinu), silver tussock, Cook Strait speargrass and wharariki. Cook Strait kowhai, Cook Strait porcupine shrub and Cook Strait speargrass are, as their names suggest, endemic to the Cook Strait region. The sea cliffs have forest cover in places, even where highly exposed. The forest is dense and low-stature and includes kohekohe, wharangi, akiraho, kanuka, manuka, mapou, mahoe and titoki, with localised occurrences of totara, matai, large-leaved milk tree and fierce lancewood. Large-leaved milk tree and fierce lancewood are rare. Coastal birds use the exposed shores and include King shags (endemic to the Sounds), and the nationally threatened little blue penguins and reef herons. Cliffs and sunny scarps are home to geckos, skinks and native invertebrates such as copper butterflies, weta and large beetles.

Of particular note are areas on D’Urville Island where cliffs of ultramafic geology occur on the coast.

Coastal wetlands

Coastal wetlands are still quite prevalent in North Marlborough, though they are mostly small and heavily modified. They include estuaries, lagoons, ponds and swamps. Largest by far of the estuaries is the extensive system at the mouth of the Pelorus River, a beautiful expanse of jointed rush with a fringe of shrubs, cabbage trees and harakeke (lowland flax). Otherwise there are small estuarine systems in the sheltered waterways of the Sounds, usually at the mouths of streams and containing sea rush, jointed rush, saltmarsh ribbonwood, harakeke, manuka, sedges and cabbage trees. Very rarely, swamp forest of kahikatea and pukatea backs the estuarine vegetation, forming an intact sequence.

The only coastal lagoons are in the west: Croisilles Harbour and D’Urville Island. This is probably because the prevailing westerlies there help create large barrier beach systems behind which water can pond. Each of the lagoons features beds of aquatic plants and is prime habitat for freshwater fish and waterfowl. Shags roost in remnant native trees by the lagoons. Elsewhere near the shore are smaller ponds, fed by small streams.

Coastal swamps are relatively common, and occur in association with lagoons and ponds or in seepage zones in lower valleys or on coastal flats. Where they retain native vegetation it usually features sedges, toetoe, harakeke and/or cabbage trees. Some swamps have shrubland of manuka or coastal shrub daisy (*Olearia solandri*), and a very few have swamp forest (kahikatea and pukatea; very rarely swamp maire).



OTHER WETLANDS AND FRESHWATER HABITATS

Inland wetlands

Intact natural inland wetlands are quite rare. Those on alluvial valley floors have invariably been logged and drained, so that all that remains are damp zones and occasional ponds with some rushes and perhaps the odd remnant kahikatea tree. Very few examples of the original towering kahikatea forests now exist. Otherwise there are various small swamps and seepages in valleys and gullies, some also on hillsides where there are natural springs. They usually contain sedges and rushes but little else.

Riparian communities

Riparian communities include trees, shrubs, harakeke, ferns and grasses on river and stream banks, flats and terraces. Native trees in inland sites typically include totara, matai, rimu, kahikatea, black beech, silver beech, red beech, kamahi, kowhai, lowland ribbonwood, narrow-leaved lacebark and lancewood. In the Sounds they also include pukatea, tawa, nikau and tree ferns. Distinctive plants such as climbing fuchsia (*Fuchsia perscandens*), rohutu (*Lophomyrtus obcordata*, often host to the dwarf mistletoe *Korthalsella lindsayi*), native verbena (*Teucrium parvifolium*), pygmy button daisy (*Leptinella nana*), *Hebe rigidula* and forest forget-me-not (*Myosotis spathulata*) occur in places. The nationally threatened deciduous tree daisy *Olearia hectorii* used to occur in the Pelorus Valley and tributaries but has gone from there: it could be re-introduced.

Braided riverbed habitats of gravel and boulders are rare in North Marlborough, although there are some small examples in rivers and streams on the Northbank of the Wairau. They have little native vegetation except small shrubs, cushion plants, herbs, mosses and lichens, but are important for several native birds (kingfishers, terns, gulls, pipits and dotterels).

Waterways

The varied topography of North Marlborough is reflected by an equally diverse number of types of waterways. The waterways vary in size from the large flows of the Pelorus River to small Sounds streams that are never more than a trickle. This diversity of type and structure of streams also provides a wide range of habitats for many native fish species. The short steep catchments of the Marlborough Sounds are more typical of high country streams in structure and yet they join directly to the sea. The close proximity to the sea allows species of fish that are usually found in inland waterways to be found very close to sea level. The absence of the introduced predatory species such as trout and salmon in many of the waterways, has resulted in many of the larger streams in Northern Marlborough being home to the rare shortjaw kokopu (*Galaxias postvectis*). Banded kokopu (*Galaxias fasciatus*), redfin bully (*Gobiomorphus huttoni*) and bluegill bully (*Gobiomorphus hubbsi*) are common in the small Sounds streams. Dwarf galaxias (*Galaxias divergens*) upland bully, (*Gobiomorphus breviceps*) and common bully (*Gobiomorphus cotidianus*) are common in the more inland waterways of North Marlborough. The regionally rare giant kokopu (*Galaxias argenteus*) and giant bully (*Gobiomorphus gobiodes*) are also occasionally found in wetlands and upper estuaries of the larger waterways.

GEOLOGICAL ECOSYSTEMS

Inland rock outcrop and cliff communities

Rock outcrops, rocky scarps and cliffs occur throughout North Marlborough. They are on ridges, on hillsides, in gullies and on riverbanks. The rocks provide special micro-environments. They are habitats for distinctive vegetation and plants such as wharariki, "hot rock ferns" (*Cheilanthes* spp. and *Pellaea calidirupium*), threatened native daphnes (*Pimelea gnidia*, which is uncommon and *P. tomentosa*, which is rare), southern rata and various orchids (*Earina autumnalis*, *E. mucronata*, *Winika cunninghamii* and the tiny *Ichthyostomum pygmaeum*). Above the bushline (see Alpine Ecosystems



below) they are habitats for numerous upland plants including daisies such as *Celmisia macmahonii* var. *macmahonii* (found only on Mt Stokes) and *Celmisia macmahonii* var. *hadfieldii* and *C. rutlandii* (both endemic to the Richmond Range).

Ultramafic communities

The ultramafic zone, an irregular strip in the west from D'Urville Island to the Red Hills, has distinctive vegetation because of the peculiar mineral composition of its soils. In addition, a hard pan generally forms in the soil profile, resulting in poor drainage so that wetland plants can be found growing on ridges and gentle slopes. The primeval cover would have been stunted forest and shrubland, but has been much disrupted by burning since human arrival. Remnants of forest still exist and feature hard beech, southern rata, lancewood, broadleaf, rimu and manuka, with various small-leaved shrubs (including *Coprosma foetidissima*, *Pittosporum rigidum*, *Pseudopanax anomalus*, *Myrsine divaricata* and *Neomyrtus pedunculatus*), ferns (especially small kiokio, *Blechnum procerum*) and sedges (including giant cutty-grasses, *Gahnia* spp.).

Extensive shrubland grows where the original forest has been cleared, also in association with rock outcrops and screes. It is generally dominated by manuka, but also contains inaka (*Dracophyllum filifolium*), kanuka, kamahi, tauhinu, southern rata, five-finger, porcupine shrub and native daphnes (several species). Square sedge (*Lepidosperma australe*) is abundant and is dominant in places. Also present are wharariki, cutty grass (*Gahnia pauciflora*), sun orchids (*Thelymitra* spp.) and small herbs such as spoon-leaved sundew (*Drosera peltata*), the eyebright *Euphrasia cuneata* and the daisies *Celmisia gracilentia* and *Brachyglottis lagopus*. Several plants are endemic to the ultramafic zone. They include *Hebe urvilleana*, *Olearia serpentina*, an unnamed woollyhead (*Craspedia* "serpentine") and a recently named gentian (*Gentianella stellata*). The localised presence of pygmy pine (*Lepidothamnus laxifolius*) is interesting. Its hybrid with yellow silver pine (which is found in similarly poorly drained, infertile places in North Westland) is also present and may represent the beginning of a new species. Wilding pines and gorse are present and pose the greatest threat to this interesting vegetation.

SHRUBLANDS AND EARLY SERAL VEGETATION

Lowland shrublands and bracken fernlands

Native shrublands are common in North Marlborough. They are the early stages of bush regeneration and occur wherever the forest blanket has been cleared in the past and pastoral farming has ceased. Manuka, kanuka and tauhinu (one or other, or in combinations) are invariably dominant, especially at first, and grow to form dense scrub and low forest. These early regenerating manuka, kanuka and tauhinu shrublands are home to many ground orchids and are excellent habitats for small native birds (fantails, grey warbler, tomtits, robins, brown creepers, silvereyes and bellbirds), and also lizards and invertebrates.

Within and beneath these enthusiastic pioneer plants, forest species invariably get established and become ever more dominant with time, so long as fire is prevented, and stock, feral animals and weeds such as wilding pines are not prevalent. First to establish are small trees such as mahoe (whiteywood), five-finger, kaikomako, karamu, lancewood, rangiora, mingimingi and koromiko, usually accompanied by tree ferns (especially mamaku). At the same time, ground ferns, small-leaved shrubs and various climbers also appear.

Within a few decades, much of the manuka and tauhinu becomes replaced by the regenerating forest plants (although kanuka grows taller and lives longer). In the longer term they in turn become overtopped by larger longer-living trees such as kamahi, hinau, kohekohe, rewarewa, beeches and podocarps.

Sometimes bracken is the pioneer plant first on the scene following forest clearance and the cessation of pastoral farming. It can form a dense blanket, but it too does not last. It provides a nursery for tree ferns, trees, shrubs and vines, which quite quickly take over the site. Native broadleaved forest



is usually the eventual result, bypassing the shrubland phase but frequently containing kanuka. Sometimes tree ferns become dominant, and dense thickets of mamaku are a familiar sight in the Sounds. Mixtures of early seral shrubs and bracken are also quite common.



Regenerating shrublands with tauhinu and bracken fern on the slopes and fingers of broadleaved species showing in the gullies.



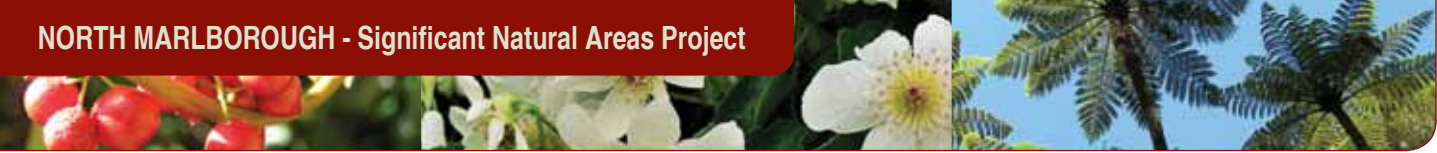
Regenerating low forest and shrubland on a narrow peninsula in the outer Sounds.

Upland and subalpine shrublands

Upland shrublands have two different types of origin. The first, like the shrublands of the lowlands, have resulted from regeneration following forest clearance. The second, subalpine shrublands, naturally occur above the bushline.

Where forest has been cleared is usually a vibrant mix of trees, shrubs and ferns. Manuka and kanuka are often first to establish, along with bracken. However, trees and other shrubs are usually quickly on the scene, and include kamahi, putaputaweta, heketara, lancewood, horopito, soft mingimingi, five-finger, broadleaf, tree fuchsia, various coprosmas, hebes and bush cabbage tree (*Cordyline banksii*). Numerous ground ferns and vines like bush lawyers establish rapidly too. Beeches and podocarps take longer to establish but eventually take over, in tandem with kamahi. These diverse and ever-changing shrublands are good habitats for native fauna, but can be disturbed and impeded by concentrations of feral pigs and goats.

Subalpine shrublands occur throughout the Richmond Range. They feature a diversity of shrubs and small trees, including inaka or turpentine scrub (*Dracophyllum* spp.), small-leaved coprosmas, several hebes, mountain wineberry, mountain toatoa, snow totara, Hall's totara, porcupine shrub, shrub daisies (*Brachyglottis*, *Olearia* and *Ozothamnus* spp.), *Pittosporum rigidum* and weeping matipo. Usually also present are wharariki (mountain flax), tall tussocks (*Chionochloa* spp.) and speargrasses (*Aciphylla* spp.). Near Lake Chalice, the rare species *Pittosporum patulum* occurs in the subalpine shrubland. On the Red Hills the subalpine shrubland is sparser and features very tough low-stature shrubs, a reflection of the ultramafic soils and rockiness. Mt Stokes is the only part of the Sounds to have subalpine vegetation and has a distinctive shrubland zone of the aptly named stoppy-stop (*Olearia colensoi*, known elsewhere as leatherwood or tupare), with weeping matipo, small-leaved coprosmas and stunted silver beech.

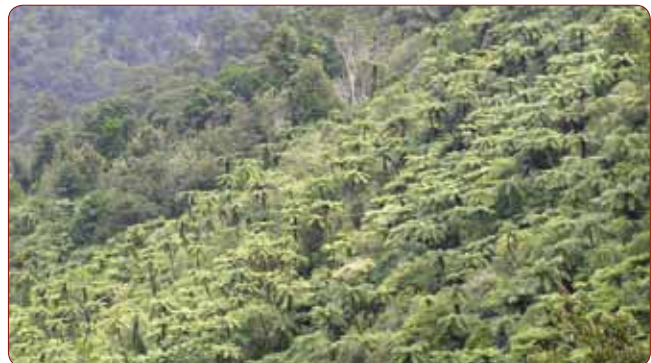


Mixed broadleaved-tree fern communities

Communities composed of young broadleaved trees and tree ferns are common. They occur more frequently in gullies and on shaded faces, but can also be on sunny slopes. They are the result of vigorous regeneration of native vegetation, the broadleaved trees and tree ferns growing through and replacing the initial post-pasture cover (usually of bracken, gorse, tauhinu or manuka). The most common tree species are five-finger (a powerhouse in the forest regeneration process, providing nectar and fruit for native birds, lizards and insects), mahoe, kaikomako, putaputaweta, cabbage tree, karamu, rangiora and heketara. Mamaku or black tree fern (*Cyathea medullaris*) is the most abundant tree fern, especially in the Sounds, and can be totally dominant in places. These mixed broadleaved-tree fern communities are a mid-seral stage in regeneration, gradually becoming naturally replaced by taller more complex-structured forests with canopies of longer-lived trees.



Regenerating broadleaved forest around the coastal margins with black beech and wilding pines present within it.



Tree ferns and broadleaved species on a shady face.

Other broadleaved trees and tree ferns can be locally dominant. In some places, kamahi forms forests where beech species would be expected, probably reflecting a disturbance event such as a storm wind-throw, fire or landslide, followed by regeneration in which kamahi was the first to arrive. In many gullies, on some slopes and in mid-altitude cloud forests, tawa is dominant. In other places, mostly where there is advanced regeneration or in ridge-crest cloud forests, there may be a mix of broadleaved trees including kamahi, tawa, mahoe, heketara, hinau, tarata (lemonwood), tree fuchsia, putaputaweta and broadleaf. Tree ferns form quite tall and enduring forests in places of reliable moisture and humidity. They represent regeneration following forest disturbance. Mamaku (*Cyathea medullaris*) is usually dominant, but ponga (silver fern, *C. dealbata*), soft tree fern (*C. smithii*), wheki (*Dicksonia squarrosa*) or wheki-ponga (*D. fibrosa*) can be locally abundant.

FORESTS AND TREELANDS

Swamp forests

Most of the natural swamp forest ecosystems have been logged of their great trees and drained. However, small remnants exist to give a guide to what used to be there. They occur in valley bottoms and on wet flats, both inland and coastal. Throughout the Sounds, the swamp forests are mainly pukatea and kahikatea, mostly the result of regeneration following logging and generally accompanied



by nikau, mamaku and other tree ferns, kiekie and supplejack. There are some rare occurrences of swamp maire (*Syzygium maire*). Inland, the swamp forests are of kahikatea, with undergrowth of small-leaved shrubs, ferns and sedges.

Alluvial valley and coastal flats forests

In the past, alluvial valleys would have been filled with towering forests of giant podocarps and beeches, with a complement of broadleaved trees, tree ferns, understory shrubs, climbers and epiphytes. Because of the excellent timber and fertile soils, these desirable sites have been largely cleared, leaving only scattered trees and tiny forest remnants. The remnants contain trees such as kahikatea, matai, rimu, totara, black beech, silver beech, red beech, tawa, pokaka and hinau. Some have well-developed undergrowth of smaller native trees, shrubs, ferns and grasses. They are precious reminders of the primeval forests.

Coastal flats forests are just as rare nowadays, for the same reasons. Most remnants occur on conservation land in the Sounds, but there are a few on private land. They typically include tawa, pukatea, puka (*Griselinia lucida*), kohekohe, hinau and nikau, and may also have matai, kahikatea, cabbage tree or black beech. There is generally a profusion of ferns, climbers (rata vines, kiekie and supplejack) and epiphytes.

Kohekohe forests

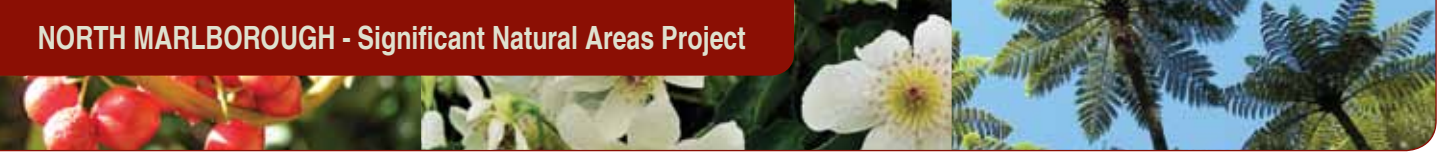
The outer Sounds are characterised by the brilliant green of kohekohe forests that occupy coastal gullies and faces. They provide a lush subtropical element, often complemented by nikau, pukatea and puka. Kohekohe trees are very susceptible to possum browsing, and where possums are common their canopies become ravaged and their flower buds (produced on branches and trunks) are destroyed before fruits and seeds can develop. Therefore, kohekohe forests on the mainland are threatened ecosystems; on possum-free islands such as Arapawa and D'Urville they are fairly safe. Kohekohe naturally occurs throughout the coastal North Island; in the South Island it is only in the Sounds, except for a pocket at the base of Farewell Spit.

Beech forests

Beech species are universal throughout North Marlborough and form the most extensive natural forest cover. They have distinct patterns relating to landforms, soil conditions and altitude. Few examples of inland valley-floor beech forests remain, but those that do feature silver beech, red beech and/or black beech. Otherwise, black beech forms localised forests on lower slopes, dry spurs and headlands. Hard beech is dominant on lowland slopes, forming forests up to about 500m above sea level. Red beech consistently takes over above this altitude, but gives way at about 700m to silver beech. Mountain beech occurs in two places in the Sounds (the tops of Editor Hill and Mt Stokes), but inland is the main high-altitude tree, forming the bushline throughout the Richmond Range. Beech forests are susceptible to storm damage and it is common to encounter areas where young beeches have grown up in a canopy gap. All of the beech forests have shrubs and ferns beneath the canopy and the upland forests, especially those regularly bathed in mist, feature festoons of mosses, lichens, filmy ferns and perching orchids.

Podocarp-broadleaved-beech forests (lowland and upland)

Forests that contain a mixture of podocarp, broadleaved and beech species occur in many places. They reflect a blending of the predominant forest types, and their composition and structure vary according to local conditions and the ecological history. In the lowlands the podocarps are matai, rimu and kahikatea, the broadleaved species include hinau, tawa, kamahi, mahoe, kohekohe, pigeonwood, wineberry, lancewood, five-finger and putaputaweta, and the beeches are black and hard. In the uplands the forests are simpler, the podocarps being miro and Hall's totara (also pahautea or mountain



cedar in places in the Richmond Range), the broadleaved species being mainly southern rata, kamahi and broadleaf, and the beeches being silver and mountain.

Sometimes the beech or broadleaved components are absent or minor, in which case the forests can be described as “lowland-podocarp-beech”, “lowland-podocarp-broadleaved” or “upland-podocarp-beech” forests.

Manuka forests

Manuka forests are quite rare. Manuka is generally abundant in the early stages of forest regeneration, but is usually overcome by taller longer-lived trees, especially kanuka. However, manuka has a competitive advantage in poorly drained sites such as wetland margins and can tolerate relatively low soil fertility and the peculiar soils of the ultramafic zone. Therefore in such places it sometimes lives long enough to form low forests.

Kanuka forests

Although a plant of disturbed and regenerating sites, and generally regarded along with manuka as fit only for firewood or stakes for the garden, kanuka often grows to become a substantial elegant tree in North Marlborough and forms extensive forests. Prior to human settlement, kanuka was probably mainly confined to erosion sites, wind-throw areas, flood zones and places of natural fires. It proliferated once the forests began to be cleared, getting established in the early stages of regeneration and becoming dominant as it over-topped smaller pioneers such as manuka, tauhinu and bracken. As kanuka can live for at least 100 years, it will continue to dominate much of the land throughout the Sounds and far inland for considerable time to come. If domestic stock and feral animals are not too numerous, kanuka provides a welcoming canopy for a rich diversity of secondary forest plants, including many native trees, shrubs, ferns and native orchids. These form tiers and some trees, such as beeches, podocarps, kamahi, lancewood, hinau and rewarewa, eventually out-grow the kanuka and form a mature forest canopy. Meanwhile, the kanuka forests are home to bush birds, lizards and invertebrates, providing shelter, nest sites and nectar.



Typical regeneration pattern in North Marlborough: manuka and kanuka on spurs, ridges and faces with broadleaved species and tree ferns in gullies and seepages. Given time, this will lead to more diverse native bush.



Kanuka forest showing emergent ferns and broadleaved species in the understory.

Treelands

Treelands occur where the forest cover has been reduced to a scattering of trees, or where trees have grown up following clearance but have yet to form a closed canopy. They occur throughout North Marlborough, mostly in valley or coastal flats situations but sometimes on slopes. Individual trees, perhaps hundreds of years old, are important as landmarks, bird roosting and nesting sites, seed sources for propagation and hosts for plants like mistletoes. The best examples of treelands made up of remnant trees are at Koromiko, in the Kaituna Valley and in the Pelorus River catchment. They include totara, kahikatea, matai, black beech, silver beech, lowland ribbonwood, kowhai and cabbage trees. At Koromiko a protection and planting programme is ensuring that not only will the remnant trees survive but forest will be restored. Other examples are being fenced and planted. In the Sounds there are many stands of cabbage trees, often associated with swamps but also on flats and hillsides.

ALPINE ECOSYSTEMS

In the mountains, above the bush and beyond the subalpine shrublands, are alpine ecosystems. They contain plants specialised for the extremes of exposure and climatic variation, notably regular strong winds, summer heat, dense clinging mist, snow and frost. The native fauna is also adapted to these extreme habitats and includes birds such as kea, upland lizards and insects dependent on particular plants. These ecosystems have natural patterns but are somewhat degraded because of feral deer, chamois, possums and hares. In North Marlborough, the alpine ecosystems are entirely on public conservation land: mostly in the Richmond Range but also a limited area on the summit of Mt Stokes in the Sounds.

Tussock grasslands

Grasslands of carpet grass (*Chionochloa australis*) and tall tussocks (other *Chionochloa* spp.) occupy much of the alpine zone where the terrain and conditions allow. Among the grasses grow small native shrubs, alpine daisies (*Celmisia* spp.), buttercups, gentians, eyebrights, speargrasses and numerous other herbaceous plants.

Other alpine ecosystems

Other alpine ecosystems include those of rock outcrops, screes, gully heads, and damp places (bogs and tarns). The rock outcrops and screes feature plants adapted to extreme exposure, weather and limited soil, such as cushion daisies (*Raoulia* spp.), tough mountain daisies (including the endemic *Celmisia macmahonii* and *C. rutlandii*), snowberries (*Gaultheria* spp.), coral daisies (*Helichrysum* spp.), edelweiss (*Leucogenes leontopodium*) and penwiper (*Notothlaspi rosulatum*). Damp sites have cushion plants such as *Donatia novae-zelandiae* and comb sedge (*Oreobolus pectinatus*), as well as mosses and creeping herbs.