

Natural areas of Waipu Ecological District

Reconnaissance Survey Report for the
Protected Natural Areas Programme

2007



Department of Conservation
Te Papa Atawhai

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Reconnaissance Survey Report for the Protected Natural
Areas Programme

Jenny Lux, Tim Martin, and Sarah Beadel

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Foreword

The Waipu Ecological District PNAP survey report was prepared by Wildland Consultants Ltd under contract to the Department of Conservation.

This report forms part of a series of reconnaissance survey reports for the Protected Natural Areas Programme (PNAP) in the Northland Conservancy of the Department of Conservation. It describes the significant natural areas of the Waipu Ecological District (ED). The natural areas were surveyed during the late spring and early summer of 2006. There has been no previous comprehensive survey and review of ecological information of this geographical area. This report will help conserve natural areas by providing a significant information resource to stake-holders such as landowners, iwi, the Department of Conservation, Whangarei District Council, Kaipara District Council, Northland Regional Council, resource management planners, interest groups, and the general public.

Waipu ED is typical of the Eastern Northland Ecological Region in that it contains a mixture of low forested ranges, alluvial plains, estuaries, coastal dunelands, and coastal cliffs. There are several very diverse, large, and good-quality examples of lowland forest in the ED, which contain small, rocky streams that are the northern stronghold for Hochstetter's frogs (this is the only population of this species in Northland, and the northern limit for it nationally).

As with most of Northland, extensive areas of indigenous habitat have been cleared and modified since human settlement. This survey has shown that habitats such as freshwater wetlands, alluvial floodplain forest, and coastal forest next to estuaries are now very rare. Several of these habitats are important for the survival of endangered species.

This study provides an objective assessment of the natural areas that remain, protected and unprotected, their value as representative examples of our natural heritage, and their relative ecological significance. The focus of the Protected Natural Areas Programme is to provide this information and guidance. The challenge then is for the community to work collaboratively to protect and enhance these natural areas.

A handwritten signature in black ink, appearing to read 'Chris Jenkins', with a stylized, flowing script.

Chris Jenkins

Conservator Northland

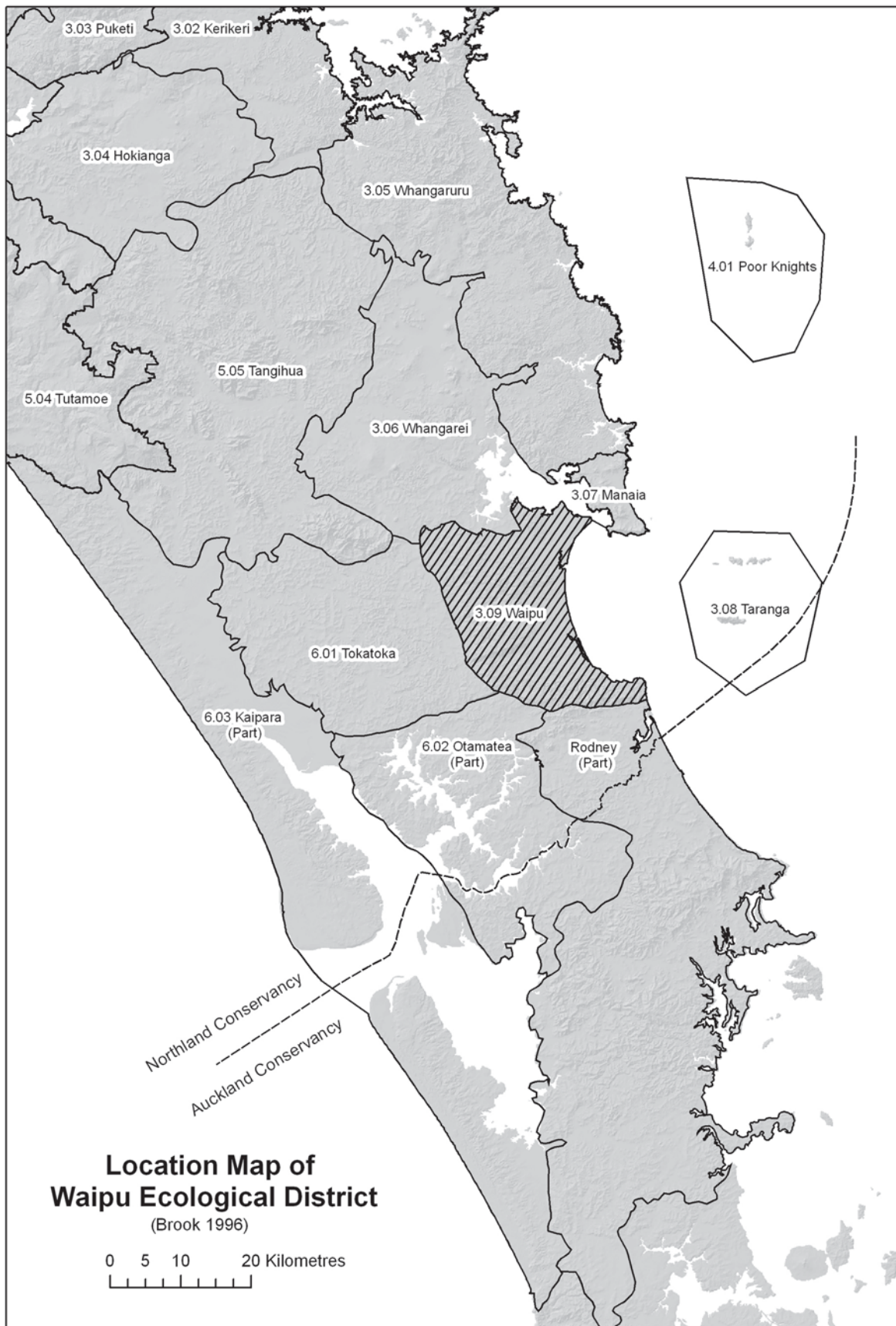
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Map 1 (above). Location map of Waipu Ecological District.

Map 2 (opposite). Map of surveyed sites, Waipu Ecological District, including land administered by the Department of Conservation. Note that the representation of protected areas is indicative only and should not be taken to accurately delineate these areas.

Abstract

Waipu Ecological District (c. 49,413 ha) is located in the Eastern Northland Ecological Region. It is centred on the catchments flowing into Bream Bay (south of Whangarei Harbour), extending from moderately dissected ranges up to 400 m elevation in the west, through low rolling hill country, down to alluvial plains and coastal dunelands in the east. Whangaruru and Whangarei Ecological Districts lie to the north, Tokatoka Ecological District lies to the west, and Otamatea and Rodney Ecological Districts lie to the south.

Natural areas of ecological significance in Waipu Ecological District were identified using information from a reconnaissance survey undertaken over the late spring and early summer of 2006, together with information from a range of ecological reports, databases and unpublished information. A total of 86 natural areas covering 14,045 ha were identified. Of these, 57 are considered to be of particular ecological significance (Level 1 sites).

Waipu Ecological District comprises several moderately large tracts of indigenous forest on small east-west trending ranges (e.g. Ruakaka Forest, Mareretu Forest, Brynderwyn Hills), a prominent coastal headland (Bream Tail), a 23.5 km-long sweep of coastal duneland and beaches, two major river estuaries which provide important bird habitat (Ruakaka and Waipu River Estuaries), small areas of estuarine habitat on the southern Whangarei Harbour margin, tiny remnants of alluvial floodplain forest and treeland, several small and degraded freshwater wetlands, and the last remaining dune lake in the Eastern Northland Ecological Region (Ruakaka Racecourse Dune Lake).

Much of the former indigenous biodiversity of Waipu ED has been lost. At present, 28.4% of the land cover is indigenous vegetation or habitats, which is mainly concentrated in the inland hill country above 100 m asl, and on the coastal dunelands and estuaries. Freshwater wetlands and floodplain forests, which would formerly have been extensive on the lowland plains, are now severely reduced in extent and in poor condition.

Only 31.4% of the identified natural areas are currently legally protected, however these are largely in areas where most indigenous habitat remains (i.e. hill country and dunelands). Priority areas for protection therefore include forest and shrubland on alluvial plains, freshwater wetlands, forest and shrubland on hill country below 100 m asl, forest adjacent to estuaries, and a range of unique coastal habitats on Bream Tail.

The physical and legal protection of priority areas for protection would constitute an important first step in safeguarding remaining indigenous biodiversity. However, even if all priority areas were protected, there would still be a need for ecological restoration of wetlands, ecological corridors, linkages, and buffers to promote better connectivity between inland hill country, alluvial plains, and the coastal dune system.

1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) was established in 1982 to implement Section 3 (b) of the Reserves Act 1977:

Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative examples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character.

The goal of the programme is:

To identify and protect representative examples of the full range of indigenous biological and landscape features in New Zealand, and thus maintain the distinctive New Zealand character of the country (Technical Advisory Group 1986).

The specific aim of the PNAP is to identify, by a process of field survey and evaluation, natural areas of ecological significance throughout New Zealand which are not well represented in existing protected natural areas, and to retain the greatest possible diversity of landform and vegetation patterns consistent with what was originally present. To achieve this, representative biological and landscape features that are common or extensive within an Ecological District (ED) are considered for protection, as well as those features which are special or unique.

As knowledge and information about the presence and distribution of biota such as invertebrates and bryophytes is limited, the protection of the full range of habitat types is important for maintaining the diversity of lesser known species.

This report differs from many PNAP reports in that:

- it is based mainly on a reconnaissance survey supplemented by existing published and unpublished information; and
- it includes descriptions of all natural areas within the study area.

The natural areas described have been evaluated and ranked using two levels of significance, based on specified criteria (see Section 2). This approach was adopted so that the survey report better meets the broader information requirements of the Department of Conservation arising from the Resource Management Act 1991 (RMA), the Convention on Biological Diversity (1992), and the more recent New Zealand Biodiversity Strategy (2000).

The Purpose and Principles of the RMA 1991 are set out in Part II of that Act and include:

- safe-guarding the life-supporting capacity of air, water, soil and ecosystems;
- the preservation of natural character of the coastal environment, wetlands and lakes and rivers and their margins;

- the protection of outstanding natural features and landscapes;
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- intrinsic values of ecosystems;
- maintenance and enhancement of the quality of the environment.

Of particular relevance is Section 6 (c) of the RMA 1991, which lists as a ‘matter of national importance’:

The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

The Convention on Biological Diversity (1992), under the auspices of the United Nations Environment Programme, has promoted the concepts of biodiversity and ecosystems. These concepts are reflected in this report by the number of sites, their size, and the emphasis on buffers and linkages in the identification and assessment of sites.

1.2 ECOLOGICAL REGIONS AND DISTRICTS

New Zealand’s physical environment is very diverse and this is reflected in the considerable diversity of indigenous plant and animal communities. In recognition of the biogeographic differences between various parts of New Zealand, a classification of Ecological Regions and Districts has been established (McEwen 1987).

An Ecological District is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities. Ecological Districts are grouped together into a series of Ecological Regions on the basis of shared general ecological and geological characteristics. In some cases, a single very distinctive Ecological District is given the status of Ecological Region to emphasise its uniqueness (Technical Advisory Group 1986).

The New Zealand Biological Resources Centre coordinated the mapping of the country into more than 268 Districts in 1982. Ecological Regions and Districts in northern New Zealand have since been redefined to more accurately classify ecological variation within the Northland and Auckland areas (Brook 1996).

The PNAP uses the division of Ecological Districts as a framework throughout the country for determining ecological significance, including representativeness.

1.3 CONTENTS OF THIS REPORT

This report presents the findings of the reconnaissance phase of the PNAP survey of the Waipu Ecological District. The methods and terminology follow those defined and specified in the Whangaruru Ecological District PNAP report (Booth 2005) and the Otamatea Ecological District (Northland) PNAP report (Lux & Beadel 2006). This report includes maps and brief descriptions of all of

the indigenous natural areas within the Ecological District which were surveyed during the late spring and early summer of 2006, together with descriptions of the main vegetation types, and information on threatened species and other taxa of scientific and/or conservation interest.

Soil sites of international, national or regional significance are derived from Arand *et al.* (1993). Important geological sites and landforms within the Northland Region, including internationally, nationally and regionally significant sites are derived from Kenny & Hayward (1996). See Appendix 8.4 for ranking criteria.

1.4 WAIPU ECOLOGICAL DISTRICT

Waipu Ecological District (c. 49,413 ha) is centred on the catchments flowing into Bream Bay, and extends from moderately dissected ranges up to 400 m asl in the west, through low rolling hill country, down to alluvial plains and coastal dunelands in the east. A 23.5 km-long sandy beach extends most of the length of Bream Bay from Marsden Point in the north down to Waipu Cove in the south. The northern boundary of the ED is formed by the southern coastline of Whangarei Harbour, and the southern boundary is delineated by the Brynderwyn Hills, which extend out to a rocky coastal headland named Bream Tail.

Waipu ED adjoins five other Ecological Districts: Whangaruru and Whangarei to the north, Tokatoka to the west, Otamatea to the southwest and Rodney to the south.

Results of this study show that, of the natural areas identified, 90.4% (12,699 ha) are forest or treeland, 5% (708 ha) are shrubland, 0.8% (116 ha) are freshwater wetland, 1.8% (257 ha) are estuarine, 1.7% (239 ha) are duneland, and 0.2% (26 ha) are rockland. The total area of sites recorded in this report is 14,045 ha (28.4% of the Ecological District).

Significant features of this Ecological District include:

- Several large, diverse, lowland forest tracts are present on moderately-dissected east-west trending hill country, which is the major landform in the ED. These include areas such as Waipu Caves Forest (371 ha), Takahiwai Forest (637 ha), North River Forest (973 ha), Ruakaka Forest (1699 ha), Mareretu Forest (2,820 ha), and the Brynderwyn Hills Forest Complex (3,308 ha).
- Bream Tail is the only prominent coastal headland in Waipu ED, with diverse coastal forest, treeland, and shrubland remnants, two small wetlands, and extensive rocky cliffs and outcrops interspersed with small sandy beaches. The vegetation of this site has close affinities with that of Taranga (Chicken) Island, which lies approximately 13.5 km offshore to the northeast. Grey-faced petrels probably nest here (Andrea Booth pers. comm.).
- Waipu ED is the northern limit of distribution for Hochstetter's frog, and populations in streams in the Brynderwyn Hills are the northern stronghold for the species (Avi Holzapfel pers. comm.). Waipu ED is the only part of Northland where this species occurs.

- Holocene dunelands and beaches behind Bream Bay are extensive, although highly modified. They support small areas of *Kunzea ericoides* var. *linearis* forest, which is a distinct variety of kanuka specific to coastal sandy soils in the northern North Island.
- The Ruakaka and Waipu River estuaries are important breeding sites for variable oystercatchers and northern New Zealand dotterels, as well as feeding grounds for low to moderate numbers of national and international migrant wader species. Waipu River Estuary is the only breeding site for the acutely threatened New Zealand fairy tern in Waipu ED, and one of only four breeding sites for the species nationwide. A shorebird protection programme is in place at both estuaries, but is more intense at the higher value Waipu River Estuary site.

2. Methods

2.1 GENERAL APPROACH

Between 1994 and 1996, reconnaissance surveys using rapid semi-quantitative methods were carried out in 12 Ecological Districts in the northern sector of the Northland Conservancy, to obtain information on the composition, extent and ecological values of indigenous natural areas. A rapid survey method was selected by the Department of Conservation (DOC) because of time constraints for the field survey, the extensive areas to be covered, and ease of application to all natural areas. These methods were also specified by DOC for the current study, in order to achieve consistency in the type of information on natural areas over several decades.

Natural areas were identified using recent aerial photography (orthophotography flown in January 2004, or where not available, flown in July 2002) and data collected as part of the Sites of Special Biological Interest (SSBI) surveys. Sites were identified irrespective of land tenure. Consequently, all natural areas, including those administered by the Department of Conservation, as well as other protected areas, were surveyed using the same methods. This provided a consistent approach to determine the representativeness of all natural areas.

Each site was mapped, allocated a generic number, and described. Following evaluation (see Section 2.4 below), sites were grouped into levels of ecological significance (Level 1 or 2). Scientific names of species for which common names have been used can be found in Appendix 8.6 (Common Plant Names) or Appendix 8.7 (Checklist of Fauna Species).

Extensive use was made of information from biological databases and information systems such as the SSBI, the Bioweb Threatened Plants Database, the Herpetofauna Database, the NIWA Freshwater Fish Database, published information and Department of Conservation internal files and reports. Herbarium records from Auckland Institute and Museum (prefixed 'AK') were

also consulted. Geographical and geological information was gained from existing published and unpublished maps.

Although most sites were not surveyed in detail, a large amount of information was collected, considerably expanding the ecological information base for the Ecological District. It is important to note that as with any large scale survey, it is possible that some significant natural areas may have been overlooked

2.2 CONSULTATION WITH LANDOWNERS

Personal contact with all landowners was not possible because of the magnitude and geographic range of the surveys being undertaken. Therefore, all ratepayers were advised by mail by way of a letter (Appendix 8.2) informing them of the survey programme and the reason for it. The letter was signed by the Northland Conservator of DOC and provided contacts for further information. A press release on the survey methods and a photograph of the survey team was issued and featured in the local newspapers (Appendix 8.2). In several instances permission for access was sought from landowners in person and this was always given.

Patuharakeke are the tangata whenua of Waipu ED. Consultation letters were sent to Ngatiwai, Patuharakeke, and Te Uri O Hau. A consultation meeting was undertaken by DOC with Patuharakeke Trust Board on 7 July 2006.

2.3 DATA ACQUISITION AND ANALYSIS

Methods followed those prescribed by DOC, as described in Booth (2005).

A rapid reconnaissance field survey was carried out to record and map the ecological and geomorphological characteristics, broad habitat type and canopy vegetation of each identified natural area. Most of this work was carried out using telescopes and binoculars from vantage points on public roads or farm tracks.

Two sites were not surveyed in this manner due their isolation and/or lack of visibility from public roads and access restrictions. In these instances, sites were identified and described from aerial photographs using nearby sites on similar topography as a guide. Information on some of these sites, therefore, remains limited, and it is likely that some vegetation types/ecological units present were not identified.

Natural areas were mapped using six broad categories of habitat type: forest, shrubland, rockland, freshwater wetland, duneland and estuary (see Appendix 8.8 for definitions of terms). At each site, the composition and relative abundance of canopy plant species was recorded on the field survey sheet (Appendix 8.1) in the following four categories: greater than 50% cover was described as 'abundant'; 20–50% cover as 'common'; 5–20% cover as 'frequent'; and less than 5% cover as 'occasional'.

Canopy composition based on percentage cover abundance is widely considered to be an appropriate method of describing forest stands. This

technique and variations of it have been used to describe canopy composition both within New Zealand (see Atkinson 1962, 1985; Leathwick & Rogers 1996; Park & Walls 1978) and in other parts of the world (see Kershaw & Looney 1985; Mueller-Dombois & Ellenberg 1974). The specific technique for vegetation description at each site is based on the approach described in Myers *et al.* (1987).

This semi-quantitative method was selected by DOC because it could be implemented over large areas with a small number of field surveyors during a limited time period, and could be applied to all vegetation types irrespective of the height of the canopy. More detailed, and therefore more time-consuming and expensive methods, would not necessarily provide more useful information for assessing representativeness. The disadvantage of this survey approach is that it does not provide a great deal of information on the distribution of uncommon or threatened canopy and understorey species, nor does it provide full information on the distribution of bird species or other fauna. Fauna observations were incidental only.

Species present in the 'abundant' and 'common' columns of the field survey forms were used to define the vegetation type of each ecological unit. 'Abundant' species appear first in the vegetation type name, followed by 'common' species in their relative order of cover. The standard technique of identifying emergent features in the canopy (i.e. /) was excluded from these specific methods. Details of vegetation types and geological units within each site were entered into an Excel spreadsheet. Geological units were classified into 16 categories and vegetation/habitat types into 259 categories (see Table 2). Some sites had only one vegetation type on one geological unit, while others had multiple of each. Sorting of these ecological units gave information on their frequency and extent in the study area. This information was used to determine the representativeness of each ecological unit (see Section 5. Summary and Conclusions, Table 2 (p. 266) Ecological units recorded in Waipu Ecological District and protection status.

For the purpose of evaluation of representativeness and description, 'coastal' ecological units are those units which occur less than 1 km from the coast, whereas 'inland' ecological units occur 1 km or more from the coast. However it must be acknowledged that this is an arbitrary division. Some 'inland' ecological units will also have some coastal influence, because of the narrowness of the Northland Peninsula, and the fact that all areas within Waipu ED are within 16 km of the coast.

Other relevant information such as fauna observations, threats and landowner information collected incidentally was also recorded on the survey sheet for each site. Once the field reconnaissance or survey had been completed, sites were numbered and information from other databases and information systems was incorporated into the site descriptions. Completed field survey forms are held by the Department of Conservation, Northland Conservancy Office, Whangarei.

2.4 CRITERIA FOR ASSESSMENT OF HABITAT SIGNIFICANCE

Assessment criteria follow Booth (2005).

The natural areas described in this report meet at least one of the following criteria:

- They are predominantly of indigenous character, by virtue of physical dominance or species composition in the canopy.
- They provide habitat for a threatened indigenous plant or animal species.
- They include an indigenous vegetation community or ecological unit, in any condition, that is nationally uncommon or much reduced from its former extent.

The conservation values of these areas were assessed using a two-level classification of habitat significance based on the PNAP ecological criteria of representativeness, rarity and special features, diversity and pattern, naturalness, habitat structure and characteristics important for the maintenance of ecosystems (i.e. buffer, linkage or corridor, size and shape) (see Table 3, p. 298).

The PNAP criterion of long-term viability has not been included in Table 3. Long-term viability was considered under the umbrella of representativeness, diversity and pattern, naturalness, size and shape. Table A outlines the links between PNAP criteria and the Level 1 and 2 criteria.

2.4.1 Level 1 sites

A level one site contains significant vegetation and/or significant habitats of indigenous fauna and is defined by the presence of one or more of the following ecological characteristics:

1. Contains or is regularly used by critical, endangered, vulnerable or declining or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally.
2. Contains or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District.
3. Contains the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units.
4. Has high diversity of taxa or habitat types for the Ecological District.
5. Forms ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.
6. Contains habitat types that are rare or threatened in the Ecological District or regionally or nationally.
7. Supports good populations of taxa which are endemic to Northland or Northland-Auckland.
8. Is important for endemic and indigenous migratory taxa.
9. Covers a large geographic area relative to other similar habitat types within the Ecological District.

2.4.2 Level 2 sites

A Level 2 site is a natural area that supports populations of indigenous flora and fauna not identified as meeting the criteria for Level 1. It is a site which:

- contains common indigenous species but which is not one of the best representative examples of its type;
- may be small and isolated from other habitats;
- may contain a high proportion of pest species;
- may be structurally modified, e.g. forest understorey grazed;
- has not been surveyed sufficiently to determine whether it meets the criteria for Level 1 sites.

TABLE A: LINKS BETWEEN THE PNAP CRITERIA AND LEVELS 1 AND 2.

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness*	Contains the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units. (3) Supports good populations of taxa which are endemic to Northland or Northland-Auckland. (7)	Not one of the best examples of its type in the Ecological District.
Rarity and special features	Contains or is regularly used by critical, endangered, vulnerable, or declining, or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally (1). Contains or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District (2). Contains habitat types that are rare or threatened in the Ecological District or regionally or nationally (6). Is important for endemic and indigenous migratory taxa (8).	Does not regularly contain, or there is no currently known threatened, rare, or species of local occurrence. Contains common habitat types. No currently known special features.
Diversity and pattern	Has a high diversity of taxa or habitat types for the Ecological District. (4).	May contain only one habitat type and/or have a low diversity of taxa relative to other areas of a similar type.
Naturalness	Exhibits a higher level of naturalness than other examples of its type.	Exhibits a lower level of naturalness than other examples of its type.
Buffering/corridors and linkages	Forms ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.(5)	May be heavily impacted by external influences or may be fragmented and isolated from other natural areas.
Size and shape	Covers a large geographic area relative to other similar habitat types within the Ecological District. (9)	Is likely to be small relative to other similar examples of its type, or if large, is not the best example of its type and meets no other criteria for a Level 1 site.
Long-term ecological viability	If the long-term viability of the site is high or medium, it is likely to meet one or more of the other criteria above, or if low, may nevertheless be the best or only example of its type in the Ecological District.	May require a high degree of management to achieve viability or may never be viable under present circumstances or, if viable, may not meet any other criteria for a Level 1 site

* Best representative examples include sites with the highest level of naturalness, diversity, in the best condition, and with values other than ecological values such as cultural and amenity values (where known).

2.5 UPDATING OF DATA

Natural ecosystems are dynamic and forever changing, both physically and biologically. Some areas are very dynamic (e.g. wetlands are particularly susceptible to changes in ground water hydrology), whilst others (e.g. forests) change more gradually. The status and composition of species also changes over time and this could result in changes in the conservation value of some habitats.

Human-induced changes and activities, both within or adjoining significant natural areas, can accelerate the processes of change. Fire, followed by the invasion of adventive weeds, can dramatically modify shrublands. Drainage of adjoining land can alter the water tables of wetlands, thereby lowering the quality of the habitat and facilitating the establishment of weeds. Ongoing piecemeal destruction or modification of habitats and sustained grazing of forest remnants will, in the long term, completely eliminate some habitats.

The natural areas identified in this survey will therefore require regular monitoring of species and habitat composition and condition, and continued assessment of their ecological significance. Over time, it is possible that, Level 2 sites may qualify as Level 1 sites, or that Level 1 sites could lose their high level of significance.

3. Ecological character

3.1 TOPOGRAPHY/GEOLOGY

The geology of Waipu ED is dominated by a series of east-west trending, moderately dissected ranges up to 400 m elevation, that typically have steep fault-bounded southern faces and more gently sloping northern sides. They comprise Mesozoic Waipapa Terrane greywacke overlain by thin and laterally discontinuous Eocene-Oligocene Te Kuiti Group glauconitic sandstone and limestone sequences, and by thicker lower Miocene Waitemata Group sandstone and mudstone sequences. Low rolling hills near Waipu are formed of Cretaceous-Paleocene allochthonous sedimentary rock units, and Lower Miocene dacite intrusions are present at Bream Tail.

The east coast has a 23.5 km-long sandy beach backed by dunefields and extensive alluvial flats of Late Pleistocene and Holocene age, extending from the mouth of Whangarei Harbour south to Waipu Cove, and a steep rocky coastline with pocket and gravel beaches around the Bream Tail coastal headland. Small estuaries are present at the mouths of the Ruakaka and Waipu Rivers.

3.2 CLIMATE

3.2.1 General

Northland's climate is influenced by its northerly location (latitudes 34°S to 36°S), the narrowness of the peninsula (no areas are more than 50 km from the sea), and its generally low topography (most areas are below 150 m asl).

Summers are warm and humid, and winters mild. Mean annual air temperatures vary from 14.0°C to 16.0°C. Air frosts are infrequent in Northland, but ground frosts ($\pm 1^\circ\text{C}$ at 2.5 cm above ground) are not uncommon, especially inland. Annual sunshine hours vary little across Northland, with 2,000 at low altitudes, decreasing to 1,700 at higher altitude sites.

Rainfall peaks in winter, with the driest seasons being summer and early autumn, and there are usually one or two “dry spells” (periods of fifteen or more consecutive days with less than 1mm of rain on any one day) between December and March. Mean annual rainfall ranges from 1,200 mm to 2,400 mm. The predominant winds are from the southwest, with inland areas being more sheltered than exposed coastal sites (mean annual wind speeds range from 10 to 30 km/hour). Gale force winds can occur at any time, but are most common in winter. The occurrence of fog and thunderstorms varies from 1 to 75 and 3 to 16 days per year, respectively (Moir *et al.* 1986).

3.2.2 Climate of Waipu Ecological District

Few climate records are available for the Waipu Ecological District, but some general comments can be made.

Mean monthly wind speed at Marsden Point (the north-eastern corner of Waipu ED) was 18 km/h between 1969 and 1978, but mean speeds are likely to be lower in less exposed parts of Waipu ED (e.g. the mean monthly wind speed at Whangarei Airport, just outside Waipu ED, was 10 km/h over the same period). Mean annual rainfall parallels orography, increasing from 1368 mm at Waipu Cove (coastal) to around 1800 mm on hill country further inland. Monthly rainfall at Waipu Cove is highest between May and August (range 123–168 mm) and lowest between November and February (range 81–97 mm). Mean annual air temperatures in eastern Northland (including Waipu ED) vary from 15.5°C to 16.0°C, similar to the Aupouri Peninsula and slightly warmer than western Northland (Moir *et al.* 1986).

3.3 VEGETATION

3.3.1 Historical

A vegetation history specific to Waipu ED has never been written, and the best information available about the extent of natural vegetation and the changes wrought on it comes from pollen studies, and the accounts of early European settlers.

During several millennia prior to the human settlement of New Zealand, which occurred around 800 years before present (BP) (McGlone & Wilmschurst 1999),

most of Waipu ED would have been clothed in a dense mantle of forest, from the ridge crests down to the dunelands along Bream Bay. In earlier times, however, the extent of forest had waxed and waned with the changes in the Earth's climate. During the most recent ice age (14,000–10,000 years BP) harsher climatic conditions forced the forests into sheltered pockets and valleys, with vast areas of fern and shrubland in between (Dodson *et al.* 1988). The beginning of the Holocene (10,000 years BP) saw a return to warm, humid and equable conditions, which allowed forest to expand from these refuges onto hillslopes and down to the coast. The sea level stabilised around 6000 years BP, and the climatic conditions which we know today were similar to those that the first Polynesian explorers encountered.

Pollen and charcoal analyses from Northland show that the fire and fire-tolerant heathland which was abundant during the last ice age, decreased during most of the Holocene, and then dramatically increased after the arrival of humans (Dodson *et al.* 1988). During the Polynesian period (800–200 years BP), approximately 50% of the forest in New Zealand was cleared by fire, but most of this was concentrated in the lowlands (McGlone 1983). Most of Waipu ED lies below 100 m asl, and it is likely that large portions of the ED were burnt at that time.

A pre-human vista of Waipu ED may have looked something like this: Tall, densely wooded kauri-podocarp-broadleaf forest on the inland hill country grading into alluvial terraces covered in dense totara, taraire and kahikatea forests with patches of kowhai nearest the river margins; steep coastal hills clothed in large sprawling pohutukawa in mixtures with puriri, kohekohe, karaka, nikau, taraire, tawapou, coastal maire, large-leaved milktree and kowhai; steep coastal cliffs with scattered pohutukawa, shrubs and tussocks such as harakeke and *Chionochloa bromoides*; Holocene dunefields supporting mosaics of *Kunzea ericoides* var. *linearis* forest and flammable indigenous shrublands dominated by manuka; older (Pleistocene) consolidated dune ridges covered in pohutukawa forest overhanging estuaries with open mudflats and small areas of mangrove and saltmarsh; mobile dunes supporting extensive spinifex, pingao, and shore spurge with occasional sand pimelea and *Austrofestuca littoralis*; riverine raupo reedlands, marshes, and pools alongside meanders; and series of palustrine dune wetlands in interdune hollows and occasional deeper dune lakes.

The Waipu area is part of a wider geographic area characterised by Ngati Wai occupation, economic activity or ancestral links encompassing coastal lands and islands from Whangaroa in the north, to Tamaki (Auckland) in the south, and eastwards to Hauturu (Little Barrier) and Aotea (Great Barrier) (Te Ara 2007).

The area around the present day Waipu township was settled by Scottish Highlanders who arrived in the period 1854–1860 after an approximately 40-year migration with short-lived settlement in Nova Scotia (Canada) and Australia. Six ships brought almost a thousand pioneering agriculturalists who rapidly set to work clearing the native vegetation for farming and gardening. Within three years grass seed was widely sown and substantial wheat crops were being harvested and exported.

McKenzie (1942, first edition from 1935) gathered original commentaries from the Scottish settlers, which give some insight into the vegetation of Waipu ED at that time.

'Some of the settlers were fortunate enough to secure land that had been cleared by the Maoris at some time in the past and which was covered with nothing more formidable than tea-tree (manuka, Leptospermum scoparium), scrub and bracken fern (Pteris aquilina). (...) Most of the land, however, was covered in virgin forest, but that fact had no terror for our sturdy settlers who were all, or nearly all, skilled axe-men.'

Settlers typically made a small clearing for a hut (usually split native logs roofed with raupo, nikau or shingles), and then cleared bush at an average rate of 'two acres or more a week'. Trees were felled, left to dry and burnt in a great fire around early March. Stumps were laboriously removed once roots had rotted. Often fires got out of hand and moved into standing bush, which was undesirable as it left half-destroyed forest with 'worthless second growth and fern' underneath it, which was harder to clear. Thus the best land in Waipu ED was cleared of its forest cover, and the remainder was used as a larder and timber resource:

'Wild pigs and native pigeons were plentiful in the bush. Wild ducks were numerous in the streams and so were eels. Those who lived near the coast had an abundant supply of sea fish.'

'...children found pleasure in foraging for the fruit of tarairi, tawa, karaka, titoki, ramarama, kahikatea, bush-lawyer, etc., the edible bracts (tawhara) of kiekie and the very young buds of the nikau palm...'

Permanent houses were constructed of mature kauri, totara, and puriri. Northern rata, puriri, manuka, and taraire were chopped for firewood. Of the latter, McKenzie (1942) writes:

'The taraire (Beilschmiedia tarairi) is practically restricted to the northern half of the Auckland province. It covered all the alluvial flats at Waipu.'

Wild cattle and pigs introduced by the settlers began causing damage to forest regenerative processes from very early on, as this quote illustrates:

'Cattle often throve well on native vegetation without the European grasses sown by the settlers. Fences were needed to protect crops from live stock and, in some instances, from wild pigs which were numerous in the bush at that time.'

The area around the Waipu settlement was part of the Auckland province kauri timber boom of the 1870s-1890s. The 'Waipu hills' (now known as Brynderwyn Hills) had 'heavy timber', with several early access roads heading up from Waipu settlement (Mabbett 1981). It is likely that most of the less fertile hill country of Waipu ED (i.e. Brynderwyn, Mareretu, North River, Ruakaka and Takahiwai) was cleared or logged-over during the late 1800s, following lowland clearance for agriculture several decades earlier. However, Waipu was not as important a timber area as other areas further north, which drew many Waipu men away from home to work as bushmen (McKenzie 1942). Due to the world-wide economic depression in the latter 19th century, agriculture had become less profitable. Kahikatea and totara forests now remaining on alluvial flats

probably regenerated on some of the disused agricultural land at that time. Commercial export of dairy products began in 1901, starting the trend towards nutrient enrichment which now affects all lowland streams and floodplains in Waipu ED.

A history of the Great North Road through the Waipu area explains how the original road used to be through Waipu Gorge, but the Brynderwyn deviation was built during the great depression in 1938. A bush track from Mangawhai to Waipu (behind Bream Tail) was constructed around 1873 (Mabbett 1981).

Although major clearance for agriculture was already finished by the early 1900s, further piecemeal clearance and drainage of wetlands continued into the twentieth century. Conversely, some areas on hill country were abandoned in the mid-twentieth century, and are now in c. 50 year-old kanuka forest, for example around Brynderwyn Hills Forest Complex - Part G (Q08/225g) and in the Caves Road Forest (Q07/120).

3.3.2 Broad pattern

Currently the vegetation of Waipu ED is almost entirely secondary in origin. The largest areas of indigenous vegetation are on hill country above 100 m asl, while the remaining landforms have small and highly modified examples of their former vegetation.

Large tracts of secondary indigenous forest and treeland are present on the major east-west trending hills. Kanuka, kauri, rimu, tanekaha, rewarewa, and totara associations are common on ridges within these ranges, whilst upper hillslopes support forest dominated by totara, kanuka, and/or mamaku, and lower hillslopes and gullies have broadleaf forest dominated by species such as taraire, towai, puriri, nikau, and tawa, often containing kahikatea. There are relatively few shrublands. On the Bream Tail coastal headland there are several coastal forest types which are not represented anywhere else in Waipu ED. However many of these sites are degraded due to fragmentation, grazing, and the presence of mammalian pests.

Vegetation on alluvial flats is limited to a few, scattered forest and treeland remnants along riparian margins, and occasional tiny stands of kahikatea and totara on floodplains away from main river channels.

Freshwater wetlands have been greatly reduced from their former extent, and several constructed ponds and dams now supplement this habitat for aquatic species. There are very few areas of natural or semi-natural wetland remaining; only five small examples within the coastal zone (including one dune lake), and nine small examples further inland. Raupo reedland is the most common wetland type.

The coastal dunelands are dominated by gorse-pampas scrub on backdunes and mixtures of indigenous and exotic grasses and herbs on the foredunes. There are also small islands of *Kunzea ericoides* var. *linearis* forest and exotic forest and treeland.

Estuaries support mosaics of saltmarsh vegetation at their margins, with the main types being mangrove shrubland and forest (although very little of the latter), and rushlands composed of oioi and sea rush. These estuaries are

sandier than comparable sites further north in Eastern Northland Ecological Region, hence glasswort herbfield and sandflats are more extensive.

3.3.3 Main vegetation types

OVERVIEW

This study recorded 249 different ecological units in Waipu ED, and these are listed in full in Table 2 (page 266), with representative units shown in bold. The following paragraphs describe the present-day vegetation patterns of Waipu ED and highlight distinctive ecological units.

For the purpose of evaluation of representativeness and description, ‘coastal’ ecological units are those units which occur less than 1 km from the coast, whereas ‘inland’ ecological units occur 1 km or more from the coast (see Table 2). However it must be acknowledged that this is an arbitrary division. Some ‘inland’ ecological units will also have some coastal influence, because of the narrowness of the Northland peninsula, and the fact that all areas within the ED are within 16 km of the coast.

FRESHWATER WETLANDS

Freshwater wetlands were documented at 24 sites within Waipu ED covering a total of 116 ha. It is considered that 16 of these are natural or semi-natural in origin, covering approximately 45 ha. Constructed wetlands were included because they either support indigenous vegetation or provide habitat to indigenous fauna. Prior to agricultural clearance, riverine and palustrine wetlands are likely to have been relatively extensive on the c. 7000 ha of alluvial plains and c. 2000 ha of coastal duneland in Waipu ED. It is estimated that in the whole of Northland only about 5% of the original freshwater wetlands (including lakes) remain, which is lower than the national estimate of 10% of freshwater wetlands remaining (Conning 2001).

Raupo reedland is the most common wetland vegetation type, and tends to be associated with valley floor alluvium (especially gullies in farmland), but also occurs around the margins of a dune lake margin and in a small dune slack. The presence of raupo is an indicator of moderate to high nutrient status (Johnson & Gerbeaux 2004), and in Waipu ED agricultural run-off often contributes to this.

Coastal freshwater wetlands

Within the coastal zone there are only five ‘natural origin’ wetlands, each with a quite different character. McEwan Road (Q07/131) and Sime Road (Q07/141) Wetlands are the two smallest; being tiny dune slack wetlands barely over half a hectare. The former has an island of manuka shrubland at its centre surrounded by *Azolla filiculoides*-burr reed herbfield and *Eleocharis sphacelata* reedland; while latter is dominated by *Eleocharis sphacelata* reedland and *Baumea articulata* reedland. Doctor’s Hill Road Wetland (Q07/127) is by far the largest in the coastal zone (17.6 ha of wetland habitat), filling a gully draining into Ruakaka River Estuary (Q07/130). Its main vegetation types are reed sweetgrass grassland (exotic) and raupo reedland, with small areas of *Baumea articulata* reedland and bracken fernland. The fourth natural wetland is the only dune lake in the whole Eastern Northland Ecological Region (Ruakaka Racecourse Dune Lake Q08/129), which is mostly open water but has raupo and lake clubrush reedlands around the margins, all of which are infested with alligator weed.

Together with the two large constructed wetlands in the northern/central coastal dunelands of Waipu ED (Northland Port Corporation Ponds Q07/164 and Semenoff Sand Supplies Ltd ponds Q07/128), these sites form an important wetland bird habitat network for species such as Australasian bittern. The fifth semi-natural coastal wetland site is located on Bream Tail Coastal Headland (R08/001) and constitutes two gullies with moderately degraded (grazed) raupo reedland, and small patches of *Baumea* sp., *Juncus* sp., *Cyperus ustulatus* and manuka-harakeke-ti kouka shrubland. Small areas of marsh clubrush sedgeland also occur at the edges of some estuaries in freshwater seepages.

Inland freshwater wetlands

Most freshwater wetlands in the inland areas of Waipu ED are small, degraded patches of raupo reedland, harakeke flaxland, reed sweetgrass grassland or *Polygonum* sp. (exotic) herbfield. Impacts include grazing and nutrient enrichment through animal faeces and urine, and mineral fertilizers.

There are two higher quality wetlands which stand out from the rest at an Ecological District scale. Glenmohr Road Wetland (Q08/223) has the largest raupo reedland in the ED, which is spread patchily along 2 km of farm gully, sheltered on one side by plantation forest. The Upper Mangawai River Wetlands (Q07/138) have two large wetland remnants, each dominated by harakeke flaxland with patches of kahikatea-harakeke treeland, and peripheral areas of grazed reed sweetgrass grassland. This wetland has a reasonable diversity of emergent woody species including occasional manatu, kowhai, pukatea, ti kouka, manuka, and *Coprosma propinqua* var. *propinqua*, with only a few invasive crack willows.

ESTUARINE VEGETATION AND HABITATS

Estuarine vegetation occurs at five sites in Waipu ED, as follows: two large river mouth estuaries on Bream Bay (Waipu River Estuary and Sandspit Q08/228 and Ruakaka River Estuary Q07/130), two small stream mouth estuaries on the southern margin of Whangarei Harbour (Blacksmith's Creek Estuary Q07/144 and Takahiwai Stream Estuary Q07/143)*, and another small site on the harbour margin (Takahiwai Saltmarsh and Shrubland Q07/167).

Two vegetation types common to the four largest estuaries are mangrove shrubland and different combinations of oioi and sea rush (e.g. a mosaic of sea rush rushland and oioi rushland, or a more blended sea rush-oioi rushland type). Mangrove forest only occurs in upper reaches of the larger two estuaries of Waipu and Ruakaka, and even then, these are tiny stands compared with those present in other Northland estuaries.

Another widespread vegetation type is glasswort herbfield, which often occurs on upper tidal sandy substrates or shellbanks, or on the edges of sandy estuarine channels. Glasswort may also occur in association with mangrove seedlings and pneumatophores, although it does not tolerate a lot of estuarine mud. Waipu and Ruakaka estuaries, and Mangawhai estuary which lies to the south in Rodney ED, are considered 'sandy estuaries' in terms of bird habitat (Richard Parrish pers. comm.), and this is also reflected in the vegetation.

* Note that only these small portions of Whangarei Harbour are within Waipu ED.

The Waipu River Estuary is the largest of all estuarine sites and has the only examples of sea rush rushland (i.e. 3-4 ha of pure sea rush), sea rush-*Austrostipa stipoides* rushland, sea primrose-remuremu herbfield, knobby clubrush-tall fescue sedgeland, and subtidal beds of sea grass grassland. It also has a large area of intertidal flats covered in the invasive saltwater paspalum. Although not listed as a vegetation type in any other estuary, saltwater paspalum forms a component of many saltmarsh, mangrove and mudflat communities in Waipu ED, and poses several threats to indigenous flora and fauna. The Ruakaka River Estuary has a few distinctive vegetation types including small areas of pure saltmarsh ribbonwood shrubland, *Austrostipa stipoides* tussockland, and some manuka shrubland and gorse scrub perched on an estuarine island. Takahiwai Stream Estuary is perhaps the least disturbed estuarine system in Waipu ED due to its relative remoteness from urban areas, but is relatively small. Blacksmith's Creek Estuary and Takahiwai Saltmarsh and Shrubland are more modified than the other three sites, the latter having been carved up with drains.

DUNELAND VEGETATION AND HABITATS

Waipu ED has extensive Holocene and Pleistocene dunelands covering the wide sweep of Bream Bay from One Tree Point and Marsden Point in the north to Waipu Cove in the south, and extending inland for several kilometres. A few smaller bays with Holocene beach sands are present at Lang's Cove, Anderson's Cove and Bream Tail. Wild duneland vegetation has been reduced to a strip that runs parallel to the beach. The strip can be as narrow as 1 m (for example in front of beachfront buildings at Waipu Cove), or up to 800 m wide (in the Ruakaka Conservation Area). Modifications which have restricted the duneland vegetation include roading, clearance for farming, grazing, industrial establishments, a power station, a golf course, a race course, a refuse station and landfill, campgrounds, recreational buildings, parkland, and residential housing. The majority of Waipu ED dunelands are now dominated by exotic plant cover, although a moderate diversity of indigenous species and vegetation types still remains.

For this study the dunelands of Waipu ED were divided into two major sites: Ruakaka Dunelands (Q07/128 - from Marsden Point to the northern side of the Waipu River) and Waipu River Estuary and Sandspit (Q08/228 - from Waipu River Estuary to the southern end of Waipu Cove). The Ruakaka Dunelands are characterised by large areas of exotic gorse-pampas scrub on the backdunes, with scattered patches of bare sand, *Kunzea ericoides* var. *linearis* forest (a threatened variety of kanuka specific to coastal sandy soils), harakeke-gorse shrubland, radiata pine forest, maritime pine treeland, brush wattle-Chinese privet-mapou scrub, tree privet-Chinese privet scrub and several other smaller exotic vegetation types. The main vegetation types on the foredunes within this site are spinifex grassland, pohuehue shrubland, pohuehue-*Coprosma acerosa* shrubland, knobby clubrush-pohuehue sedgeland, sweet vernal-harestail grassland, and harestail-gazania-marram grassland, all harbouring many exotic species. *Coprosma acerosa* is present at one site but was probably previously much more widespread in Waipu ED (Lisa Forester, NRC, pers. comm.). The Waipu Sandspit is characterised by a lack of exotic scrubby vegetation, more extensive shifting sands and spinifex grassland, large areas of purple groundsel-South African iceplant herbfield, and smaller areas dominated by buffalo grass or South African iceplant in association with mainly exotic species. Both sites

have scattered remnants of the previously more common pingao sedgeland. Old records of *Pimelea arenaria* (1899) and *Austrofestuca littoralis* (1973) at Ruakaka show that these species and their types were once present, however they have now almost completely disappeared from Waipu ED sand dunes.

Lang's Beach (Q07/235) has a tiny sand dune with haretail-spinifex grassland and pingao sedgeland (probably planted), and the Bream Tail Coastal Headland (R08/001) beaches are sometimes backed by small dunes with pohuehue-buffalo grass shrubland. Both these sites have occurrences of *Carex pumila* sandfield in the upper intertidal zone.

Some planting of indigenous species has occurred in recent times along Waipu ED coast, probably with a view to restoring dune vegetation. Species recorded in plantings include pingao, spinifex, *Austrofestuca littoralis*, and *Carex testacea*. Planting appears to be quite limited in extent, although this can be difficult to determine over time if locally sourced species are used and natural ecological patterns are followed.

ALLUVIAL LANDFORM VEGETATION

The area of indigenous vegetation on alluvial flats and gullies remaining in Waipu ED is approximately 360 ha, occurring within 28 different sites. The sites are usually divided into several separate remnants. Alluvial flats are the most productive land and would have been the first to be cleared and the most zealously maintained through time.

Coastal alluvium vegetation

The only vegetation recorded on coastal alluvium is kanuka shrubland on the border of Takahiwai Stream Estuary (Q07/143) and at Blacksmith's Creek Estuary (Q07/144), and a patch of manuka-harakeke shrubland in the latter. All of the alluvial flats next to Ruakaka River Estuary (Q07/130) and Waipu River Estuary and Sandspit (Q07/228) are devoid of indigenous vegetation.

Inland alluvium vegetation

The most common vegetation types present on broad alluvial river plains adjoining the coastal dunelands (Holocene and Late Pleistocene alluvium and/or estuarine deposits) are mixtures of secondary totara, kahikatea, and kanuka, as in the following: kahikatea forest and treeland, kahikatea-totara forest and treeland, totara forest and treeland, totara-kanuka forest, kanuka-kahikatea forest, and totara-kahikatea forest. There is no mature forest remaining on alluvial flats. Totara and kahikatea are hardy podocarp species which are resistant to trampling and grazing, hence their dominance within grazed riparian forests and treelands along rivers in the Waipu ED lowlands. Previously species such as taraire, titoki, kowhai, manatu, puriri, turepo, ti kouka, karaka, mapou, matai, houhere, and pukatea would have formed a greater part of the normal canopy diversity of alluvial plain forests. At present, there are only very tiny remnants of the following habitat types which approximate the former vegetation (though in much poorer condition): taraire forest, titoki-kowhai-totara forest, titoki-totara forest, puriri-totara treeland, totara-taraire-kanuka treeland, kahikatea-puriri treeland, and kowhai-kahikatea forest. A very unusual occurrence is that of kauri forest on alluvium in the Waiotira Stream Forest Remnants (Q07/148), because kauri is usually associated with infertile, dry soils.

Within small pockets of Holocene alluvium in smaller streams the main vegetation types are heavily dominated by kahikatea and nikau, such as in kahikatea-nikau forest in Q07/113, nikau forest in Q08/222, and kahikatea forest in Q08/220 and Q07/147. There are occasional mature trees (especially kahikatea and totara) in these alluvial pockets within larger forest tracts.

HILL VEGETATION

The majority of the terrain of Waipu ED is hilly, and hill country is where most indigenous vegetation remains or has been allowed to regenerate since logging and burn-offs in the 1800s and 1900s. The series of east-west trending moderately dissected ranges still supporting large forest remnants begins with Takahiwai Forest (Q08/124) in the north and continues southwards through Ruakaka Forest (Q07/121), Waipu Caves Forest (Q07/118), North River Forest (Q07/117), Mareretu Forest (Q08/220) (the largest continuous area of indigenous forest) and ends in the south with the Brynderwyn Hills (a mosaic of indigenous forest and radiata pine plantations, with the indigenous parts described in 12 separate sites in this study). Rolling hill country, such as in the west of the ED around Mangapai, Springfield, and Ruarangi, or in the foothills of the previously listed sites, has been more heavily deforested compared with the steeper more elevated land.

Coastal hill vegetation

Indigenous hill vegetation within the coastal zone was recorded at the following sites: Takahiwai Forest (Q07/124) (northern side) and Pakauhokio Knoll Forest (Q07/122) next to Whangarei Harbour in the north; low consolidated sand ridges next to Ruakaka River Estuary (Q07/130) and Waipu River Estuary and Sandspit (Q08/228) within Bream Bay; lower parts of Brynderwyn Hills Forest Complex - Part G (Q08/225g); and Bream Tail Coastal Headland (R08/001) in the south.

Takahiwai Forest (Q07/124) has one of the largest areas of coastal kanuka forest, with kauri-kanuka forest dominant on many of the ridges. These types are also common further inland, but here they are likely to have a different suite of species regenerating through them due to the coastal influence. Small patches of more diverse totara-puriri forest and karaka-nikau-kanuka forest remain in the gullies and gully heads. These broadleaf forest types would have been more extensive in the area before widespread human disturbance. Pakauhokio Knoll Forest (Q07/122) is mainly degraded kanuka forest.

Pleistocene consolidated sand ridges next to the two large estuaries have been largely cleared, but some parts still support relatively healthy pohutukawa forest and treeland with associated species such as totara, houpara, karaka, kawakawa, kahakaha, *Astelia banksii*, karo, hangehange, *Coprosma macrocarpa*, mamaku, and harakeke. There are, however, some very weedy areas of totara-pohutukawa forest at Ruakaka River Estuary (Q07/130) infested with species such as gorse, wild cherry, crack willow, woolly nightshade, brush wattle, radiata pine, and pampas.

Brynderwyn Hills Forest Complex - Part G (Q08/225g) has the largest area of coastal kanuka forest overall. Lang's Beach Coastal Forest and Shrubland (Q08/226) has a small area of coastal kanuka shrubland, and two distinctive coastal forest types. Within a Queen Elizabeth II Open Space Covenant in Q08/226

there is a small stand of pohutukawa-rimu forest with frequent totara and puriri, and occasional kauri, kowhai, kahikatea, and rewarewa. Pohutukawa forest at the northern end of Lang's Beach is growing on limestone, and is particularly lush, with an understorey of kohekohe, houpara, nikau, mamaku, kawakawa, hangehange, and kiekie, but it also harbours smothering infestations of many weed species, including ginger, garden nasturtium, cotoneaster, agapanthus, tuber ladder fern, arum lily, and hydrangea. Further north on this coast, healthier areas of pohutukawa forest on spectacular limestone formations have been described (Forester 2007).

Bream Tail Coastal Headland (R08/001) supports the widest variety of coastal hill forest, shrubland, and rockland vegetation, most of which is unique in Waipu ED. The only vegetation similar to that in other sites is kanuka shrubland and kanuka forest which makes up about one fifth of the site. Bream Tail's vegetation has affinities with that of Taranga (Hen) Island (Wright 1978), although most of it is in poorer condition due to fragmentation, grazing, and mammalian pests. The following points highlight some of the uncommon ecological units within the site; for a full description see Section 4.1 Site Descriptions.

Ecological units recorded on the open coastal hillslope at Bream Tail Coastal Headland (R08/001) that are not present elsewhere in Waipu ED:

- Substantial areas of nikau-karaka-pohutukawa-mahoe treeland interspersed with large patches of exotic grasses, indigenous ferns, and regenerating shrubs; also contains occasional elements of the original coastal forest, e.g. ti kouka, kawakawa, kohekohe, puka, puriri, taraire, harakeke, kahakaha, kahikatea, totara, tawapou* (Forester *et al.* 2001) and coastal maire* (Forester *et al.* 2001) (the latter two plant species are both regionally significant).
- Gullies with dense nikau forest; dead or dying pohutukawa often emergent.
- Kanuka-puriri-pohutukawa forest with frequent kowhai and totara.
- Puriri forest with frequent totara, kowhai and nikau.
- Dense, healthy pohutukawa forest with an understorey of houpara, harakeke, hangehange, and nikau (only one small area; several degraded examples are also present).
- Kanuka-tawa forest with frequent puriri and occasional rimu and kauri.
- Extensive coastal cliff habitat with rocky outcrops rising above intertidal platforms; harakeke and pampas common, *Chionochloa bromoides* and *Astelia banksii* frequent.
- Hangehange-harakeke shrubland with frequent ti kouka and pampas.
- Harakeke-pampas flaxland.
- Harakeke-kawakawa flaxland.

Ecological units recorded at the back of the coastal hillslope at Bream Tail Coastal Headland (R08/001) that are not present elsewhere in Waipu ED:

- Taraire forest with frequent puriri, nikau, and kohekohe, and occasional puka, rewarewa, kahakaha, mamaku, karaka and *Metrosideros perforata*.

* Not seen in this survey.

- Taraire–totara–puriri forest with frequent kahikatea and occasional pukatea, karaka, tawa, white maire, lancewood, rewarewa, ti kouka and mapou.
- Nikau–mahoe forest with frequent puriri, kahikatea, pate, supplejack, and mamaku, and occasional puka, pukatea, miro, ponga, karaka, tawa and *Metrosideros perforata*.
- Puriri–rewarewa–pohutukawa forest with occasional emergent northern rata and kauri (distinctive because pohutukawa and northern rata are present in the same vegetation type).
- Kahikatea forest with frequent rewarewa, puriri and nikau, and occasional pukatea, miro, and puka.
- Kauri–kanuka forest with occasional tanekaha, totara, rimu, puriri and mamaku.

Inland hill vegetation

On the inland hills of Waipu ED, the following vegetation pattern is typical: ridges and upper hillslopes covered in secondary kanuka forest in association with young emergent kauri, tanekaha, and rimu (these species sometimes exclude kanuka entirely on the ridge crest); recently disturbed ridges with kanuka and/or manuka shrubland; hillslopes supporting forest dominated by totara, kanuka, and/or mamaku; lower hillslopes and gullies with broadleaf forest dominated by species such as taraire, towai, puriri, nikau, and tawa, often containing kahikatea; disturbed gullies or gully heads with shrublands of pate, mahoe, hangehange, and mamaku; totara-dominant forest on pasture margins and in many of the smaller, heavily grazed forest remnants. These patterns are summarised in more detail in the following points, which list the main vegetation types on different topographic positions.

Common vegetation types on inland hill country in Waipu ED:

Ridges and upper hillslopes

- Kanuka forest
- Kauri forest
- Tanekaha forest
- Rimu forest
- Combinations of kanuka, kauri, tanekaha, and rimu, sometimes including rewarewa and/or totara
- Kanuka shrubland
- Manuka shrubland

Mainly on hillslopes, but also on ridges

- Kanuka–mamaku forest
- Kanuka–totara forest and treeland
- Kahikatea–totara forest and totara–kahikatea forest, sometimes in association with kanuka or taraire
- Kanuka–totara–mamaku forest
- Totara forest and treeland, sometimes in association with puriri, mamaku, kanuka, rewarewa, rimu, taraire, tanekaha, and/or radiata pine
- Totara–kanuka forest and treeland, including associations with kahikatea and mamaku

- Shrublands with a range of species, e.g. kanuka, manuka, mamaku, mahoe, pate, hangehange, mapou, ponga, mingimingi, and gorse

Mainly on hillslopes, but also in gullies

- Taraire-tawa forest and tawa-taraire forest
- Towai forest and towai-mamaku forest
- Taraire forest, including various associations with totara, kahikatea, kanuka, mamaku, rimu, rewarewa, and nikau
- Totara-taraire forest
- Totara-mamaku forest
- Mamaku forest, including various associations of mamaku with kanuka, mahoe, mapou, rewarewa, and ponga

Gullies

- Taraire forest
- Taraire-puriri forest
- Puriri forest and puriri-nikau forest
- Kahikatea forest
- Nikau-mamaku forest, nikau-ponga forest and ponga-nikau forest
- Shrublands with mamaku, pate, mahoe, and hangehange

Ecological units on inland hill country which are considered unusual or uncommon in Waipu ED:

- Bracken-tangle fern fernland in Q07/137
- Mahoe-totara-kohuhu shrubland in Q07/112
- Rockland at Q07/132
- Kahikatea-pukatea forest in Q07/122
- Kohekohe forest at Q08/224 and Q08/225c
- Kohuhu forest at Q08/225c
- Miro-tawa-rewarewa forest at Q08/225c
- Nikau forest in Q07/120
- Nikau-rewarewa forest in Q08/225f
- Puriri-taraire-rewarewa-totara-nikau-mamaku forest in Q08/225c
- Rewarewa-mamaku-tarata forest in Q08/225c
- Rewarewa-tanekaha forest in Q08/225f
- Rimu-rewarewa-tanekaha forest in Q08/225a
- Taraire-tawa-rewarewa-mamaku forest in Q08/220
- Tawa-nikau forest in Q08/225c
- Tawa-rewarewa-mamaku-ponga-nikau-kohekohe forest Q08/225h
- Ti kouka-putaputaweta-manuka shrubland in Q08/221

3.3.4 Species of botanical interest

The Brynderwyn Hills Forest Complex (Q08/225) is a stronghold for *Hebe macrocarpa* var. *macrocarpa*, which is a regionally significant plant species

(Lisa Forester, NRC, pers. comm.). Makamaka reaches its southern limit of distribution in this site (Lisa Forester, NRC, pers. comm.).

3.3.5 Threatened plant species

The current threat status of species listed below follows de Lange *et al.* (2004). Appendix 8.3 gives the definitions of threat categories as set out in Molloy *et al.* (2002).

CHRONICALLY THREATENED

Pingao *Desmoschoenus spiralis* (Gradual Decline)

Pingao, or golden sand sedge, is found in small patches spread along the seaward sand dunes of Bream Bay and on small beaches around the Bream Tail coastline. Pingao would once have been more common, but this species has declined dramatically throughout its natural range. Threats include competition from weeds, dune stabilisation and compaction, harvesting, trampling, vehicle traffic, browsing animals, rodents eating seeds, and lack of seed set due to distance between populations (NZPCN 2007).

***Doodia squarrosa* (Gradual Decline)**

Doodia squarrosa is a small tufted fern with a local, discontinuous distribution in coastal and lowland forests of the North Island, and tends to be found near water (Allan 1982). It is threatened by loss of habitat through weed invasion (NZPCN 2007). It was recorded in 1992 at North River Forest (Q07/117) (SSBI Q07/H059), but may be more widespread in Waipu ED.

***Kunzea ericoides* var. *linearis* (Serious Decline)**

This kanuka variety was originally recognised and described by Thomas Kirk as a 'very slender' tree, with 'leaves very narrow linear' (Allan 1982), and is known to occur from Pakiri and Pouto northwards on coastal, sandy habitats (NZPCN 2007). In Waipu ED it is the dominant species in scattered patches of dune forest amongst gorse-pampas shrubland on the sand dunes behind Bream Bay. Its main threats are habitat loss and harvesting for firewood (NZPCN 2007). The north-eastern coast of Waipu ED is one of the strongholds for this subspecies (Peter de Lange pers. comm.).

***Mida Mida salicifolia* (Gradual Decline)**

Mida, a small, shiny-leaved tree, is a generalist root parasite which is naturally sparsely distributed in lowland to lower montane forests of the North Island. It is extremely palatable to possums and goats. It is known from eleven different forested sites in Waipu ED from the Brynderwyn Hills in the south to Pokapu Hill in the north, generally in forest without stock grazing in the understorey.

***Pimelea arenaria* (Gradual Decline)**

Pimelea arenaria, also known as sand daphne, is a low, spreading, silky-haired shrub in the daphne family that grows on coastal sand dunes. It is endemic to the North Island and has two distinct forms, of which one is further restricted to Northland. Its major threats are habitat loss (e.g. through development of dunes and plantings to stabilise moving sand) and disturbance of habitat by vehicles (Forester and Townsend 2004). It is also adversely affected by browsing and grazing mammals, seed destruction by rodents, and competition from marram

grass (NZPCN 2007). There are few plants on the beach near Ruakaka (Q08/128) (Lisa Forester, NRC, pers. comm.).

AT RISK

***Anzybas rotundifolius* (Sparse)**

Formerly known as *Corybas unguiculatus* (Moore & Edgar 1970), this tiny, winter-flowering spider orchid is only known from a few localities in the North Island, mostly from Warkworth northwards (NZPCN 2007). In Waipu Ecological District, it was recorded in the Marunui QEII Open Space Covenant within Brynderwyn Hills Forest Complex - Part H (Q08/225h) in 1990 (Jones 1991).

***Doodia mollis* (Sparse)**

This is another small tufted fern in the genus *Doodia* (see *D. squarrosa* above) (Allan 1982). It also has a localised distribution in moist forest habitats of the northern North Island, and is often found in association with the most common *Doodia* species, *D. australis* (NZPCN 2007). In Waipu ED, *D. mollis* is known from four sites: Waipu Gorge Forest Remnants (Q08/222) (recorded in 1985, AK 175781), North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059), Bream Tail Coastal Headland (R08/001) (Forester *et al.* 2001), and Waipu Caves Forest (Q07/118) (current survey, AK 298335).

***Monoao Halocarpus kirkii* (Sparse)**

Monoao is an uncommon podocarp which has a northern distribution and is associated with kauri forest. It was recently found in Waipu ED at Waipu Gorge Forest Remnants (Q08/222) (Wilcox 2006, AK 295324). This species is naturally sparsely distributed.

***Kawaka Libocedrus plumosa* (Sparse)**

This podocarp species has a disjunct biogeographic range (restricted to Northland and Northwest Nelson) where it is found in localised patches within coastal to lowland forest. In the north it often occurs in association with kauri. Within Waipu ED it is known from Mareretu Forest (Q08/220) (recorded in 2001, SSBI Q08/H001), Waipu Gorge Forest Remnants (Q08/222), and various points along the Brynderwyn Hills Forest Complex including in Q08/225d (Kendrick and Young 2006), in Q08/225g (recorded in 1992, SSBI Q08/H053), in Q08/225c (recorded in 1997, SSBI Q07/H021), in Q08/225e (Peter Anderson, DOC, pers. comm.), and in Q08/225a (current survey). This species is naturally sparsely distributed, and appears to regenerate well after disturbance.

***Parapara Pisonia brunontana* (Sparse)**

Known also as the 'bird-catcher' due to its propensity to catch small birds and insects in its sticky seeds (which are adapted to dispersal via large sea birds), this small, shiny-leaved tree is only known from scattered locations on the Northland mainland, and occurs mainly on offshore islands in the north. It has suffered a range contraction from the Auckland, Coromandel and East Cape regions where historical records show it used to occur (NZPCN 2007). The 1994 record from Bream Tail Coastal Headland (R08/001) is probably its southernmost modern record on mainland New Zealand (DOC Bioweb database). Its large leaves are especially palatable to browsing animals such as possums, goats and other feral livestock, and its leaves and seeds are also eaten by rodents (NZPCN 2007).

***Streblus ?banksii* × *S. heterophyllus* (*Streblus banksii* - Sparse)**

This is a hybrid between an 'at risk' tree species, large-leaved milk tree (*Streblus banksii*) and a common tree species, turepo (*Streblus heterophyllus*), that was collected from Bream Tail Coastal Headland (R08/001) in the current survey (AK 298332). This hybrid has been noted previously at Bream Tail (Forester *et al.* 2001). Large-leaved milk tree is extremely uncommon on the mainland, where it is threatened by rodents, possums, goats, and deer (NZPCN 2007). Large-leaved milk tree has never been recorded in Waipu ED, however it occurs on Bream Head (Manaia ED), and on the pest-free Taranga Island, 13.5 km offshore of Bream Tail (Wright 1978).

***Tetragonia tetragonioides* (Sparse)**

This species is known as 'New Zealand spinach' or 'kokihi', but should not be confused with the common New Zealand spinach *Tetragonia implexicoma*. *T. tetragonioides* occurs throughout New Zealand on coastal rocks and sandy habitats, where its main threat is habitat disturbance. In the current survey it was recorded on coastal rocks around Bream Tail Coastal Headland (R08/001), but may also occur in Waipu ED along the sand dunes behind Bream Bay.

***Cbtonochloa bromoides* (Range Restricted)**

This tussock grass is a specialist of coastal cliffs and bluffs. It is endemic to the north of the North Island where it is confined to northern offshore islands and mainland headlands south to Leigh on the east coast and Maunganui Bluff on the west coast (Edgar & Connor 2000). In Waipu ED it occurs locally at Bream Tail Coastal Headland (R08/001).

***Nematoceras rivulare* (Data Deficient)**

This spider orchid (formerly known as *Corybas rivularis*; Moore & Edgar 1976) occurs in the North Island probably from Taranaki north, on mossy rock banks close to water level or in year-round seepage on mud-flow in native forest (NZPCN 2007). Within Waipu ED it has been recorded at Mareretu Forest (Q08/220) (recorded in 2001, SSBI Q08/H001) and North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059).

3.3.6 Regionally significant plant species

The following species are included in a draft list of regionally significant species prepared by DOC Northland Conservancy (DOC in prep.).

Azolla filiculoides

This is an indigenous floating water fern species; a similar exotic species (*A. pinnata*) has out-competed it in many potential habitats. In Waipu ED *A. pinnata* is present in most areas of standing water, whilst *A. filiculoides* was only found at McEwan Road Wetland (Q08/131) during the current survey. There are no other records of this species in the ED.

Brachyglottis kirkii* var. *angustior

Brachyglottis kirkii var. *angustior* is a narrow-leaved, ground-dwelling variety of a fleshy-leaved shrub in the daisy family. This species is quite palatable to browsers such as goats and possums, and is uncommon in Northland. It has been recorded at three sites in Waipu ED, but is likely to be more common than this suggests: Waipu Gorge Forest Remnants (Q08/222) (DOC internal files

1997), North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059), and Brynderwyn Hills Forest Complex – Part D (Q08/225d) (Kendrick and Young 2006). The other variety (*Brachyglottis kirkii* var. *kirkii*) is ranked as being in Serious Decline (not recorded in Waipu ED).

Coprosma acerosa

Coprosma acerosa is a sprawling, small-leaved shrubby ground cover which occurs frequently in the sand dunes of Ruakaka Dunelands (Q07/128), Ruakaka River Estuary (Q07/130), and Waipu River Estuary and Sandspit (Q08/228). Its threats include rabbit/hare browse, competition from invasive weeds, and destruction of dune habitat. *Coprosma acerosa* has all but disappeared from dunes in Auckland and was probably previously much more widespread in Waipu ED (Lisa Forester, NRC, pers. comm.).

Coprosma rigida

Coprosma rigida is an erect small-leaved, divaricating shrub found throughout the North and South Islands although it is relatively uncommon in Northland. In Waipu ED it has been recorded in Takahiwai Forest (Q07/124) (Lisa Forester, NRC, pers. comm.), Mareretu Forest (Q08/220) (recorded in 2001, SSBI Q08/H001), Bream Tail Coastal Headland (R08/001) (Boffa Miskell 2003), Waionehu Stream Forest Remnants (Q08/232) (current survey, AK 297990), and SH1 Forest Remnants (Q08/233) (current survey, AK 298333).

Coprosma parviflora

Coprosma parviflora is a small-leaved, divaricating shrub which occurs only in Northland and north Auckland. It was recorded in Brynderwyn Hills Forest Complex – Part G (Q08/225g) in the current survey, and in Brynderwyn Hills Forest Complex – Part D (Q08/225d) in another recent survey (Kendrick and Young 2006).

Gully tree fern *Cyathea cunninghamii*

This is a very tall, narrow-trunked tree fern (when mature), similar to mamaku (*Cyathea medullaris*), but with thinner stipes and shorter fronds that curl upwards slightly at the ends. It is usually sporadic within its distribution (North, South and Chatham Islands, also Australia). It is known from the following sites in Waipu ED: Mareretu Forest (Q08/220), North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059), Ruakaka Forest (Q07/121) (recorded in 1991, SSBI Q07/H055), Brynderwyn Hills Forest Complex – Part A (Q08/225a) (recorded in 1993, SSBI Q08/H021), and Brynderwyn Hills Forest Complex – Part C (Q08/225c) (recorded in 1997, SSBI Q07/H021).

Epacris pauciflora

This is a slender, small-leaved shrub up to 2 m tall which usually occurs on nutrient-poor soils, and is naturally sparsely distributed in the North and South Islands. It was recorded in 2006 in the Waipu Gorge Forest Remnants (Q08/222) (AK 295325).

Tree fuchsia *Fuchsia excorticata*

Tree fuchsia is a small tree (up to 12 m tall) found in forests throughout New Zealand. It has orange-coloured peeling bark, multi-coloured flowers, dark purple berries, and soft, deeply-veined leaves that are white underneath. Its foliage is very palatable to possums and stock, which are the main threats to the species. It occurs locally in forests in Waipu ED, and has been recorded from

most of the larger forested sites, though generally occurring in low numbers at any one site.

Hebe macrocarpa* var. *macrocarpa

This is a northern North Island endemic thick-leaved (almost fleshy-leaved) shrub to 2.5 m tall with larger capsules than other similar *Hebe* species, e.g. *H. stricta*. It is threatened by browsing mammals such as goats and possums. This species occurs in at least five sites in Waipu ED: Mareretu Forest (Q08/220) (recorded in 1999, AK 248072), Waipu Gorge Forest Remnants (Q08/222) (DOC internal files 1997), North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059), Waipu Caves Road Sandstone Knoll (Q07/132) (current survey, AK 298337), and the Brynderwyn Hills Forest Complex (including in Q08/225d (Kendrick & Young 2006), in Q08/225j (recorded in 1965, AK 121839), and in Q08/225e) (current survey, AK 298338)). The Brynderwyn Hills are a stronghold for this species (Lisa Forester, NRC, pers. comm.).

Loxsonia cunninghamii

This delicate fern has wide, light green fronds with whitish undersides. It is a North Island endemic (belonging to an endemic genus), which prefers open habitats such as clearings, open forest and stream banks. It is uncommon in Northland, and in Waipu ED it has only been recorded from Waipu Gorge Forest Remnants (Q08/222) in 1985 (AK 176354).

Carmine rata* *Metrosideros carminea

This is a tall epiphytic rata vine with carmine flowers in late winter/early spring. This species is threatened by possum browse and is uncommon in Northland. In Waipu ED it is known from Waipu Gorge Forest Remnants (Q08/222) (recorded in 1933, AK 102216), Brynderwyn Hills Forest Complex – Part A (Q08/225a) (recorded in 1993, SSBI Q08/H021), Waipu Caves Road Sandstone Knoll (Q08/132) (current survey), and Waipu Caves Forest (Q07/118) (current survey, AK 297995).

Northern rata* *Metrosideros robusta

This is a tall, often emergent, red-flowered forest tree which sometimes begins life as an epiphyte. It has palatable foliage, and possums have been the main agent of its destruction throughout the country. It has been eliminated or severely reduced in abundance in most mainland indigenous forests in Northland. It has been recorded at nine sites in Waipu ED during the current survey, but is uncommon at these locations and often in poor health.

Coastal maire* *Nestegis apetala

This is a small (to 6 m tall) coastal tree endemic to northern New Zealand which has been mostly eliminated from the mainland. Decline in the abundance of this species has been attributed to seed predation by rats (Campbell & Atkinson 2002). Coastal maire occurs frequently on pest-free marine islands offshore of Waipu ED, such as Taranga Island (Wright 1978), and was recorded on Bream Tail Coastal Headland (R08/001) in 2001 (Forester *et al.* 2001), but was not seen during the current survey.

Hard beech* *Nothofagus truncata

Hard beech is closely related to red beech (*N. fusca*), and is patchily distributed in lowland to lower montane forest from Northwest Nelson to the Hihi

Peninsula, Northland in the North Island. This species is very uncommon north of Auckland. There are two 1993 records from opposite ends of Waipu ED: Takahiwai Forest (Q07/124) (SSBI Q07/H047) and Bream Tail Coastal Headland (R08/001) (SSBI R08/H008). It is also present at Ruakaka Forest (Q07/121) (Peter Anderson, DOC, pers. comm.).

Oxalis magellanica

This is a small, white-flowered herb found in damp places such as streamsides and grassland; recorded only from North River Forest (Q07/117) (recorded in 1992, SSBI Q07/H059) and Waipu Gorge Forest Remnants (Q08/222) (current survey, AK 297992) in Waipu ED.

Pelargonium inodorum

This is an annual to biennial low-growing sparsely hairy herb with pink to red flowers, known only from Brynderwyn Hills Forest Complex - Part I (Q08/225i) in Waipu ED (recorded in 1993, DOC Bioweb 2007). It occurs locally in open habitats such as gumland and grassland throughout New Zealand, but is not common in Northland.

Kaikomako *Pennantia corymbosa*

Kaikomako is small, slender tree (up to 10 m) with a divaricating juvenile stage that is widespread in lowland New Zealand. An adult was noted at Paparoa Road Riparian Forest Remnants (Q07/152) during the present study, and it has also been reported from Caves Road Forest (Q07/120) (Ian Fox pers. comm.).

Wharariki *Phormium cookianum*

Also known as mountain flax, this species is closely related to harakeke. In comparison with the latter, its foliage is smaller, not so stiff, and inclined to droop, while its seed capsules are pendulous rather than upright. It is often common on coastal cliffs and mountain slopes in the North, South and Stewart Islands, however in Northland it is generally restricted to higher altitudes (Wendy Holland pers. comm.). It has only been recorded once in Waipu ED in 1993 (SSBI R08/H008), on coastal cliffs at Bream Tail Coastal Headland (R08/001).

Manatu *Plagianthus regius*

Also known as ribbonwood, this is a tall tree typical of lowland forest on fertile soils throughout the country. It has become less common through severe reduction of riverine floodplain forest. This species was recorded at seven sites in Waipu ED in the current survey.

Tawapou *Pouteria costata*

This coastal, shiny-leaved tree (up to 20 m tall) is endemic to northern New Zealand and has large red-brown berries that are a favourite with rats. As a result of seed and seedling predation and loss of habitat, these trees are becoming increasingly uncommon in Northland. The species is very uncommon on the mainland, but is frequent on Taranga Island (Wright 1978) which is 13.5 km offshore of Bream Tail Coastal Headland (R08/001). Bream Tail Coastal Headland is which is the only place it has been recorded in Waipu ED (recorded in 1993, SSBI R08/H008).

Pratia angulata

This is a small, creeping herb with white flowers and purplish-red berries that commonly grows in lowland to subalpine damp places throughout New Zealand, but is uncommon in Northland. In Waipu ED it is known from Takahiwai Forest (Q07/124) (recorded in 1993, SSBI Q07/H047), Brynderwyn Hills Forest Complex - Part D (Q08/225d) (Kendrick & Young 2006), and Cove Road Shrubland and Forest (R08/002) (current survey).

Schizaea bifida

This is a tiny, forked comb fern typical of lowland heathy clay and pumice soils in the North Island and the tip of the South Island (also Australia). It was recorded in the Brynderwyn Hills Forest Complex - Part I (Q08/225i) in 1999 (AK 244703).

Burr reed *Sparganium subglobosum*

This is a monocotyledon which occurs locally in wetlands throughout the North Island and upper South Island. It is known as burr reed, for its rounded, white burrs (flower heads) appearing in late spring. Its main threat is habitat loss and modification. Within Waipu ED a substantial population (c. 0.4 ha) was noted at McEwan Road Wetland (Q08/131) during the current survey (AK 297989).

Suaeda novae-zelandiae

This is succulent saltmarsh herb that occurs locally in upper intertidal areas of the North Island and the South Island. It is locally common in estuaries along the Whangarei coast (Lisa Forester, NRC, pers. comm.). It was found at Blacksmith's Creek Estuary (Q07/144) on the Whangarei Harbour during the current survey (AK 297982), but probably also occurs at the other estuaries.

Maire tawake *Syzygium maire*

This tree species is a North Island and South Island lowland swamp forest specialist which is now uncommon due to the destruction and modification of its habitat. Remaining habitat is still under threat from drainage and clearance. In Waipu ED maire tawake has been noted in Takahiwai Forest (Q07/124) (recorded in 1993, SSBI Q07/H047) and Ruakaka Forest (Q07/121) (recorded in 1991, SSBI Q07/H055).

Arrow grass *Triglochin striata*

This is a small salt meadow monocotyledon, which grows on mudflats in sparse swards like a tiny grass (although it is not a grass), and is often mixed with other salt meadow herbs such as sea primrose and remuremu. Its main threat is competition from invasive weeds, for example saltwater paspalum. In Waipu ED it is known from Ruakaka Racecourse Dune Lake (Q07/129) (current survey, AK 298334) and Waipu River Estuary and Sandspit (Q08/228) (recorded in 1992, SSBI Q07/H051).

3.3.7 Threatened and regionally significant plant species not recorded for some time in the Ecological District

Sand tussock *Austrofestuca littoralis* (Gradual Decline)

This grass species used to occur throughout the country on coastal sand dunes. However, it is very palatable to grazing and browsing mammals and is also a poor competitor with introduced marram grass and is susceptible to fire, so its

range has been severely reduced. Natural populations of this species have not been seen in this ED recently (the most recent record is from 1973 on estuary sands on the southern side of the Ruakaka River Estuary (Q07/130) (DOC Bioweb 2007)). However, it has been planted at Bream Tail and Waipu Cove, with little success.

***Grammitis ciliata* (regionally significant)**

This small fern was collected from Robert Hastie Memorial Scenic Reserve (in Brynderwyn Hills Forest Complex – Part J, Q08/225j) in 1965 (AK 121745), but has not been recorded since.

3.4 FAUNA

3.4.1 Overview of indigenous fauna

Information on indigenous fauna in this report has been compiled from the following sources:

- Sites of Significant Biological Interest (SSBI) files held at the Northland Conservancy office, Department of Conservation.
- The Northland Region Ornithological Society of New Zealand (OSNZ) Newsletter *Amokura*.
- Classified summarised notes (CSN) from *Notornis* (the national journal of OSNZ).
- The Department of Conservation Bioweb Herpetofauna database (DOC 2007).
- ‘Uncommon and rare land snails in the Northland Region of New Zealand, and an assessment of conservation management priorities’ (Brook 2002) and personal communications with Fred Brook.
- The New Zealand Freshwater Fish Database (NIWA 2007).
- Incidental field observations during November 2006 (current study).
- Surveys and incidental observations by Dr Ray Pierce between 1987 and 2007.
- Surveys and incidental observations by Richard Parrish (DOC) between 1979 and 2007.
- Observations by Peter Anderson (DOC), Katrina Hansen, and John Kendrick.
- Records from unpublished technical reports, including those by Wildland Consultants Ltd.

A comprehensive discussion and checklist of fauna, particularly invertebrates, is beyond the scope of the present study. The descriptions for each site detail known threatened fauna and provide some records of non-threatened species. There are very few records of reptiles and invertebrates, irrespective of their prevalence, and it is recognised that they are a significant facet of indigenous ecosystems which are often overlooked. Indigenous New Zealand insects are our largest fauna group, and are intimately associated with indigenous habitat, carrying out a wide range of roles in ecosystems. In addition to their consumption of live plant material, they are involved in pollination, breakdown of leaves, litter and logs, soil formation, general scavenging, parasitism, and predation, as well as providing the main food for birds, lizards, and most freshwater fish (Watt 1975). It is generally acknowledged that although there

are many 'generalist' species of insects, the great majority have particular habitat requirements that restrict their populations in both space and time. With the present state of knowledge of these species, the protection of a diverse and representative range of habitat types is considered the most important strategic approach to provide a minimum basis on which populations can be maintained.

The Waipu and Ruakaka River Estuaries are small in extent, but are critical breeding and feeding grounds for many indigenous water bird and wader species including three threatened tern species (New Zealand fairy tern, Caspian tern, and white-fronted tern), the threatened northern New Zealand dotterel and reef heron, and many international migrant wader species. The Whangarei Harbour coast and small areas within the river estuaries along Bream Bay have saltmarsh and mangrove communities that provide important breeding and feeding habitat for banded rail, fernbird, herons, and shag species.

Seabirds formerly nested over large areas of mainland New Zealand. The former extent of seabird colonies in Waipu ED is not known but many elevated areas such as the Brynderwyn Hills, Bream Tail, Mareretu Forest, and Takahiwai Forest probably supported colonies. Seabirds play a critical role in nutrient cycling, raising fertility of soils through the deposition of guano and fish deposits, and creating soil turnover through burrow excavation. The extinction of colonies therefore results in long-term effects on ecosystem function. A suite of species (such as coastal cresses – *Lepidium* spp., invertebrates living in burrows, and others) are reliant on seabird colonies for habitat, and the decline of these species is closely linked with the decline of seabird colonies (Bellingham *et al.* 2006). Within Waipu ED, seabirds that nest on land, such as shags and possibly grey-faced petrel, are now confined to coastal forest (Ray Pierce pers. comm.).

Natural freshwater wetlands occur throughout Waipu ED but are often highly modified and drastically reduced in extent. Most wetlands within Waipu ED are associated with streams or rivers, although small but important wetland habitats occur within the coastal dune system. Constructed lakes and ponds now function as important wetland habitat and are likely to provide habitat linkages between the remaining natural freshwater wetlands. Constructed water bodies provide almost all of the open water habitat for indigenous water birds such as grey duck, grey teal, Australasian little grebe, and New Zealand dabchick. The larger, less modified wetlands, and some of the smaller wetlands if larger wetlands are nearby, are habitat for threatened species such as spotless crake and Australasian bittern. Bitterns, in particular, feed in a variety of natural and artificial water bodies within their home range. Common indigenous bird species associated with wetlands in Waipu ED include pukeko, paradise shelduck, welcome swallow, and New Zealand kingfisher. The Waipu River catchment supported a significant pateke (brown teal) population until the 1960s (Bell 1959; McKenzie 1971; Parrish & Williams 2001).

Indigenous birds of forests, shrublands, and grasslands which are common within Waipu ED include tui, grey warbler, welcome swallow, shining cuckoo, Australasian harrier, New Zealand kingfisher, North Island fantail, paradise shelduck, pukeko, spur-winged plover, black-backed gull, morepork, and silvereye.

Within the last 30 years, terrestrial reptile species recorded from Waipu ED are copper skink, shore skink, forest gecko, and Auckland green gecko. The only remaining endemic frog species is Hochstetter's frog. The former diversity of herpetofauna in Waipu ED is indicated by deposits in caves; for example, in the Waipu Caves area bones of a further three skink species (robust skink *Cyclodina alani*, ornate skink *C. ornata*, and *C. northlandi*), one gecko species (pacific gecko, *Hoplodactylus pacificus*), and three frog species (Archey's frog *Leiopelma archeyii*, *L. markhamii*, and *L. waitomoensis*) were found between 1986 and 1991 (DOC 2007). However, it is likely that ornate skink and pacific gecko still occur in Waipu ED as they occur in neighbouring EDs (Richard Parrish pers. comm.).

Four of the seven species of marine reptiles that reach New Zealand waters have been found on the coast of Waipu ED. These species are regarded as visitors or vagrants to New Zealand and are sometimes dead or in poor condition (Gill & Whitaker 1996). The yellow-bellied sea snake is a 'relatively regular visitor to northern New Zealand' with more than 35 records since 1930 (Gill & Whitaker 1996). At Waipu Cove a dead sea snake was found in January 1931, and a live one was found in January 1965. The green turtle is found throughout the tropics and is an occasional visitor to northern New Zealand, with more than 12 records since 1980 (Gill & Whitaker 1996). Two dead specimens have been found on the coast of Waipu ED, at Ruakaka Beach in February 1985 and May 2002. The loggerhead turtle is found throughout the tropics but also regularly visits temperate areas (Gill & Whitaker 1996). One live specimen was found on Ruakaka Beach in July 1973. The hawksbill turtle is also an occasional visitor to New Zealand waters and one was found dead at One Tree Point in May 2004. Although all sea turtles worldwide are considered threatened (IUCN 2006), New Zealand does not list them in the threat classification lists for indigenous species (Hitchmough *et al.* 2007).

Eleven species of indigenous freshwater fish, and four introduced species, have been recorded from Waipu ED. With the exception of shortjaw kokopu, they are not threatened, however banded kokopu and giant bully are considered to be regionally significant. Some marine fish species such as grey mullet, yelloweyed mullet, and kahawai are likely to visit the lower reaches of the larger streams and rivers. The Ahuroa River and North River catchments support a small, self-sustaining rainbow trout fishery, and the water supply dam on the upper Waiwarawara Stream is stocked by the Northland Fish and Game Council with brown trout (Andrew Venmore pers. comm. 2006).

Several species of threatened endemic land snail occur in Waipu ED, and some of these have localised distributions. The kauri snail is relatively widespread, occurring in forest and shrubland habitats.

There are few records of invertebrates within Waipu ED. No extensive invertebrate surveys have been undertaken, and most of the records are incidental observations made during ecological surveys, often without full identification. *Peripatus* sp. (Range Restricted) was found in the Waipu Gorge Forest Remnants (Q08/222) in 1992.

The following sections (3.4.2 to 3.2.11) are brief notes on nationally and regionally threatened species in Waipu ED (as per Hitchmough *et al.* 2007 which uses the threat classification system of Molloy *et al.* 2002; see Appendix

8.3) or DOC, in prep., Wendy Holland pers. comm.). A checklist of fauna recorded in Waipu ED is presented in Appendix 8.7. Nomenclature follows Hitchmough *et al.* (2007) for indigenous threatened species, and the following for all other species: Heather & Robertson (1996) for birds, Gill & Whitaker (1996) for amphibians, McDowall (2000) for fish, and King (2005) for mammals.

3.4.2 Threatened bird species

Waipu ED has a high number of threatened bird species: ten species are acutely threatened, eight species are chronically threatened, and eight species are classed as being at risk (Range Restricted or Sparse). Seventeen migrant species and four vagrant species have been recorded.

ACUTELY THREATENED

New Zealand fairy tern *Sterna nereis davitsae* (Nationally Critical)

Endemic subspecies

The New Zealand subspecies of fairy tern has an estimated total population of 35-40 individuals, with only 11 breeding pairs. The Waipu Wildlife Refuge is one of only four breeding locations, and four pairs nested there in 2005-06. Nesting success at Waipu is threatened by predation, storm-related events, and direct disturbance of nesting and feeding areas, such as quad bikes on the beach, jet-skis on the water, and other potentially disruptive recreational use by people (Hansen 2005; Williams 2006; Richard Parrish pers. comm.). This species formerly bred at Ruakaka River Estuary (Q07/130), with the last breeding record from 1985 (Parrish and Honnor 1997).

White heron *Egretta alba modesta* (Nationally Critical)

Indigenous

White heron inhabits freshwater wetlands and estuaries, and breeds only at Okarito, on the west coast of the South Island (Heather & Robertson 1996). There are occasional individual white heron records from the Waipu River Estuary (Q08/228) (one in 1990 – CSN *Notornis* 39; one in 1993 – CSN *Notornis* 41; one in 1995 – Burt *et al.* 1995; and another in 1995 CSN *Notornis* 43) and from the Ruakaka River Estuary (Q07/130) (one in 1995 – CSN *Notornis* 43).

Australasian bittern *Botaurus poiciloptilus* (Nationally Critical)

Indigenous

Australasian bitterns mainly inhabit freshwater wetlands, but may utilise estuarine wetlands in autumn and winter (Heather & Robertson 1996). Within Waipu ED, all records of this species are from the freshwater and estuarine wetlands on the north-east coast between Waipu and Whangarei Harbour. Australasian bitterns are recorded regularly from Doctor's Hill Road Wetland (Q07/127), McEwan Road Wetland (Q07/131), Northland Port Corporation Ponds (Q07/164), Semenoff sand supply ponds within the Ruakaka Dunelands (Q07/128), Ruakaka Racecourse Dune Lake (Q07/129), Ruakaka River Estuary (Q07/130), and Blacksmith's Creek Estuary (Q07/144), and were first recorded at Sime Road Wetland (Q07/141) during this survey. They are likely to breed only in the larger freshwater wetlands in Waipu ED, and utilise a wider range of wetlands for feeding.

New Zealand shore plover *Thinorntis novaeseelandiae* (Nationally Critical)

Endemic

New Zealand shore plover is a rare wader species which became extinct on mainland New Zealand in the late 1700s/early 1800s with the arrival of Norway rats and feral cats, surviving only on two predator-free islands in the Chathams. Since 1994 it has been twice released on Motuora Island (Hauraki Gulf), and several individuals have appeared on the east coast of Northland. There was one record (possibly two) from Waipu River Estuary (Q08/228) by Lorna Simpkin of OSNZ in the late 1990s (Richard Parrish pers. comm.).

North Island kaka *Nestor meridionalis septentrionalis* (Nationally Endangered)

Endemic

North Island kaka have been recorded as occasional visitors to the Brynderwyn Hills (Q08/225e) in 1989, from forest remnants on Bream Tail Coastal Headland (R08/001) in 1993, in the Flyger Road area (near Q07/125) in 1994, near Ruakaka Forest (Q07/121) in the early 2000s, and in recent years in the Marunui Queen Elizabeth II Open Space Covenant in the southeastern Brynderwyn Hills (Q08/225h). This species is resident on larger offshore islands off the eastern coast of Northland and Auckland, and birds often wander to mainland areas (Heather & Robertson 1996).

Reef heron *Egretta sacra sacra* (Nationally Vulnerable)

Indigenous

This species occurs in very low numbers in Waipu ED, probably because of limited habitat. The nearest substantial concentration, of at least 20 birds, is along the rocky, northern shores of Whangarei Harbour. Reef herons have been recorded in ones and twos from the Ruakaka and Waipu River Estuaries (Q07/130, Q08/228), and there are recent unconfirmed reports of breeding at or near the Ruakaka River Estuary (Q07/130) (Margaret Hick pers. comm.). Confirmed nesting pairs are present on three Whangarei Harbour islands very near to Waipu ED ("McDonald's" Island (one pair), Motukaroro Island (three or possibly four pairs) and Calliope Island (possibly up to three pairs) (Richard Parrish pers. comm., Wildland Consultants 2005).

Bush falcon *Falco novaeseelandiae* (Nationally Vulnerable)

Endemic

The nearest breeding population of bush falcon to Waipu ED is in the Coromandel Range. Juveniles disperse widely in the autumn and winter (Heather & Robertson 1996) and these young birds may account for sightings of this species in Northland. Within Waipu ED, there is an unconfirmed report of bush falcon from the Brynderwyn Hills Forest Complex - Part G (Q08/225g).

Caspian tern *Sterna caspia* (Nationally Vulnerable)

Indigenous

Knight Point, on the southern shores of Whangarei Harbour, to the north of Waipu ED, and Mangawhai Harbour to the south of Waipu ED, are important breeding sites for this species. Caspian terns have been recorded from the

coastal sites in Waipu ED including the Ruakaka River Estuary (Q07/130) (a maximum of 12 birds in 2002, CSN *Notornis* 50), the Waipu River Estuary (Q08/228) (a maximum of 13 birds in 2001, CSN *Notornis* 49), and the coastline between Bream Tail Coastal Headland (R08/001) and Whangarei Harbour.

Wrybill *Anarhynchus frontalis* (Nationally Vulnerable)

Endemic

This species nests on South Island braided rivers but migrates to feeding grounds in northern New Zealand during for the autumn and winter months (Dowding and Moore 2006). Within Waipu ED, wrybills have been recorded from the Ruakaka River Estuary (Q07/130) (a maximum of two birds in 1999, CSN *Notornis* 47) and the Waipu River Estuary (Q08/228) (a maximum of 12 birds in 1999, CSN *Notornis* 47). The Takahiwai tidal flats, adjacent to the northern boundary of Waipu ED are a key feeding area for wrybill that overwinter in the Whangarei Harbour area (Pierce 2005). The Whangarei Harbour supports a wintering population of up to 150 birds each year (3% of the national population) (Parrish 1984, Richard Parrish pers. comm.).

Northern New Zealand dotterel *Charadrius obscurus aquilonius* (Nationally Vulnerable)

Endemic

This species has an estimated population of 1700 birds, 48% of which are in Northland (Dowding & Moore 2006). Sandy beaches, sandspits, shellbanks, sand bars, and low dunes are favoured breeding sites (Heather & Robertson 1996), and the Waipu River Estuary and Sandspit (Q08/228) is a key breeding site for the species with 14–17 pairs (Dowding & Moore 2006; CSN *Notornis* 41). An average of six pairs of northern New Zealand dotterel currently breed at the Ruakaka River Estuary (Q07/130) (Richard Parrish pers. comm.), and the species formerly bred on the margins of the Semenoff Sand Supplies ponds within the Ruakaka Dunelands (Q07/128). Breeding no longer occurs at these ponds, presumably due to recent vegetation clearance and disturbance (John Kendrick pers. comm.). Both Ruakaka and Waipu River Estuaries are major post-breeding and wintering sites for this species, with up to 51 birds present at Waipu River Estuary. Whangarei Harbour to the north and Mangawhai Harbour to the south are also very important breeding and feeding areas for this species, with the four areas holding in excess of 10% of the national population (Richard Parrish pers. comm.).

CHRONICALLY THREATENED

Grey duck *Anas superciliosa superciliosa* (Serious Decline)

Indigenous

This species was recorded from lakes, ponds, estuaries, and slow-flowing rivers throughout Waipu ED in the 1970s and early 1980s (Q07/115, Q07/126, Q07/127, Q07/129, Q08/220, Q08/228). Sites with recent records are relatively few: Ruakaka River Estuary (Q08/130) in 1991, Ruakaka River Forest Remnants (Q07/119) in 1993, Piroa Stream in the southern Brynderwyn Hills (Q08/225a) in 2006, and Ruakaka Racecourse Dune Lake (Q07/129) in 2007. Grey ducks have not been recently recorded at several of the sites where they were formerly present, for example Waipu River Estuary (Q08/228), Mountfield Road

Wetland (Q07/126) and Doctor's Hill Road Wetland (Q07/127). Introgressive hybridisation and competition with the introduced mallard, along with habitat loss, are key reasons for the decline of this species (Heather & Robertson 1996).

North Island brown kiwi *Apteryx mantelli* (Serious Decline)

Endemic

Prior to the late 1970s, brown kiwi were widespread throughout the larger forest remnants of Waipu ED, including the Brynderwyn Hills,* Mareretu Forest (Q08/220), and Ruakaka Forest (Q07/121) (Miller & Pierce 1995), and North River Forest (Q07/117) (SSBI Q07/R07/H059). An assessment of North Island brown kiwi distribution and abundance in 1992 detected no kiwi in southeastern Northland, and kiwi are now probably locally extinct in Waipu ED, with now only occasional unconfirmed records of birds being heard. Local extinction can be attributed to habitat loss, and particularly to uncontrolled predation by introduced mammalian predators. During the 1970s and early 1980s there was large-scale land clearance throughout Northland (encouraged by government-subsidised rural bank land clearance loans), which, combined with intense dog predation and the release of ferrets into the wild after the 'fitch' farming industry failed in the 1980s, may have contributed to the dramatic decline of kiwi during that period (Peter Anderson, DOC, pers. comm.).

Banded dotterel *Charadrius bicinctus bicinctus* (Gradual Decline)

Endemic

The total population of banded dotterels has been recently estimated at 50,000 birds (Dowding & Moore 2006). Whangarei Harbour, on the northern edge of Waipu ED, is an important wintering site nationally for banded dotterels, most of which originate from breeding grounds in Marlborough and the southern and central North Island (Pierce 1999). The Takahiwai tidal flats, adjacent to the northern boundary of Waipu ED, are estimated to support 65% of the wintering banded dotterel population in Whangarei Harbour (Wildland Consultants 2005). Within Waipu ED, banded dotterels are regularly present in the Ruakaka River Estuary (Q07/130) (a maximum of 27 birds in 1990, CSN *Notornis* 38) and the Waipu River Estuary (Q08/228) (a maximum of 35 birds in 1997, Audrey Williams and Richard Parrish pers. comm.).

Long-tailed cuckoo *Eudynamys taitensis* (Gradual Decline)

Breeding endemic

This species has been recorded once within Waipu ED, flying over the Brynderwyn Hills Forest Complex - Part G (Q08/225g) in 1992. Long-tailed cuckoo breed only in New Zealand, and in the North Island they parasitise the nests of whiteheads (*Moboua albicilla*). Whiteheads are now absent from Northland, therefore records in this area are likely to be of birds migrating to their wintering grounds in the tropical Pacific (Heather & Robertson 1996). Long-tailed cuckoo typically pass north through Northland in February-early

* The last known brown kiwi in the Brynderwyn Hills was killed by a pig dog in 1966 (Peter Anderson, DOC, pers. comm.)

March (Ray Pierce pers. comm.). The decline of this species follows the decline of its host species, and is possibly further contributed to by the loss of its rainforest habitat on tropical Pacific islands (Heather & Robertson 1996).

Northern little blue penguin *Eudyptula minor tredalet* (Gradual Decline)

Endemic

The nearest significant breeding colonies of this species to Waipu ED are on islands off the eastern coast of Northland and in the Hauraki Gulf. Small numbers of northern little blue penguins still breed on Motukaroro Island and probably elsewhere in Whangarei Harbour to the north of Waipu ED. In addition, birds (particularly young of the year) frequently wash up on Bream Bay beaches following severe storms when many are left exhausted and starving (Richard Parrish pers. comm.). Northern little blue penguins were seen on beaches in the southern Waipu ED in the 1990s, including Bream Tail and Waipu Cove, and some residents still report them in the Lang's Beach area (Ray Pierce pers. comm.). This species nests in burrows or natural cavities and is prone to predation by introduced mammalian predators such as dogs, cats, and mustelids. Extreme fluctuations in numbers can also occur, and have been attributed to food shortages or biotoxins (Heather & Robertson 1996).

Kukupa *Hemiphaga novaeseelandiae* (Gradual Decline)

Endemic

Kukupa are threatened by illegal hunting of adult birds, competition for fruit from possums, and the predation of eggs and chicks by rats, stoats, and possums (Heather & Robertson 1996). This species occurs in small numbers throughout Waipu ED and individuals will usually travel between several forest remnants to utilise seasonally available food resources. Kukupa are generally resident in larger indigenous forest tracts that include areas of mixed podocarp-broadleaf forest, but have also been recorded in many small forest remnants.

Red-billed gull *Larus novaehollandiae scopulinus* (Gradual Decline)

Endemic subspecies

Red-billed gull is listed as chronically threatened (Gradual Decline) because of a decline in numbers at its three largest colonies. This species appears to be common and widespread on the coast of Waipu ED with records from the Ruakaka and Waipu River Estuaries (Q07/130, Q08/228), Ruakaka Racecourse Dune Lake (Q07/129), Lang's Beach (Q08/230) and the coast of Bream Tail (R08/001). It breeds every year at Whangarei Harbour (up to 1000 pairs), and in most years at Mangawhai Harbour (up to 100 pairs) (Richard Parrish pers. comm.).

White-fronted tern *Sterna striata striata* (Gradual Decline)

Indigenous

White-fronted terns breed on islands in Whangarei Harbour and a total of 1,200 birds were seen during a survey of the harbour in 2005 (Wildland Consultants 2005). Major breeding concentrations can occur at Mangawhai Harbour to the south (a maximum of 1,098 nests recorded in 2000/2001 (CSN *Notornis* 49). Within Waipu ED, this species frequents the Ruakaka River Estuary (Q08/130)

and breeds occasionally on the Waipu River Estuary and Sandspit (Q08/228), e.g. c.30 pairs recorded in 2002/2003 (CSN *Notornis* 50).

AT RISK

North Island fernbird *Bowdleria punctata vealeae* (Sparse)

Endemic subspecies

Fernbirds were present in mangrove and saltmarsh habitat in the Takahiwai Stream Estuary (Q07/143) in 1979/1980 (Parrish 1984) and in the Ruakaka River Estuary (Q07/130) in 1991 (SSBI Q07/H051), although the latter population disappeared following a fire that destroyed fernbird habitat in the early 1990s (Peter Anderson, DOC, pers. comm.). There are no recent records from the Ruakaka River Estuary (Wildland Consultants 2004a; Richard Parrish pers. comm.), but birds have been reported recently from Takahiwai, and it is likely that mangroves in the Takahiwai-Mangapai River area are used as a dispersal corridor (Wildland Consultants 2005).

Brown skua *Catharacta antarctica lonnbergi* (Sparse)

Indigenous

The brown skua is a subantarctic and Antarctic breeder, nesting from the Stewart Island region and Chatham Islands south. This species is an occasional winter visitor to the entrance of Whangarei Harbour (Ray Pierce pers. comm.).

Banded rail *Gallirallus philippensis assimilis* (Sparse)

Indigenous

Banded rails are still widespread within Whangarei Harbour, on the northern boundary of Waipu ED (Parrish 1984, Pierce 2005), and have a preference for areas of mangrove that grade into saltmarsh. Estuarine vegetation in the Takahiwai area, including the Takahiwai Stream Estuary (Q07/143), has an important banded rail population, and banded rails are also known to occur in the Blacksmith's Creek Estuary area (Q07/144) (Parrish 1984). Further south, banded rails may breed in the Ruakaka River Estuary (Q07/130) (Wildland Consultants 2004a), although their numbers have greatly declined since a 1979/1980 survey of the estuary (Richard Parrish pers. comm.). In the Waipu River Estuary (Q08/228) only two individuals have been recorded since 1992 (CSN *Notornis* 41; CSN *Notornis* 47). Banded rails were formerly present at the Waipu Caves Road Wetland (Q07/123) in 1978, but are now likely to be absent or very rare in freshwater wetlands in Waipu ED.

Black shag *Phalacrocorax carbo novaehollandiae* (Sparse)

Indigenous

Black shags have been recorded at only five sites in Waipu ED. The species was seen at the Northland Port Corporation Ponds (Q07/164) and the Ruakaka Racecourse Dune Lake (Q07/129) during the current survey, and has previously been recorded at the Ruakaka River and Waipu River Estuaries (Q07/130, Q08/228) and the Ruakaka River Forest Remnants (Q07/119).

New Zealand dabchick *Poliocephalus rufpectus* (Sparse)

Endemic

New Zealand dabchick is well distributed on lakes and ponds in the North Island, and was formerly present in the South Island, but died out there in the

nineteenth century due to unknown causes (Heather & Robertson 1996). There are three recent records of New Zealand dabchick in Waipu ED, both from constructed water bodies (Semenoff Sand Supplies Ltd ponds in 2004 and 2007 (Ray Pierce pers. comm.), and recently on a farm dam beside Ormiston Road (in Q07/120) (John Kendrick pers. comm.)).

Spotless crane *Porzana tabuensis plumbea* (Sparse)

Indigenous

Spotless cranes have been recorded at five wetlands in Waipu ED, but are probably now absent from some of these sites. A spotless crane was confirmed present at Ruakaka Racecourse Dune Lake (Q07/129) in 2007 (Ray Pierce pers. comm.), and there is also a recent record from the Ruakaka River Estuary (Q07/130) nearby (Wildland Consultants 2004a). One bird was recorded in reed sweetgrass and raupo at Doctor's Hill Road Wetland (Q07/127) during the current survey. The species was present in Mountfield Road Wetland (Q07/123) and Waipu Caves Road Wetland (Q07/126) in 1978, however a tape of spotless crane was played at these sites several times during the current survey with no response. These wetlands appear to have been severely reduced in extent and this may explain why spotless cranes were not detected.

Little black shag *Phalacrocorax sulcirostris* (Range Restricted)

Indigenous

Little black shag breeds mainly in freshwater wetlands at selected sites throughout the North Island, with many birds moving to coastal areas in Northland and Auckland in the autumn (Heather & Robertson 1996). Small groups of little black shag are often seen feeding in the Waipu River (Ray Pierce pers. comm.; CSN *Notornis* 38). Flocks are present in Whangarei Harbour every winter and can number in excess of 100 birds (Richard Parrish pers. comm.).

Red-tailed tropicbird *Phaethon rubricuda* (Range Restricted)

Indigenous

The red-tailed tropicbird is widely distributed in the Indian and Pacific Oceans, but, within the New Zealand region, breeds only on the Kermadec Islands. Birds are most often seen in summer off the coast of Northland and in the Hauraki Gulf, or are found beach-wrecked on the coast of northern and western North Island. One live bird was collected, cared for and released in Bream Bay in 1989 (Richard Parrish pers. comm.). A dead red-tailed tropicbird was found on Uretiti Beach in September 2006 (John Kendrick pers. comm.).

NON-RESIDENT NATIVE

Turnstone *Arenaria interpres* (Migrant)

Indigenous

Turnstone is a transequatorial migrant wader species with approximately 5000–7000 individuals arriving in New Zealand each year (Dowding and Moore 2006). This species was recorded at the Ruakaka River Estuary (Q07/130) in 1978, and is a regular visitor in low numbers to the Waipu River Estuary and Sandspit Q08/228) (Katrina Hansen pers. comm. 2005). A maximum of 49 birds were recorded there in 1992 (CSN *Notornis* 41).

Cattle egret *Bubulcus ibis* (Migrant)

Indigenous

Cattle egrets were first recorded in New Zealand in 1963, and since then have been an increasingly common winter visitor. Birds arrive in April-May, probably from Australia, and return in October-November. Some juveniles remain for the summer months (Heather & Robertson 1996). Cattle egrets favour farmland and open habitats, often accompanying livestock (Heather & Robertson 1996). Within Waipu ED, birds have frequently been seen on paddocks adjacent to the Waipu River (CSN *Notornis* 45; CSN *Notornis* 49; Richard Parrish pers. comm.) and four birds were seen feeding alongside cattle near Oakleigh in the western part of Waipu ED in July 2005 (John Kendrick pers. comm.).

Sharp-tailed sandpiper *Calidrus acuminata* (Migrant)

Indigenous

Sharp-tailed sandpipers breed in northeastern Siberia and 50-200 birds visit New Zealand each summer (Heather & Robertson 1996), being occasional visitors to Waipu River Estuary and Sandspit (Q08/228) (Katrina Hansen pers. comm. 2005).

Lesser knot *Calidris canutus* (Migrant)

Indigenous

Lesser knot is the second most common transequatorial migrant wader species that reaches New Zealand with approximately 50 000–70 000 birds arriving each year (Dowding & Moore 2006). The intertidal areas of Whangarei Harbour are important feeding grounds (with up to c. 6500 birds in 1993, CSN *Notornis* 42), and this species also uses the Ruakaka River Estuary (Q07/130) (the usual number of birds in summer is c. 200–300 but will on occasions reach 500, Richard Parrish pers. comm.) and the Waipu River Estuary (Q08/228) with up to 260 birds recorded in 1989 (CSN *Notornis* 38).

Curlew sandpiper *Calidris ferruginea* (Migrant)

Indigenous

The curlew sandpiper is an Arctic-breeding wader species which winters in Africa, southern Asia, and Australasia, with flocks of up to 10–50 birds recorded in various New Zealand harbours (Heather & Robertson 1996). Two birds were seen at Waipu River Estuary (Q08/228) in 1994 (CSN *Notornis* 43).

Pectoral sandpiper *Calidris melanotos* (Migrant)

Indigenous

The pectoral sandpiper is an Arctic-breeding wader species which mainly winters in South America, but a few birds also migrate to southeastern Asia, small islands in the Pacific, Australia, and New Zealand (Heather & Robertson 1996). One pectoral sandpiper was seen at Waipu River Estuary (Q08/228) in 1992 (CSN *Notornis* 41).

Red-necked stint *Calidrus ruftollis* (Migrant)

Indigenous

Red-necked stint is a transequatorial migrant wader species with approximately 150–200 birds arriving in New Zealand each year (Dowding & Moore 2006). It is infrequently recorded at the Waipu River Estuary and Sandspit (Q08/228) and

has been seen once at Ruakaka River Estuary (Q08/130) in 1980 (Richard Parrish pers. comm.).

White-winged black tern *Chlidonias leucopterus* (Migrant)

Indigenous

The white-winged black tern breeds in the northern hemisphere and migrates to winter in tropical Africa, southeastern Asia, and Australasia, with usually fewer than ten reaching New Zealand each year (Heather & Robertson 1996). One bird was seen at Ruakaka River Estuary (Q07/130) in 1998/1999 (CSN *Notornis* 47).

Hudsonian godwit *Limosa haemastica* (Migrant)

Indigenous

The Hudsonian godwit breeds in North America and overwinters in South America but a few birds are recorded on New Zealand estuaries and lagoons each year (Heather & Robertson 1996). Hudsonian godwit is an occasional visitor to the Waipu River Estuary and Sandspit (Q08/228) (Katrina Hansen pers. comm. 2005), and there is one 1999 record from Ruakaka River Estuary (Q07/130) (CSN *Notornis* 47).

Bar-tailed godwit *Limosa lapponica* (Migrant)

Indigenous

Bar-tailed godwit is the most common transequatorial migrant wader species that reaches New Zealand, with approximately 85 000–105 000 arriving each year (Dowding & Moore 2006). Within Waipu ED, this species is frequently recorded from the Ruakaka River Estuary (Q07/130) where around 150 individuals feed and roost most summers (Richard Parrish pers. comm.). Up to c. 3000 birds were recorded in the Ruakaka estuary in March 2001 (CSN *Notornis* 49), although this high number has been attributed to birds from Whangarei Harbour which left there after nests were inundated by king tides. Waipu River Estuary (Q08/228) is also a wintering site for this species with 1–150 birds present every summer (Richard Parrish pers. comm.), and a recorded maximum of 153 birds in 1989 (CSN *Notornis* 38).

Eastern curlew *Numenius madagascariensis* (Migrant)

Indigenous

Eastern curlew breeds in northeastern Asia and 20–50 birds visit New Zealand each year (Heather & Robertson 1996). Single birds are occasionally recorded at Ruakaka River Estuary (Q07/130) and at Waipu River Estuary (Q08/228) (Katrina Hansen pers. comm.; Richard Parrish pers. comm.).

Whimbrel *Numenius phaeopus* (Migrant)

Indigenous

The whimbrel is a transequatorial migrant wader that breeds in the lower Arctic and overwinters in tropical regions and the temperate Southern Hemisphere. Most of the 100–200 birds that arrive each year are the Asiatic subspecies (*Numenius phaeopus variegata*). Small flocks of 10–30 birds regularly visit larger harbours such as Whangarei Harbour, on the northern boundary of Waipu ED, and smaller groups have been recorded from estuaries throughout New Zealand (Heather & Robertson 1996). Within Waipu ED, whimbrels were recorded once in the Waipu River Estuary (Q08/228) in the 1990s (Ray Pierce pers. comm.).

Pacific golden plover *Pluvialis fulva* (Migrant)

Indigenous

Pacific golden plover is a transequatorial migrant wader species with approximately 600–1200 birds visiting New Zealand annually (Dowding and Moore 2006). This species is an occasional visitor to the Waipu River Estuary and Sandspit (Q08/228) (Katrina Hansen pers. comm. 2005). It is a regular visitor to the intertidal flats at Takahiwai, Whangarei Harbour (north of Waipu ED boundary), with a maximum of 100 birds arriving per year (Richard Parrish pers. comm.).

Arctic skua *Stercorarius parasiticus* (Migrant)

Indigenous

Arctic skua is an occasional visitor to Waipu ED, and has been recorded from the Waipu River Estuary and Sandspit (Q08/228) (Katrina Hansen pers. comm. 2005). It is frequently seen within the entrance to Whangarei Harbour, just to the north of Waipu ED (Richard Parrish pers. comm.). This species visits New Zealand waters on the way from its breeding grounds in the Arctic and sub-Arctic to its wintering grounds in the southern hemisphere (Heather & Robertson 1996).

Pomarine skua *Stercorarius pomarinus* (Migrant)

Indigenous

Pomarine skua is an occasional visitor to Waipu ED, and has been recorded from the Waipu River Estuary and Sandspit (Q08/228) (Katrina Hansen pers. comm. 2005). This species is an uncommon but regular visitor to New Zealand waters on the way from its breeding grounds in the Arctic and sub-Arctic to its wintering grounds in the southern hemisphere (Heather & Robertson 1996).

Little tern *Sterna albifrons* (Migrant)

Indigenous

Little tern breeds worldwide, but about 150–200 birds of the Asian subspecies (*Sterna albifrons sinensis*), which breeds in Australia, China, Japan, Korea, and southeastern Asia, migrate to New Zealand during the northern winter (Heather & Robertson 1996). One bird was seen at Waipu River Estuary (Q08/228) in 2001 (CSN *Notornis* 49). Their foods and feeding behaviour are similar to the New Zealand fairy tern (which breeds at Waipu River Estuary), except little terns chatter while hovering to feed (Heather & Robertson 1996).

Terek sandpiper *Tringa flavipes* (Migrant)

Indigenous

Terek sandpipers breed in northern Europe and Asia and are a 'scarce but annual visitor to New Zealand' (Heather & Robertson 1996). One bird was seen feeding at low tide at the Waipu River Estuary and Sandspit (Q08/228) in March 2005 (John Kendrick pers. comm.).

Common sandpiper *Tringa hypoleucos* (Vagrant)

Vagrant

Common sandpipers breed in the northern hemisphere and overwinter in the southern hemisphere from Africa to Australasia, occasionally straying to New Zealand. There have been fewer than 20 sightings since they were first recorded

in 1964 (Heather & Robertson 1996). One common sandpiper was seen at Ruakaka in 1980 (Richard Parrish pers. comm.).

Greenshank *Tringa nebularia* (Vagrant)

Vagrant

Greenshanks breed in the northern hemisphere and overwinter in the southern hemisphere from Africa to Australasia, occasionally straying to New Zealand, with singles or parties of up to four reported (Heather & Robertson 1996). One greenshank was seen at Waipu River Estuary (Q08/228) in 2001 during a banded dotterel census (Richard Parrish pers. comm.).

Western sandpiper *Calidris mauri**

Vagrant

Western sandpipers breed in Siberia and Alaska, and overwinter in coastal California, Mexico, Central America, and northern South America, rarely appearing in New Zealand (five records at publication of Heather & Robertson (1996)). One western sandpiper was seen at Waipu River Estuary (Q08/228) in 1999 (CSN *Notornis* 47).

White-tailed tropicbird *Phaethon lepterus**

Vagrant

The white-tailed tropicbird breeds on tropical islands in the Atlantic, Indian, and western Pacific Oceans, but otherwise remains at sea when not breeding. They are rare vagrants to New Zealand waters, possibly blown south by cyclones, and usually beach-wrecked on Northland coasts (Heather & Robertson 1996). One bird was brought in to DOC from Bream Bay in the late 1990s/early 2000s and was cared for and released (Richard Parrish pers. comm.).

3.4.3 Regionally significant bird species

The following species are included in a draft list of regionally significant species prepared by the Northland Conservancy (DOC, in prep.).

Grey teal *Anas gracilis*

Indigenous

Grey teal are found on lowland lakes and estuaries throughout North and South Island (Heather & Robertson 1996). This species has been recorded within Waipu ED in low numbers in wetlands around the Ruakaka River Estuary (Q07/130) and in flocks of up to 68 birds on the Northland Port Corporation Ponds (Q07/164) (Beauchamp & Parrish 1999).

Australasian shoveler *Anas rhynchos*

Indigenous

This species has two subspecies, one of which breeds in Australia (*Anas rhynchos rhynchos*) and the other which breeds in New Zealand (*Anas rhynchos variegata*, also known as New Zealand shoveler). They occur throughout New Zealand, preferring lakes, shallow wetlands and ponds, usually

* A vagrant not classified by Hitchmough *et al.* (2007).

away from cities (Heather & Robertson 1996). Habitat loss has led to a decline in abundance in Northland, hence they are regarded as regionally significant (Wendy Holland pers. comm.). Within Waipu ED Australasian shoveler has been recorded at Waipu River Estuary and Sandspit (Q08/228) in 1997, and from Ruakaka Racecourse Dune Lake (Q07/129) in 2007.

Bellbird *Anthornis melanura melanura*

Endemic

Within Waipu ED, bellbirds are occasionally seen in the southern Brynderwyn Hills (Q08/225h). Bellbirds were formerly widespread throughout New Zealand but became locally extinct on the mainland north of the Waikato in the 1860s (Heather & Robertson 1996). Previously it was thought that females were unable to reach the mainland in sufficient numbers from offshore islands, e.g. Hen and Chicken Islands (Heather & Robertson 1996). However, pest control at Bream Head (Manaia ED) in recent times has resulted in successful breeding there and increased bellbird sightings away from the control site (Ray Pierce pers. comm.).

New Zealand scaup *Aythya novaeseelandiae*

Endemic

NZ scaup are widespread in New Zealand, but have a patchy distribution. In Northland they mostly occur on dune lakes (Heather & Robertson 1996), and they are uncommon due to loss of habitat (Wendy Holland pers. comm.). Within Waipu ED one was observed at the Ruakaka Racecourse Dune Lake (Q07/129) in March 2007 (Ray Pierce pers. comm.).

Red-crowned kakariki *Cyanoramphus novaezelandiae novaezelandiae*

Endemic

Red-crowned kakariki have secure and thriving populations on predator-free islands, but are rare on the mainland. This species visits the eastern coast of Northland from nearby islands (Heather & Robertson 1996). Red-crowned kakariki were seen in the forest remnants of Bream Tail Coastal Headland (R08/001) in 1993, and are occasional visitors to forest remnants on the southern side of the Brynderwyn Hills (Q08/225h).

Variable oystercatcher *Haematopus unicolor*

Endemic

Variable oystercatcher is a coastal species with its stronghold in the northern North Island. The total population is currently estimated at c. 4500 birds, and the Waipu and Ruakaka River Estuaries (Q07/130, Q08/228) are wintering and breeding sites of considerable importance, with up to 25 pairs breeding at Ruakaka and 39 pairs breeding at Waipu. Post-breeding flocks can number 200 birds or more on each estuary (Richard Parrish pers. comm.). The species is currently increasing in numbers, and appears to be benefiting from predator control carried out to protect fairy tern and northern NZ dotterel (Beauchamp & Parrish in press; Dowding & Moore 2006). Current management of variable oystercatcher nesting areas on the coast of Waipu ED includes fencing of nests to reduce human disturbance, and control of mustelids, cats, rats, and hedgehogs (Hansen 2005).

North Island tomtit *Petroica macrocephala toitoti*

Endemic

North Island tomtit declined throughout New Zealand after lowland forest clearance and the introduction of predatory mammals, but was able to adapt to these changes in many parts of the country and persisted in forest remnants (Heather & Robertson 2000). Within Waipu ED, tomtits are most frequently seen in the Brynderwyn Hills Forest Complex (Q08/225) to the east of State Highway 1, where indigenous forest cover is more extensive. Birds are reportedly resident and increasing in numbers in the Marunui Queen Elizabeth II Open Space Covenant within the south-eastern Brynderwyn Hills (Q08/225h). Further north in the ED, tomtits have been reported from Mareretu Forest (Q08/220) in 2001, Ruakaka Forest (Q07/121) in 1992, and Takahiwai Forest (Q07/124) in 1978.

Grey-faced petrel *Pterodroma macroptera*

Endemic

Grey-faced petrel is the most common petrel species breeding in the New Zealand region (Heather & Robertson 1996). The main grey-faced petrel breeding colonies are on offshore islands off the upper North Island (with one colony on Taranga Island, just outside Waipu ED), and the few remaining mainland colonies are restricted to headlands and clifftops, due to declines inflicted by rats, cats, dogs, mustelids, and humans (Heather & Robertson 1996). Within Waipu ED, the steep coastal face of Bream Tail Coastal Headland (R08/001) is a probable nesting area (Andrea Booth pers. comm. 2006). However it is not known how many birds nest here, or if the colony is still present. A grey-faced petrel breeding colony is present on Sentinel Rock, Mangawhai, immediately south of Waipu ED (Cameron & Taylor 1997).

Australasian little grebe *Tachybaptus novaehollandiae novaehollandiae*

Indigenous

Australasian little grebe self-introduced from Australia in the 1960s and 1970s and inhabits ponds and lakes in the northern North Island. The total New Zealand population was c. 50 birds in 1995 (Heather & Robertson 1996) and may now be as high as 100–200 birds (Ray Pierce pers. comm.). In Waipu ED, Australasian little grebes were first recorded at the Semenoff Sand Supplies ponds (Q07/128) in the late 1990s (Richard Parrish pers. comm.), and in 2006 they were recorded at the Ruakaka Racecourse Dune Lake (Q07/129) (Peter Anderson, DOC, pers. comm.), and a farm dam beside Ormiston Road (Q07/120) (John Kendrick pers. comm.).

3.4.4 Threatened mammal species

There have been recent, unconfirmed reports of bats from the southeastern Brynderwyn Hills (Q08/225h), but there are no confirmed records of either of New Zealand's endemic bat genera in Waipu ED. If the animals were correctly identified as bats, they were most likely to be the North Island long-tailed bat (*Chalinolobus tuberculata*, Nationally Vulnerable). This species has been recently recorded from the adjacent Rodney ED, and occurs throughout larger

forested areas of North Island. The northern short-tailed bat (*Mystacina tuberculata aoupourica*, Nationally Endangered) is now only known from Puketi/Omahuta, Warawara, and Little Barrier Island. Both of these bats would have been present in Waipu ED before mammalian predators became abundant and major human-mediated habitat loss occurred (Molloy 1995).

ACUTELY THREATENED

Southern elephant seal *Mitrounga leonina* (Nationally Critical)

Indigenous

Southern elephant seals are circumpolar in distribution, and haul out to breed near the southern tip of South America and on subantarctic islands of the Atlantic, Indian, and Pacific Oceans. Within New Zealand their main breeding colonies are on Antipodes Island and Campbell Island, where there have been huge population reductions (Taylor & Taylor 1989). Southern elephant seals occasionally haul out on sand or gravel beaches to moult and rest (King (ed.) 1990). An elephant seal hauled out on the beach at Waipu Cove in January 1996 during the national beach volleyball championship (Richard Parrish pers. comm.).

NON-RESIDENT NATIVE

Leopard seal *Hydrurga leptonyx* (Migrant)

Indigenous

The leopard seal also has a circumpolar distribution, being present throughout the pack ice and southwards to the Antarctic continent. Those seen in Northland are vagrant individuals (King 1990). A leopard seal was seen at Marsden Spit, Whangarei Harbour, in early 1990s. It had been snagged by a net and was resting (Richard Parrish pers. comm.).

3.4.5 Threatened land snail species

Several threatened species of land snail occur in remnants of indigenous vegetation throughout Waipu ED. The larger, least modified forest remnants appear to support the greatest diversity, but smaller forest and shrubland remnants can provide important habitat.

ACUTELY THREATENED

Punctidae sp. 64 (Nationally Endangered)

Endemic

This species is endemic to eastern Northland, where it is present in areas of indigenous forest on limestone karst. Four populations are known, one of which, at the Waipu Caves Forest (Q07/118), is within Waipu ED. The historical decline of this species is attributed to forest clearance and habitat modification, and the area now occupied by this species is probably less than 10 ha. Current threats to the Waipu Caves population include predation by rodents and the cellar glass snail, and trampling and browsing by cattle (Brook 2002).

CHRONICALLY THREATENED

***Schizoglossa worthyae* (Gradual Decline)**

Endemic

This species occurs sparsely in conifer-broadleaved forest in the northern North Island and its decline has been attributed to habitat loss, predation by rodents, possums, pigs, and hedgehogs, and trampling and browsing by livestock, as for other land snail species (Brook 2002). In Waipu ED this species has been recorded from the Mareretu Forest (Q08/220) and Waipu Gorge Forest Remnants (Q08/222).

***Amborhyttida dunntae* (Gradual Decline)**

Endemic

This land snail is endemic to Auckland and Northland with a sporadic distribution resulting from extensive habitat destruction. The main threats to the species are predation by mammalian predators and loss or degradation of habitat, especially through browsing and trampling by livestock or land clearance (Brook 2002). Within Waipu ED this species has been recorded at nine sites, including Takahiwai Forest (Q07/124) in 1993, and Brynderwyn Hills Forest Complex - Part G (Q08/225g) in 1992.

Kauri snail *Paryphanta busbyi* (Gradual Decline)

Endemic

The kauri snail is endemic to Northland and north Auckland with a fragmented distribution resulting from the extensive destruction of indigenous vegetation. Predation by pigs, rats, possums, and possibly hedgehogs, and continued loss of habitat are the main threats to the species (Brook 2002). Kauri snails have been recorded from eight areas of forest or shrubland in Waipu ED between 1978 and 2006.

3.4.6 Threatened frog species

Recent records confirm the presence of only one endemic species of frog in Waipu ED. At least three other endemic species of frog are now either extinct or locally extinct within Waipu ED.

AT RISK

Hochstetter's frog *Letopelma hochstetteri* (Sparse)

Endemic

Hochstetter's frog is the most widely distributed endemic frog and is currently found from central Northland to the central North Island. This species is semi-aquatic and is found in or near small, forested streams (Gill & Whitaker 1996). The northernmost limit of Hochstetter's frog is the forest remnants of the central Waipu ED. Hochstetter's frog has been recorded from many of the larger forest remnants between North River and the Brynderwyn Hills but appears to be most abundant in Waipu Gorge Forest Remnants (Q08/222) and the Brynderwyn Hills Forest Complex (Q08/225a, Q08/225b, Q08/225c, Q08/225d), which are considered to be its northern stronghold (Avi Holzapfel pers. comm.). Recent surveys for Hochstetter's frog have raised concerns regarding the effects of cattle, pigs, and goats on frog populations in North River Scenic

Reserve (Q07/117), Mareretu Forest (Q08/220), and in the Brynderwyn Hills Forest Complex – Part A area (Q08/225a) (Parrish 1993a and 1993b).

3.4.7 Threatened lizard species

CHRONICALLY THREATENED

Auckland green gecko *Naultinus elegans elegans* (Gradual Decline)
Endemic

Auckland green gecko is an arboreal species endemic to Auckland and Northland (north to approximately Hokianga Harbour). It has been reported from four sites in eastern and southern Waipu ED. Auckland green geckoes were seen in the Ruakaka Dunelands (Q07/128) in 1992, and were recently found by road-workers clearing vegetation in Waipu Gorge Forest Remnants (Q08/222). The third and fourth records are unconfirmed; a resident near Robert Hastie Memorial Scenic Reserve in the Brynderwyn Hills Forest Complex (Q08/225j) recently reported to DOC that he had seen green lizards climbing through vegetation on his property (Desmond Hetherington pers. comm.), and there are also unconfirmed reports of this species in the vicinity of the Brynderwyn Hills Forest Complex – Part C (Q08/225c).

3.4.8 Threatened fish species

CHRONICALLY THREATENED

Longfin eel *Anguilla dieffenbachii* (Gradual Decline)
Indigenous

Longfin eels have been recorded from many rivers and streams throughout Waipu ED (NIWA 2007). Longfin eels occur throughout New Zealand, but are threatened by over-harvesting (especially of large females) and habitat modification.

AT RISK

Shortjaw kokopu *Galaxias postvectis* (Sparse)
Endemic

Shortjaw kokopu are very uncommon in Waipu ED, with records from two forested tributaries of the Ruakaka River in the 1980s (Q07/121, Q07/124), although DOC now believes that these may have been misidentified (Peter Anderson, DOC, pers. comm.) Shortjaw kokopu are usually found in small streams flowing through unmodified indigenous forest, and extensive forest clearance is likely to have contributed to its current rarity (McDowall 1990). Until recently the distribution of shortjaw kokopu in Northland was poorly understood, however they have recently been recorded from several parts of Northland, with the most recent record (2005) being the Pikiwahine Stream in Tangihua Forest (Tangihua ED) (NIWA 2007).

3.4.9 Regionally significant fish species

Banded kokopu *Galaxias fasciatus*
Endemic

Within Waipu ED, banded kokopu have been recorded from many streams that flow through forested catchments, which is their preferred habitat (McDowall

1990). The young of banded kokopu have considerable climbing ability, and this species can be present considerable distances inland, including above tall waterfalls (McDowall 1990).

Giant bully *Gobtomorphus gobioides*

Endemic

Northland appears to be the stronghold for this species, which has an intermittent distribution throughout New Zealand (McDowall 1990). The species may be more common than records indicate, due to the difficulty of sampling in estuaries, and the lower reaches of rivers and streams, which are its preferred habitats (McDowall 1990). Within Waipu ED, giant bully has been recently recorded from the small streams that enter the southern end of Lang's Beach and Waipu Cove from the Brynderwyn Hills Forest Complex - Part G (Q08/225g).

3.4.10 Threatened arachnid species

CHRONICALLY THREATENED

Black katipo *Latrodectus atratus*

Endemic

The black katipo is a small spider in the world-wide widow spider genus *Latrodectus*. It occurs along the west coast of the North Island down to Oakura (Taranaki), and on the east coast down to Te Kaha (Bay of Plenty), amongst grasses, sedges, herbs, driftwood, and flotsam on sandy beaches (Griffiths 2001). Females are approximately eight times larger than males, and have a poisonous bite (Griffiths 2001). Black katipo females are all black and differ from the closely related red katipo (which does not occur in Northland) only in that they do not have a red stripe bordered in white down the top of the abdomen (both species have a red or brown hour-glass shape underneath the abdomen) (Sutton *et al.* 2006). Mature males are predominantly white with a series of red-orange diamonds running from the thorax to the spinnerets that are bordered by irregular black lines (Sutton *et al.* 2006). There is a dense population of black katipo within the Ruakaka Dunelands site (Q07/128), which is one of the top three populations for this species on the east coast of Northland in terms of density (Griffiths 2000). Populations of black katipo on the east coast are fragmented and sometimes separated by distances in excess of 100 km, therefore this site is highly significant to the species in Northland (Griffiths 2000; Peter Anderson, DOC, pers. comm.). The introduction of exotic sand-binding plants such as marram grass and lupin, and others, along with the reclamation of dune systems for agriculture, forestry and recreational use, deprive katipo of the conditions they need to prosper (Patrick 2002).

3.4.11 Threatened and regionally significant fauna species not recorded recently in the Waipu Ecological District

ACUTELY THREATENED

Pateke/brown teal *Anas chlorotis* (Nationally Endangered)

Endemic

Pateke or brown teal were formerly present in the Waipu River catchment until the 1950s and 1960s and this area retained significant numbers of birds for

much longer than many other areas around Whangarei Harbour and to the south of Waipu township. One count was made in the July 1958 breeding season of 19 birds over c. 8 km of the Waihoihoi Stream and another 58 birds over 100 km of other creeks in the Waipu area (Bell 1959, McKenzie 1971; Parrish & Williams 2001). Introduced mammalian predators have been identified as the current main agents of decline (O'Connor *et al.* 2007). A more recent report of pateke on the Otaika River in 2003 could not be confirmed when visited by DOC staff (Richard Parrish pers. comm.).

North Island weka *Gallirallus australis greyi* (Serious Decline)

Endemic

North Island weka were widespread until the 1920s and 1930s, but mainland populations are now restricted to the east of Opotiki (Bay of Plenty) and the Bay of Islands (where it was reintroduced) (Heather & Robertson 1996). Within Waipu ED there is an old, undated record from the Brynderwyn Hills (Q08/225e). A record of weka in the Brynderwyn Hills (Bull *et al.* 1985), made between September 1969 and December 1979, may be the same sighting. The latest unconfirmed report of weka from the Brynderwyn Hills was in 1986 (Peter Anderson, DOC, pers. comm.). Weka were released into the dunelands of Ruakaka and Waipu during the 1970s, and there were several sightings of birds on sand dunes near Tip Road, Uretiti, until about the early to mid 1980s (Richard Parrish pers. comm.; Peter Anderson, DOC, pers. comm.). There is an unsubstantiated report from c. 2000 of two adults and chicks at Uretiti (Tony Beauchamp pers. comm.).

AT RISK

Marsh crake *Porzana pusilla affinis* (Sparse)

Indigenous

Marsh crakes are possibly now locally extinct in Waipu ED, with one record from the Waipu Caves Road Wetland (Q07/123) in 1978. This wetland has been severely reduced in extent and marsh crake are unlikely to still be present, but this requires confirmation.

3.5 THREATS

There are several ongoing and potential threats to the natural areas of Waipu ED. Most of these threats are shared with all of lowland New Zealand.

Invasive plants

Saltmarshes, freshwater wetlands, dunelands, and shrublands are the worst affected habitat types in terms of weed infestation. Saltwater paspalum forms a component of many saltmarsh, mangrove, and mudflat communities in Waipu ED, and is a serious threat to indigenous estuarine vegetation, in particular through the displacement of indigenous salt meadow species such as arrow grass. Saltwater paspalum also excludes burrowing fauna, reduces access to feeding and roosting sites of shore birds, alters fish spawning and feeding grounds, and changes estuarine hydrology by accumulating sediment (Graeme & Kendal 2001; Shaw & Allen 2003).

The dunelands of Waipu ED are prone to weed invasion due to the low stature and frequent disturbance of the vegetation, mild winter temperatures, and close proximity to residential gardens. Pampas and gorse are dominant over large areas of the dunes at Ruakaka (Q07/128), and in places the duneland vegetation has been replaced by a canopy of maritime pine, radiata pine, Chinese privet, or tree privet. Marram grass, a South African species widely planted for dune stabilisation but now recognized as a threat to coastal dune systems, is of localised distribution within Waipu ED. Other weeds found throughout the dune systems include haretail, South African iceplant, dimorphotheca, lupin, purple groundsel, smilax, and gazania.

Few freshwater wetlands remain in Waipu ED, and most have been heavily modified by weed invasion. Small riparian wetlands alongside streams and rivers are often dominated by crack willow. Dense swards of reed sweetgrass are present in at least two natural wetlands, and this species covers approximately 45% of the Doctor's Hill Road Wetland site (Q07/127). Drier parts throughout wetlands, or wetland margins, are often dominated by pampas or gorse.

There are several relatively common invasive tree species which attain forest canopy height (e.g. radiata pine, maritime pine, crack willow, black wattle, and tree privet), however the main weed threat in forests is in the understorey. Dense growth of exotic species inhibits the growth of indigenous seedlings, and can prevent forest regeneration even when stock are excluded. Smothering weeds (e.g. tradescantia) are particularly prevalent in riparian forest remnants, because periodic flooding and greater light intensities at the edges of the remnant provide suitable habitat (Standish 2002). Flooding also spreads weeds by dispersing plant fragments and seeds.

Shrublands are more readily invaded by invasive plants than forests due to relatively higher light levels reaching the ground. In some shrublands, the indigenous cover and their associated weeds may have established at the same time following the clearance of former vegetation. On inland hills, gorse and black wattle are often present. In coastal areas, invasive plants of shrubland areas include gorse, brush wattle, maritime pine, radiata pine, woolly nightshade (tobacco weed), and pampas. As most of these areas are likely to be gorse shrubland reverting to indigenous shrubland, rather than gorse invading indigenous shrubland, the future vegetation of many exotic-dominant shrublands on hill country is likely to be indigenous or mixed indigenous-exotic forest.

Pest animals

Several mammalian pest animals are present in Waipu ED (Appendix 8.7). Pest control appears to be restricted to high value conservation sites, or is undertaken over relatively small areas by private landowners.

Mustelids, cats, rats, and hedgehogs prey on indigenous birds, lizards and invertebrates, and are a major cause of decline for threatened seabirds. The threat posed by these species is particularly evident on coastal sand dunes and estuary margins on the coast of Waipu ED, which are nationally important breeding sites for threatened seabird species. Management of the acutely threatened New Zealand fairy tern and other threatened seabirds in Waipu ED is focused on control of mustelids, cats, rats, and hedgehogs, and reducing human

disturbance of nests (Hansen 2005). Hedgehogs are particularly abundant in sand dune areas of the Northland coast, due to the abundance of introduced brown snails, an important food source, and few winter frosts (Jones & Sanders 2005). Stoats, ferrets, and weasels are all present in Waipu ED (King 2005), although ferrets only colonized this area in the last 20–40 years (Miller & Pierce 1995). Ferrets had only spread as far north as the eastern Kaipara by the 1960s, but had reached high densities in southern Northland by the early 1990s. Ferrets were likely to have increased in numbers when the ferret or ‘fitch’ farming industry failed in the 1980s and animals were released into the wild by careless owners in the hope that they could be caught again should the industry be revived (Peter Anderson, DOC, pers. comm.). Ferrets were probably the cause, or at least a significant contribution to, the severe decline and probable extinction of kiwi in Waipu ED (Miller & Pierce 1995).

Possums are ‘opportunistic herbivores’ but also eat meat including birds, eggs, and land snails. Within each region they have distinct preferences, and this often results in canopy dieback and loss for some plant species (Cowan 2005). The full effects of possum browse on the biota of Waipu ED are yet to be realised; possums were released in the Auckland region in the 1860s and 1870s, and by 1963 had spread as far north as the Bay of Islands and Hokianga Harbour (Cowan 2005). Thus, in the majority of forest remnants the current canopy comprises tree species that established prior to or at the time of the arrival of brushtail possum. Brushtail possums have been well implicated in the decline of highly palatable species such as northern rata, pohutukawa, tree fuchsia, kohekohe, and titoki, and the establishment of possums in Waipu ED is certainly a key factor in the decline of these species. Highly palatable plant species are now scarce and comprise a minor proportion of possum diet in Waipu ED. Less palatable species are now frequently browsed and these species are predicted to decline. Until relatively recently, the importance role of possums as predators was underestimated; recent research by Innes *et al.* (2004) has clearly demonstrated predation of threatened species such as kukupa by possums, and this decline is further exacerbated by competition for food resources between possums and indigenous species.

Feral goats are not widespread in Waipu ED, with records from North River Forest (Q07/117), Ormiston Road Forest and Shrubland (Q07/135), and Brynderwyn Hills Forest Complex – Part E (Q08/225e). Goats inhibit forest regeneration, particularly where they coexist with stock, and cause the decline or localised extinction of highly palatable species such as mida and tree fuchsia.

Feral pigs browse and uproot vegetation, consume seeds and root material, and prey on large invertebrates such as land snails and earthworms. Pigs probably occur throughout the larger forest remnants of Waipu ED, with recent records from Ruakaka Forest (Q07/121) and the Brynderwyn Hills, where there are extensive plantation forests contiguous with indigenous forest. Populations may be supplemented by illegal releases for hunting purposes, as occurs in other parts of Northland.

Effects of agriculture on natural areas

Grazing and trampling by livestock in natural areas limits regeneration of most indigenous plant species, causes soil compaction, and reduces habitat quality

for indigenous animals. In the long-term, grazing leads to the loss of forest areas by halting forest regeneration. The effects of grazing can be clearly seen throughout Waipu ED; many grazed remnants are characterised by a sparse, species-poor understorey, and are degrading on their edges into indigenous treeland with a groundcover of exotic pasture species. In addition, run-off from pugging and high volumes of urine and faeces from livestock adversely affect water quality, causing eutrophication of waterways, which degrades habitat for indigenous fish and sensitive aquatic macroinvertebrate species (e.g. stoneflies, caddisflies, and mayflies), and has negative downstream effects on estuaries.

Effects of residential dwelling on natural areas

The main threats from residential areas in contact with natural areas are weed invasion through ‘garden escapes’ (horticultural plants which naturalise), dumping of refuse, increased direct disturbance by humans (e.g. trampling of plants and birds’ nests on dunes), and predation by domestic pets (e.g. dogs and cats) on indigenous fauna. Waipu ED is currently undergoing some of the most extensive coastal subdivision and residential development in New Zealand, which intensifies the above-mentioned effects.

Sullivan *et al.* (2005) recently demonstrated a clear link between the number of exotic plant species in remnants and proximity to gardens in coastal Northland. The recent increase in residential developments, particularly in the south-eastern coastal areas of Waipu ED, will see further weed invasion and degradation of remaining indigenous habitats.

Domestic pets, as well as feral animals, can be important factors in the decline of indigenous species. Domestic cats prey on a wide range of indigenous fauna, including birds, lizards, invertebrates, and occasionally frogs (Gillies & Fitzgerald 2005). As residential development increases, particularly in the coastal areas of Waipu ED, the effects of agriculture may lessen, but the types of threats listed here are likely to increase.

Ongoing effects of former land clearance

Former land clearance has led to severe habitat fragmentation throughout Waipu ED. Smaller habitats have a greater ratio of edge to area, and are therefore more vulnerable to a wide range of threats; these processes are often referred to as ‘edge effects’. Edge effects include: (a) increased penetration by invasive weeds and pest animals, (b) more light entering the understorey from the sides, which changes conditions for plant growth and hence vegetation composition, and (c) increased wind in the understorey and consequent drying effects. Some forest remnants are so small and exposed that the edge effects render them ecologically dysfunctional; they are in effect tree museums. They no longer contain palatable species and regeneration is limited by the combined impacts of stock grazing, trampling and infestation by pest animals and plants. In addition, the further away they are from other habitats and seed sources, the less likely it is that regeneration can occur. If regeneration does not occur then trees will not be replaced in the landscape after they mature and die.

Present-day land clearance

In an assessment of recent loss of indigenous cover, Walker *et al.* (2005) ranked the majority of Waipu ED as 'at risk' (based on percent cover of lost habitat and protected areas as of May 2005), and mapped the ED as having a 0.25–1% loss of indigenous cover for the five-year period 1996/97 to 2001/02. While this rate of loss may appear to be low, Walker *et al.* (2005) concluded that Northland, including Waipu ED, is losing indigenous habitats at a higher rate than most of the country, and recent clearance appears to be concentrated in coastal areas, or on marginal hill country. Any amount of further clearance could be considered ecologically damaging. For example, residential subdivision developments near or within natural areas can lead to small-scale clearances for house sites or gardens that may appear to be of little consequence when considered individually, but may collectively contribute to a high level of loss or degradation of habitat.

Intensification of land use can also cause increased isolation of habitat remnants. Whilst clearance of gorse-dominated scrub is an agricultural activity with an assumption of few negative impacts on indigenous biodiversity, the linkages that these habitats can in some instances provide may assist the movement of indigenous fauna across pastoral landscapes. Indigenous forest remnants have recently become isolated by the clearance of gorse in the Helmsdale Road/North River area of Waipu ED. Similarly, pine plantations can act as functional yet temporary linkages between forest remnants, and can support considerable indigenous biodiversity themselves, depending on management. Plantation forest cover can be subject to rapid change in response to economic fluctuations, e.g. grazing of plantations, and the current trend of conversion of plantations to agriculture.

Poaching of kukupa

Kukupa occur sparsely in Waipu ED and are chronically threatened at a national level. It is an offence to kill or harm kukupa, but illegal poaching is likely to occur in Waipu ED from time to time.

Legal protection versus conservation management action

Although several large areas in Waipu ED have some legal protection status and are managed by the Department of Conservation, the Whangarei District Council or the QEII National Trust, these areas will continue to lose indigenous biodiversity without active conservation management. Furthermore, all of the larger protected areas are on steeper topography and many ecological units (particularly those of coastal areas, wetlands, and forest on alluvium) are absent from or under-represented in protected areas. As a bare minimum, the following actions need to be undertaken to protect the immediate and long-term viability of the natural areas:

- Fencing to exclude livestock from remnants of indigenous habitat.
- Reducing the impact of invasive plants through targeted control programmes.
- Regular control of mammalian pests.

- Education of local residents regarding the negative impacts caused by residential developments and how to reduce these impacts, particularly in areas relatively remote from the main urban centres.

A lack of active conservation management, in the face of all the pressures discussed above, is probably the greatest threat to the future viability of the natural areas of Waipu ED. Priority areas for protection are described in Section 5.2 (page 262).

4. Site descriptions

Midpoint grid references are given for all sites. Where more than one remnant exists in a site, the number of remnants is given in brackets after the grid reference.

Vegetation types within ecological units are defined by 'abundant' (species which form > 50% of the canopy) and 'common' (species which form 20–50% of the canopy) species. If there is more than one canopy species, these are listed in descending order of abundance. The percentage cover of ecological units has been included in the site descriptions, however individual ecological units within sites are not mapped. Broad habitat types, (e.g. 'forest', 'shrubland', 'freshwater wetland', 'estuarine wetland' and 'duneland', 'rockland') have been mapped according to Section 2.3.

Records of threatened plants and fauna have been sourced from herbaria and other databases and information systems mentioned in Section 2.1, or were direct observations during the course of this survey. The status of all records was checked prior to inclusion in this report. The fauna section of each site description lists incidental indigenous fauna observations (exotic fauna are not recorded here) and identifies significant fauna with their current New Zealand conservation status in capitals (e.g. Gradual Decline) which is derived from Hitchmough *et al.* (2007). See Appendix 8.7 for a list of fauna present in Waipu Ecological District.

'Not surveyed' is stated in the fauna section of the site description if, at the time of publication, the Department of Conservation, Northland Conservancy, did not have any information on indigenous fauna species from that natural area.

4.1 LEVEL 1 SITES

The following were assessed to be Level 1 sites. These are listed in Table B, and described and mapped in the following sections.

TABLE B: LIST OF LEVEL 1 SITES.

SITE NAME	SURVEY NO.	GRID REF.
Ruarangi Road Forest Remnants 1	Q07/112	Q07 249913
Takatearea Stream Forest	Q07/113	Q07 277865
Pokapu Hill Forest Remnants	Q07/114	Q07 274925
Mangapai Caves Road Forest and Shrubland	Q07/116	Q07 303895
North River Forest	Q07/117	Q07 331824
Waipu Caves Forest	Q07/118	Q07 318852
Ruakaka River Forest Remnants	Q07/119	Q07 359910
Caves Road Forest	Q07/120	Q07 350840
Ruakaka Forest	Q07/121	Q07 363874
Takahiwai Forest	Q07/124	Q07 379937
Tauroa Floodplain Forest Remnants	Q07/125	Q07 388901
Mountfield Road Wetlands	Q07/126	Q07 392848
Doctor's Hill Road Wetland	Q07/127	Q07 413859
Ruakaka Dunelands	Q07/128	Q07 430847
Ruakaka Racecourse Dune Lake	Q07/129	Q07 422891
Ruakaka River Estuary	Q07/130	Q07 420881
McEwan Road Wetland	Q07/131	Q07 429926
Waipu Caves Road Sandstone Knoll	Q07/132	Q07 308866
Ormiston Road Forest and Shrubland	Q07/135	Q07 355854
McDonnell Road Forest and Shrubland	Q07/137	Q07 291899
Upper Mangawai River Wetlands	Q07/138	Q07 263801
Eastern Mangawai Catchment Remnants	Q07/139	Q07 291812
Sime Road Wetland	Q07/141	Q07 424912
Takahiwai Stream Estuary	Q07/143	Q07 391950
Blacksmith's Creek Estuary	Q07/144	Q07 441948
Tauraroa River Forest Remnants	Q07/145	Q07 230923
Waiotira Stream Forest Remnants	Q07/148	Q07 259873
Russek Road Natural Area 1	Q07/149	Q07 232880
Russek Road Natural Area 2	Q07/150	Q07 238889
Paparoa Road Riparian Forest Remnants	Q07/152	Q07 246901
Ngatoka Forest and Shrubland	Q07/158	Q07 278883
Parry Road Forest Remnants	Q07/162	Q07 289911
Pohuenui River Forest Remnants	Q07/163	Q07 389830
Northland Port Corporation Ponds	Q07/164	Q07 443945
Mareretu Forest	Q08/220	Q08 326767
Brooks Road Forest and Shrubland	Q08/221	Q08 355733
Waipu Gorge Forest Remnants	Q08/222	Q08 361708
Glenmohr Road Wetland	Q08/223	Q08 411731
Ahuroa Road Forest Remnants	Q08/224	Q08 376786
Brynderwyn Hills Forest Complex	Part A	Q08/225a
	Part B	Q08/225b
	Part C	Q08/225c
	Part D	Q08/225d
	Part E	Q08/225e
	Part F	Q08/225f
	Part G	Q08/225g
	Part H	Q08/225h
	Part I	Q08/225i
	Part J	Q08/225j
Lang's Beach Coastal Forest and Shrubland	Q08/226	Q08 484723
Waipu River Estuary and Sand Spit	Q08/228	Q08 447762
Lang's Beach	Q08/230	Q08 491716
Waihoihoi River Forest Remnants	Q08/231	Q08 396773

SITE NAME	SURVEY NO.	GRID REF.
Waionehu Stream Forest Remnants	Q08/232	Q08 419768
SH1 Forest Remnants	Q08/233	Q08 390782
Ahuroa River Forest Remnants	Q08/235	Q08 379766
Dodd Road Forest Remnant	Q08/236	Q08 330702
Durham Road Forest and Shrubland	Q08/237	Q08 369723
Maxwell Creek Forest Remnant	Q08/238	Q08 346717
Helmsdale Road Forest and Shrubland	Q08/239	Q08 333801
Kaikowhiti Stream Forest Remnants	Q08/240	Q08 313737
Smales Road Forest Remnants	Q08/241	Q08 317720
Brooks Road Wetland	Q08/244	Q08 363750
Shoemaker Road Forest Remnant 2	Q08/247	Q08 402780
Bream Tail	R08/001	Q08 530706
Cove Road Shrubland and Forest	R08/002	Q08 504708

RUARANGI ROAD FOREST REMNANTS 1

Survey no.	Q07/112
Survey date	10 November 2006
Grid reference	Q07 249913 (15 remnants)
Area	58.8 ha (56.8 ha forest, 1.9 ha shrubland)
Altitude	75–160 m asl

Ecological units

- (a) Totara forest on moderate hillslope (25%)
- (b) Taraire forest on moderate hillslope or in gully heads (21%)
- (c) Totara–kahikatea forest on moderate hillslope (16%)
- (d) Taraire–kahikatea forest on moderate hillslope (15%)
- (e) Totara–kahikatea–taraire forest on moderate hillslope (10%)
- (f) Mahoe–totara–kohuhu shrubland on gentle hillslope (5%)
- (g) Kahikatea forest in gully (4%)
- (h) Kahikatea–pukatea forest on gentle hillslope (4%)

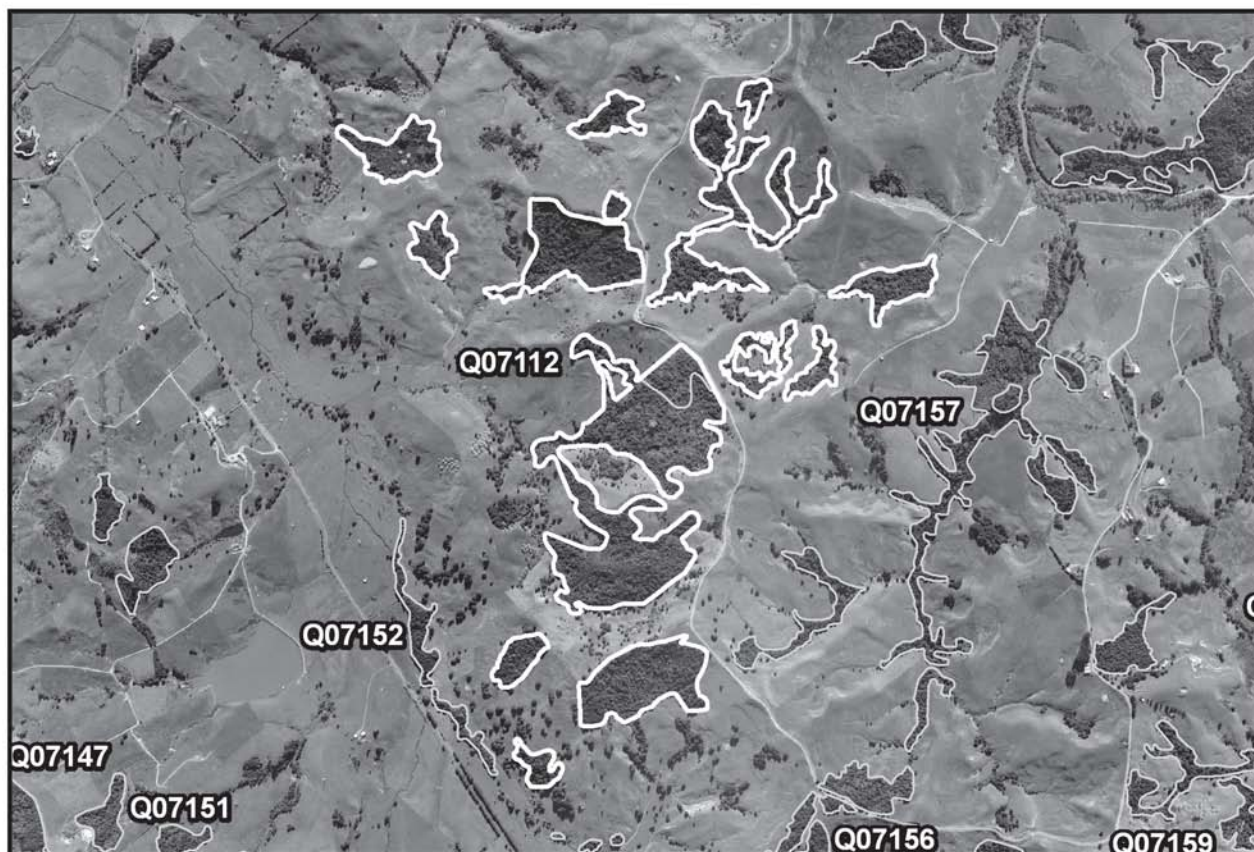
Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

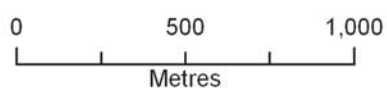
Vegetation

This site comprises 15 forest remnants in the Ruarangi Road area. The road extends along a ridge orientated north–south, and the remnants are on either side of the road on east- or west-facing hillslopes and gullies. They contain a diverse range of vegetation types according to disturbance history and topography. Totara–kahikatea–taraire forest (e) in one of the remnants had mature, emergent kahikatea suggesting that at least some of the forest remnants are not secondary. Most of the remnants are grazed with minimal understorey but part of the largest remnant and the southernmost remnant is fenced with an established understorey.

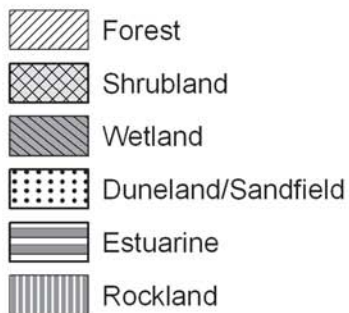
Totara forest (a), totara–kahikatea forest (c) and totara–kahikatea–taraire forest (e) are common forest types on moderate hillslopes. In the totara-dominated remnants at this site there is occasional kanuka, kauri, kahikatea, taraire, puriri, nikau, tawa, rimu,



Q07/112 Ruarangi Road Forest Remnants 1



Habitat Type



pukatea, tanekaha, kohuhu, mamaku, and ti kouka. Taraire forest on moderate hillslopes or in gully heads (b), or taraire–kahikatea forest (d) on moderate hillslopes are the second most extensive forest types in the remnants and is often associated with frequent kanuka, totara, and kahikatea, and a diverse range of other species

including occasional nikau, pukatea, tawa, mamaku, rimu, rewarewa, mahoe, pigeonwood, kauri and puriri.

On the upper slopes of the largest remnant is an area of indigenous shrubland. Mahoe, totara and kohuhu are common (f), with occasional kahikatea, putaputaweta, ponga, pate, mapou, ti kouka, kanuka, manuka, gorse, and Yorkshire fog.

Kahikatea is often dominant in the gullies (g) and kahikatea-pukatea forest (h) occurs on the gentler hillslopes. Species occurring occasionally in kahikatea-dominated mixtures include puriri, taraire, kauri, rimu, and ponga.

Fauna

Kukupa (Gradual Decline), NZ kingfisher, Australasian harrier, shining cuckoo and welcome swallow were recorded in this survey. *Amborhytida dunni* (Gradual Decline) has also been recorded (Fred Brook pers. comm. 2007).

Significance

This site contains five representative ecological units: (b) taraire forest on moderate hillslope or in gully head, which includes mature, emergent kahikatea, (d) taraire-kahikatea forest on moderate hillslope, (g) kahikatea forest in gully, (h) kahikatea-pukatea forest on gentle hillslope, and (f) mahoe-totara-kohuhu shrubland on gentle hillslope, which is the only example of this ecological unit in Waipu ED. The canopy of the remnants is generally diverse and healthy, and there is minimal weed infestation. Most of the remnants are grazed with a sparse understorey. Areas that are fenced to exclude cattle have an established and diverse understorey. The site supports a threatened bird species (kukupa) and a threatened land snail (*Amborhytida dunni*).

TAKATEAREA STREAM FOREST

Survey no.	Q07/113
Survey date	12 November 2006
Grid reference	Q07 277865 (17 remnants)
Area	105.5 ha
Altitude	80–240 m asl

Ecological units

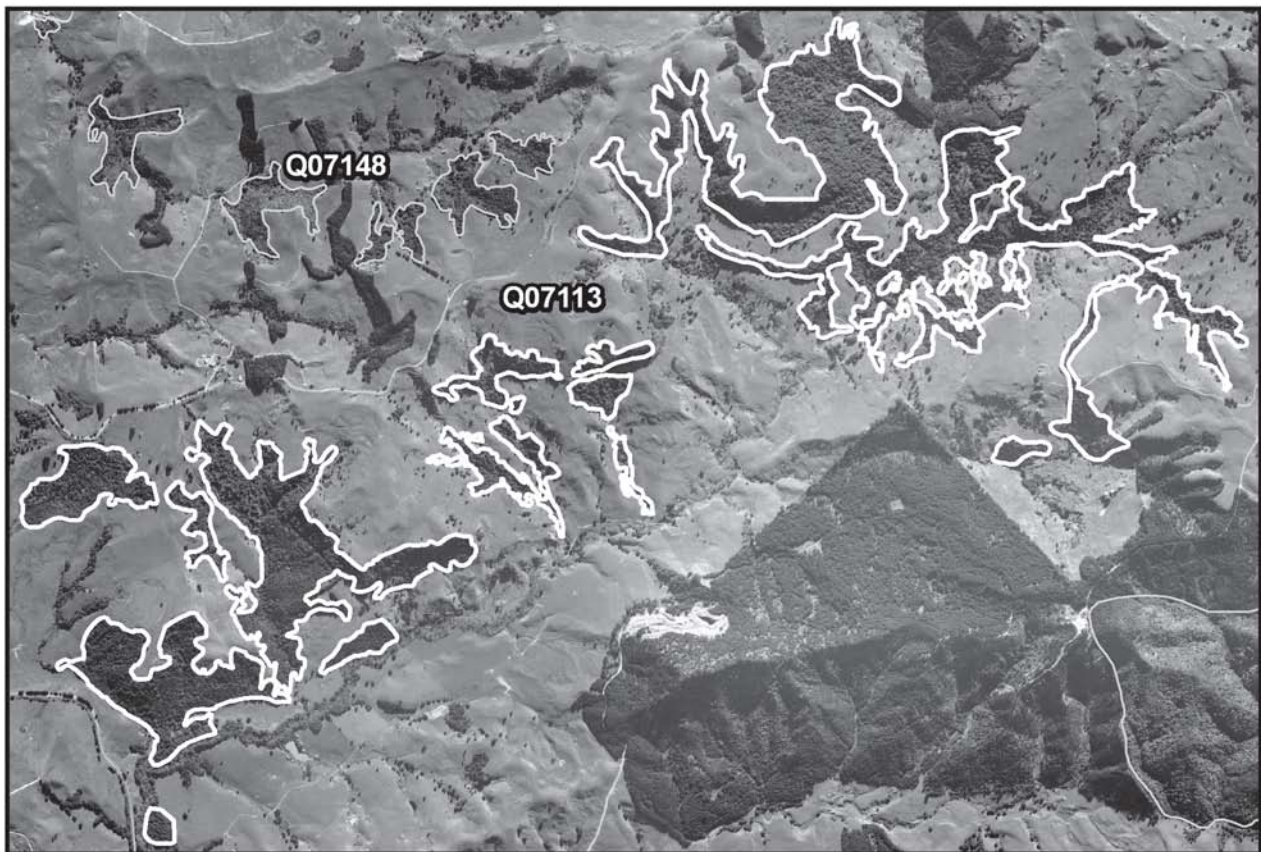
- (a) Totara forest on moderate to steep hillslope and cliff (60%)
- (b) Totara treeland on moderate to steep hillslope and cliff (20%)
- (c) Kanuka-totara-mamaku forest on steep hillslope (10%)
- (d) Kahikatea-nikau forest on alluvium (5%)
- (e) Kahikatea forest in gully (5%)

Landform/geology

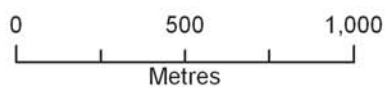
Hillslopes and gullies predominantly underlain by Miocene sandy mudstone and bluff-forming sandstone (Waitemata Group), with a small area of Mesozoic greywacke (Waipapa Terrane) in the vicinity of Q07/263856, and areas of Holocene valley-floor alluvium along Takatearea Stream.

Vegetation

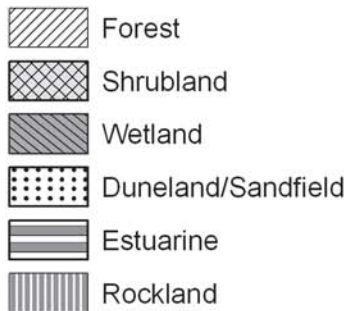
This site comprises scattered remnants of indigenous forest and treeland in the upper Takatearea Stream catchment, to the east of Paparoa Road. The remnants have been heavily impacted by stock (i.e. lack of understorey and edge vegetation,



Q07/113 Takatearea Stream Forest



Habitat Type



fragmentation) because they are generally unfenced from surrounding pastoral land, however there are many sandstone cliffs and steep hillslopes which deter stock and provide refuges for palatable vegetation. Riparian forest dominated by crack willow which occurs along the main stream gully, and contains only a low density of indigenous species, has been excluded from the site.

Totara is the most common tree species throughout the site. In places it forms forest in association with frequent kahikatea and occasional kauri, ti kouka, rewarewa, taraire, rimu, towai, nikau, puriri and radiata pine (a). In areas with heavier stock impacts totara treeland occurs (b). Scattered mapou, Chinese privet, arum lily and exotic grasses occur outside of the site on occasional bare mudstone cliff faces between totara forest and treeland remnants. There are several steep faces with kanuka-totara-mamaku forest (c) in the western part of the site. At the foot of the largest cliff within the site there is a small area of kahikatea-nikau forest on alluvium (d) with frequent totara and occasional pukatea and rewarewa. Some large old kahikatea are present here. At least one gully in the upper catchment has dense young kahikatea forest (e) with frequent totara and kanuka, and occasional pukatea and taraire. Not all parts of the site were easily visible, therefore some ecological units may have been overlooked.

Fauna

Australasian harrier.

Significance

This site has two representative ecological units: (d) kahikatea-nikau forest on alluvium (not recorded elsewhere in the ED) and (e) kahikatea forest in gully. Apart from these small units the site is not particularly diverse; totara is dominant across the area as a result of grazing impacts. The steep sandstone cliffs are a distinctive feature of the local area. Forest and treeland on steep areas provides some protection to the Takatearea Stream catchment.

POKAPU HILL FOREST REMNANTS

Survey no.	Q07/114
Survey date	13 November 2006
Grid reference	Q07 274925 (6 remnants)
Area	82.8 ha
Altitude	40–55 m asl

Ecological units

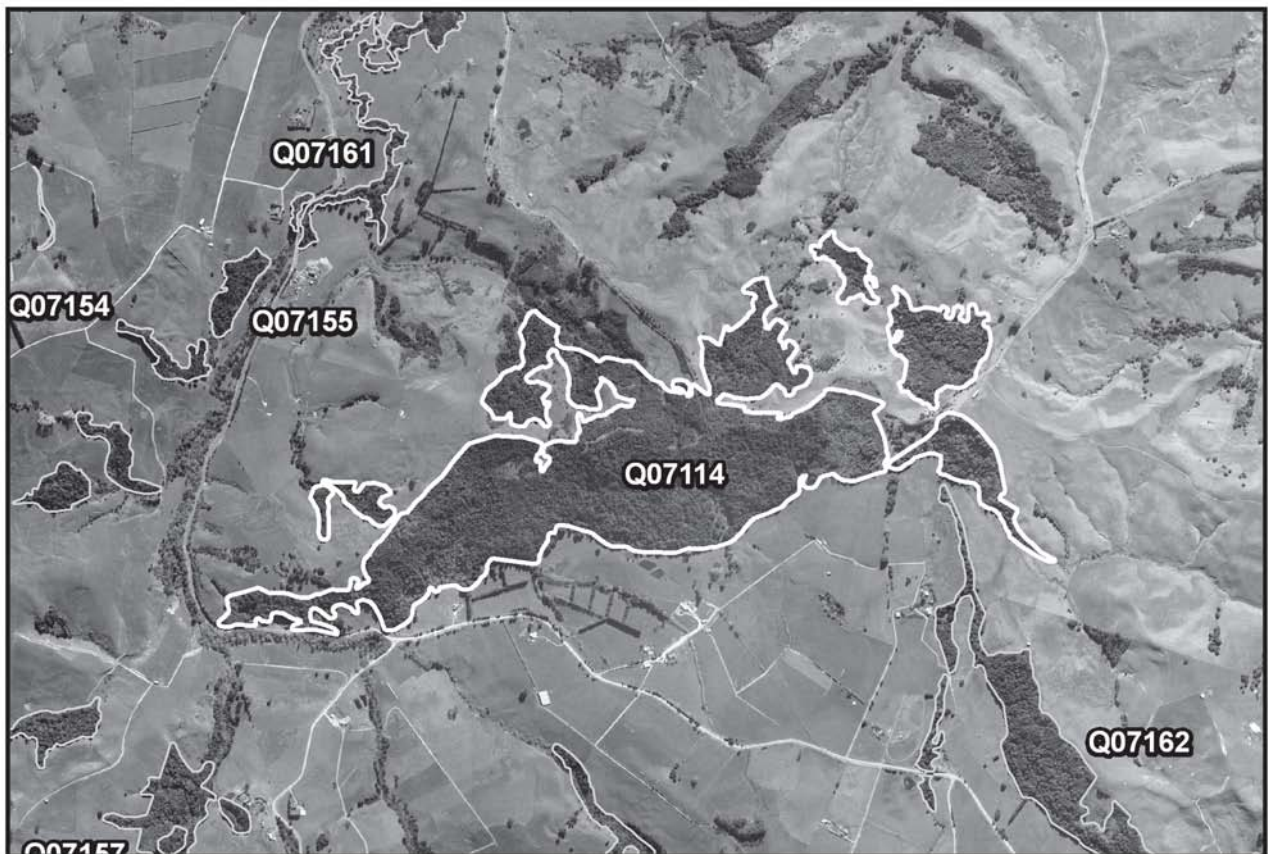
- (a) Taraire forest on moderate hillslope (35%)
- (b) Totara-kahikatea-kanuka forest on moderate hillslope (25%)
- (c) Kanuka-kahikatea forest in gully (20%)
- (d) Kanuka-totara forest on ridge (15%)
- (e) Mamaku-mahoe forest on steep hillslope (5%)

Landform/geology

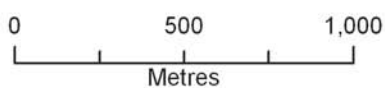
Hillslopes and gullies predominantly underlain by Miocene sandy mudstone (Waitemata Group), with a small area of Mesozoic greywacke (Waipapa Terrane) in the vicinity of Q07 262920, and Holocene valley-floor alluvium along the southern margin of the site.

Vegetation

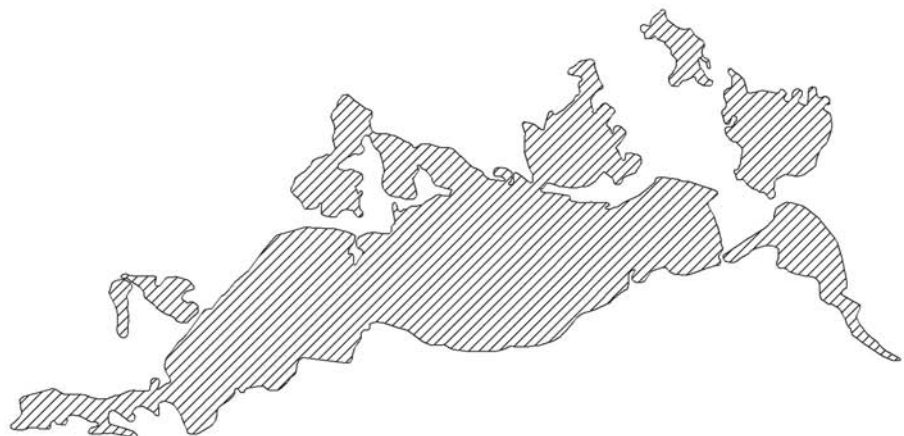
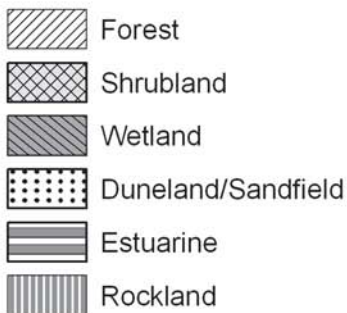
This site comprises one large and five small forest remnants in the vicinity of the 162 m highpoint to the north of Mangapai Caves Road. The western end of the largest remnant is grazed by cattle and has a severely depleted understorey. The central area of the main remnant, on a moderately sloping, south-facing hillslope, has been fenced



Q07/114 Pokapu Hill Forest Remnants



Habitat Type



to exclude stock and has an established understorey; this area is approximately 20 ha in area, 16 ha of which is subject to a sustainable harvest permit (Grant McClellan pers. comm.). The larger remnant in the northeast is fenced, and the remaining remnants are probably all grazed (Grant McClellan pers. comm.).

(a) The central, south-facing slope of the largest remnant is taraire forest with frequent puriri and kahikatea, and occasional pukatea, nikau, rimu, towai, mamaku, totara, rewarewa, puka, and kahakaha.

(b) The northern remnants and the edges of the main remnant are totara forest. Kahikatea and kanuka are common with occasional ponga, pukatea, mahoe, mamaku, mapou, kohekohe, kauri, towai, and puriri.

(c) Kanuka- and kahikatea-dominant forest occurs in the gully along the southern edge of the largest remnant, with frequent pukatea and totara, and occasional kowhai, ponga, puriri, ti kouka, kohuhu, and pate.

(d) Kanuka forest occurs on the main ridge of the largest remnant. Totara is common, with frequent rimu and occasional rewarewa, kahikatea, and ti kouka. There are a few mida in the understorey.

(e) The westernmost area of the remnant, on a steep hillslope, is dominated by mamaku and mahoe, with frequent totara and occasional ponga and pate.

Significant flora

Mida (Gradual Decline) is occasional in the kanuka-dominated forest along the main ridge.

Fauna

Kukupa (Gradual Decline), kauri snail (Gradual Decline), tui, North Island fantail, grey warbler and shining cuckoo are present in the central part of the largest forest remnant and in some of the smaller northern remnants (Grant and Lea McClellan pers. comm.). Australasian harrier, pukeko, morepork and silvereye were recorded in 1978 (SSBI Q07/R07/H 052).

Significance

This site is representative of three ecological units: (c) kanuka-kahikatea forest in gully, (b) totara-kahikatea-kanuka forest on moderate hillslope, and (e) mamaku-mahoe forest on steep hillslope. The remnants have a diverse, healthy canopy and an established understorey where stock are excluded. Weeds are largely confined to the forest margins. The remnant provides riparian protection for a tributary of the Tauraroa River. The site supports two threatened fauna species (kukupa and kauri snail) and one threatened plant species (mida).

MANGAPAI CAVES ROAD FOREST AND SHRUBLAND

Survey no.	Q07/116
Survey date	13 November 2006
Grid reference	Q07 303895 (4 remnants)
Area	271.3 ha (270.8 ha forest, 0.6 ha shrubland)
Altitude	60–180 m asl

Ecological units

(a) Kauri forest on moderate hillslopes and ridges (40%)

(b) Kanuka forest on moderate to steep hillslope (20%)

(c) Kanuka-totara forest on moderate hillslope (8%)

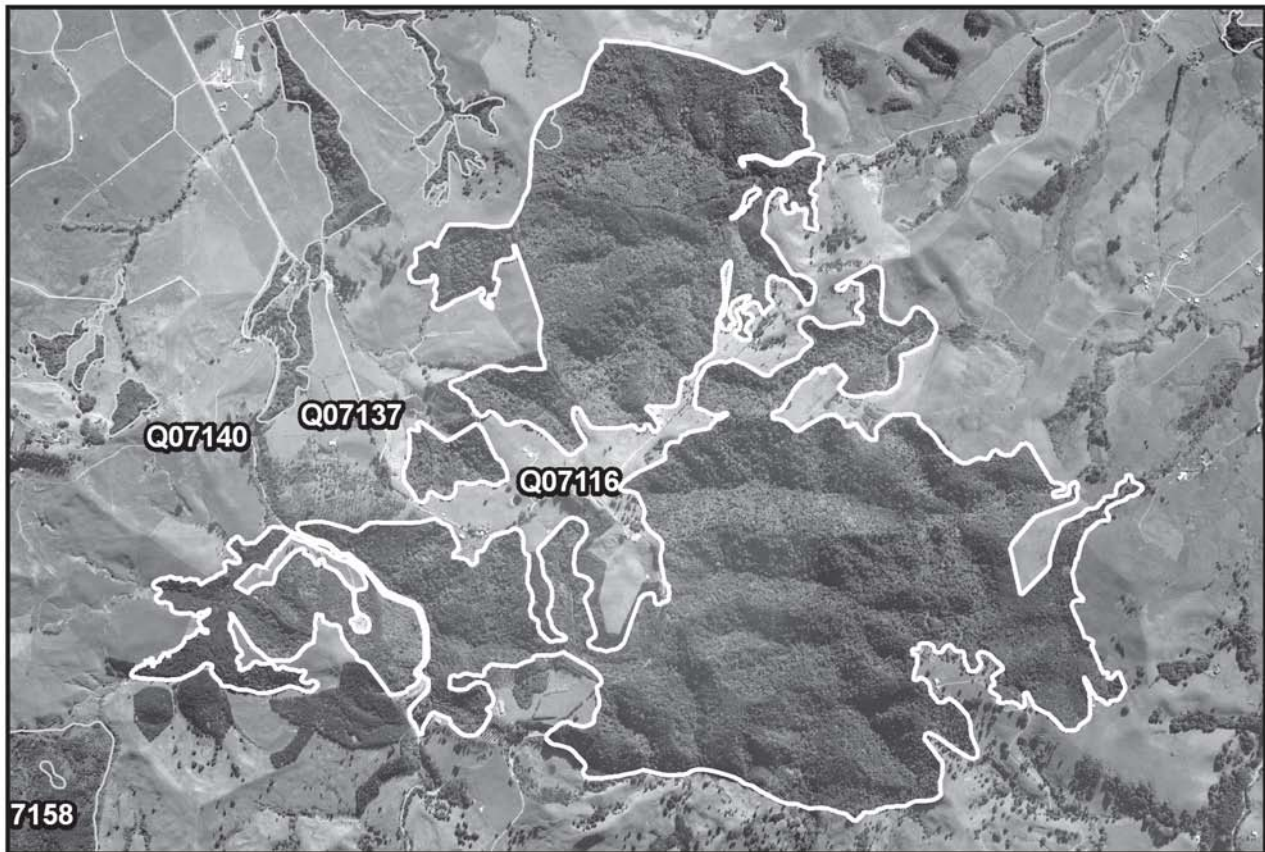
(d) Kanuka-towai forest on moderate hillslope and in gully (8%)

(e) Manuka shrubland on ridge (2%)

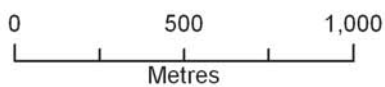
(f) Towai forest on moderate hillslope and in gully (2%)

Landform/geology

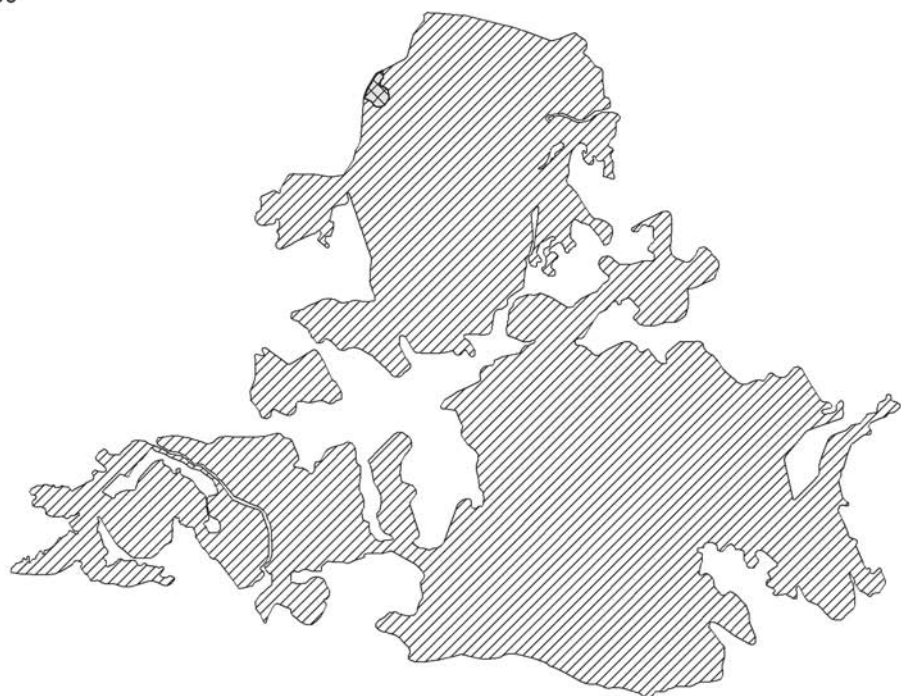
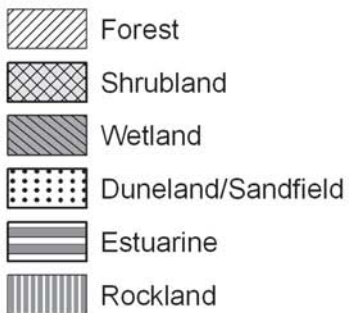
Gullies underlain by Miocene sandy mudstone (Waitemata Group).



Q07/116 Mangapai Caves Road Forest and Shrubland



Habitat Type



Vegetation

This site comprises forest remnants in the headwaters of the Waikokopa Stream. The smaller northern remnant is primarily secondary kanuka-totara forest (c) with frequent kahikatea, kauri and tanekaha and occasional puriri, puka, ponga, taraire, rewarewa, rimu, nikau, and mamaku. On the northwestern edge of the remnant on a

ridge is a small area of manuka shrubland (e) with frequent ponga and gorse, and occasional totara, mamaku, and kanuka. Some areas on moderate hillslopes and in gullies comprise towai forest (f) with frequent rewarewa and kanuka, and occasional taraire and tawa.

The larger, southern remnant is also secondary. Kauri forest (a) with occasional kanuka and tanekaha is the most commonly occurring vegetation type on the central hillslopes and ridges, with younger kanuka (b) or kanuka-totara (c) forest on the southern and eastern edges. The western area of the remnant, on either side of Mangapai Caves Road, is also dominated by kanuka. Kanuka forest (b) covers the steep hillslope on the southern side of the road with frequent mamaku and occasional kohuhu, ti kouka, ponga, lancewood, ti ngahere, and mahoe. The vegetation on the moderate hillslope on the northern side of the road, some of which is fenced to exclude stock, is kanuka-towai forest (d) with frequent rewarewa, and occasional pukatea, pigeonwood, pate, mamaku, tawa, taraire, nikau, karaka, and kahikatea.

Significant flora

Mida (Gradual Decline) recorded in 1991 (SSBI Q07/R07/H 054).

Fauna

NZ kingfisher and shining cuckoo were recorded in this survey. Kukupa (Gradual Decline), kauri snail (Gradual Decline), Australasian harrier, grey warbler, North Island fantail, silvereye, and tui were recorded in 1991 (SSBI Q07/R07/H 054).

Significance

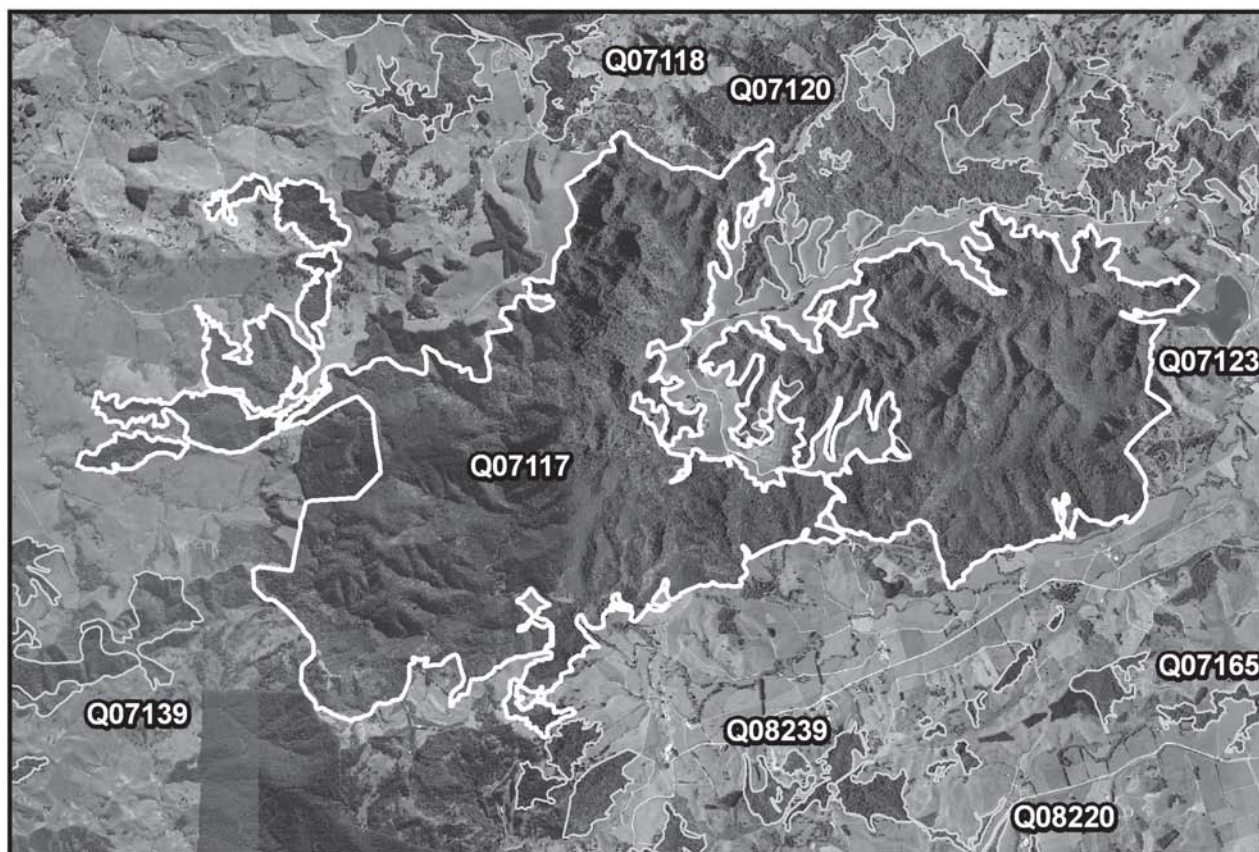
This site contains two representative units: (c) kanuka-totara forest on moderate hillslope, and (d) kanuka-towai forest on moderate hillslope and in gully. The remnants have an established understorey where stock are excluded, and weeds are largely confined to forest edges. The vegetation provides riparian protection for the headwaters of the Waikokopa Stream and a tributary of the Tauraroa River. Twenty-three ha of this site are in a DOC-administered scenic reserve.

NORTH RIVER FOREST

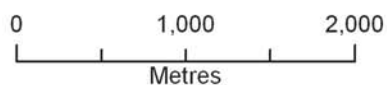
Survey no.	Q07/117
Survey date	12 November 2006
Grid reference	Q07 331824 (9 remnants)
Area	973.4 ha (968.9 ha forest, 4.5 ha shrubland)
Altitude	40–240 m asl

Ecological units

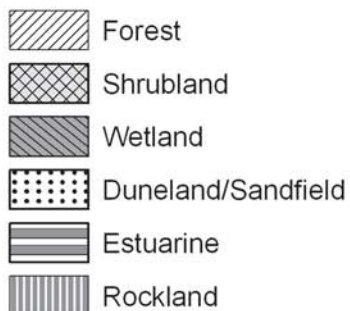
- (a) Kanuka-rimu-tanekaha-kauri forest on ridge (30%)
- (b) Kanuka-mamaku forest on ridge, hillslope and in gully head (20%)
- (c) Taraire forest on moderate to steep hillslope and gully (15%)
- (d) Tanekaha-kanuka forest on ridge and steep hillslope (10%)
- (e) Kanuka forest on ridge (10%)
- (f) Puriri forest in gully (5%)
- (g) Kauri-kanuka forest on ridge (3%)
- (h) Kanuka-rewarewa forest in gully head (2%)
- (i) Totara forest on moderate hillslope (1%)



Q07/117 North River Forest



Habitat Type



- (j) Totara-taraire forest in gully (1%)
- (k) Rimu-tanekaha forest on ridge (1%)
- (l) Kowhai-kahikatea forest on alluvium (1%)
- (m) Kanuka shrubland on ridge (1%)

Landform/geology

Steep hill country with deeply incised valleys and gullies; predominantly underlain by Mesozoic greywacke (Waipapa Terrane), but with areas of Oligocene limestone karst

(Whangarei Limestone, Te Kuiti Group) along Waipu Caves Road, and Miocene sandy mudstone (Waitemata Group) in the vicinity of Q07 311811. Small areas of Holocene alluvial flats are present in the North River gorge from Q07 328832–326829, and on the southern side of a prominent fault scarp at Q07 358819.

Vegetation

North River Forest is a large, semi-continuous area of indigenous forest and shrubland on east-west-trending steep hill country south of Waipu Caves Road and north of Helmsdale Road. North River lies to the south of these hills, draining eastwards into the Pohuenui River, the Waipu River and ultimately into Bream Bay. Two sub-catchments of the North River lie within this site. One draining eastwards off the northern side of the hills, and one draining south through a steep, winding, limestone gorge that descends from Waipu Caves Road. This gorge has 'impressive water falls' (SSBI Q07/H059). The alluvial plains associated with the North River are mainly in pasture and exotic vegetation, except for a small area of kowhai-kahikatea forest on alluvium (l), which is at the southeastern edge of the site. Piecemeal vegetation clearance has occurred all around the edges of the site, as well as in the central area off Palmer Road around the 239 m asl peak. Within the Palmer Road clearing there are residential houses, small radiata pine plantations, and paddocks, next to which small areas of kanuka shrubland (m) are regenerating. Directly to the east of the Palmer Road clearing lies the North River Scenic Reserve, which contains some of the most densely forested north-facing landforms of the site. The Waipu Scenic Reserve and McLean Queen Elizabeth II Open Space Covenant are located in the deep gorge to the west, which appears to support mature taraire forest with emergent podocarps, however this area was not visible during the survey.

The most widespread forest type within the site is secondary kanuka-rimu-tanekaha-kauri forest (a) on broad ridges, especially those facing northwards. At the lower end of north-facing ridges and on side slopes there is often pure tanekaha over kanuka (d). Small, localised stands of rimu-tanekaha forest (k) occur throughout. These types are probably no older than 100 years, judging by the uniform size and morphology of rimu, tanekaha and kauri poles. Certain prominent ridgelines support kauri-kanuka forest (g) which is probably of a similar age, however on this landform kauri trees have broadened their crowns due to open growing conditions. Extensive areas of younger (i.e. < 50 year old) kanuka-mamaku forest (b) and kanuka forest (e) occur on ridges and hillslopes throughout, although these types appear to be more common on the more frequently disturbed southwestern hills, and also on southern aspects.

The most common forest type in gullies and on steep, shaded hillslopes is taraire forest (c) which was noted as being particularly dominant in very steep south-facing gullies and hillslopes directly above the North River. The canopy comprises abundant taraire, associated with frequent kahikatea and occasional puriri, towai, kohekohe, rimu, kauri, kanuka, rewarewa, totara, karaka, nikau, tree fuchsia and puka. The understorey of this type was briefly investigated in the head of one gully. Vegetation was typical of a southern-aspect, shaded broadleaf forest understorey, with kiekie, supplejack, pate and numerous ferns, e.g. gully fern, ponga, heruheru, *Blechnum chambersii*, thread fern, hanging spleenwort, *Lastreopsis hispidula*, and fragrant fern.

A 1992 ecological survey of this site (SSBI Q07/H059) describes taraire forest in gullies to the southwest of Waipu Scenic Reserve (which was not visible during the current survey) as having kauri, rimu and rewarewa emergent over a canopy of taraire and karaka, with puriri, miro, totara and tawa occurring less frequently. In the

surveyed section the subcanopy comprises kohekohe and nikau with mida and tarata uncommon; the shrub tier consists of taurepo, ponga, kawakawa, rangiora, hangehange and kiekie; ground cover is *Blechnum chambersii* and thread fern. In some areas the understorey was sparse due to grazing

Puriri forest in gullies (f) was less visible, but appeared to be more common in steep north-draining gullies. Puriri forest was associated with frequent kohekohe, nikau and mamaku. Some disturbed gully heads on the north side of the crest appear to be dominated by kanuka and rewarewa (h). Totara-taraire forest (j) with frequent rewarewa and occasional nikau occurs in a few locations within the lower parts of gullies, adjacent to pasture. Forest edges bordering Waipu Caves Road in the north are generally dominated by totara, with scattered puriri, kahikatea and karaka (i).

Significant flora

Doodia squarrosa (Gradual Decline), mida (Gradual Decline), *Doodia mollis* (Sparse), *Nematoceras rivulare* (Data Deficient), *Hebe macrocarpa* var. *macrocarpa* (regionally significant) (AK 220574), tree fuchsia (regionally significant), *Oxalis magellanica* (regionally significant), *Brachyglottis kirkii* var. *angustior* (regionally significant), and gully tree fern (regionally significant) were recorded in 1992 (SSBI Q07/H059).

Fauna

Kauri snail (Gradual Decline), kukupa (Gradual Decline), Hochstetter's frog (Sparse), NZ kingfisher, welcome swallow, grey warbler, fantail, silvereye, tui, and Australasian harrier were recorded in 1992 (SSBI Q07/H059). The land snail *Amborhytida dunni* (Gradual Decline) (a landsnail) is known from this site (Fred Brook pers. comm.). Two copper skinks were noted in the deeply dissected upper North River valley in 1992 (DOC Bioweb 2007). In 1994 Hochstetter's frogs were also recorded at several locations in the North River catchment, in low numbers (e.g. 1–6 individuals per site) (DOC Bioweb 2007).

Unconfirmed reports of North Island brown kiwi (Serious Decline) and tomtit (regionally significant) were noted in 1992 (SSBI Q07/H059). It is unlikely that kiwi remain at this site, as they are largely absent from southern Northland (Miller & Pierce 1995).

Longfin eel (Gradual Decline), banded kokopu (regionally significant), shortfin eel, inanga, redfin bully, Cran's bully, torrentfish, and koura have been recorded at various points along the North River within this site between 1995 and 2001 (NIWA 2007).

Significance

North River Forest is one of the largest areas of indigenous forest areas in Waipu ED, and occupies an important position between Ruakaka Forest (Q07/121) and Mareretu Forest (Q08/220) in the centre of the inland hill country of the ED. This site provides habitat for four threatened plant species (*Doodia squarrosa*, *D. mollis*, mida, and *Nematoceras rivulare*), five regionally significant plant species (*Hebe macrocarpa* var. *macrocarpa*, tree fuchsia, *Oxalis magellanica*, *Brachyglottis kirkii* var. *angustior*, and gully tree fern), five threatened fauna species (kauri snail, kukupa, Hochstetter's frog, *Amborhytida dunni*, and longfin eel), and two regionally significant fauna species (tomtit and banded kokopu). It has nine representative ecological units: (a) kanuka-rimu-tanekaha-kauri forest on ridge, (b) kanuka-mamaku forest on ridge, hillslope and in gully head, (c) taraire forest on moderate to steep hillslope and gully, (d) tanekaha-kanuka forest on ridge and steep hillslope, (e) kanuka forest on ridge, (f) puriri forest in gully, (g) kauri-kanuka forest

on ridge, (h) kanuka–rewarewa forest in gully head, (k) rimu–tanekaha forest on ridge and (l) kowhai–kahikatea forest on alluvium (this unit is unique in the ED, and rare nationally). This site is very similar to Ruakaka Forest and Mareretu Forest but is more disturbed and has younger vegetation overall. However, it does include an area of limestone and associated caves which these other sites do not have. Limestone geology and the vegetation it supports is regionally distinctive. Pressures on this site include feral goats, felling of shrubland areas, and moderate recreational use (particularly caving, trail bikes, orienteering, and horse riding) (SSBI Q07/H059). Approximately 21% of the site is protected. (167 ha of the site is within North River Scenic Reserve and Waipu Scenic Reserve (DOC-administered), and there is a 32.5 ha Queen Elizabeth II Open Space Covenant).

WAIPU CAVES FOREST

Survey no.	Q07/118
Survey date	10 November 2006
Grid reference	Q07 318852 (5 remnants)
Area	370.8 ha
Altitude	84–260 m asl

Ecological units

- (a) Totara forest on moderate hillslope (60%)
- (b) Totara–taraire forest on moderate hillslope and in gully (18%)
- (c) Kanuka forest on moderate hillslope and ridge (10%)
- (d) Totara–mamaku forest on moderate hillslope (5%)
- (e) Totara treeland on gentle hillslope (3%)
- (f) Totara–hawthorn forest on gentle hillslope (2%)
- (g) Kauri–kanuka forest on ridge (2%)

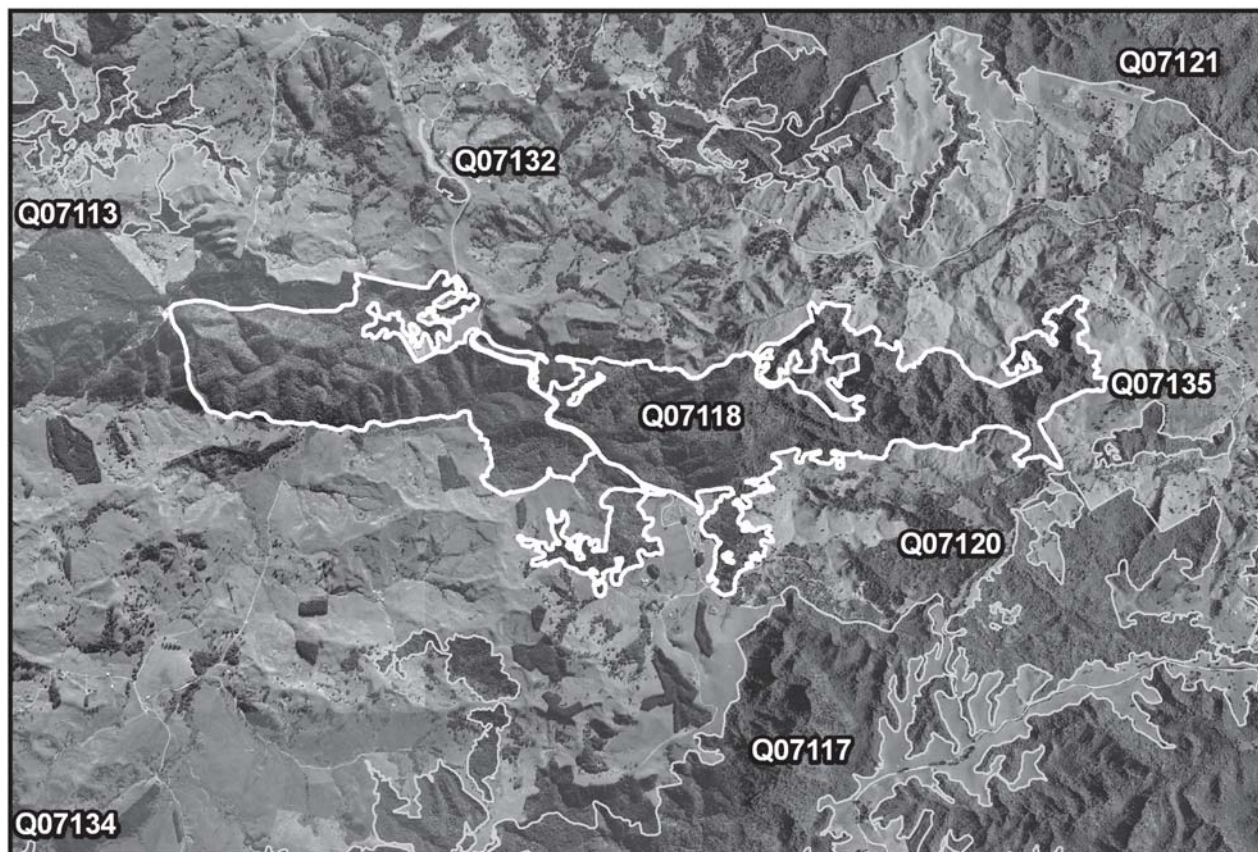
Landform/geology

Steep hill country with deeply incised valleys and gullies; predominantly underlain by Mesozoic greywacke (Waipapa Terrane), but with Oligocene limestone karst (Whangarei Limestone, Te Kuiti Group) at Waipu Caves, and small areas of Miocene sandy mudstone (Waitemata Group).

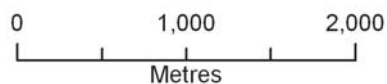
Vegetation

Waipu Caves Forest is a long, narrow tract of indigenous forest—the site extends over approximately 5 km in an east–west direction and 600 m wide in a north–south direction—which covers steep hill country in the western part of the ED. The site is dissected by Waipu Caves Road and is surrounded by agricultural and silvicultural land. A large radiata pine plantation abuts the site to the west. The forest edge is convoluted and irregular in the south, where it extends out towards the Waipu Caves reserve entrance. Apart from the Waipu Caves Road Scenic Reserve at centre, few areas appear to be fenced off from stock. Consequently, on the site margins, there are several areas of grazed totara treeland (e).

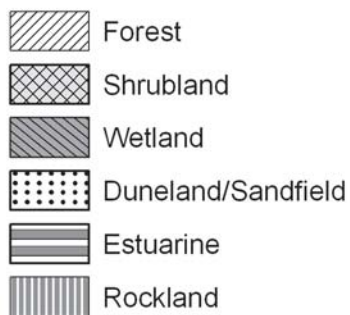
The main forest type is totara forest (a) with frequent kanuka and occasional tawa, puriri and karaka. In gullies and on shaded (i.e. predominantly south-facing) hillslopes totara forest grades into a more diverse mixture of totara–taraire forest (b)



Q07/118 Waipu Caves Forest



Habitat Type



with occasional emergent northern rata and large ancient totara (perhaps the largest in the ecological district). There is a wide range of locally occurring species in the canopy, including kahikatea, rimu, kauri, tawa, rewarewa, ti ngahere, ti kouka, nikau, kohekohe, puriri, puka, and kiekie. Secondary kanuka forest (c) with occasional tanekaha, rimu, totara, mamaku, ponga, mapou, hangehange, mingimingi and

manuka is present on several broad ridges and moderate hillslopes within the site, usually near the forest edge, which indicates retiring of land or disturbance in these areas around 30–50 years ago. Similarly there are small areas of young totara–mamaku forest (d) on recently disturbed hillslopes with frequent kanuka and occasional lancewood, ti kouka, rimu and kahikatea. One of the most distinctive forest types within the site is totara–hawthorn forest (f) which occurs on areas of low limestone outcrops. Although heavily grazed and trampled, there are several rare, and plants not commonly seen in the ED in unit (f), often perched on the limestone, e.g. *Peperomia urvilleana*, *Parietaria debilis*, *Doodia mollis*, carmine rata and tree fuchsia.

Significant flora

Doodia mollis (Sparse) (AK 298335), carmine rata (regionally significant) (AK 297995), and tree fuchsia (regionally significant).

Fauna

Kukupa (Gradual Decline) are present (current study). 1978 records include kauri snail (Gradual Decline), kukupa, Hochstetter's frog (Sparse), white-faced heron, paradise shelduck, Australasian harrier, pukeko, NZ kingfisher, grey warbler, fantail, silveryeye, and the land snail *Liarea turriculata turriculata** (SSBI Q07/H057). The land snail species *Amborhytida dunniae* (Gradual Decline) and Punctidae sp. 64 (Nationally Endangered) are known from this site (Brook 2002, Fred Brook pers. comm.). Five Hochstetter's frogs were recorded again in the stream on the northern side of the road in 1994 (DOC Bioweb 2007), but were absent when resurveyed in 2005, with stock disturbance and silt smothering being the apparent causes of the decline (Peter Anderson, DOC, pers. comm.).

Significance

The two major ecological units of this site are representative of their types: (a) totara forest on moderate hillslope and (b) totara–taraire forest on moderate hillslope and in gully. Parts of these types occur on limestone. Limestone geology and the vegetation it supports is regionally distinctive. Kenny & Hayward (1996) have ranked the Waipu Cave System as regionally important for geomorphology, because it includes the largest cave passage in Northland and some fossil bone deposits, and it is also considered to be a soil site of national importance (Arand *et al.* 1993 – specifically the Waipu Caves Road Scenic Reserve). Although in parts the vegetation is in poor condition due to stock disturbance (particularly in the lower areas around the caves), this site provides an important ecological linkage between North River Forest (Q07/117) and Ruakaka Forest (Q07/121). One threatened plant species (*Doodia mollis*) and two regionally significant plant species (carmine rata and tree fuchsia) are present. Five threatened fauna species (kukupa, kauri snail, Hochstetter's frog, *Amborhytida dunniae*, and Punctidae sp. 64) use this site. Approximately 20% of the site is formally protected. 70.5 ha at the centre of this site is in Waipu Caves Road Scenic Reserve (DOC-administered) and there is a smaller (3.2 ha) Scenic Reserve (WDC) at the main access point to the Waipu Caves. All ecological units have some representation in the protected areas.

* The *Liarea turriculata* species complex is currently ranked 'not threatened'; however, it is considered an invertebrate for which insufficient information is known on it, and which may be of conservation concern (McGuinness 2001).

RUAKAKA RIVER FOREST REMNANTS

Survey no.	Q07/119
Survey date	10 November 2006
Grid reference	Q07 359910 (39 remnants)
Area	104.3 ha
Altitude	20–60 m asl

Ecological units

(a) Totara–kahikatea forest on alluvium (87%)

(b) Totara treeland on alluvium (8%)

Landform/geology

Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

This site comprises a discontinuous ribbon of indigenous riverine floodplain forest on the alluvial plains formed by the Ruakaka River and its tributaries (Waikopakopa Stream, Waipapa Stream, Tauroa Stream, and Waiwarawara Stream). A portion of the Waikopakopa Stream occurs in the Whangarei Ecological District and has already been described in the relevant PNA report (site Q07/047, Manning 2001). This site exists in a landscape of intense pastoral agriculture, and the amount of effective riparian fencing varies considerably from property to property. Several areas of exotic forest dominated by crack willow, Chinese privet or walnut (*Juglans* sp.) are scattered along the river margins, but these have not been included in the site. Possums are present (SSBI Q07/H111).

The main forest type has abundant totara with kahikatea common (a). Kowhai, kanuka and crack willow occur frequently, with occasional rewarewa, titoki, ti kouka, matai, puriri, manatu, karaka, houhere, pukatea, kohuhu, mapou, karamu and nikau. Most forest remnants are 50–100 m wide, and the understorey is often badly infested with riparian weeds, for example tradescantia, montbretia, Chinese privet, creeping buttercup, jasmine, passionfruit, elaeagnus, coral tree, Jerusalem cherry, inkweed, and woolly nightshade. In some fenced areas the understorey is dominated by divaricating plant species including turepo and small-leaved *Coprosma* species (Peter Anderson, DOC, pers. comm.), which is an uncommon community in Waipu ED. Upstream areas of the Waikopakopa Stream have sparse, grazed totara treeland (b) with frequent kanuka and crack willow, and occasional kahikatea, karaka, houhere, titoki, ti kouka, kowhai, walnut, and Chinese privet.

Significant flora

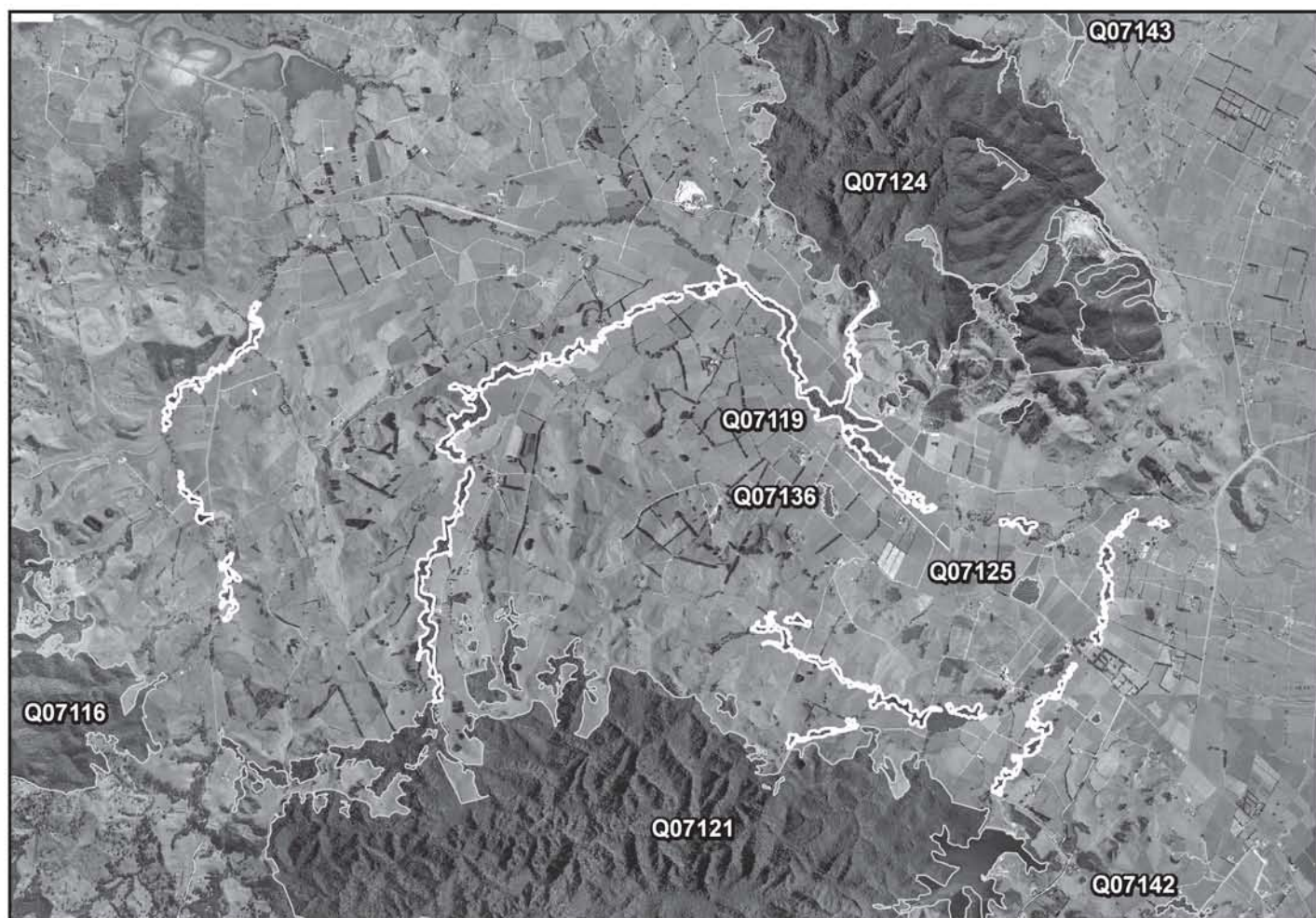
Manatu (regionally significant).

Fauna

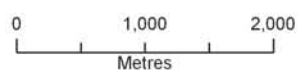
Grey duck (Serious Decline), kukupa (Gradual Decline), pukeko, spur-winged plover, NZ kingfisher, grey warbler, fantail, silvereye, and tui were recorded in 1993 (SSBI Q07/H111). Black shag (Sparse), little shag, kukupa, fantail, tui, grey warbler, and welcome swallow have been recorded here recently (Wildland Consultants 2006). Shining cuckoo was recorded in the current survey.

In 1981 longfin eel (Gradual Decline), shortfin eel, redfin bully, common bully, and koura were recorded in tributaries of the Ruakaka River within this site. In addition, shortjaw kokopu (Sparse)* and banded kokopu (regionally significant) were known

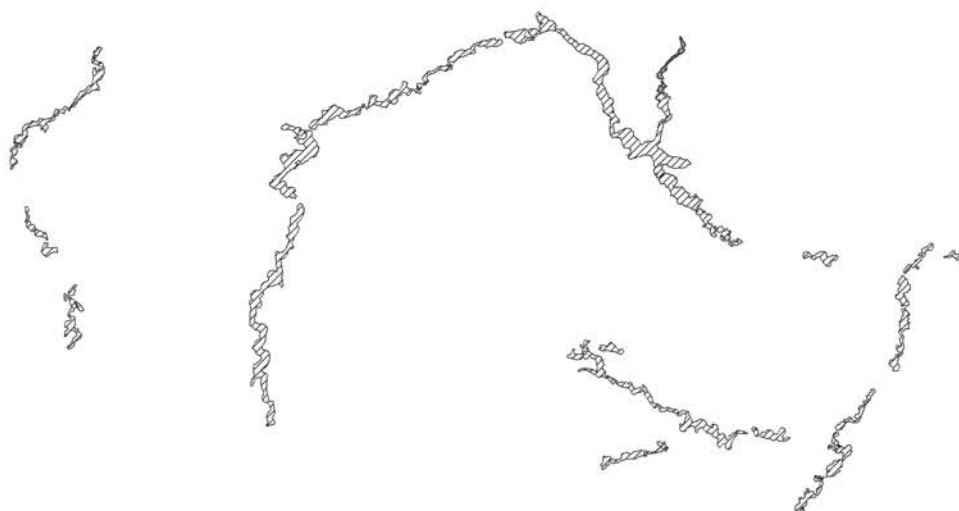
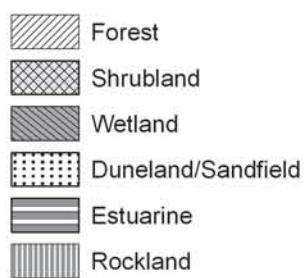
* This may have been a misidentification (Peter Anderson, DOC, pers. comm.).



Q07/119 Ruakaka River Forest Remnants



Habitat Type



from a small Ruakaka River tributary above Fulton Road in the Takahiwai Forest (Q07/124) (NIWA 2007).

Significance

This lowland river complex contains the best representative examples in Waipu ED of a formerly extensive floodplain forest type (with manatu, a regionally significant plant species). Floodplain forest is also a nationally rare habitat type. Four threatened fauna species (grey duck, kukupa black shag, and longfin eel) have been recorded in the site. It is recognised as a wildlife corridor linking Ruakaka Forest (Q07/121), Takahiwai Forest (Q07/124) and Mangapai Caves Road Forest and Shrubland (Q07/116) (SSBI Q07/H111). Some of the remnants have been fenced to exclude livestock (Wildland Consultants 2006), but most are grazed and severely impacted by pest plants and animals. The streams in this catchment support a range of fish and aquatic bird species including five threatened species, and one regionally significant species. The forest and treeland remnants provide some protection to the riparian margins, though large stretches remain open and unvegetated, with breaks between remnants up to 500 m in length. Potential impacts of construction of a proposed rail route between the main trunk line and Marsden B power station are loss of floodplain forest, disruption of movement corridors for animals and erosion impacting on instream fauna (Wildland Consultants 2006). Approximately 2.5% of the total site area is protected. 2.37 ha of the site is within the Ruakaka River Marginal Strip No. 1 (DOC-administered), 0.16 ha within a local purpose reserve (WDC) and 0.1 ha within the Springfield Domain Recreation Reserve (WDC).

CAVES ROAD FOREST

Survey no.	Q07/120
Survey date	11 November 2006
Grid reference	Q07 350840 (9 remnants)
Area	171.9 ha (171.0 ha forest, 0.8 ha wetland)
Altitude	31–220 m asl

Ecological units

- (a) Kanuka forest on moderate hillslope and in gully (55%)
- (b) Totara-kanuka forest on moderate hillslope (20%)
- (c) Totara-kanuka treeland on moderate hillslope (10%)
- (d) Taraire forest on gentle hillslope (5%)
- (e) Nikau forest on moderate hillslope (5%)
- (f) Kauri-rimu forest on ridge (2%)
- (g) Kahikatea forest on gentle hillslope (1%)
- (h) Rimu-tanekaha forest on ridge (1%)
- (i) Open water (constructed ponds) (1%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane), Oligocene limestone karst (Whangarei Limestone, Te Kuiti Group), and Miocene sandy mudstone and bluff-forming sandstone (Waitemata Group).

Vegetation

This is a diverse but highly fragmented area of indigenous forest situated directly north of Waipu Caves Road and west of Ormiston Road, where it is closely linked with North River Forest (Q07/117), Ormiston Road Forest Remnants (Q07/135), Waipu Caves Forest (Q07/118) and Waipu Caves Road Wetland (Q07/123). Small parts of the site also extend east of Ormiston Road and south of Waipu Caves Road a short way down steep limestone ravines. This site has been affected by piecemeal clearance for traditional pastoral agriculture as well as for 'lifestyle blocks', which has resulted in the planting of various tree crops (e.g. olives and fruit trees) and non-ecosourced indigenous species around the forest margins, e.g. karo, taupata, harakeke and *Astelia banksii*. There are also numerous invasive weed species present, e.g. arum lily, tradescantia, ivy, Chinese privet, and coastal banksia. Most areas are not fenced and are grazed by stock.

The vegetation over most of the site is characterised by young kanuka forest (a) with frequent totara and mamaku, and occasional ponga, nikau, kauri, kahikatea, rimu, and radiata pine; especially on the western side, which was allowed to regenerate from farmland around 50–60 years ago (Ian Fox pers. comm.). Within gullies the kanuka forest tends to have frequent taraire and kahikatea, and may also include occasional puriri, karaka, towai and tanekaha. Most of the northern half of the site was not easily visible during this survey, therefore its vegetation cover has been estimated from aerial photography (flown in January 2004).

Totara-kanuka forest (b) and treeland (c) occurs in stock-damaged areas on limestone geology around the Ormiston Road junction. Within these types puriri and karaka occur frequently, and there are occasional scattered matai, kahikatea, titoki, and puka. Taraire-dominant forest (d) with occasional rewarewa, kauri, tanekaha, puriri and kahikatea occurs on gentle hillslopes at the eastern end of the site. On a south-facing hillslope to the north of Waipu Caves Road there is a particularly dense, diverse and distinctive forest type which has abundant nikau (e) and a high number of locally occurring canopy species including pukatea, kiekie, taraire, puriri, kahikatea, titoki, lancewood, and toro. Ridges generally have kanuka forest (a), but can also support tall stands of secondary kauri and rimu with frequent tanekaha and kanuka (f), or rimu and tanekaha with frequent kauri and kanuka (h). There is a relatively small area of secondary kahikatea forest (g) at the toeslope of a small hill in the very east of the site. This area has frequent rimu and occasional pukatea, kanuka, and totara.

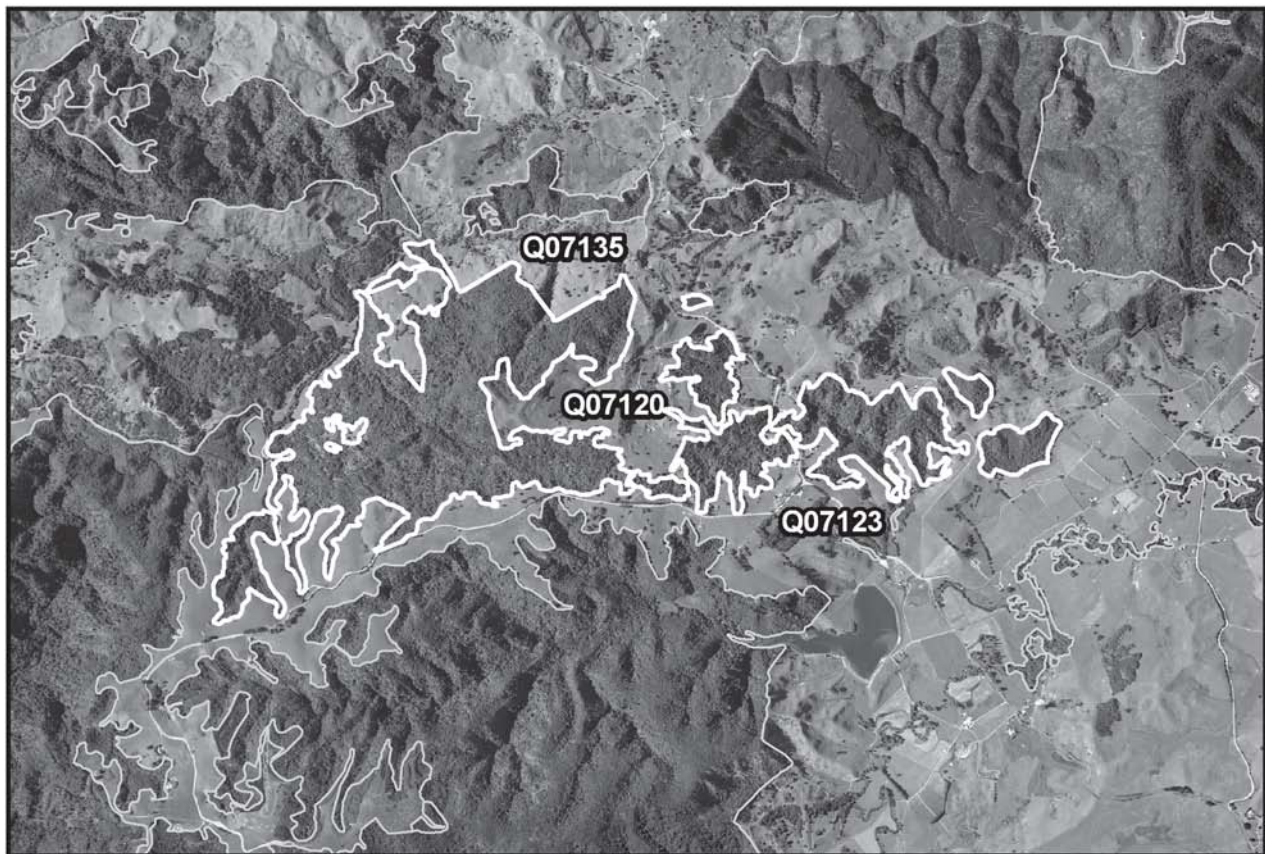
Two constructed ponds on Ormiston Road have been included within this site because they provide habitat for uncommon water birds.

Significant flora

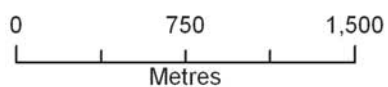
Kaikomako (regionally significant) is present under nikau forest (Ian Fox pers. comm.).

Fauna

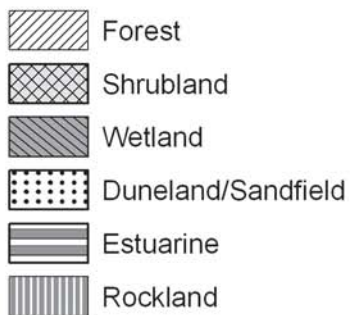
Northernmost known population of Hochstetter's frog (Sparse) recorded in 1977 (SSBI Q07/H058). New Zealand dabchick (Sparse) and Australasian little grebe (Coloniser; regionally significant) recently reported from dam on Ormiston Road (John Kendrick pers. comm.). Kukupa (Gradual Decline) seen in nikau forest (current survey).



Q07/120 Caves Road Forest



Habitat Type



Significance

This site contains a representative example of (c) nikau forest on moderate hillslope, which is diverse, unrecorded elsewhere in the ED, and contains a regionally significant plant species (kaikomako). Three threatened fauna species (Hochstetter's frog, NZ dabchick, and kukupa) and one regionally significant fauna species (Australasian little

grebe) have been recorded. Also Hochstetter's frog reaches its northern limit of distribution in this site. This site provides an ecological linkage between North River Forest (Q07/117) and Ruakaka Forest (Q07/121). Parts of the site are on limestone geology. Limestone geology and the vegetation it supports is regionally distinctive. The eastern part of the site is impacted by pest plants, habitat fragmentation, and potential genetic pollution through planting of non-ecosourced species.

RUAKAKA FOREST

Survey no.	Q07/121
Survey date	10 November 2006
Grid reference	Q07 363874 (19 remnants)
Area	1,699.3 ha (1,653.4 ha forest, 5.9 ha shrubland, 39.9 ha wetland)
Altitude	20–260 m asl

Ecological units

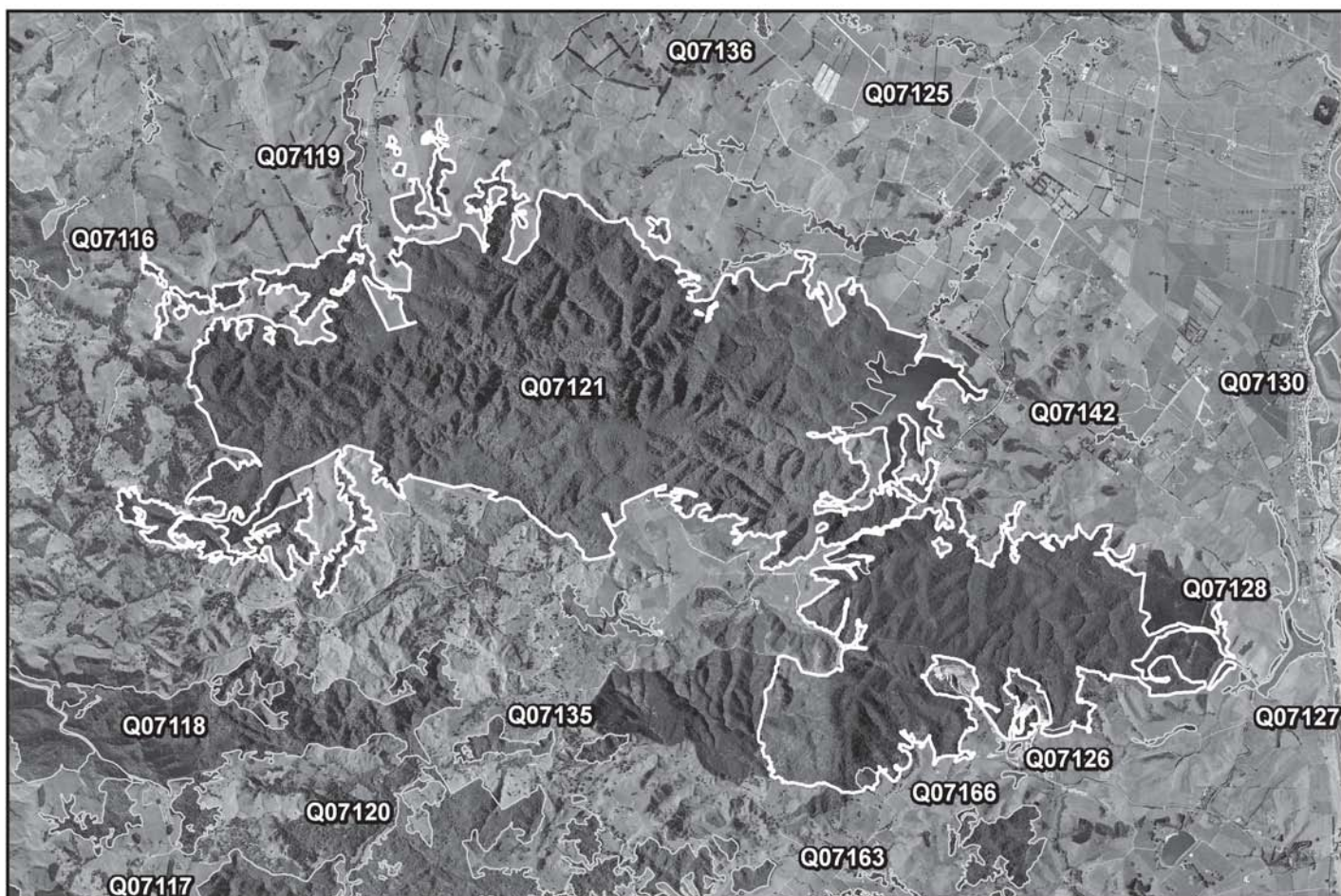
- (a) Kanuka-rimu-tanekaha forest on moderate to steep hillslope and ridge (45%)
- (b) Kauri forest on ridge (10%)
- (c) Totara forest on moderate to steep hillslope and in gully (10%)
- (d) Kanuka forest on gentle hillslope (5%)
- (e) Towai forest on moderate hillslope (5%)
- (f) Taraire-totara forest in gully (4%)
- (g) Totara-mamaku forest on moderate hillslope (4%)
- (h) Open water (constructed dam) (4%)
- (i) Taraire forest on steep hillslope and in gully (3%)
- (j) Tanekaha-kanuka forest on moderate hillslope and ridge (2%)
- (k) Totara-rewarewa forest in gully head (1%)
- (l) Kanuka-mamaku forest on moderate hillslope and in gully head (1%)
- (m) Kahikatea-totara forest in gully (1%)
- (n) Kauri-rimu forest on steep hillslope (1%)
- (o) Nikau-ponga forest in gully (1%)
- (p) Kanuka shrubland on steep hillslope and cliff (1%)
- (q) Mahoe-kanuka shrubland on ridge (1%)
- (r) Pate-ti kouka shrubland on ridge (1%)

Landform/geology

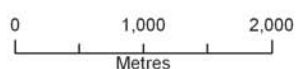
Steep hill country with deeply incised valleys and gullies; predominantly underlain by Mesozoic greywacke (Waipapa Terrane), but with small areas of Miocene sandy mudstone (Waitemata Group).

Vegetation

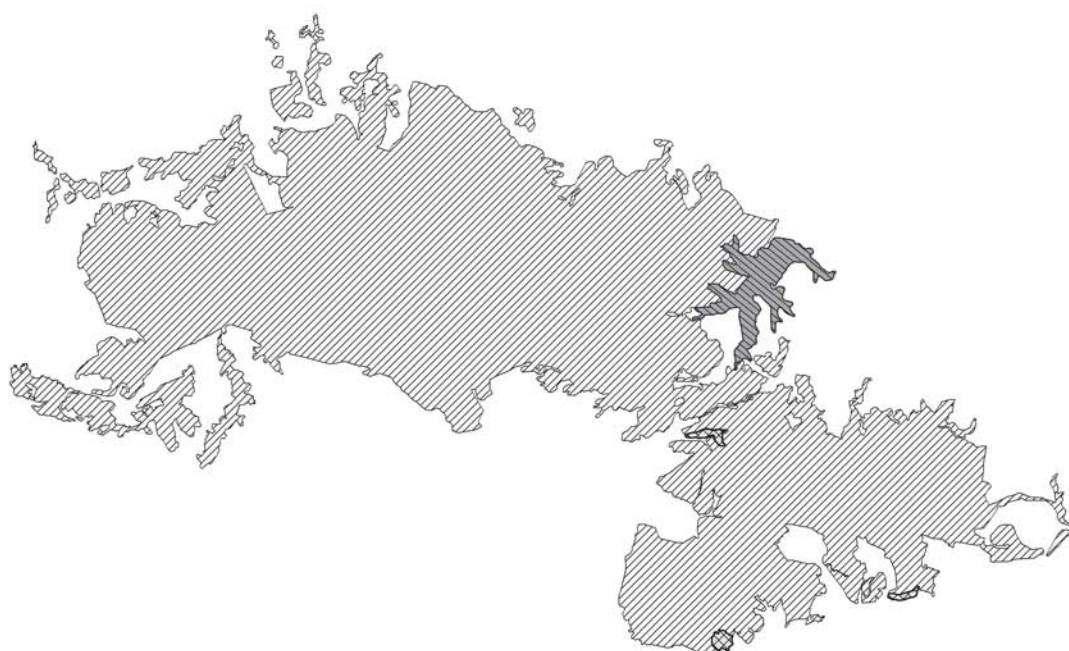
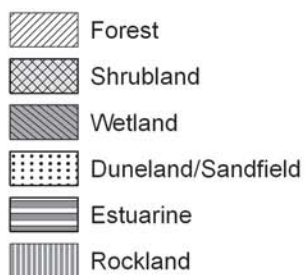
Ruakaka Forest is one of the largest and most diverse areas of indigenous forest in Waipu Ecological District. It is located on steep hill country inland of Ruakaka, rising to a high point of 262 m asl known as Kukunui. This site is generally elongated from west to east, extending in an arc approximately 9 km long and 2 km wide from Ormiston and Kukunui Roads in the west, to Prescott Road (where the forest narrows



Q07/121 Ruakaka Forest



Habitat Type



to about 1 km wide), and around to Mountfield Road in the southeast. Parts of the headwaters of the Waipapa Stream, Waikopakopa Stream, Tauroa Stream, Waiwarawara Stream, Pohuenui Stream and some unnamed streams draining into

Doctor's Hill Road Wetland (Q07/127) lie within this site. The biggest forested catchment is that of the Waipapa Stream in the west. The Waiwarawara Stream was dammed in 2002 and fully flooded in October 2003 for the purpose of providing a drinking water supply to the Ruakaka area. It is also stocked with brown trout for recreational fishing (Andrew Venmore pers. comm.). The open water habitat within Wilson's Dam (h) is included within the Ruakaka Forest site because it is bordered almost entirely by indigenous forest (a small area of forest was flooded during its creation) and may provide habitat for indigenous species, e.g. water birds and invertebrates.

It appears that all indigenous vegetation within Ruakaka Forest is secondary in origin, varying in age from decade-old shrublands to c. 150–200 year-old forest.

The major ecological unit is kanuka-rimu-tanekaha forest with frequent kauri (a), which occurs over large areas of broad ridges and moderately to steeply sloping terrain, generally with a northern aspect. Within the canopy there are also occasional totara, kahikatea, rewarewa, mamaku, lancewood, mahoe, kohuhu, mamangi, towai, tarata, and mapou. A younger and more kanuka-dominant forest type (d) occurs on lower, gentle hillslopes throughout. This type is associated with frequent kauri and occasional rimu, totara, and tanekaha. Typical understorey species include regenerating kauri, tanekaha, totara, kahikatea, rimu, lancewood, towai, and tarata, and there is a dense shrub tier of *Gabnia xanthocarpa*, *G. lacera*, hangehange, *Coprosma spathulata*, mamangi, mingimingi, turutu, *Lycopodium deuterodensum*, ponga, ti kouka, mapou, kiokio, and *Alseuosmia* spp. On disturbed edges prickly hakea can be present. Many of the prominent ridge lines, especially those radiating down from Kukumui, have dense stands of kauri (b) in association with frequent kanuka and rewarewa, and occasional totara. There are also localised stands of kauri mixed with rimu on steep, dry terrain (n). Forest with abundant tanekaha over kanuka (j) often occurs on north-facing ridges and steep hillslopes at lower altitudes.

On southern hillslopes, totara forest (c) with a diverse range of canopy associates is present. Totara is abundant, but is associated with many other species, including towai, kauri, kahikatea, nikau, miro, puriri, tanekaha, taraire, mamaku, kohekohe and rewarewa. More disturbed and younger totara-mamaku forest with frequent kahikatea (g) occurs on the margins, especially near Kukumui Road. Towai forest (e) with frequent ponga, rewarewa, and mamaku, and occasional taraire, tawa, nikau, karaka, and puka is present on some south-facing hillslopes, especially in the Pohuenui Scenic Reserve and the McKenzies of Limestone Hill Park Scenic Reserve. Taraire forest (i) with frequent puriri and karaka, and occasional tawa and kohekohe also occurs on southern hillslopes and gullies.

Broadleaf forest in gullies is often very diverse. However it was not readily visible from accessible survey points, and most north-draining gullies were only visible from a distance of 2 km. Nikau-ponga forest (o) was described from one location in the Waipapa Stream catchment. Much of the upper Waipapa Stream catchment has been deforested except for several deep gullies extending south to Ormiston Road, which allowed these gully forest types to be seen more easily. Taraire-totara forest (f) is the main forest type in this area; it incorporates frequent nikau, rewarewa, ponga, kahikatea, and supplejack, and occasional pate, karaka, rimu, tawa, mamaku, mahoe, puka and kohekohe. There are also small areas of totara-rewarewa forest (k) and kanuka-mamaku forest (l) in the heads of these gullies. Mexican devil and tradescantia infestations are apparent within these gully areas, probably exacerbated

by disturbance within the catchment around them. The small part of the Waikopakopa Stream catchment within this site supports narrow areas of kahikatea-totara forest with frequent kanuka (m) surrounded by pasture.

Only small areas of shrubland are present and include kanuka shrubland (p), mahoe-kanuka shrubland (q) and pate-ti kouka shrubland (r), all of which occur around the margins of the site. Pate-ti kouka shrubland occurs on more poorly drained sites than the other two types.

Significant flora

Maire tawake (regionally significant), gully tree fern (regionally significant) and tree fuchsia (regionally significant) recorded in 1991 (SSBI Q07/H055). Hard beech (regionally significant) is present (Peter Anderson, DOC, pers. comm.).

Fauna

North Island brown kiwi (Serious Decline), NZ kingfisher, welcome swallow, grey warbler, fantail, silveryeye, and tui were recorded in 1978, however North Island brown kiwi are probably no longer present, as they were not found anywhere in Waipu Ecological District in 1992 (Miller and Pierce 1995). During a 1992 survey kukupa (Gradual Decline), longfin eel (Gradual Decline), tomtit (regionally significant), common bully, koura, and copper skink were found at this site. Native frogs were searched for in 1992, but not found (SSBI Q07/H055).

In 1988 the upper Waiwarawara Stream supported longfin eel, shortjaw kokopu (Sparse),* banded kokopu (regionally significant), shortfin eel, redbfin bully, and koura. However, the situation may have changed since damming of the river in 2002. Banded kokopu were also known from the upper Waipapa Stream catchment in 1981 (NIWA 2007).

Observations by local landowner Jackie Adenbrook: Kauri snails (Gradual Decline) are regularly found crossing Ormiston Road at the western end of Ruakaka Forest; kukupa and morepork populations have declined over the past decade; possum, mustelid and ship rat numbers remain high; three North Island kaka (Nationally Endangered) were sighted in the early 2000s and remained in the area for several days before they were shot by local children.

Significance

Ruakaka Forest is the second largest contiguous area of indigenous forest in the ED (after Mareretu Forest Q08/220). Wilson's Dam is the largest freshwater body in the ED, though it has only recently been created and indigenous fauna are not yet well established. Except for the dam (which is constructed) all of the ecological units are representative individually of their types. When considered collectively the different ecological units are representative of a secondary forest sequence on greywacke and sandy mudstone. Several threatened and regionally significant species have been recorded here (four regionally significant plant species—maire tawake, gully tree fern, tree fuchsia, and hard beech; five threatened fauna species—kukupa, longfin eel, shortjaw kokopu, kauri snail, and North Island kaka; and two regionally significant fauna species—tomtit and banded kokopu). Feral browsing animals, pigs and stock are present and there are several localised weed infestations, e.g. Mexican fireweed and mistflower (SSBI Q07/H055). 442 ha is within McKenzies of Limestone Hill Park Scenic Reserve and Pohuenui Scenic Reserve (DOC-administered) collectively cover 442 ha of the site, and 294.3 ha lie within the Ruakaka Forest Conservation Area

* This may have been a misidentification (Peter Anderson, DOC, pers. comm.).

(DOC-administered). A further 136 ha of the site lies within local purpose reserve land (WDC) in the Waiwarawara catchment (around Wilson's Dam). A Queen Elizabeth II Open Space Covenant protects 6.5 ha of forest remnants on the northern edge. Approximately 52% of the site is therefore protected.

TAKAHIWAI FOREST

Survey no.	Q07/124
Survey date	16 November 2006
Grid reference	Q07 379937 (11 remnants)
Area	641.2 ha (635.3 ha forest, 4.2 ha wetland, 1.7 ha shrubland)
Altitude	15–195 m asl

Ecological units

- (a) Kanuka forest on moderate hillslope (65%)
- (b) Kauri-kanuka forest on ridge-top (30%)
- (c) Totara forest on moderate hillslope (2%)
- (d) Open water in constructed lake (1%)
- (e) Totara-puriri forest in gully head (<1%)
- (f) Manuka shrubland on moderate hillslope (<1%)
- (g) Karaka-nikau-kanuka forest in gully (<1%)
- (h) Kanuka-puriri treeland in gully (<1%)
- (i) Raupo reedland in gully (<1%)

Landform/geology

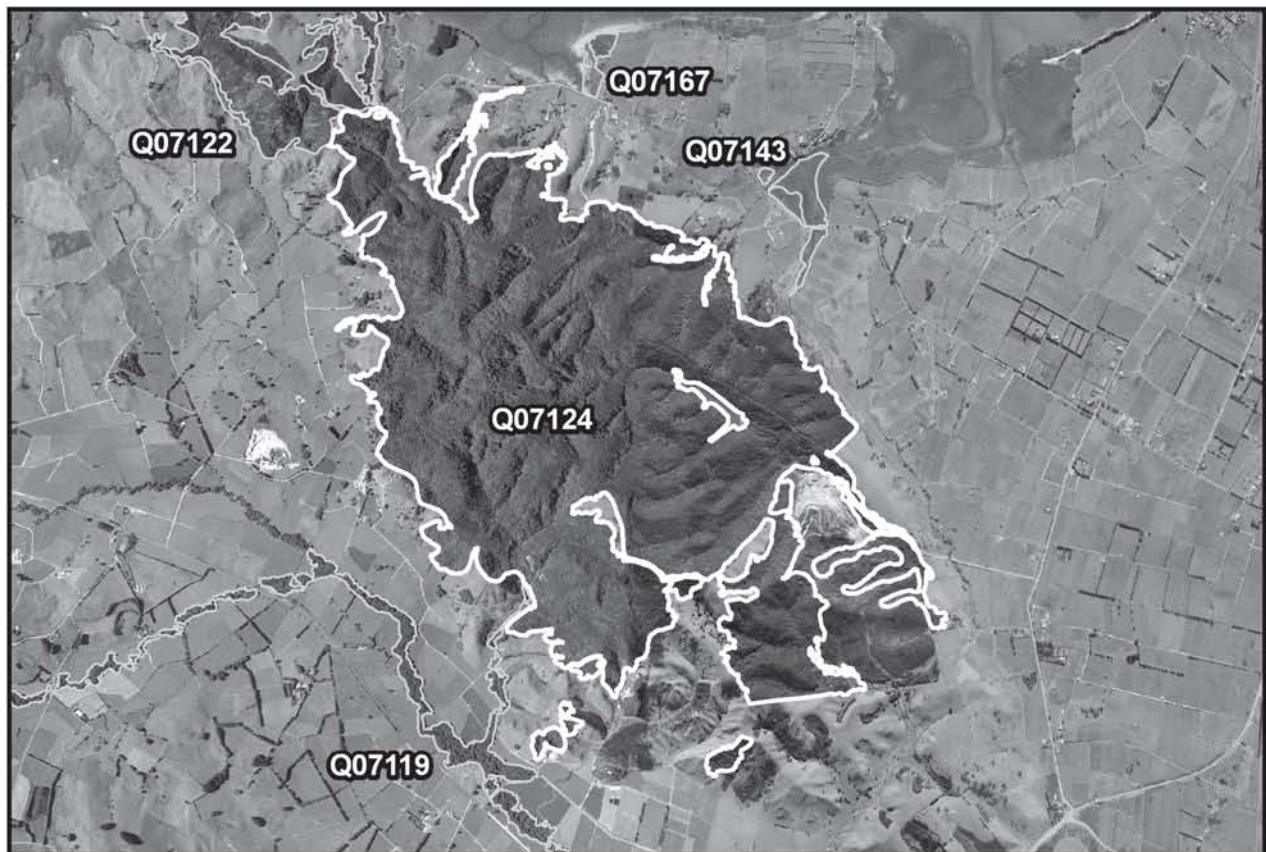
Dissected hill country on Mesozoic greywacke (Waipapa Terrane).

Vegetation

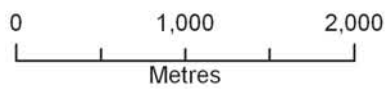
This site comprises one large and 10 small forest remnants between SH 1 and Whangarei Harbour. Most of the vegetation is secondary; most of the hillslopes are kanuka forest (a) although there are small areas of totara forest (c) and manuka shrubland (f). Kauri-kanuka forest (b) is dominant on many of the ridges. Small patches of more diverse totara-puriri (e) and karaka-nikau-kanuka (g) forest remain in the gullies and gully heads. These coastal broadleaf remnants are likely to be representative of the vegetation that was formerly extensive in the area, prior to human clearance. On the northwestern edge of the remnant is a small area of kanuka-puriri treeland (h) where the forest grades into pasture. Examination of the aerial photographs suggested that a gully in the south east of the remnant has an area of raupo reedland (i), and the headwaters of a tributary of the Ruakaka River has been dammed to form an artificial lake (d).

Significant flora

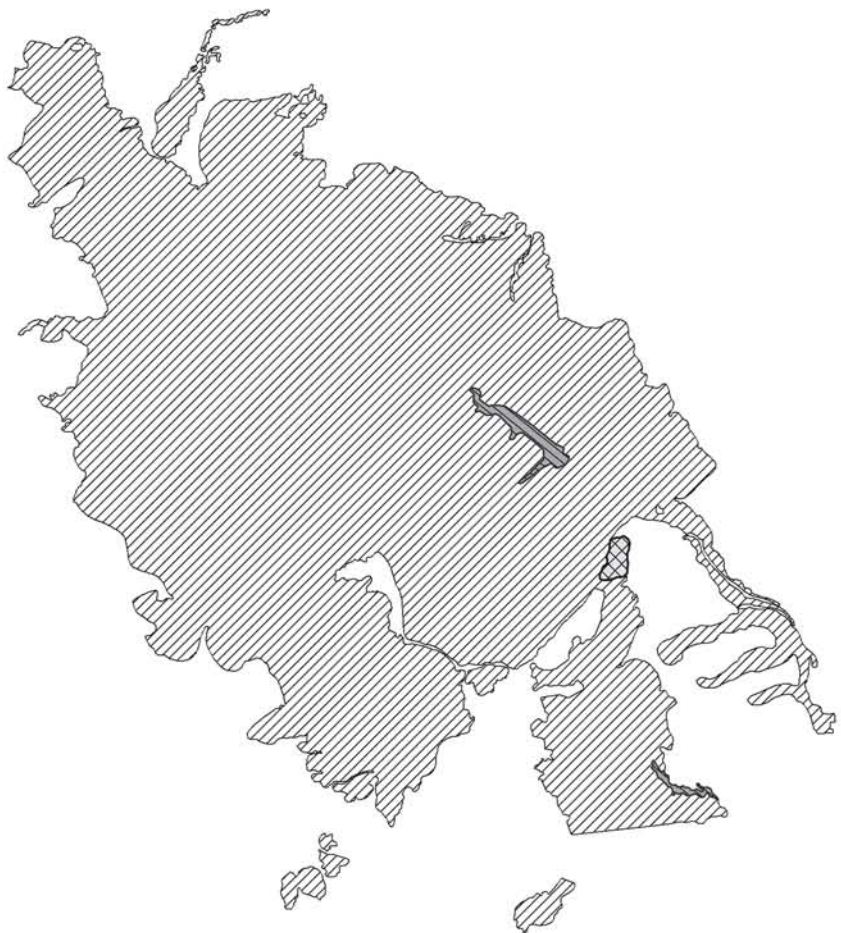
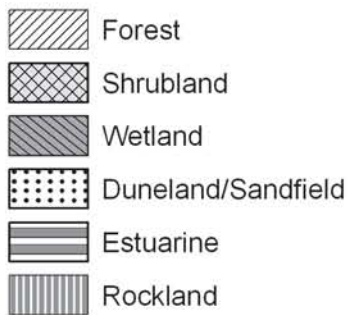
Northern rata (regionally significant) and maire tawake (regionally significant) recorded in 1990, and *Pratia angulata* (regionally significant) and hard beech (regionally significant) recorded in 1993 (SSBI Q07/H047). *Coprosma rigida* (regionally significant) has been recorded from here (L. Forester, NRC, pers. comm., date unknown).



Q07/124 Takahiwai Forest



Habitat Type



Fauna

Kukupa (Gradual Decline), morepork, welcome swallow, grey warbler, North Island fantail, silvereye, and tui recorded in 1992 (SSBI Q07/R07/H047). Tomtit (regionally significant) recorded in 1978 (SSBI Q07/R07/H 047). New Zealand kingfisher and *Amborhytida dunni* (Gradual Decline) were recorded in 1993 (SSBI Q07/R07/H047 #1).

Longfin eel (Gradual Decline), shortjaw kokopu (Sparse),* banded kokopu (regionally significant), and koura were recorded in tributaries of the Ruakaka River, on the southern slopes of Takahiwai Forest, above Fulton Road, in 1981 (NIWA 2007).

Significance

This site contains seven representative ecological units: (a) kanuka forest on moderate hillslope, (b) kauri-kanuka forest on ridge-top, (c) totara forest on moderate hillslope, (e) totara-puriri forest in gully head, (f) manuka shrubland on moderate hillslope, (g) karaka-nikau-kanuka forest in gully, and (h) kanuka-puriri treeland in gully. Takahiwai Forest is a relatively large area and of compact shape, however grazing occurs on the forest edges, and in places is resulting in canopy breakdown and the formation of treeland (h). The site supports three threatened fauna species (kukupa, *Amborhytida dunni*, and longfin eel), two regionally significant fauna species (tomtit and banded kokopu), and five regionally significant plant species (northern rata, hard beech, maire tawake, *Pratia angulata*, and *Coprosma rigida*). Takahiwai Forest provides important riparian protection for tributaries of the Ruakaka River, and Takahiwai Stream. Approximately 65.0 ha of this site is within a scenic reserve (DOC-administered) (Mata Farm Settlement Scenic Reserve).

TAUROA FLOODPLAIN FOREST REMNANTS

Survey no.	Q07/125
Survey date	10 November 2006
Grid reference	Q07 388901 (2 remnants)
Area	4.7 ha
Altitude	20 m asl

Ecological unit

(a) Kahikatea forest on alluvium (100%)

Landform/geology

Terrace on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits.

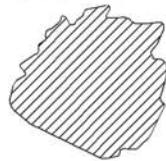
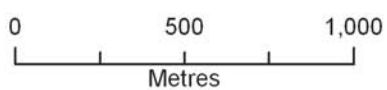
Vegetation

This site comprises two kahikatea forest remnants on alluvial floodplains near the confluence of the Tauroa Stream and the Ruakaka River. The larger remnant, which is 2 km southeast of the Flyger Road intersection along State Highway 1, is a dense stand of secondary kahikatea (perhaps 150 years old) associated with frequent puriri and totara, and occasional ti kouka, kanuka, rimu, and pukatea. This remnant appears to be entirely fenced, and has a relatively thick understorey of kohekohe, karaka, *Gabnia* spp., small-leaved *Coprosma* species, and occasional Japanese honeysuckle. It is occasionally lightly grazed (Peter Anderson, DOC, pers. comm.).

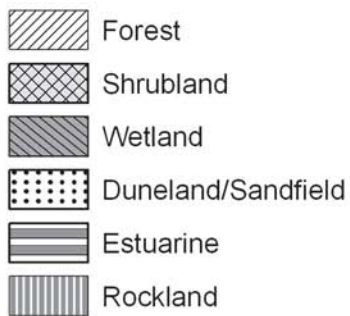
* This may have been a misidentification (Peter Anderson, DOC, pers. comm.).



Q07/125 Tauroa Floodplain Forest Remnants



Habitat Type



The smaller remnant is in noticeably worse condition lacking any appreciable undergrowth. The canopy, which is relatively open, comprises secondary pole kahikatea with occasional puriri, totara, ti kouka, and karaka. It has a 3-wire fence, but dead and dying puriri indicate previous heavy grazing and trampling by stock.

Fauna

North Island fantail and silvereye were recorded in 1978, and a North Island kaka (Nationally Endangered) was seen in the Flyger Road area in 1994 (SSBI Q07/H048).

Significance

Forest on alluvial floodplains is nationally rare, hence these small remnants are representative of their type. The larger remnant is in relatively good condition due to the general exclusion of stock, and it is one of the few kahikatea remnants with a relatively intact understorey remaining on floodplains in Waipu ED.

MOUNTFIELD ROAD WETLANDS

Survey no.	Q07/126
Survey date	11 November 2006
Grid reference	Q07 392848 (4 remnants)
Area	2.3 ha
Altitude	40–60 m asl

Ecological units

- (a) Raupo reedland in gully (60%)
- (b) Open water (constructed ponds) (30%)
- (c) Willow weed herbfield in gully (10%)

Landform/geology

Valley floor wetlands on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits, and Holocene alluvium.

Vegetation

This site comprises four separate open water ponds near the quarry on Mountfield Road, two of which have been constructed and two of which are semi-natural. All have some indigenous vegetation around the water margins and provide habitat for indigenous birds. The most common vegetation type is raupo reedland (a), with occasional scattered harakeke, *Carex virgata*, ti kouka and mamaku. This type encircles each pond and extends up to 100 m up gullies feeding into the largest pond in the southwest. On the edges between the raupo reedland and the open water habitat (b) there are frequent *Carex virgata* tussocks standing above the water, often grading into a herbfield dominated by willow weed (c)* with occasional water plantain. The wetlands are surrounded by grazed exotic grassland dominated by Yorkshire fog with occasional dally pine.

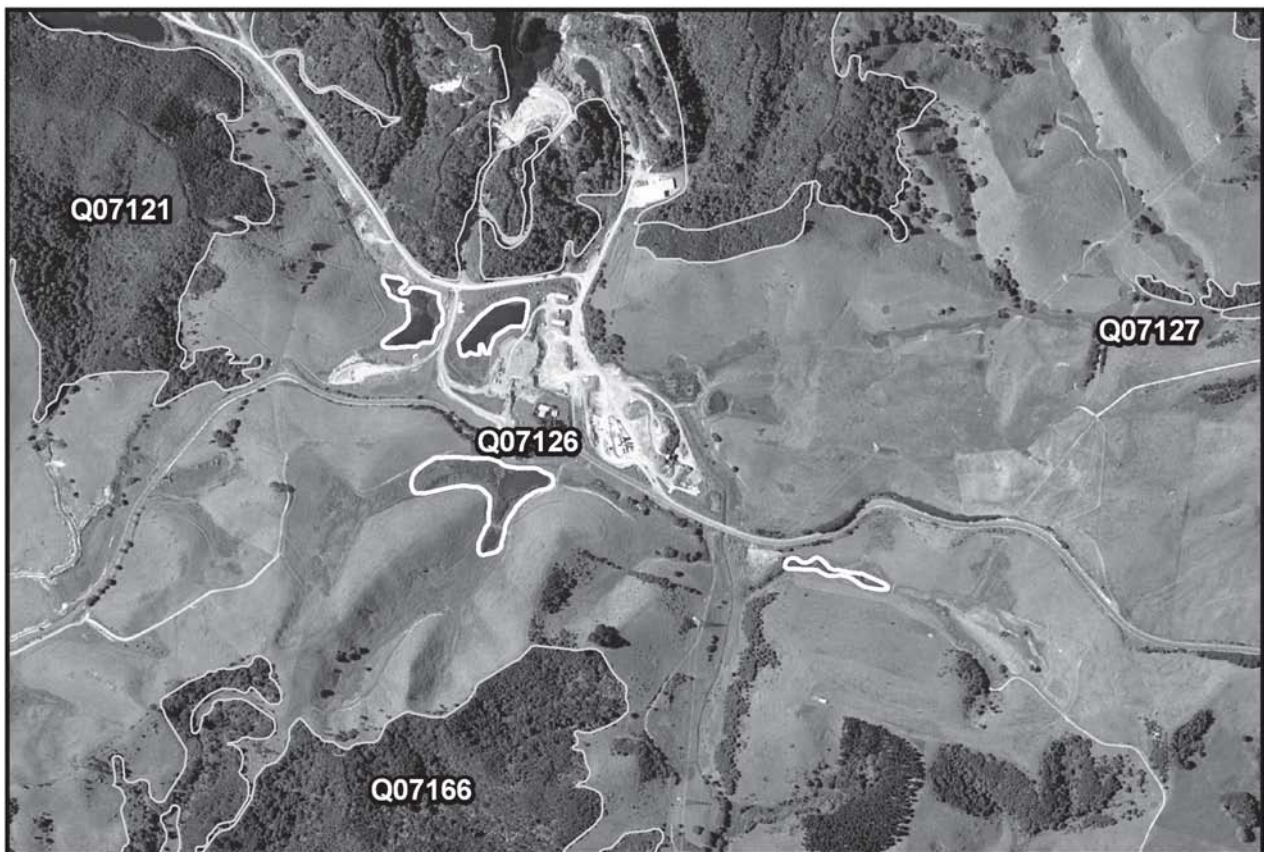
Fauna

Grey duck (Nationally Endangered), spotless crane (Sparse), paradise shelduck, Australasian harrier, pukeko, grey warbler, fantail and silvereye were recorded in 1978 (SSBI Q07/H061). During the current survey a spotless crane tape was played in close proximity to the wetland several times, with no response. NZ kingfisher and welcome swallow were recorded in the site.

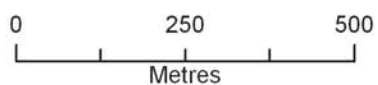
Significance

This site contains small but significant freshwater wetland habitats with representative examples of (a) raupo reedland in gully. Most natural freshwater

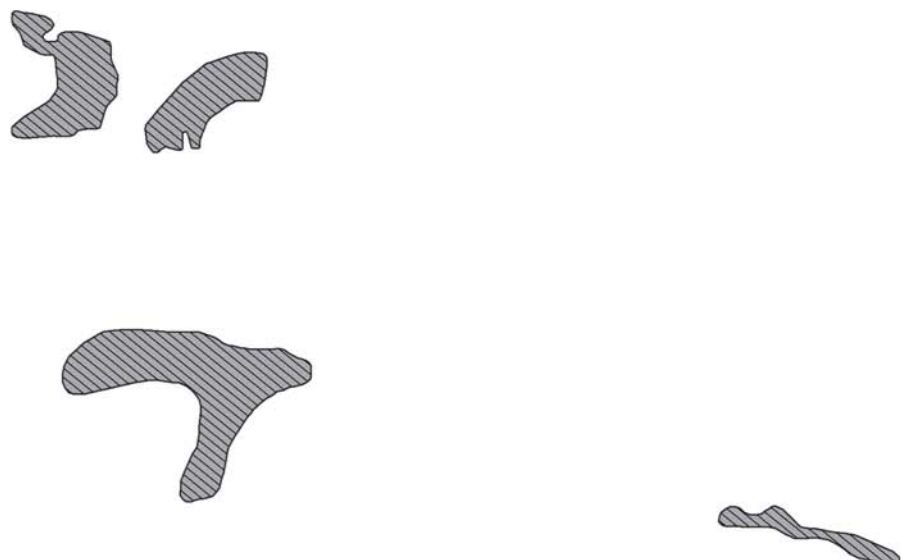
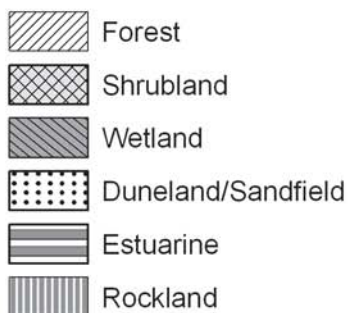
* The species of willow weed could not be determined from a distance, but it is likely to be either *Persicaria decipiens* (an indigenous species) or *Polygonum hydropiper* (an exotic species).



Q07/126 Mountfield Road Wetlands



Habitat Type



wetlands which were present in the ED in the past have been drained or modified, and now there are only approximately 45 ha of natural or semi-natural wetland remaining. Two threatened bird species (grey duck and spotless crane) may be present but have not been recorded for 18 years. There are heavy grazing and weed impacts.

DOCTOR'S HILL ROAD WETLAND

Survey no.	Q07/127
Survey date	10 November 2006
Grid reference	Q07 413859 (8 remnants)
Area	23.2 ha (5.6 ha forest, 17.6 ha wetland)
Altitude	14–29 m asl

Ecological units

- (a) Reed sweetgrass grassland in gully (45%)
- (b) Raupo reedland in gully (35%)
- (c) *Baumea articulata* reedland in gully (5%)
- (d) Totara forest on steep hillslope (5%)
- (e) Open water in gully (3%)
- (f) Totara treeland on gentle hillslope (3%)
- (g) Bracken fernland in gully (3%)
- (h) Kahikatea treeland in gully (1%)

Landform/geology

Hillslopes of Mesozoic greywacke (Waipapa Terrane) bordering a valley floor wetland ponded behind a Holocene coastal dunefield.

Vegetation

Doctor's Hill Road Wetland is an extensive freshwater wetland located in the gully of an unnamed stream which originates in Ruakaka Forest (Q07/121) and drains into the Ruakaka River Estuary (Q07/130). State Highway 1 crosses the wetland at its lower, eastern end and potentially impedes water flows out of the gully, thus maintaining water levels. Doctor's Hill Road also traverses one area of the wetland and may play a similar role. The entire site is surrounded by grazed paddocks, which are not fenced off from the wetland, and small remnants of contiguous totara forest and treeland (d and f) and kahikatea treeland (h). The forest remnants have been included in the site as they provide perching sites for wetland birds and help to stabilise slopes.

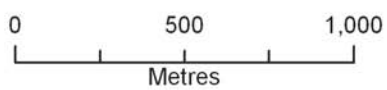
Within the wetland the dominant vegetation types are reed sweetgrass grassland (a) and raupo reedland (b), which both have occasional crack willow, harakeke, ti kouka and wheki around their margins. Small, discrete patches of *Baumea articulata* reedland (c) and bracken fernland (g) with frequent raupo occur; the latter in slightly raised areas which are better drained. Raised areas sometimes also have manuka and/or karamu. There are small but important areas of open water habitat (e) adjacent to the raupo and *Baumea articulata* reedlands, which provide habitat for water birds. The exotic floating fern *Azolla pinnata* forms a variable amount of cover over the water surface in these areas. Manchurian wild rice and alligator weed were noted in 1996 (SSBI Q07/H056). Manchurian wild rice was not found during a field inspection in March 2007 (Brett Miller, Northland Regional Council, pers. comm.).

Fauna

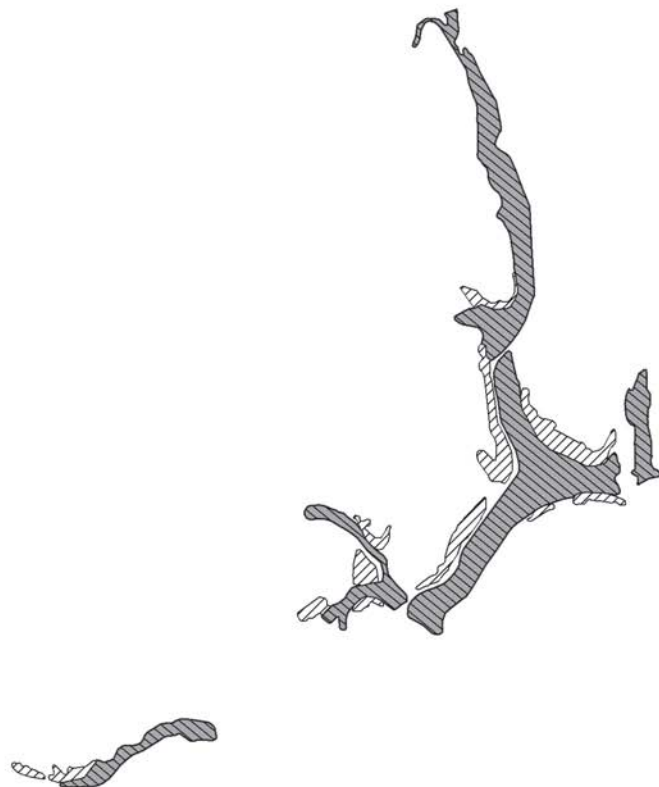
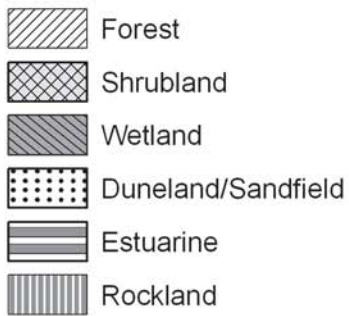
Australasian bittern (Nationally Endangered) recorded in 2003 (Amokura 93, February 2004) and observed again in 2006 during current survey (2 birds). Grey duck (Nationally Endangered), kukupa (Gradual Decline), spotless crane (Sparse), paradise shelduck, pukeko, pied stilt, grey warbler, tui, Australasian harrier, welcome swallow, and fantail have all been recorded here by various observers between 1978



Q07/127 Doctor's Hill Road Wetland



Habitat Type



and 1996 (SSBI Q07/H056). Spotless crane presence was confirmed during the current study via response to taped calls.

Significance

This is the largest natural freshwater wetland remaining in Waipu ED. Despite modification, grazing, and extensive weed infestation (the dominant species is reed sweetgrass), the site is ecologically significant due to the rarity of wetland habitat and the presence of four threatened bird species (Australasian bittern, grey duck, spotless crane, and kukupa). It is one of only five natural coastal freshwater wetlands remaining in Waipu ED (Q07/131, Q07/141, Q07/127, Q07/129 and R08/001). Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. There are four representative ecological units: (b) raupo reedland in gully, (c) *Baumea articulata* reedland in gully, (e) open water in gully, and (g) bracken fernland in gully. A small part of the lower end of the wetland (0.22 ha) is within the Ruakaka Conservation Area (DOC-administered), and another small part (0.1 ha) is within the Ruakaka Wildlife Refuge (DOC-administered). Only 1.4% of the total site area is protected.

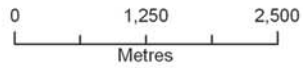
RUAKAKA DUNELANDS

Survey no.	Q07/128
Survey date	13 November 2006
Grid reference	Q07 430847 (6 remnants)
Area	725.7 ha (154.9 ha duneland, 91.5 ha forest, 474.8 ha shrubland, 4.7 ha wetland)
Altitude	0–20 m asl

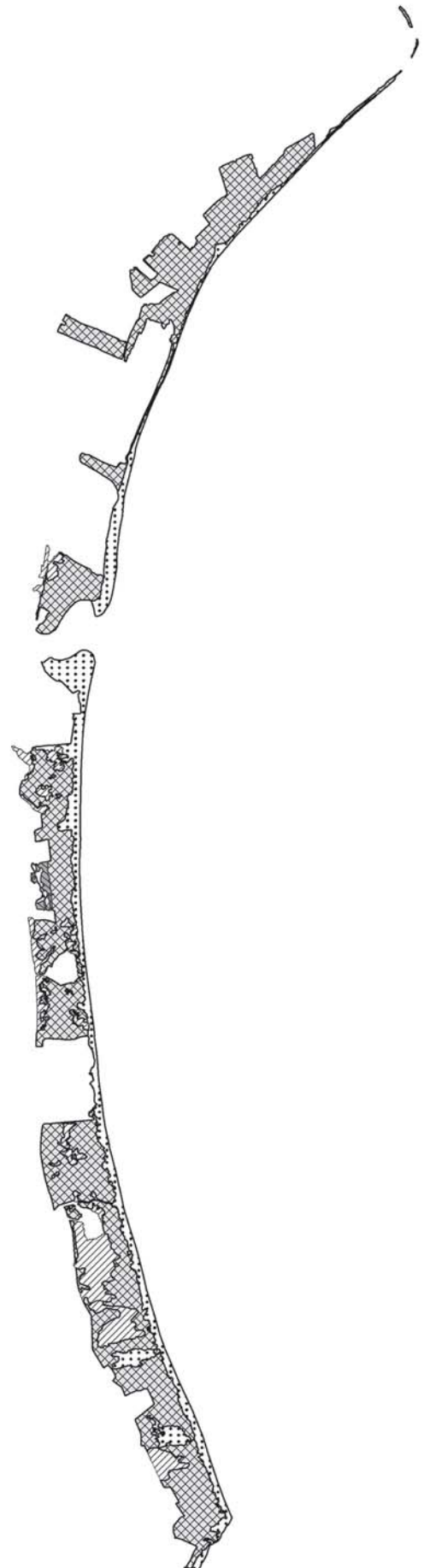
Ecological units

- (a) Gorse–pampas scrub on sand dune (65%)
- (b) Sandfield habitat on beach and sand dune (10%)
- (c) Pohuehue shrubland on sand dune (4%)
- (d) Sweet vernal–haretail grassland on sand dune (3%)
- (e) *Kunzea ericoides* var. *linearis* forest on sand dune (2%)
- (f) Maritime pine treeland on sand dune (2%)
- (g) Brush wattle–Chinese privet–mapou scrub on sand dune (2%)
- (h) Radiata pine forest on sand dune (1%)
- (i) Spinifex grassland on sand dune (1%)
- (j) Pingao sedgeland on sand dune (1%)
- (k) Tree privet–Chinese privet scrub on sand dune (1%)
- (l) Pohuehue–*Coprosma acerosa* shrubland on sand dune (1%)
- (m) Pampas–ginger scrub on sand dune (1%)
- (n) Sweet vernal grassland on sand dune (1%)
- (o) Knobby clubrush–pohuehue sedgeland on sand dune (1%)
- (p) Haretail–gazania–marram grassland on sand dune (1%)
- (q) Harakeke–gorse flaxland on sand dune (1%)
- (r) Glasswort herbfield in estuary (1%)
- (s) Open water (constructed pond) (1%)

Q07/128 Ruakaka Dunelands



Habitat Type



Landform/geology

Holocene coastal dunefield and beach sands.

Vegetation

This site comprises an approx. 19 km long band of sand dunes extending from Marsden Point in the north to the Waipu River Estuary (Q08/228) in the south, varying in width from approximately 800 m at the widest to 30 m at the narrowest. Adjacent land use on sand dunes and alluvial flats is generally intense, being a mixture of industrial, pastoral, residential and recreational activities which are serviced by State Highway 1 and other heavily transited coastal roads. Several of these roads run north-south near the western boundary of the site.

Whilst overall the vegetation is dominated by exotic plant species, there is still a moderate diversity of indigenous species remaining.

Moving inland from the top of the intertidal zone, the first terrestrial zone is a fine grained sandfield habitat (b) with occasional sea rocket (both *Cakile edentula* and *C. maritima*) scattered along the strand line. Glasswort herbfield (r) is present on gently sloping estuarine beaches next to the Ruakaka River Estuary (Q07/130), and tends not to occur on the open coast.

On the seaward slope of the foredune there is spinifex grassland (i) with occasional lupin, shore bindweed, purple groundsel and pingao, as well as a few discrete, dense areas of pingao sedgeland (j). From the top of the foredune back, exotic species become more prevalent. There are large areas of sweet vernal-haretail grassland (d) with frequent *Carex testacea*, gorse, ripgut brome, pohuehue, and knobby clubrush, and occasional large quaking grass, catsear, broomrape, shore bindweed, catchfly, South African iceplant, and *Coprosma acerosa*. The most common vegetation type at the back of the foredune (i.e. sheltering on the landward-facing slope) is low, tangled pohuehue shrubland (c) with frequent purple groundsel, lupin, knobby clubrush, sweet vernal, and haretail, and occasional sand wind grass, *Cortaderia splendens*, *Oxalis rubens*, *Carex testacea*, South African iceplant, dimorphotheca, smilax, apple of Sodom, bracken, gorse and gazania. There are several minor vegetation types forming mosaics at the back of the foredune, including knobby clubrush-pohuehue sedgeland (o), haretail-gazania-marram grassland (p) and pohuehue-*Coprosma acerosa* shrubland (l), however all of these are essentially similar communities comprising varying percentages of the same species. Marram is uncommon and occurs only locally.

Immediately behind the foredune the most extensive vegetation type begins. This type extends to the inland boundaries of the site often for hundreds of metres. It comprises exotic scrub dominated by gorse and pampas (a), associated with a multitude of species, including *Haloragis erecta*, pohuehue, mingimingi, patotara, *Lepidosperma laterale*, *Coprosma acerosa*, climbing asparagus, *Acacia sophorae*, willow-leaved hakea, radiata pine, brush wattle, kikuyu, Yorkshire fog, wild carrot, aristeia, veldt grass, watsonia, and tall fescue. This area also encompasses two small areas of exotic scrub; brush wattle-Chinese privet-mapou scrub (g) with frequent woolly nightshade, tree privet, and pampas, and tree privet-Chinese privet scrub (k) which has frequent mapou and ginger, and occasional ti kouka.

Within this scrub there are several 'islands' of wilding radiata pine forest (h) and *Kunzea ericoides* var. *linearis* forest (e) rising above the level of the surrounding vegetation. The latter is composed of a distinct variety of kanuka which is specific to coastal sandy soils the northern North Island. Associated species include manuka, radiata pine, gorse, mingimingi, turutu, cotoneaster, mapou, hangehange, pohuehue,

Lepidosperma laterale, and *Baumea juncea*. Manuka is common in the canopy on the edges of the kanuka stands and dead manuka stems are common in the understorey, suggesting that manuka may have colonised the same site earlier and facilitated kanuka forest development. Dead gorse is also often found beneath the kanuka canopy.

At the entrance to the campground at Uretiti there is a stand of maritime pine treeland (f) associated with frequent tree privet, kanuka, mapou, brush wattle, and sweet vernal, and occasional black wattle, radiata pine, woolly nightshade, mingimingi and turutu. The maritime pines may have been planted. Within and around this area there are small patches of pampas-ginger scrub (m) and sweet vernal grassland (n). The latter is typically dominant throughout the site where semi-consolidated sand has been cleared for infrequently used vehicle tracks. There are also bare sand tracks which are frequently used by vehicles and there are also large bare sand blow-outs in several locations caused by vehicle disturbance and/or natural sand movement.

To the north of Ruakaka Racecourse, and also in a few other dune slacks where soils have higher moisture year round, there is harakeke-gorse flaxland (q). The only areas of open water (s) present within this site are the constructed ponds at Semenoff Sand Supplies Ltd on State Highway 1. These are included as habitat because they have been used by threatened bird species in the past, and at times have supported reedland vegetation on their margins, however this is no longer present (John Kendrick pers. comm.).

Significant flora

Kunzea ericoides var. *linearis* (Serious Decline), *Pimelea arenaria* (Gradual Decline) (very rare at this site—Lisa Forester, NRC, pers. comm.), pingao (Gradual Decline), and *Coprosma acerosa* (regionally significant).

Fauna

Australasian bittern (Nationally Endangered) were recorded at Semenoff Sand Supplies Ltd ponds in 1999 (SSBI Q07/H110), and New Zealand dabchick (Sparse) were recorded from the same locality in 2004 (Amokura 93, 2004) and in 2007 (Ray Pierce pers. comm.). Australasian little grebe (regionally significant) have also been found here occasionally since the 1990s (Richard Parrish pers. comm.). The sandy margins of these ponds have been used as a northern NZ dotterel (Nationally Vulnerable) breeding site in the recent past, however frequent disturbance and vegetation clearance appears to have deterred them (John Kendrick pers. comm.). Northern NZ dotterel and variable oystercatcher (regionally significant) breed at the Ruakaka Wildlife Refuge (Hansen 2005). The refuge is also considered to be the sixth most important wintering site for variable oystercatcher in the country (Dowding and Moore 2006). One of the densest populations of black katipo (Serious Decline) in Eastern Northland occurs along this coast (Griffiths 2000). Auckland green gecko (Gradual Decline) and shore skink were recorded in 1992 (SSBI Q07/H110). Individual green and loggerhead sea turtles, both alive and dead, wash up on the beach from time to time (DOC Bioweb 2007). One leopard seal (Migrant) was seen on the spit off Marsden Point, Whangarei Harbour in the early 1990s (Richard Parrish pers. comm.). Occasionally, northern blue penguins (Gradual Decline) from the Motukaroro Island (Whangarei Harbour) breeding site wash up on to Bream Bay beaches exhausted and starving (Richard Parrish pers. comm.). Individual red-tailed tropicbirds (Range Restricted), also known as amokura, occasionally appear beach-wrecked along Bream Bay (Richard Parrish pers. comm., John Kendrick pers.

comm.). A white-tailed tropicbird was also found once in the late 1990s/early 2000s (Richard Parrish pers. comm.).

Significance

This site has the largest continuous stretch of duneland habitats in Waipu ED. It has eight representative ecological units: (b) sandfield habitat on beach and sand dune, (c) pohuehue shrubland on sand dune, (e) kanuka forest on sand dune, (l) pohuehue-*Coprosma acerosa* shrubland on sand dune, (o) knobby clubbrush-pohuehue sedgeland on sand dune, (q) harakeke-gorse flaxland on sand dune, (r) glasswort herbfield in estuary, and (i) spinifex grassland on sand dune. The site supports populations of two threatened plant species (*Kunzea ericoides* var. *linearis* and pingao) and one regionally significant plant species (*Coprosma acerosa*). It provides habitat for five threatened fauna species (Australasian bittern, NZ dabchick, northern NZ dotterel, black katipo, and Auckland green gecko), and northern blue penguins (Gradual Decline) also wash up but are not using the site as habitat. Two regionally significant fauna species are present (variable oystercatcher and Australasian little grebe); and the former is known to breed here. No natural freshwater wetlands remain, but wildlife use the constructed ponds within this site (e.g. Semenoff Sand Supplies Ltd ponds). This site forms a protective buffer between the sea and land and acts as an important wildlife corridor. It is near to, or linked with, several coastal wetlands e.g. McEwan Road Wetland (Q07/131), Sime Road Wetland (Q07/141), Doctor's Hill Road Wetland (Q07/127), and Ruakaka River Estuary (Q07/130), but it is relatively isolated from large forested areas. The Ruakaka coast has high visitor use, and a very high level of disturbance from people and pets (e.g. dogs and cats), which impacts negatively on nesting shorebirds. Temporary fencing is used to protect the main breeding areas for northern NZ dotterels and variable oystercatchers. The campground on the southern side of the Ruakaka River estuary has c. 10,000 visitors over the summer holiday period (Hansen 2005). Approximately 80% or 579 ha of this site is under some form of legal protection, as follows: 411.6 ha of stewardship land (Ruakaka Conservation Area, DOC-administered); 73.4 ha of government purpose reserve (Waipu Government Purpose Wildlife Refuge, DOC-administered); 62.3 ha of recreation reserve (Uretiti Recreation Reserve, DOC-administered); 17.3 ha of marginal strip (Ruakaka Beach Marginal Strip Nos 1 and 2, DOC-administered); 13.6 ha of wildlife refuge (Ruakaka Wildlife Refuge, DOC-administered); 0.3 ha of crown-owned seabed (DOC-administered); and 0.4 ha of esplanade reserve (WDC).

RUAKAKA RACECOURSE DUNE LAKE

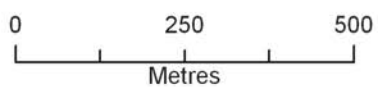
Survey no.	Q07/129
Survey date	9 November 2006
Grid reference	Q07 422891 (2 remnants)
Area	4.0 ha (1.3 ha shrubland, 2.7 ha wetland)
Altitude	sea level

Ecological units

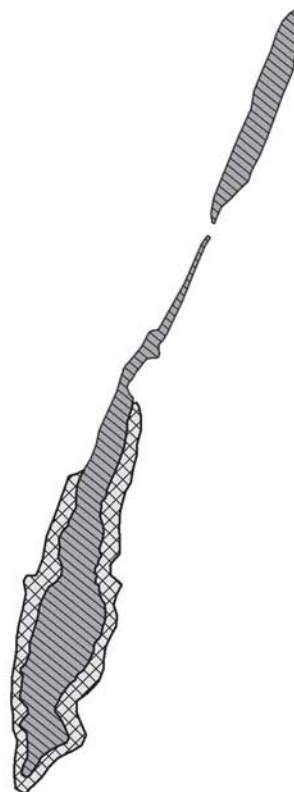
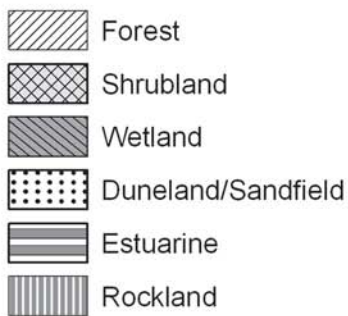
- (a) Open water (dune lake) (65%)
- (b) Gorse scrub on sand dune (25%)
- (c) Raupo-alligator weed reedland on dune lake margin (4%)



Q07/129 Ruakaka Racecourse Dune Lake



Habitat Type



(d) Ti kouka treeland on dune lake margin (3%)

(e) Raupo reedland on dune lake margin (2%)

(f) Lake clubrush-alligator weed reedland on dune lake margin (1%)

Landform/geology

Lake in interdune hollow on Holocene coastal dunefield.

Vegetation

The Ruakaka Racecourse Dune Lake is situated in an approximately north-south oriented interdune hollow behind the foredune which forms the northern side of the Ruakaka River mouth. The lake is the northern end of an impounded watercourse and there are several small ponds to the south shaded by acacias (not included in the site). The estuarine waters of the river curve around behind the dune lake, but do not inundate it, thus the lake is essentially freshwater, probably rain-fed. Much of the foredune to the east of the lake has been occupied by the racecourse and associated buildings and horse paddocks, and the western side (on sand dunes between the lake and the river) is also used for horse grazing. On a short section of the northwestern side horses graze up the edge of the lake, otherwise it is protected by a buffer of exotic scrub. The narrow northern extension of the lake is currently being substantially modified by heavy equipment employed to flatten dunes and increase land area for a major residential development being undertaken. This northern extension would once have been integral to the wetland margin of the lake. An unsealed road runs past the southern end of the lake, and a small pond with exotic vegetation has formed or been constructed on the southern side of this road (not included in the site).

The lake is very shallow (less than 2 m) and the habitat is mostly open water (a) with several emergent reedland types around the margins such as raupo-alligator weed reedland (c), raupo reedland (e), and lake clubrush-alligator weed reedland (f). *Baumea articulata*, *Juncus pallidus* and *Azolla pinnata* are scattered around the lake margins within these reedlands. On the eastern side there is a small area of wetland forest dominated by ti kouka in which gorse is frequent and manuka, arum lily, ginger, pampas, harakeke, ngaio,* and brush wattle are occasional. The lake is bordered by a narrow strip of gorse shrubland (b) within land administered by DOC, or otherwise by grazed or rank grassland. Other species within the shrubland include frequent brush wattle and bracken, and occasional crack willow, kanuka, taupata, lupin, blackberry, and woolly nightshade. Reed sweetgrass was noted at the southern lake margin in 1998 (SSBI Q07/H049), but was not found during the current survey.

Significant flora

Arrow grass (regionally significant) (AK 298334).

Fauna

During a recent survey (19/02/2007) the following species were observed on the lake: 4-5 each of black shag (Sparse), little black shag and little shag, three white-fronted tern (Gradual Decline), 10 grey duck (Nationally Endangered), three Australasian shoveler (regionally significant), one spotless crane (Sparse) and one banded rail (Sparse) (Ray Pierce pers. comm.). In addition, a single NZ scaup (regionally significant) was observed on 6/03/2007 (Ray Pierce pers. comm.).

Australasian bittern (Nationally Endangered) have been reported by a local resident, and in 1998, red-billed gull (Gradual Decline) were recorded here (SSBI Q07/H049). Australasian little grebe (Coloniser; regionally significant) have also been noted (Peter Anderson, DOC, pers. comm. 2006). Other non-threatened species such as white-faced heron, Australasian harrier, pukeko, black-backed gull, welcome swallow, shining cuckoo, paradise shelduck, pied shag and NZ pipit have been recorded here from 1980 to recently (SSBI Q07/H049; current study).

* The ngaio is probably planted.

Significance

This is the only dune lake in Waipu ED and the only dune lake recorded in the whole Eastern Northland Ecological Region, therefore it is a site of very high ecological significance. It is one of only five natural coastal freshwater wetlands remaining in Waipu ED (Q07/131, Q07/141, Q07/127, Q07/129 and R08/001). Most natural freshwater wetlands which were present in the ED in the past have been drained or modified, so that now there are only approximately 45 ha of natural or semi-natural wetland remaining (in total, across both inland and coastal zones). There are no natural dune lakes between this site and the Karikari Peninsula to the north and the Tomarata dune lakes to the south. Although most Northland dune lakes are of national significance, this site is considered to be of regional significance due to small size, level of modification and compromised biodiversity values (Wendy Holland pers. comm.). Despite this, there are seven threatened fauna species (Australasian bittern, spotless crane, banded rail, red-billed gull, grey duck, white-fronted tern, and black shag) and three regionally significant fauna species (Australasian little grebe, Australasian shoveler, and NZ scaup) recorded from here, and there is a new record of a regionally significant plant species (arrow grass). Apart from (b) gorse scrub, all of the ecological units are representative of their types (because they do not occur elsewhere in the ED. The southern part of the main lake (2.83 ha) is in the Ruakaka Conservation Area (DOC-administered) but the northern end and the smaller northern extension, are unprotected and are both open to grazing and land development pressures which could negatively affect the entire lake.

RUAKAKA RIVER ESTUARY

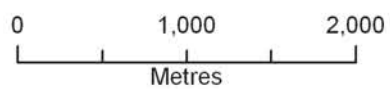
Survey no.	Q07/130
Survey date	15 November 2006
Grid reference	Q07 420881 (5 remnants)
Area	87.2 ha (81.3 ha estuary, 6.0 ha forest)
Altitude	0–18 m asl

Ecological units

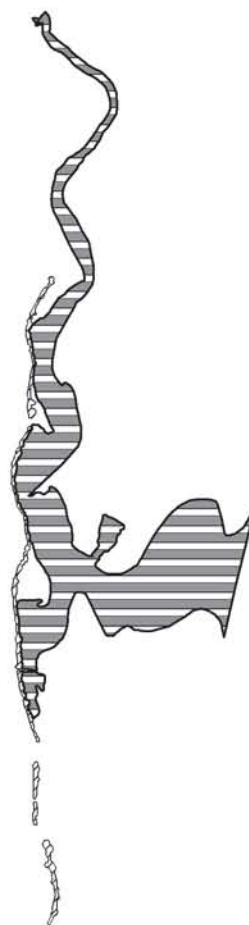
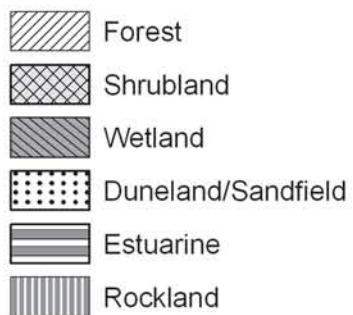
- (a) Mudflat and sandflat in estuary (65%)
- (b) Estuarine open water (15%)
- (c) Mangrove shrubland and forest in estuary (7%)
- (d) Totara–pohutukawa forest on steep hillslope (3%)
- (e) Pohutukawa forest on steep hillslope (2%)
- (f) Oioi rushland in estuary (1%)
- (g) Oioi–sea rush rushland in estuary (1%)
- (h) *Austrostipa stipoides* tussockland in estuary (1%)
- (i) Glasswort–mangrove sandfield in estuary (1%)
- (j) Glasswort herbfield in estuary (1%)
- (k) Saltmarsh ribbonwood shrubland in estuary (1%)
- (l) Manuka shrubland in estuary (1%)
- (m) Gorse scrub in estuary (1%)



Q07/130 Ruakaka River Estuary



Habitat Type



Landform/geology

Estuarine sandy intertidal flats and channels, backed by cliffs cut in Pleistocene consolidated dune sand.

Vegetation

The Ruakaka River Estuary begins as an 80–100 m wide meandering estuarine channel (b) heading southwards parallel to the coast between Ruakaka township to the east and sand dunes around the Ruakaka Racecourse to the west. Where the river turns out to the coast the estuary opens out into mudflats and sandflats (a) stretching to approximately 500 m wide at the river mouth. At the southern margin of the bend, a small stream joins the estuary giving rise to an additional inlet with mudflats, saltmarsh and mangroves. Low mangrove shrubland (c) is the main vegetation type around estuarine margins, but there are also tiny areas of mangroves large enough to be classified as forest, in particular around the southern stream mouth. Mosaics of low growing saltmarsh vegetation occur in and around the edges of the mangroves. Sandy channel margins often have glasswort–mangrove sandfield vegetation (i) comprising frequent glasswort mixed with frequent mangrove pneumatophores and seedlings, or these areas can have more dense mats of glasswort herbfield (j), with frequent sea primrose. On broad mudflats and sandflats there are uniform copper-coloured areas of oioi rushland (f) mixed with golden stripes of *Austrostipa stipoides* tussockland (h) which generally occur on drier, sandy ridges within the mudflats. Each of these types has scattered occurrence of all the dominant species in ecological units (f)–(i), and occasional saltmarsh ribbonwood. Saltmarsh ribbonwood shrublands (k) occur locally around the terrestrial margins. Oioi–sea rush rushland (g) is present in the major saltmarsh area on the northern side of the estuary, just inland of the mouth. At this location manuka shrubland (l) with frequent harakeke, mapou and gorse, and occasional saltmarsh ribbonwood and brush wattle grows on low raised islands. Similar small islands of terrestrial/estuarine vegetation exist on the southern side of the river estuary. These are often dominated by gorse scrub (m) and can have other invasive species such as woolly nightshade and *Acacia sophorae*. In addition to those already detailed there is a range of weedy species around the estuarine margins including many pasture weeds, coral tree, a running bamboo species, watsonia, tuber ladder fern and coastal banksia (planted).

The coastal scarp to the west of the estuary is covered in native forest which is contiguous with the estuarine vegetation at various points. The vegetation includes high-quality, mature pohutukawa forest (e) with occasional totara, houpara, karaka, kawakawa, kahakaha and *Astelia banksii*, as well as more disturbed and weed-infested totara–pohutukawa forest (d) with frequent gorse and occasional kawakawa, puriri, karamu, mahoe, mamaku, bracken, wild cherry, crack willow, woolly nightshade, brush wattle, radiata pine, and pampas. On terrestrial alluvial flats between the scarp and the estuary there is either exotic grassland or residential housing (not included in this site). The dunes to the north and south of the river mouth are both part of Ruakaka Dunelands (Q07/128).

Significant flora

There is a 1973 record of *Austrofestuca littoralis* (Gradual Decline) from the southern shore of Ruakaka River Estuary, where it grew on drifting sands with pingao (DOC Bioweb 2007). This may be the last confirmed record of this species in Waipu ED, though it has more recently been reported from the adjoining Ruakaka Dunelands (Q07/128) (Lisa Forester, NRC, pers. comm.). Pingao (Gradual Decline)

still remains in small amounts on the fringes of the estuary. Arrow grass (regionally significant) was recorded in 1992 (SSBI Q07/H051).

Fauna

A moderately diverse range of coastal and estuarine bird species use the Ruakaka River Estuary and adjacent coastline. Wildland Consultants (2004a) recorded eleven threatened or rare species, two Arctic migrant species, two regionally significant species, and fourteen common indigenous species, as follows: Australasian bittern (Nationally Endangered), Caspian tern (Nationally Vulnerable), wrybill (Nationally Vulnerable), reef heron (Nationally Vulnerable), northern NZ dotterel (Nationally Vulnerable), banded dotterel (Gradual Decline), red-billed gull (Gradual Decline), white-fronted tern (Gradual Decline), black shag (Sparse), banded rail (Sparse), spotless crake (Sparse), bar-tailed godwit (Migrant), lesser knot (Migrant), grey teal (regionally significant), variable oystercatcher (regionally significant), pied oystercatcher, little shag, pied shag, Australasian gannet, Australasian harrier, pied stilt, spur-winged plover, NZ pipit, NZ kingfisher, black-backed gull, welcome swallow, silvereye, grey warbler and white-faced heron. Northern NZ dotterel and variable oystercatcher are known to breed in and around the estuary (Wildland Consultants 2004a) and banded rail possibly do so also, but this is not confirmed (Ray Pierce pers. comm.). Also, at least one pair of reef herons has bred there recently (Margaret Hicks pers. comm.).

Additional to the species listed above, grey duck (Nationally Endangered) and North Island fernbird (Sparse) were recorded in 1991 (SSBI Q07/H051). Unfortunately fernbirds have not been seen again since a fire in 1992. This fire destroyed their habitat which was largely replaced by gorse (Peter Anderson, DOC, pers. comm.). Turnstone (Migrant) were recorded in 1978 (SSBI Q07/H051). NZ fairy terns (Nationally Critical) have been recorded in small numbers feeding over the water (*Amokura* 90 and 91); most recently in early 2007 (Kelly Brogtrop pers. comm.). A white heron (Nationally Critical) was recorded in 1995 (Gavin Grant in CSN *Notornis* 43). One red-necked stint (Migrant) was observed in 1980 (Richard Parrish pers. comm.) and solitary eastern curlews (Migrant) were noted in 1980 and 1993 (Richard Parrish pers. comm.; Richard Parrish in CSN *Notornis* 41). A Hudsonian godwit (Migrant) was seen in 1999 (Pauline Smith in CSN *Notornis* 47). A white-winged black tern was observed in 1998/1999 (Burt and Snell in CSN *Notornis* 47). A common sandpiper (Vagrant) was seen in 1980 (Richard Parrish pers. comm.). Shore skinks were found here in 2006 (Peter Anderson, DOC, pers. comm.).

Ruakaka River Estuary supports abundant macroinvertebrates, particularly bivalve molluscs such as cockle, pipi, nutshell, *Macomona liliana*, *Cyclomactra ovata*, *Dosinea subrosea*, NZ rock oyster and Pacific oyster (exotic), and gastropods such as mudsnail, *Cominella glandiformis*, *Zediloma subrostrata* and *Zeacumantus lutulentus*. There is also a variety of barnacle, crab and shrimp species, and populations of polychaete worm species which are consumed by waders such as bar-tailed godwit and northern NZ dotterel (Wildland Consultants 2004a).

Black katipo (Serious Decline) have been recorded in this site. These are part of one of the densest populations in eastern Northland, which extends the length of the Ruakaka Dunelands (Q07/128) to the north and south of this estuary (Griffiths 2000).

Significance

Ruakaka River Estuary supports a wide variety of fauna species and is a particularly important habitat for threatened bird species within the northern coastal dune

systems of Waipu ED. The estuary supports at least twelve threatened bird species (NZ fairy tern, Australasian bittern, Caspian tern, wrybill, reef heron, northern NZ dotterel, banded dotterel, red-billed gull, white-fronted tern, black shag, banded rail, spotless crane) of which three species breed in the area (NZ dotterel, variable oystercatcher, and reef heron). Grey duck and NI fernbird may also be present. There are also two regionally significant bird species (variable oystercatcher and grey teal), one of which breeds here (variable oystercatcher). Habitat for the threatened black katipo spider is present. The Ruakaka coast has high visitor use, and a very high level of disturbance from people and pets (e.g. dogs and cats), which impacts negatively on nesting shorebirds. Temporary fencing is used to protect the main breeding areas for northern NZ dotterels and variable oystercatchers. The campground on the southern side of the Ruakaka River estuary has c.10,000 visitors over the summer holiday period (Hansen 2005). The estuary has 11 representative ecological units (this includes all units except (d) totara-pohutukawa forest and (m) gorse scrub, as these both have a high component of exotic species). Two threatened plant species (*Austrofestuca littoralis* and pingao) and one regionally significant plant species (arrow grass) have been recorded here. 86% (74.7 ha) of the site has some form of legal protection, as follows: 50.1 ha of wildlife refuge (Ruakaka Wildlife Refuge, DOC-administered); 22.8 ha of stewardship land (Ruakaka Conservation Area, DOC-administered); 0.5 ha of recreation reserve (Ruakaka Domain Recreation Reserve, DOC-administered); 0.2 ha of marginal strip (Ruakaka River Marginal Strip No. 2, DOC-administered), 0.2 ha esplanade reserve (WDC-administered), and 0.9 ha of wildlife refuge (WDC-administered).

McEWAN ROAD WETLAND

Survey no.	Q07/131
Survey date	11 November 2006
Grid reference	Q07 429926
Area	0.7 ha
Altitude	6 m asl

Ecological units

- (a) *Azolla filiculoides*-burr reed herbfield in small dune slack (36%)
- (b) Manuka shrubland in small dune slack (35%)
- (c) *Eleocharis sphacelata* reedland in small dune slack (20%)
- (d) *Azolla filiculoides* herbfield in small dune slack (5%)
- (e) Soft rush-*Azolla filiculoides* rushland in small dune slack (2%)
- (f) *Eleocharis acuta*-*Azolla filiculoides* sedgeland in small dune slack (1%)
- (g) Yorkshire fog grassland in small dune slack (1%)

Landform/geology

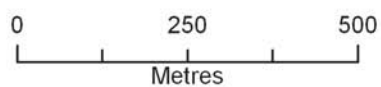
Wetland in interdune hollow in Holocene coastal dunefield.

Vegetation

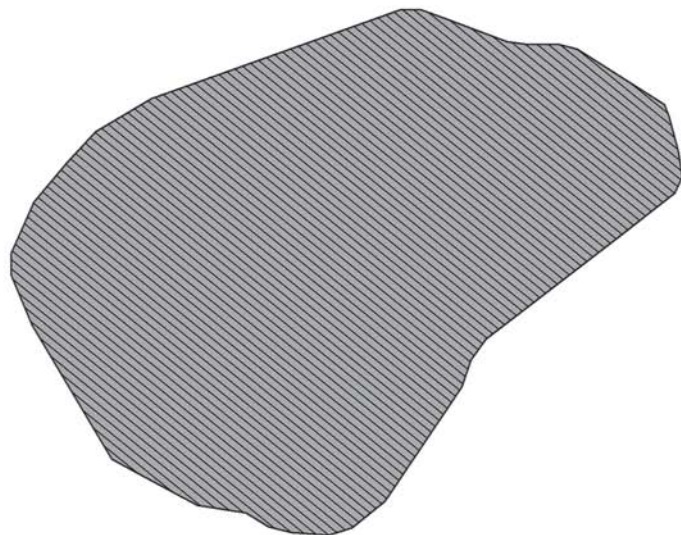
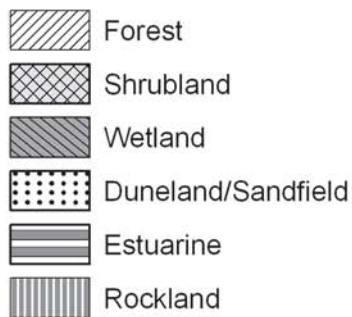
The wetland at the Marsden Point Road and McEwan Road junction is a small dune slack on consolidated sand with mainly indigenous palustrine herbfield, rushland, sedgeland, and grassland vegetation around an island of manuka shrubland at centre. The site is surrounded by exotic grassland and scattered patches of gorse.



Q07/131 McEwan Road Wetland



Habitat Type



The most extensive vegetation type is *Azolla filiculoides*-burr reed herbfield (a), which has frequent *Eleocharis acuta* and occasional *Lachnagrostis filiformis* and *Paspalum*. A water fern *A. filiculoides* floats on the surface of the water, giving the wetland a deep reddish colour at certain times of the year, with emergent clumps of various sedges and grasses in different associations. *A. filiculoides* is associated with

abundant *Eleocharis acuta* in small patches (f). Around the wetland edges there are patches of *A. filiculoides* herbfield (d) with frequent kikuyu and paspalum, and occasional *Juncus pallidus*, duckweed and *Carex ovalis*, and also small areas of soft rush–*A. filiculoides* rushland (e) with frequent paspalum, *Polygonum strigosum*, *Carex ovalis*, and *Juncus articulatus*, and occasional shivery grass, *Lachnagrostis filiformis*, bachelor's button, track rush, starwort, and lotus. Deeper water supports tall, bright green stands of *Eleocharis sphacelata* reedland (c), which is emergent over *A. filiculoides*, starwort and duckweed, and occasional *Polygonum strigosum*. Slightly raised ground at the centre has manuka shrubland (b) on it, associated with frequent *Eleocharis sphacelata*, *Eleocharis acuta* and *Baumea* sp. There is also a small raised patch of ground with Yorkshire fog grassland (g).

Significant flora

Burr reed (regionally significant) (AK 297989) and *Azolla filiculoides* (regionally significant) are abundant within this site.

Fauna

Australasian bittern (Nationally Endangered) were recorded in present study and in 2004 (Wildland Consultants 2004a), and are known to be regular occupants of this wetland by local observers (John Kendrick pers. comm., Margaret Hicks pers. comm.). Pukeko were also recorded during the current site visit.

Significance

Despite its small size, McEwan Road Wetland is a unique and significant habitat, and it is one of only five natural coastal freshwater wetlands remaining in Waipu ED (Q07/131, Q07/141, Q07/127, Q07/129 and R08/001). Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. This site has fairly large populations of two regionally significant plant species (burr reed and *Azolla filiculoides*), and it provides habitat for the Nationally Endangered Australasian bittern. This site has five representative ecological units: (f) *Eleocharis acuta*–*Azolla filiculoides* sedgeland in small dune slack, (d) *Azolla filiculoides* herbfield in small dune slack, (c) *Eleocharis sphacelata* reedland in small dune slack, (b) manuka shrubland in small dune slack, and (a) *Azolla filiculoides*–burr reed herbfield in small dune slack. Units (a), (d) and (f) have not been recorded elsewhere in the ED. This site is isolated from other similar habitats by pasture, roads and industrial areas, however it is probably part of a wider network of wetland bird habitat remnants which includes other natural and constructed freshwater wetlands and estuarine wetlands in the northern half of Waipu ED.

WAIPU CAVES ROAD SANDSTONE KNOLL

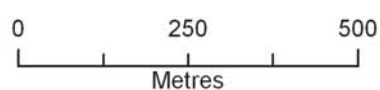
Survey no.	Q07/132
Survey date	11 November 2006
Grid reference	Q07 308866
Area	2.4 ha (1.8 ha forest, 0.5 ha rockland)
Altitude	216–245 m asl

Ecological units

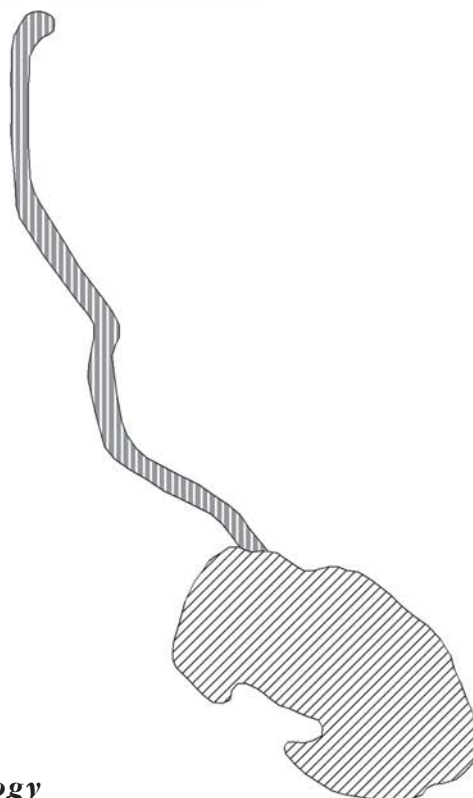
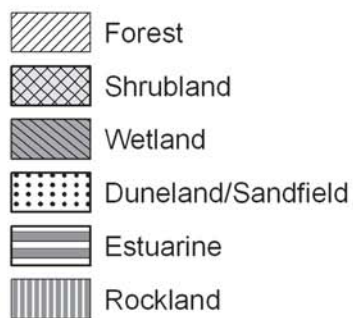
- (a) Taraire forest on ridge (90%)
- (b) Rockland on cliff (10%)



Q07/132 Waipu Caves Road Sandstone Knoll



Habitat Type



Landform/geology

Knoll of Miocene bluff-forming sandstone (Waitemata Group).

Vegetation

This site comprises a very small area of taraire forest (a) and rockland habitat (b) on a high point to the west of the Waipu Caves Road-Springfield Road-Mangapai Caves

Road intersection. The site is surrounded by grazed pasture and appears to be heavily grazed itself. The forest association comprises abundant taraire with frequent nikau and totara and occasional examples of karaka, mapou, karamu, tawa, pate, hangehange, and *Gabunia lacera*. The rockland cliffs support scattered *Astelia solandri*, hangehange, mapou, *Metrosideros perforata*, *Metrosideros fulgens*, carmine rata, Japanese honeysuckle, Mexican daisy, foxglove, hound's tongue fern, koromiko, and *Muehlenbeckia australis*.

Significant flora

A large, mature plant of carmine rata (regionally significant) was recorded growing on a sandstone cliff near the road intersection during this survey. *Hebe macrocarpa* var. *macrocarpa* (regionally significant) was collected from a sandstone cliff below the taraire forest (AK 298337) during this survey.

Fauna

Not surveyed.

Significance

This is a very small site which is significant for the presence of two regionally significant plant species (carmine rata and *Hebe macrocarpa* var. *macrocarpa*), and because it is a distinctive landform. The rockland habitat on sandstone cliffs (b) is representative of its type in the ED. The forest is in poor condition due to grazing and trampling by stock, however the cliff habitat probably provides a refuge for the aforementioned plant species which are both very palatable.

ORMISTON ROAD FOREST AND SHRUBLAND

Survey no.	Q07/135
Survey date	10 November 2006
Grid reference	Q07 355854 (3 remnants)
Area	31.7 ha (29.7 ha forest, 1.9 ha shrubland)
Altitude	60–215 m asl

Ecological units

- (a) Totara forest on steep hillslope (50%)
- (b) Totara-kanuka forest on steep hillslope (30%)
- (c) Kauri-rimu forest on ridge (10%)
- (d) Totara treeland on steep hillslope (5%)
- (e) Manuka-kanuka shrubland on steep hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane) in the two eastern remnants, and by Miocene sandy mudstone and bluff-forming sandstone (Waitemata Group) in the western remnant.

Vegetation

This site comprises three separate indigenous forest remnants in the vicinity of Ormiston Road, which are part of a linkage between Ruakaka Forest (Q07/121), Waipu Caves Forest (Q07/118) and Caves Road Forest (Q07/120). The surrounding landscape is pasture with scattered totara. Vegetation within this site is less diverse than nearby larger forest remnants.

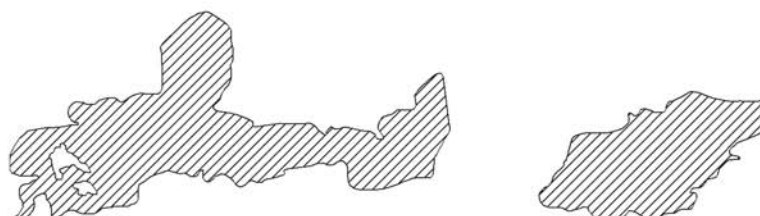
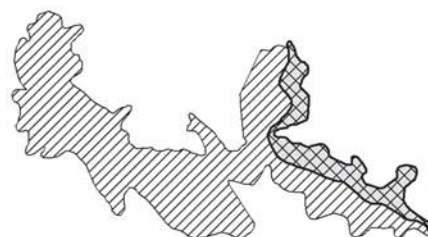


Q07/135 Ormiston Road Forest and Shrubland

0 500 1,000
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Totara forest (a) with frequent kauri and occasional ponga, mamaku, lancewood, rewarewa, kahikatea and ti kouka covers c. 50% of the site, and represents the least disturbed type of totara-dominant vegetation within the site. Totara-kanuka forest

(b) represents a more disturbed forest type and is present mainly in the southwestern remnants. Other species include frequent mamaku and towai, and occasional kahikatea and rewarewa. Totara treeland (d) on the western edge represents the most disturbed forest type. There are small areas of manuka-kanuka shrubland (e) with occasional mamaku on the northern edge of the northern remnant. A prominent hilltop within the southwestern remnant supports an impressive stand of kauri-rimu forest (c) with frequent kanuka and kahikatea.

Fauna

Kukupa (Gradual Decline), tui, silvereye, and NZ kingfisher are present (Ian Fox pers. comm.)

Significance

The small but distinctive area of (c) kauri-rimu forest on ridge is a representative ecological unit for Waipu ED, however all the other ecological units in this site are better represented in other sites in the ED. Several bird species use this site, including one threatened species (kukupa). These remnants are widely spaced. Their main value is as habitat stepping stones between much larger forested areas nearby, principally Ruakaka Forest (Q07/121), Waipu Caves Forest (Q07/118) and Caves Road Forest (Q07/120). According to a local landowner, possums are regularly poisoned and shot in the northernmost remnant and are far less abundant than three years ago. Feral cats, weasels, cattle, and goats are present (Ian Fox pers. comm.).

McDONNELL ROAD FOREST AND SHRUBLAND

Survey no.	Q07/137
Survey date	13 November 2006
Grid reference	Q07 291899 (2 remnants)
Area	3.4 ha (3.3 ha forest, 0.1 ha shrubland)
Altitude	120 m asl

Ecological units

- (a) Kanuka forest on gentle hillslope (95%)
- (b) Bracken-tangle fern fernland on gentle hillslope (5%)

Landform/geology

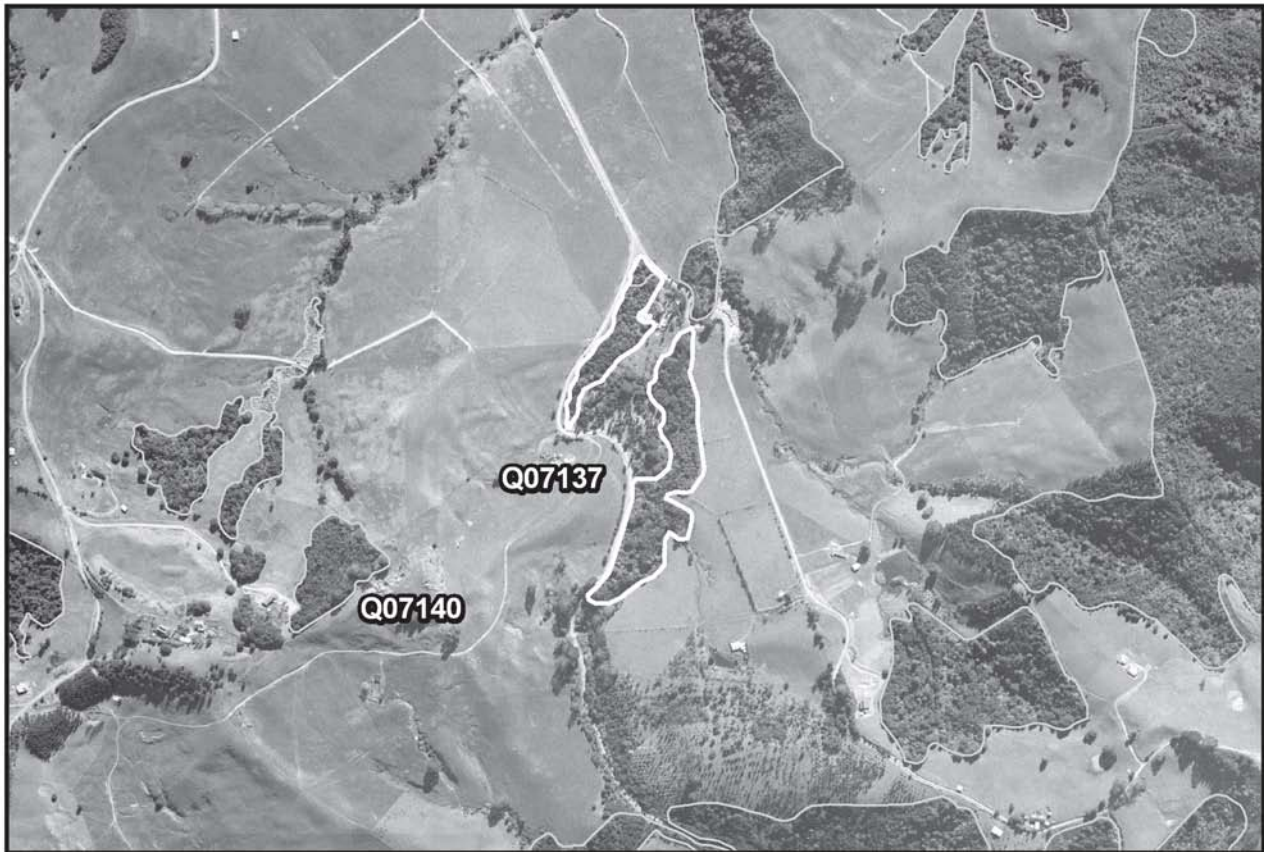
Hillslope underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

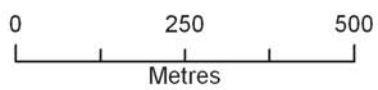
This site comprises two small remnants of indigenous forest and shrubland. The western edge of the site is bordered by Mangapai Caves Road and the eastern edge by grazed pasture. The remnants are approximately 300 m from the extensive Mangapai Caves Road forest remnant.

(a) There is a small area of shrubland on the northern edge of the site adjacent to the intersection of McDonnell Road and Mangapai Caves Road. Bracken and tangle fern are common, with frequent kiokio, kohuhu, towai, mingimingi, manuka, and kanuka, and occasional ponga, wheki, mapou, shining karamu, *Dracophyllum lessonianum*, hangehange, turutu, harakeke, and *Schoenus tendo*.

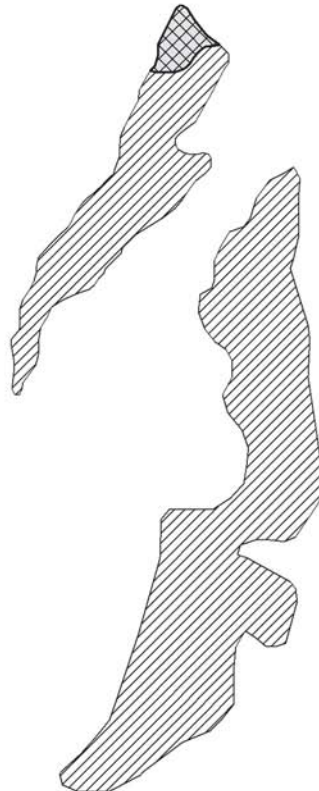
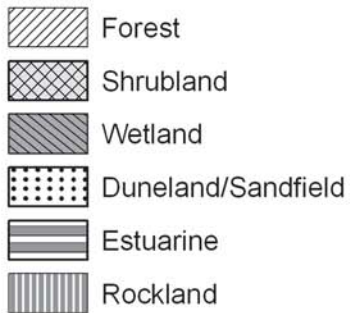
(b) The majority of the site is secondary forest dominated by kanuka. Towai is frequent and there are occasional kauri, totara, tanekaha, makamaka, lancewood, rimu, mingimingi, mahoe, ti kouka, and *Schoenus tendo*.



Q07/137 McDonnell Road Forest and Shrubland



Habitat Type



Fauna

Kauri snail (Gradual Decline), North Island fantail, silvereye, and welcome swallow were recorded in this survey. Kukupa (Gradual Decline) and morepork were reported by the landowner.

Significance

The bracken-tangle fern fernland within this remnant is the only known example of its type in Waipu ED and is therefore a representative ecological unit. The remnant is fenced to exclude stock and weed infestation is minimal. The remnant provides riparian protection for a tributary of the Tauraroa River, and provides a linkage between the Mangapai Caves Road and Pokapu Hill remnants. Two threatened fauna species (kukupa and kauri snail) are present.

UPPER MANGAWAI RIVER WETLANDS

Survey no.	Q07/138
Survey date	12 November 2006
Grid reference	Q07 263801 (2 remnants)
Area	6.8 ha
Altitude	40–43 m asl

Ecological units

- (a) Harakeke flaxland in gully (50%)
- (b) Kahikatea-harakeke treeland in gully (25%)
- (c) Reed sweetgrass grassland in gully (25%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

This site comprises two remnant patches of palustrine/riverine wetland in the broad, flat gullies of two tributaries to the Mangawai River, located near the Paparoa-Oakleigh Road-Cassidy Road intersection. The western patch lies outside Waipu ED boundary (in Tokatoka ED), however it has not been previously surveyed as part of the PNA programme, and is naturally linked with the patch inside the ED boundary.

Harakeke flaxland (a) with frequent emergent ti kouka and *Coprosma propinqua* var. *propinqua*, and frequent vines of Japanese honeysuckle constitutes the main vegetation type in both patches. There are occasional emergent kahikatea, manatu, pukatea, kowhai, mamaku, and crack willow, and at lower levels there are occasional pampas, creeping buttercup, and karamu. In the western patch, young kahikatea forms an emergent treeland over the top of the flaxland (b), with similar associated species. Grazed areas of the wetland support reed sweetgrass grassland (c) with occasional kahikatea, ti kouka, manuka, *Coprosma propinqua* var. *propinqua*, and harakeke.

Significant flora

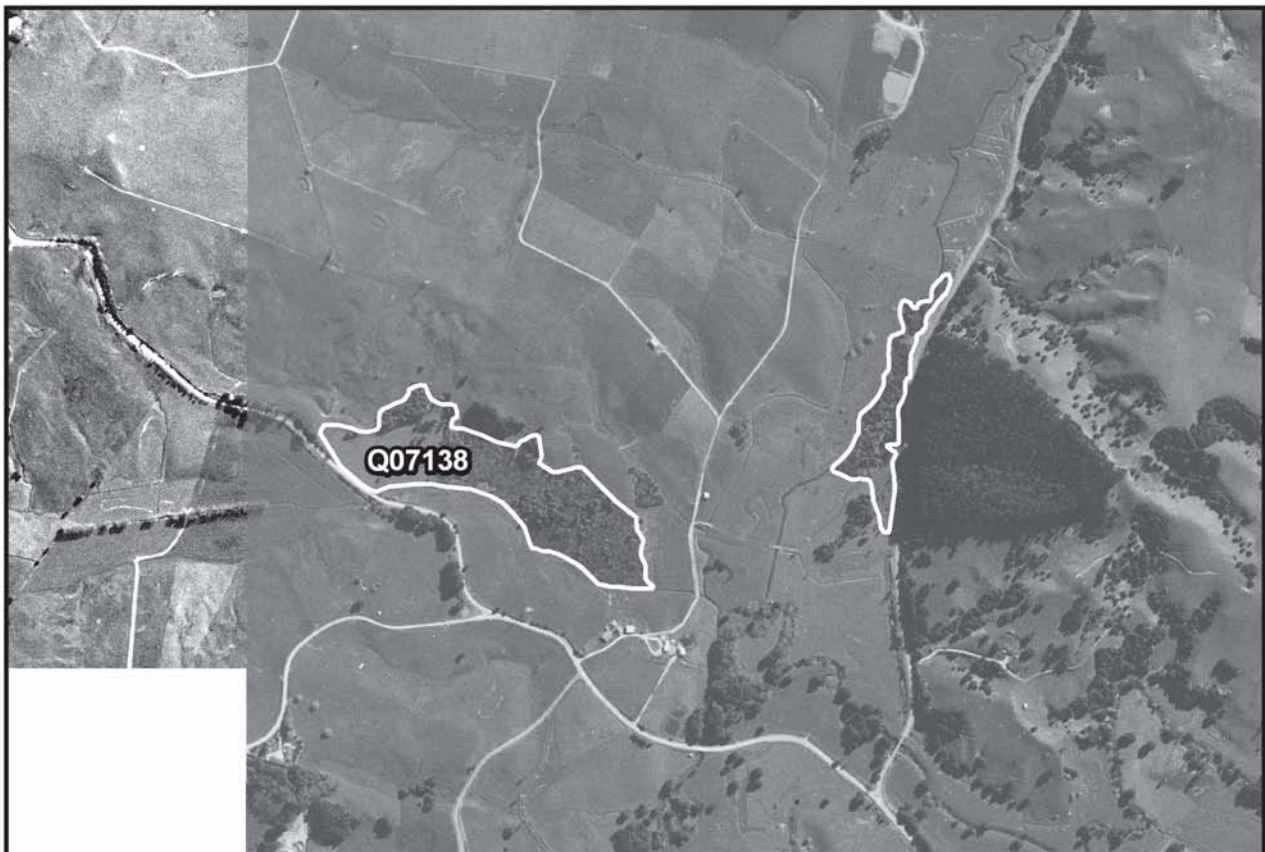
Manatu (regionally significant).

Fauna

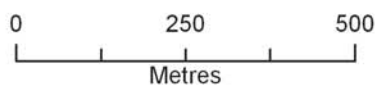
Grey warbler and tui were recorded in the current survey.

Significance

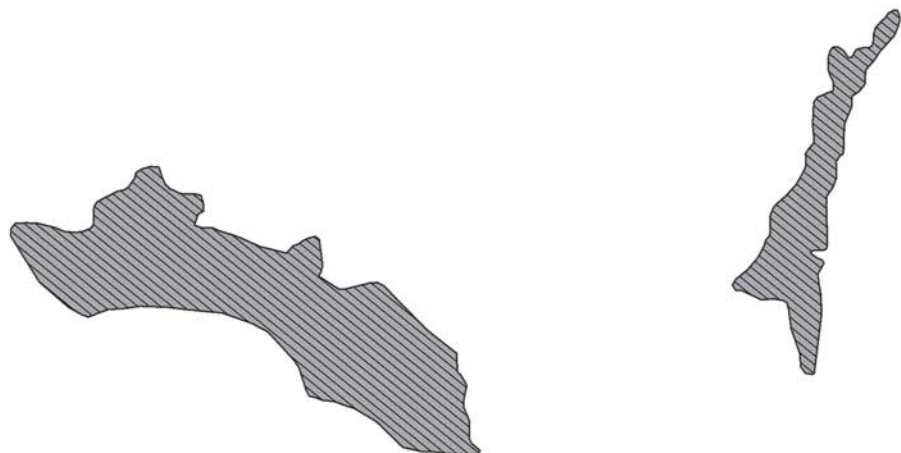
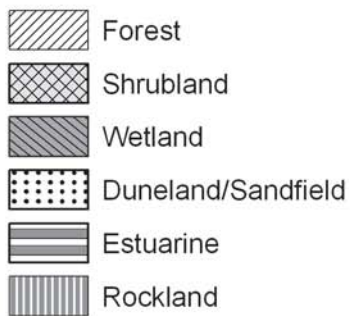
This site contains representative, although relatively degraded, examples of (a) harakeke flaxland and (b) kahikatea-harakeke treeland in a gully wetland system. In terms of area it is the second largest natural freshwater wetland in Waipu ED.



Q07/138 Upper Mangawai River Wetlands



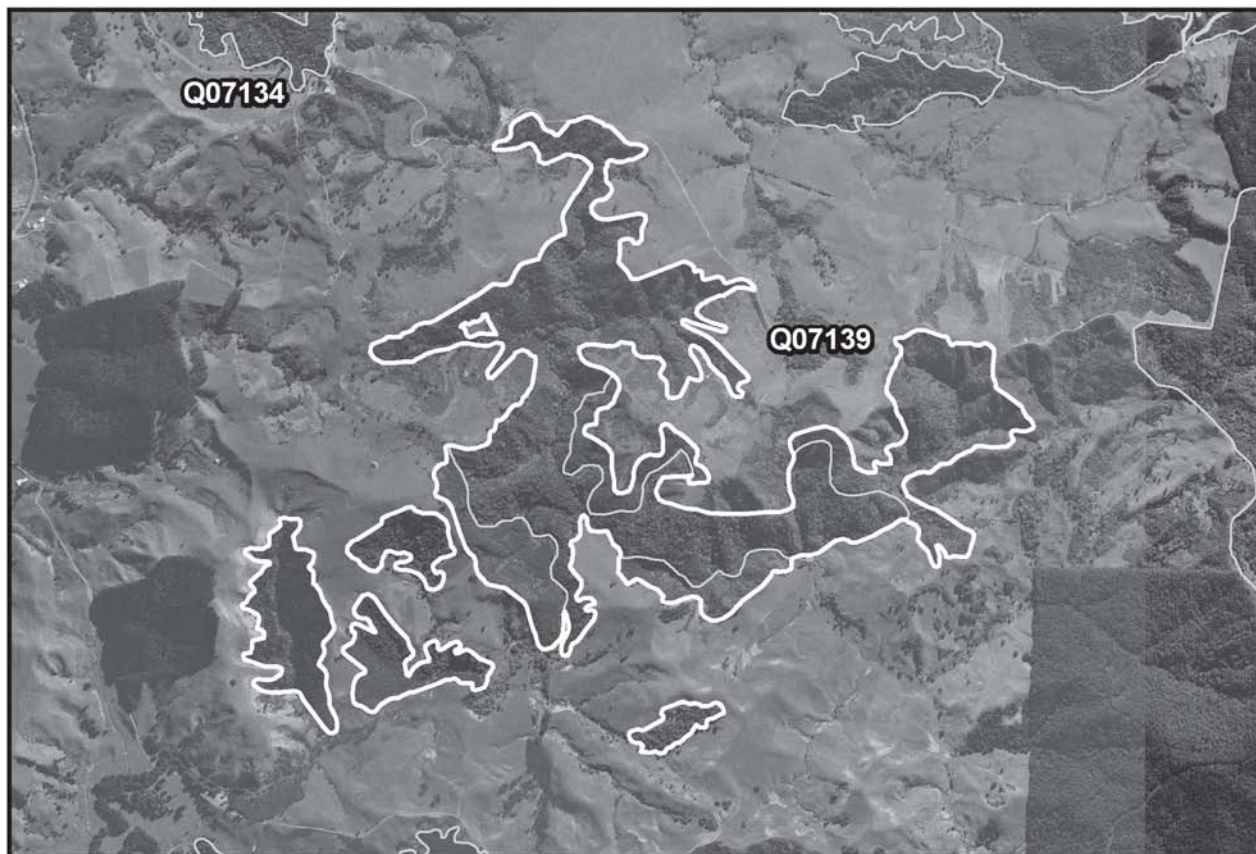
Habitat Type



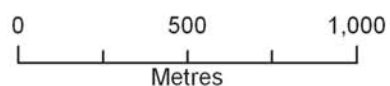
Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. Manatu, a regionally significant plant species, is present at low abundance.

EASTERN MANGAWAI CATCHMENT REMNANTS

Survey no.	Q07/139
Survey date	12 November 2006
Grid reference	Q07 291812 (5 remnants)
Area	117.6 ha (84.0 ha forest, 33.6 ha shrubland)
Altitude	60-200 m asl



Q07/139 Eastern Mangawai Catchment Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological units

- (a) Totara–kahikatea–taraire forest on steep hillslope and in gully (50%)
- (b) Kanuka shrubland on steep hillslope and ridge (20%)
- (c) Totara forest on steep hillslope (10%)
- (d) Manuka–gorse–kanuka shrubland on moderate hillslope (10%)
- (e) Totara–kanuka shrubland on steep hillslope (10%)

Landform/geology

Steep hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

This site comprises a series of generally south-facing, semi-forested gullies and steep hillslopes in the upper eastern Mangawai catchment. The forest remnants are linked by areas of mixed indigenous–exotic shrubland. Gorse scrub and pasture surround the site. Two thirds of the site was able to be viewed and described from public roads; the rest of the vegetation types and percentages were estimated using aerial photography flown in July 2002.

Totara–kahikatea–taraire forest (a) clothes steep hillslopes, gullies and gully heads. Mamaku, kohekohe and puriri are frequent associates, while tawa, rewarewa, nikau, and ponga were recorded as occasional. There are also small stands of less diverse totara forest (c) with occasional kahikatea and rewarewa. Kanuka shrubland (b) with frequent mamaku and gorse, and occasional young totara, is the most common shrubland type on ridges and hillslopes between the forest remnants. Less common shrubland types include manuka–gorse–kanuka shrubland (d) and totara–kanuka shrubland (e), each of which also have frequent mamaku.

The site does not appear to be fenced, but is probably not heavily grazed, as evidenced by the strong regeneration of indigenous shrubland and gorse scrub.

Fauna

Australasian harrier.

Significance

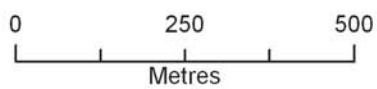
These remnants include some of the largest regenerating shrubland areas in Waipu ED, which can provide important habitat for species such as kiwi and lizard (e.g. Auckland green gecko). They are also important as habitat stepping stones for birds in a landscape which is otherwise mostly pasture (western Waipu ED). This site contains representative examples of two ecological units: (a) totara–kahikatea–taraire forest on steep hillslope and in gully, and (e) totara–kanuka shrubland on steep hillslope. It also provides some protection from erosion in the Mangawai Stream catchment.

SIME ROAD WETLAND

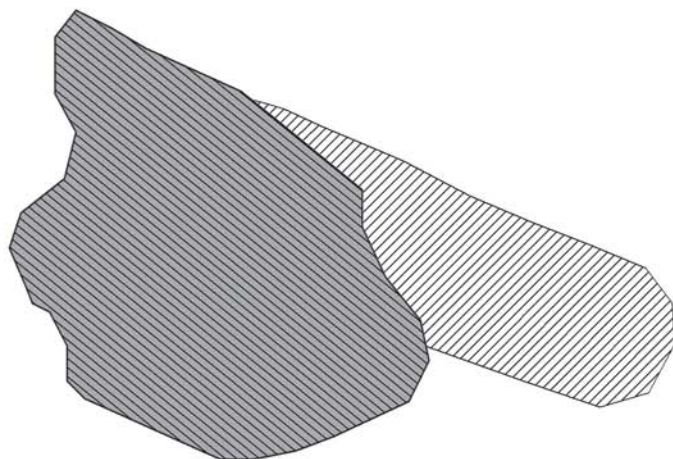
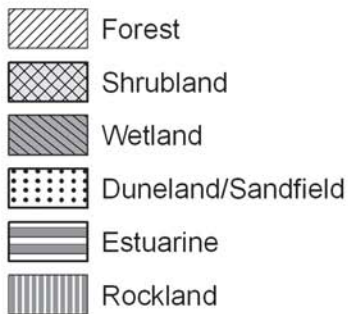
Survey no.	Q07/141
Survey date	13 November 2006
Grid reference	Q07 424912
Area	0.7 ha (0.2 ha forest, 0.5 ha wetland)
Altitude	8–10 m asl



Q07/141 Sime Road Wetland



Habitat Type



Ecological units

- (a) *Eleocharis sphacelata* reedland in small dune slack (50%)
- (b) Kanuka forest on sand dune (25%)
- (c) *Baumea articulata* reedland in small dune slack (20%)
- (d) *Baumea teretifolia* sedgeland in small dune slack (3%)
- (e) *Carex ovalis* sedgeland in small dune slack (1%)
- (f) Raupo reedland in small dune slack (1%)

Landform/geology

Wetland in hollow behind Holocene coastal dunefield.

Vegetation

Behind industrial buildings at the intersection of Sime Road and Marsden Point Road there is a small dune slack with indigenous wetland vegetation. It comprises a mosaic of *Eleocharis sphacelata* reedland (a) and *Baumea articulata* reedland (c) with small patches of *Baumea teretifolia* sedgeland (d), *Carex ovalis* sedgeland (e), and raupo reedland (f). On the eastern margin there is a very small area of kanuka forest with frequent manuka and occasional mamaku (b). Immediately surrounding the wetland there is Yorkshire fog-sweet vernal grassland, and further away to the north, there are extensive gorse-pampas shrublands within the Ruakaka Dunelands (Q07/128).

Fauna

Australasian bittern (Nationally Endangered) heard calling from wetland during this survey. A spotless crake tape was played, with no response. Welcome swallow present.

Significance

Despite its small size, Sime Road Wetland is a unique and significant habitat, as it is one of only five natural coastal freshwater wetlands remaining in Waipu ED (Q07/131, Q07/141, Q07/127, Q07/129 and R08/001). Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. There are three representative ecological units in this site: (a) *Eleocharis sphacelata* reedland in small dune slack, (c) *Baumea articulata* reedland in small dune slack, and (d) *Baumea teretifolia* sedgeland in small dune slack. The Nationally Endangered Australasian bittern uses this small wetland. Although it is isolated from other similar habitats by pasture, roads and industrial areas, it is probably part of a wetland bird habitat network which includes other natural and constructed freshwater wetlands and estuarine wetlands in the northern half of Waipu ED.

TAKAHIWAI STREAM ESTUARY

Survey no.	Q07/143
Survey date	16 November 2006
Grid reference	Q07 391950 (3 remnants)
Area	11.1 ha (9.1 ha estuary, 2.0 ha shrubland)
Altitude	0–2 m asl

Ecological units

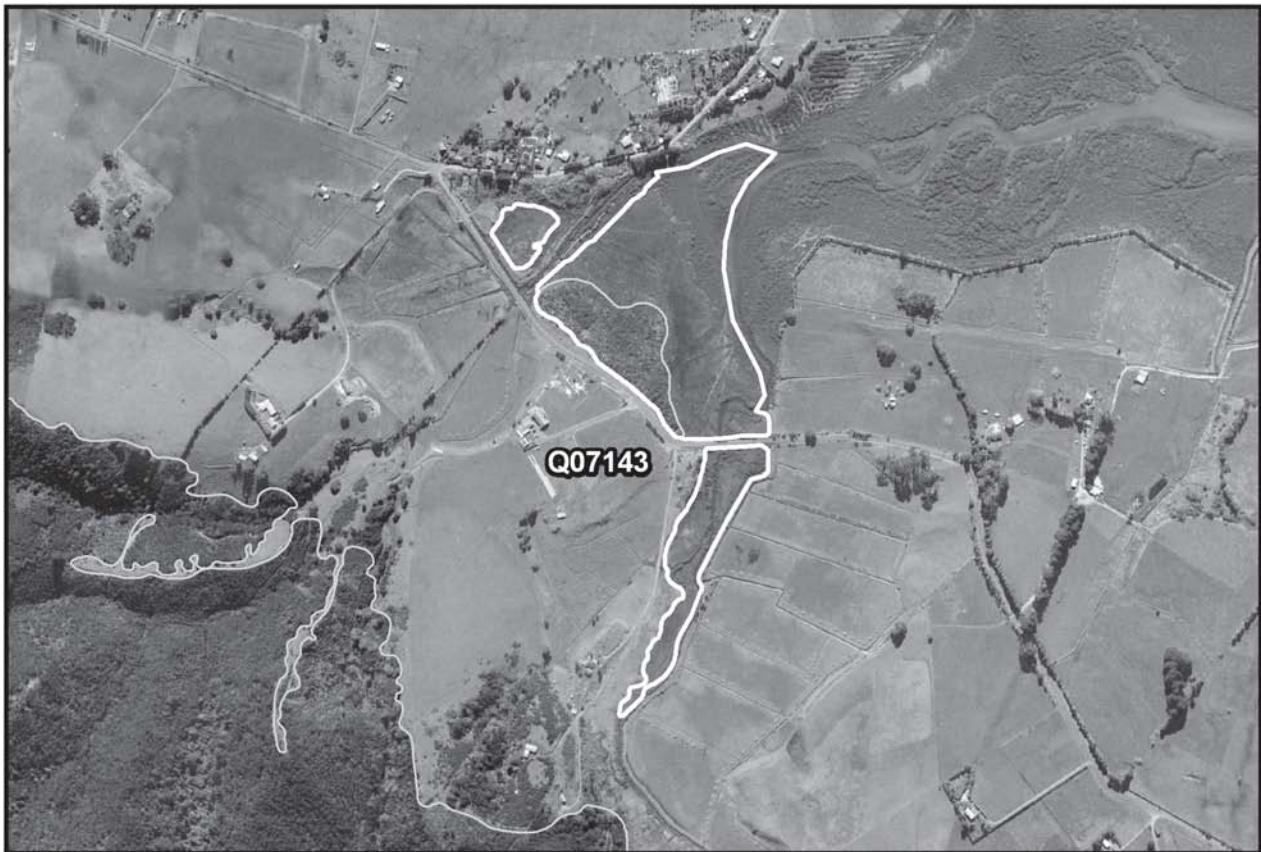
- (a) Sea rush–oioi rushland in estuary (50%)
- (b) Mangrove shrubland in estuary (25%)
- (c) Manuka shrubland on alluvium (25%)

Landform/geology

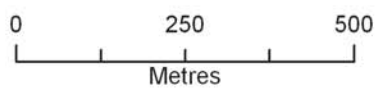
Muddy intertidal flats and channels at head of estuary.

Vegetation

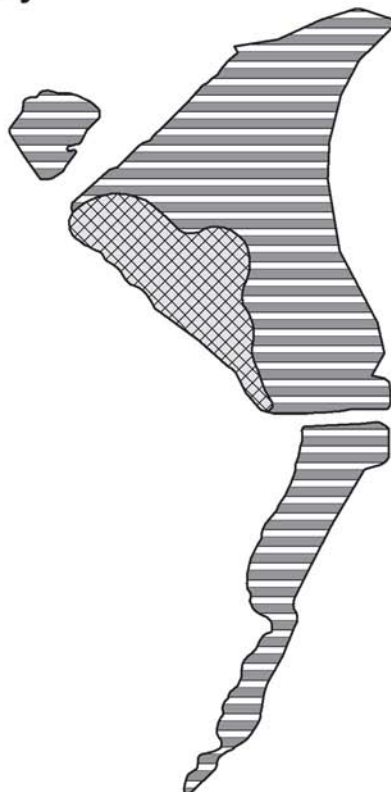
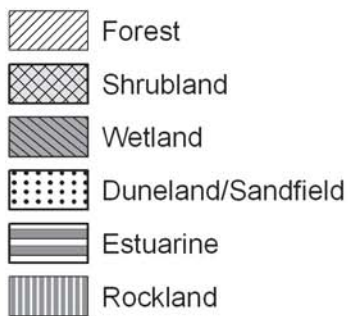
This site is adjacent to the lower reaches of Takahiwai Stream. The site includes a complete terrestrial to estuarine vegetation sequence from manuka shrubland to saltmarsh to mangrove shrubland.



Q07/143 Takahiwai Stream Estuary



Habitat Type



(a) The majority of the area is estuarine rushland. Sea rush is abundant, oioi is common, small mangrove seedlings and shrubs are frequent, and remuremu, sea primrose, and saltmarsh ribbonwood are occasional.

(b) The seaward margin of the site is low mangrove shrubland with occasional sea-rush.

(c) The landward margin of the site, between the rushland and Takahiwai Road is manuka shrubland. Harakeke, brush wattle, and pink bindweed are frequent, and ti kouka, kanuka, mapou, kiokio, hangehange and pampas are occasional. Japanese honeysuckle is occasional on the roadside edge of the shrubland.

Fauna

This is one of two currently known sites for North Island fernbird (Sparse) in the whole of the Whangarei Harbour (Parrish 1984; Wildland Consultants 2005). This site also supports a population of banded rail (Sparse) which has its stronghold in Northland (Wildland Consultants 2005).

Significance

All of the ecological units present are representative of their type, and these form an unbroken continuum from terrestrial to estuarine vegetation. The site is perhaps the least disturbed estuarine system in Waipu ED due to its relative remoteness from urban areas. The Takahiwai Stream Estuary provides a buffer to the Takahiwai tidal flats with which it is contiguous. The site provides habitat for two threatened bird species (banded rail and North Island fernbird), and is probably the only population of the latter in the ED. The terrestrial margins of the site, particularly alongside Takahiwai Road and Pirihi Road, are being invaded by brush wattle, Japanese honeysuckle, and pampas.

BLACKSMITH'S CREEK ESTUARY

Survey no.	Q07/144
Survey date	16 November 2006
Grid reference	Q07 441948 (2 remnants)
Area	22.0 ha (19.4 ha estuary, 2.4 ha shrubland, 0.3 ha wetland)
Altitude	sea level

Ecological units

- (a) Mangrove shrubland in estuary (83%)
- (b) Kanuka shrubland on alluvium (10%)
- (c) Sea rush–oioi rushland in estuary (5%)
- (d) Glasswort herbfield on shellbank (<1%)
- (e) Marsh clubrush sedgeland on alluvium (<1%)
- (f) Manuka–harakeke flaxland on alluvium (<1%)
- (g) Watercress–*Polygonum* sp.–bachelors button–*Baumea articulata* herbfield in stream channel (<1%)

Landform/geology

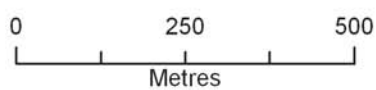
Estuarine muddy and sandy intertidal flats and shellbanks.

Vegetation

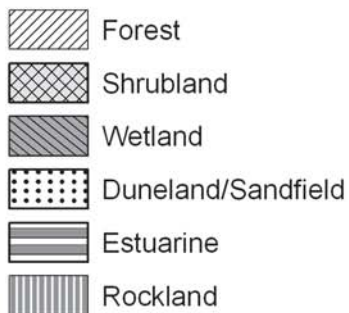
Blacksmith's Creek, which flows into the Whangarei Harbour near Marsden Point contains a diverse range of estuarine and terrestrial vegetation types. Within the reach of tidal influence mangrove shrubland (a) is dominant, with areas of sea rush–oioi rushland (c) on the edges where salt water immersion is less frequent. Shellbanks near



Q07/144 Blacksmith's Creek Estuary



Habitat Type



the end of Albany Road support small patches of glasswort herbfield (d). Indigenous vegetation is limited in extent on the margins of the site because of industrial land, roading, and residential areas. Kanuka shrubland (b) with frequent manuka and gorse is present on the northern side of the estuary mouth, and on the southwestern edge of the estuary are small areas of marsh clubrush sedgeland (e), manuka-harakeke flaxland (f), and watercress-*Polygonum* sp.-bachelors button-*Baumea articulata*

herbfield (g). Blacksmith's Creek is in an area of increasingly intensive development, with a residential canal development currently under construction on its western side. Increased urbanisation of the catchment may lead to further hydrological changes. Local residents also report regular disturbance of the estuary by uncontrolled dogs. An area of sea rush–oioi rushland adjacent to Albany Road is being filled in with soil, tree stumps and garden refuse.

Significant flora

Suaeda novae-zelandiae (regionally significant) was recorded in the current survey (AK 297982) and is frequent in the glasswort herbfield near the end of Albany Road.

Fauna

Banded rail (Sparse) reportedly occurs in mangroves in Marsden Bay (Wildland Consultants 2005). Australasian bittern (Nationally Endangered) are also found here (Tony Beauchamp pers. comm.).

Significance

Blacksmith's Creek supports the third largest area of estuarine habitats in the ED. The site contains a diverse mosaic of estuarine, freshwater and terrestrial vegetation and is habitat for a two threatened bird species (banded rail and Australasian bittern) and a regionally significant plant species (*Suaeda novae-zelandiae*). Blacksmith's Creek is representative for the following ecological units: (b) kanuka shrubland on alluvium, (f) manuka–harakeke flaxland on alluvium, (d) glasswort herbfield on shellbank, and (e) marsh clubrush sedgeland on alluvium. Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. The site provides a protective buffer to the coastal fringe and is contiguous with the Marsden Bay tidal flats. New residential developments adjacent to Blacksmith's Creek, along with weed invasion and the dumping of waste, currently threaten the site. One Tree Point Seabed and Marsden Spit Government Purpose Reserve (both DOC-administered) make up 19 ha of the site.

TAURAROA RIVER FOREST REMNANTS

Survey no.	Q07/145
Survey date	10 November 2006
Grid reference	Q07 230923 (5 remnants)
Area	1.2 ha
Altitude	60 m asl

Ecological units

- (a) Totara–kahikatea forest on alluvium (40%)
- (b) Kahikatea forest on alluvium (35%)
- (c) Totara forest on alluvium (10%)
- (d) Titoki–kowhai–totara forest on alluvium (10%)
- (e) Titoki–totara forest on alluvium (5%)

Landform/geology

River flats on Holocene alluvium.

cattle and have harakeke in the understorey. A brief description of the forest types based on canopy composition is present below:

(a) The largest of the remnants (in the centre of the site) is totara forest, in which kahikatea is common and kanuka, titoki, and kowhai are occasional.

(b) The southern remnant is a grazed stand of kahikatea with occasional ti kouka and totara.

(c) The northeastern remnant comprises abundant totara and occasional kowhai.

(d) The western remnant comprises titoki, kowhai and totara with occasional manatu.

(e) The smallest remnant overall, between ecological units (a) and (c), comprises titoki and totara with occasional karaka, rewarewa, kowhai, ti kouka, and pukatea.

Significant flora

Manatu (regionally significant).

Fauna

Australasian harrier was recorded in this survey.

Significance

The site contains two representative ecological units not known from elsewhere in Waipu ED: (d) titoki-kowhai-totara forest on alluvium, and (e) titoki-totara forest on alluvium. Manatu, a regionally significant plant species, is present. All of the remnants are small, and with the exception of (d) and (e), are grazed with a sparse understorey. The remnants are isolated from other indigenous remnants on alluvium, with the majority of riverine forest in the area now being dominated by crack willow.

WAIOTIRA STREAM FOREST REMNANTS

Survey no.	Q07/148
Survey date	10 November 2006
Grid reference	Q07 259873 (19 remnants)
Area	24.7 ha
Altitude	80–205 m asl

Ecological units

(a) Totara forest on alluvium (60%)

(b) Totara-kahikatea forest on alluvium (25%)

(c) Kahikatea-totara forest on gentle hillslope (10%)

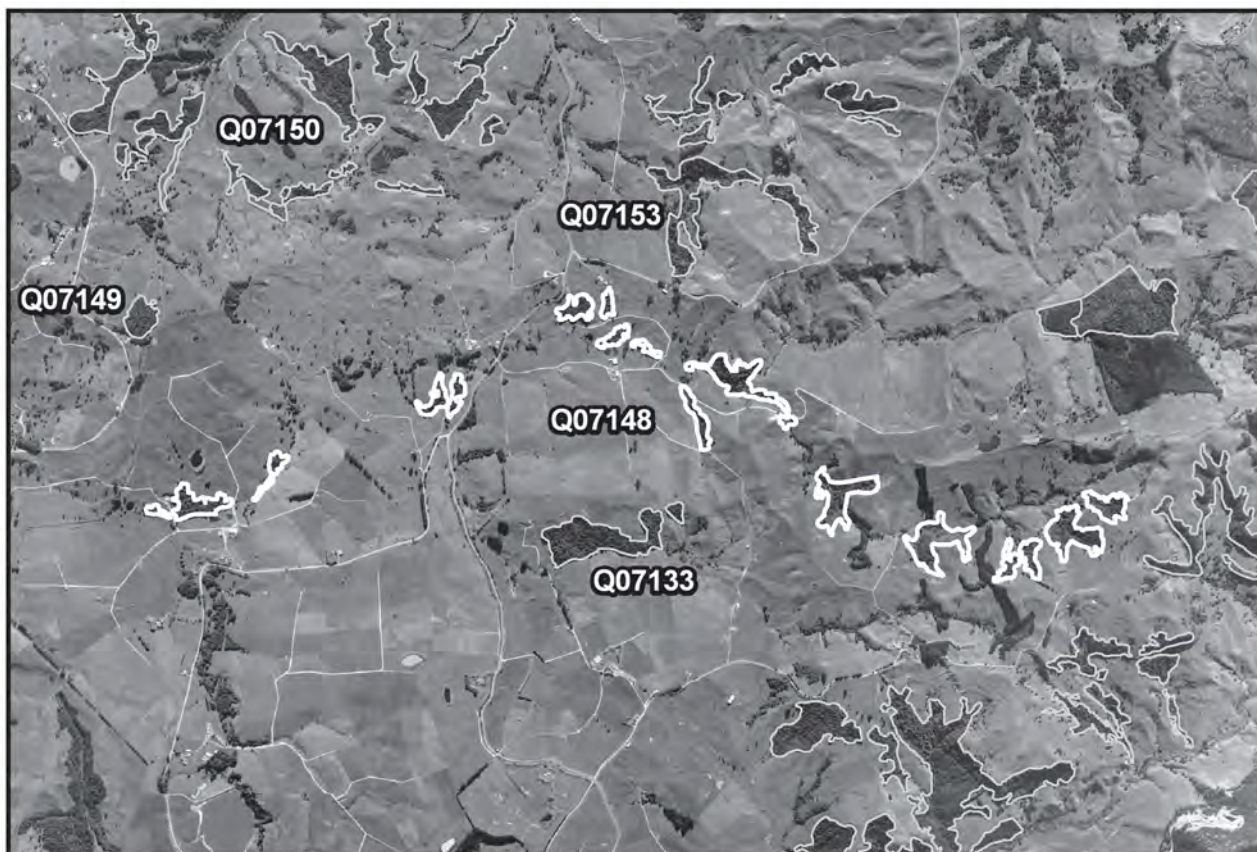
(d) Kauri forest on alluvium (5%)

Landform/geology

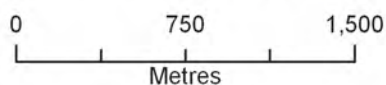
Predominantly gullies and hillslopes on melange (undifferentiated Mangakahia and Motatau Complex lithologies), and Miocene sandy mudstone and bluff-forming sandstone (Waitemata Group), with Holocene valley floor alluvium present locally.

Vegetation

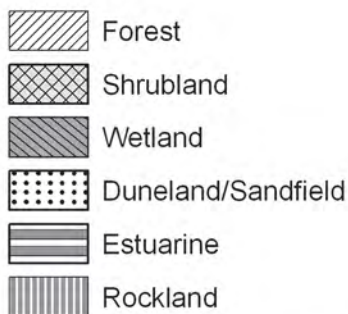
This site comprises 19 small riparian forest remnants in the headwaters of the Waiotira Stream. Totara forest (a), with common or frequent kahikatea and kauri, is the most common vegetation type, followed by totara-kahikatea forest (b), and kahikatea-totara forest (c). Rimu, kowhai, kanuka, ti kouka, and rewarewa are occasional. The site is unusual in that it contains kauri forest (d) on alluvium. No



Q07/148 Waiotira Stream Forest Remnants



Habitat Type



fences to exclude stock were visible from the road and most if not all of the remnants are probably grazed.

Fauna

Not surveyed.

Significance

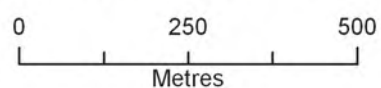
The site is representative for two ecological units: (d) kauri forest on alluvium, which is the only example of this ecological unit in Waipu ED, and (c) kahikatea-totara forest on gentle hillslope. The remnants, which are grazed and generally narrow, provide some riparian protection to the upper reaches of the Waiotira Stream.

RUSSEK ROAD NATURAL AREA 1

Survey no. Q07/149
Survey date 10 November 2006
Grid reference Q07 232880
Area 1.9 ha
Altitude 118-134 m asl

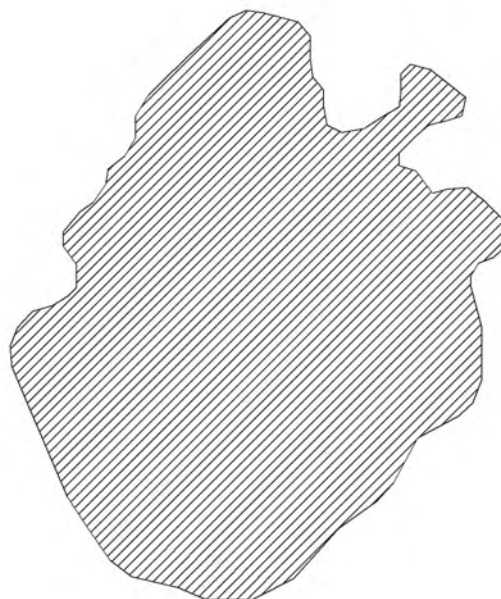


Q07/149 Russek Road Natural Area 1



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological units

(a) Kahikatea-totara forest on gentle hillslope (60%)

(b) Totara-rimu forest on moderate hillslope (40%)

Landform/geology

Knoll underlain by Oligocene muddy limestone (Mahurangi Limestone, Motatau Complex).

Vegetation

This site is an isolated, podocarp-dominated remnant adjacent to Russek Road. Kahikatea-totara forest (a) is on the lower slopes of the remnant, with frequent rimu, and occasional ti kouka, kauri, and kanuka. On the upper slopes is totara-rimu forest (b) with occasional kanuka. No mature emergent podocarps are present, suggesting that the forest is secondary. The remnant may have recently been fenced; a fence bounds the upper part of the remnant and tall pasture grasses have grown up between the remnant and the fence.

Fauna

Not surveyed.

Significance

This remnant occurs on an uncommon geological unit (Oligocene muddy limestone) and both ecological units, (a) kahikatea-totara forest on gentle hillslope, and (b) totara-rimu forest on moderate hillslope, are representative of their types. The remnant has a sparse understorey but has been fenced recently. Limestone geology and the vegetation it supports is regionally distinctive.

RUSSEK ROAD NATURAL AREA 2

Survey no.	Q07/150
Survey date	10 November 2006
Grid reference	Q07 238889 (14 remnants)
Area	30.3 ha (29.0 ha forest, 0.5 ha shrubland, 0.9 ha wetland)
Altitude	80-140 m asl

Ecological units

(a) Totara forest on moderate hillslope (47%)

(b) Kanuka-totara forest on moderate hillslope and in gully (17%)

(c) Kahikatea-rimu-totara forest on moderate hillslope (10%)

(d) Totara-kanuka-kahikatea forest in gully (10%)

(e) Kanuka forest in gully (5%)

(f) Raupo reedland in gully (5%)

(g) Manuka shrubland in gully (4%)

(h) Kahikatea-totara treeland in gully (1%)

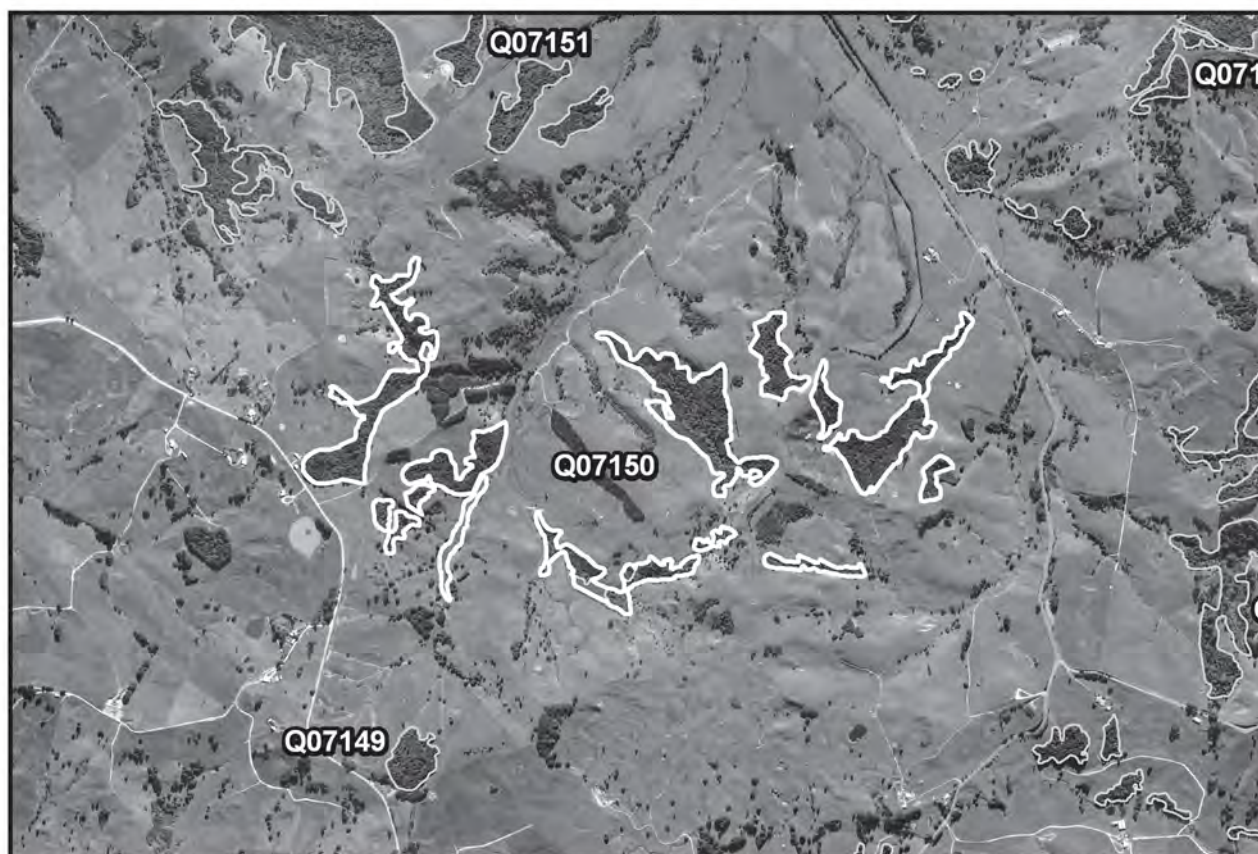
(i) Kauri forest in gully (1%)

Landform/geology

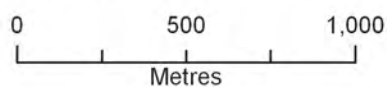
Hillslopes and gullies underlain by Mangakahia Complex mudstone.

Vegetation

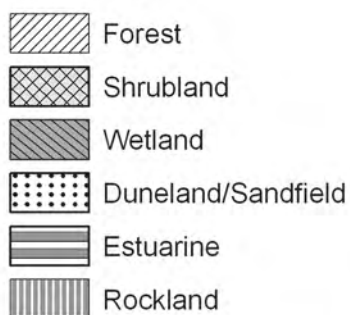
This site comprises a group of small forest and shrubland remnants in gullies and on hillslopes between Russek Road and Paparoa Road. Totara, kanuka, and kahikatea



Q07/150 Russek Road Natural Area 2



Habitat Type



are the most common species in the forest remnants, with manuka abundant or common in shrubland remnants. Totara forest (a) or kanuka-totara forest (b) is common on the hillslopes. On the upper slopes of the largest remnant, in a north-east facing gully adjacent to Russek Road, is kahikatea-rimu-totara forest (c) with occasional kauri, kanuka, ti kouka, miro, mapou, and tawa. Lower in the gully is totara-kanuka-kahikatea forest (d) with frequent tanekaha, and small areas of kanuka forest (e), kanuka-totara forest (b) and kauri forest (i). A diverse range of other indigenous species occurs occasionally in the gullies including pukatea,

mamaku, mahoe, rewarewa, manuka, titoki, karaka, and lancewood. This remnant is in the process of being fenced as funds become available to the landowner and is currently grazed by young cattle to reduce the impacts on regeneration (Jeremy White pers. comm.). The understorey in the lower gully has localised regeneration of a diverse range of species including houhere, pate, hangehange, nikau, kiekie, gully fern, mamangi, wheki, and ponga.

Visibility of wetlands was poor due to distance from roads or obscuration by taller vegetation. Some of the manuka shrubland (g) may be wetland, and the adjacent wetland is likely to be raupo-reedland (f), based on interpretation of the aerial photography. The kahikatea-totara treeland (h), which has occasional ti kouka and manuka, is grazed and may also be a wetland.

Fauna

Grey warbler, North Island fantail, shining cuckoo, and Australasian harrier were recorded in this survey.

Significance

This site has a diverse, healthy canopy and where only lightly grazed an established understorey. The site is representative for all of its ecological units except for (i) kahikatea-totara treeland in gully, which is heavily grazed and has an understorey dominated by pasture species. The small freshwater wetland is significant because natural freshwater wetlands have been greatly reduced in extent in the ED and now only approximately 45 ha of natural or semi-natural wetlands remain.

PAPAROA ROAD RIPARIAN FOREST REMNANTS

Survey no.	Q07/152
Survey date	10 November 2006
Grid reference	Q07 246901 (8 remnants)
Area	5.5 ha
Altitude	60–88 m asl

Ecological units

- (a) Totara forest on alluvium (45%)
- (b) Kahikatea-totara forest on alluvium (45%)
- (c) Kahikatea forest on alluvium (10%)

Landform/geology

Hillslope of Miocene sandy mudstone (Waitemata Group), and valley floor Holocene alluvium.

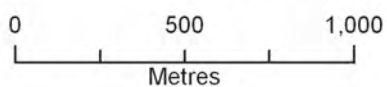
Vegetation

This site comprises eight small riparian remnants on the banks of a northerly-flowing tributary of the Tauraroa River. The largest and northernmost remnant is a thin band of totara forest approximately 500 m long by 10–80 m wide. Smaller kahikatea-dominated remnants are scattered along the next 1.2 km upstream. The surrounding land use is grazed alluvial flats with scattered kahikatea and totara.

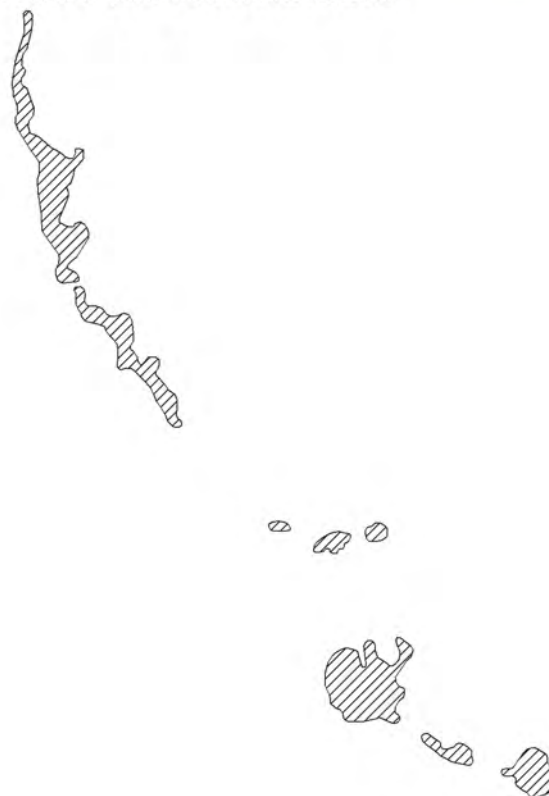
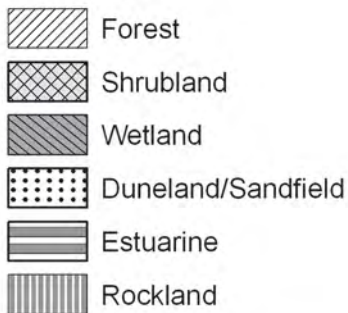
- (a) The largest and northernmost remnant has abundant totara with frequent kahikatea. Matai, ti kouka, kowhai, and titoki are occasional. The remnant is partly fenced with a single wire electric fence and in places has an understorey dominated by nikau, harakeke, and *Coprosma* species.



Q07/152 Paparoa Road Riparian Forest Remnants



Habitat Type



(b) The three tiny remnants in the central part of the site are dominated by kahikatea with occasional totara. The remnants are heavily grazed with no understorey.

(c) The southernmost remnants are dominated by kahikatea, totara is common, and rimu, titoki, ti kouka, and kanuka are occasional. One flowering kaikomako was seen

on the edge of the remnant closest to the road. The remnants are grazed and arum lily was present in the understorey. Some of the oldest kahikatea probably established prior to human clearance.

Significant flora

Kaikomako (regionally significant) were recorded in this survey.

Fauna

Spur-winged plover and Australasian harrier were recorded in this survey.

Significance

The site is representative for (c) kahikatea on alluvium. One regionally significant plant species (kaikomako) was seen on the edge of one of the kahikatea remnants. This species is very uncommon in Waipu ED. The remnants are all grazed and have a sparse understorey and localised weed infestation. The vegetation provides riparian protection for a tributary of the Tauraroa River.

NGATOKA FOREST AND SHRUBLAND

Survey no.	Q07/158
Survey date	11 November 2006
Grid reference	Q07 278883 (2 remnants)
Area	30.1 ha (27.5 ha forest, 2.6 ha shrubland)
Altitude	120–171 m asl

Ecological units

- (a) Kanuka forest on gentle to moderate hillslope (92%)
- (b) Manuka-kanuka-ponga shrubland on gentle hillslope (8%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

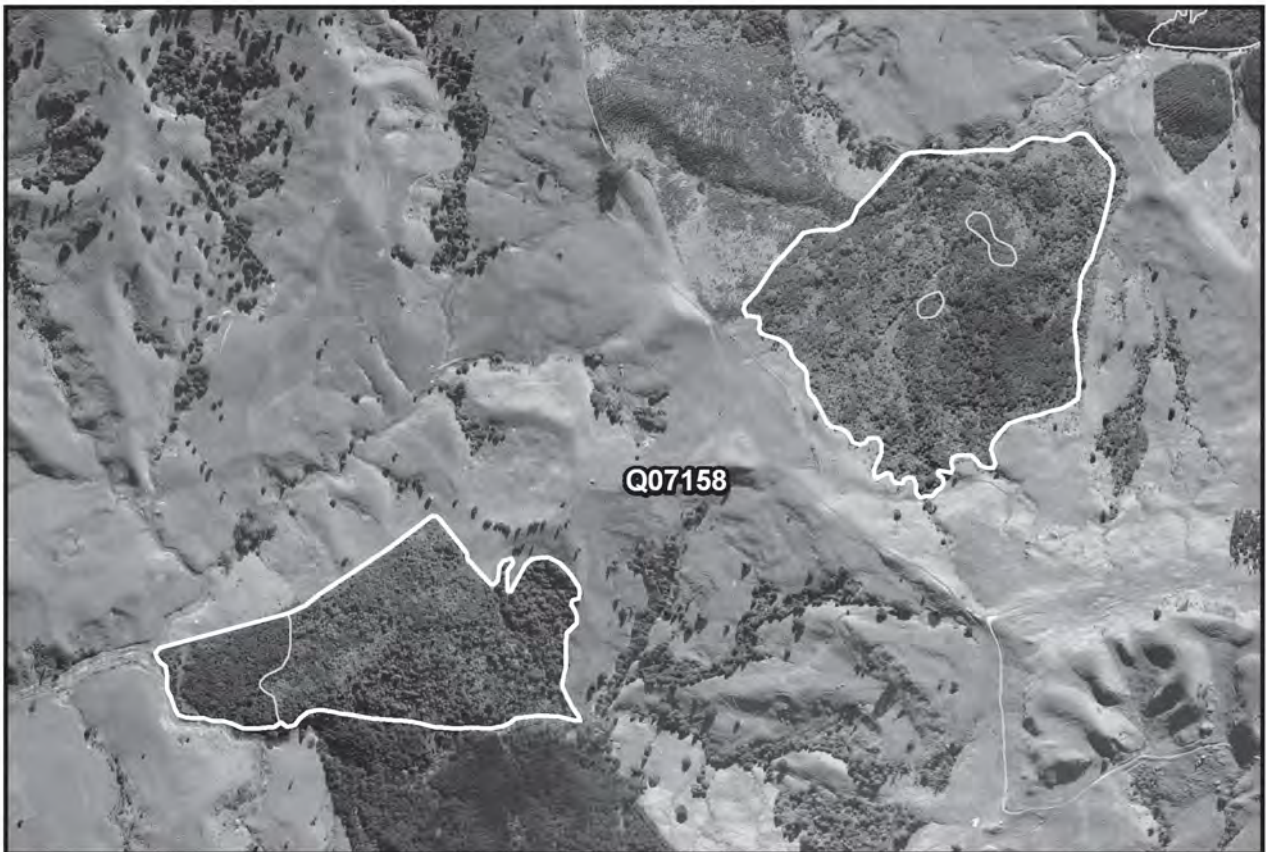
Vegetation

This site comprises of two forest and shrubland remnants approximately 400 m apart. The intervening and surrounding land is covered in pasture, except for the southern edge of the western remnant and the north-western edge of the northern remnant, which adjoin radiata pine forest. Comparison of the aerial photographs with the NZMS 260 Q07 map, produced in 1988, suggests that both of the adjoining forestry areas were formerly indigenous vegetation, and that the area remaining in indigenous vegetation has been reduced by over 50%. From Ruarangi Road a fence is visible adjacent to the northern edge of the western remnant and undergrowth is present; this area of the western remnant is therefore probably either partially fenced or only lightly grazed. No fences were seen adjacent to the eastern remnant and the lack of undergrowth suggests that this remnant is grazed.

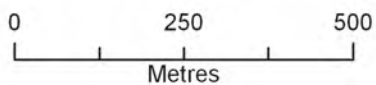
- (a) Kanuka forest on gentle to moderate hillslopes covers most of the two remnants. Manuka and ponga are frequent, and gorse, totara, pate, mamaku, maritime pine and radiata pine are occasional.
- (b) The western edge of the western remnant, and two small patches near the centre of the eastern remnant, is manuka-kanuka-ponga shrubland. Totara is frequent, and kahikatea, mahoe, and ti kouka are occasional.

Fauna

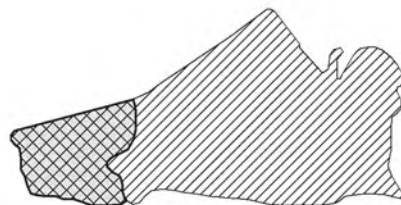
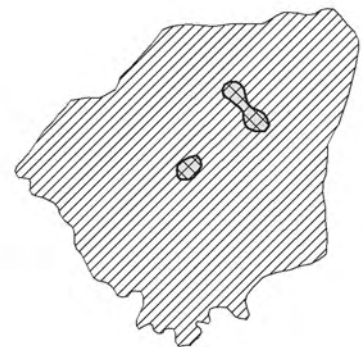
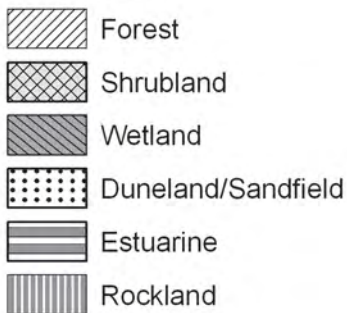
Not surveyed.



Q07/158 Ngatoka Forest and Shrubland



Habitat Type



Significance

This site contains a small but relatively good quality, weed-free example of an ecological unit which was not recorded elsewhere in Waipu ED and is therefore representative: (b) manuka-kanuka-ponga shrubland. The forest and shrubland remnants provide riparian protection to the upper reaches of two streams. Each remnant is contiguous with pine plantations which would provide some buffering from negative impacts.

PARRY ROAD FOREST REMNANTS

Survey no.	Q07/162
Survey date	13 November 2006
Grid reference	Q07 289911 (8 remnants)
Area	30.9 ha
Altitude	100–145 m asl



Q07/162 Parry Road Forest Remnants

0 500 1,000
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological units

- (a) Totara forest on moderate hillslope (80%)
- (b) Totara-taraire-kanuka forest on moderate hillslope (15%)
- (c) Kauri forest on ridge (5%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises a group of forest remnants adjacent to a tributary of the Tauraroa River. At the southern end of the largest remnant there is no roadside fence and the forest is only lightly grazed. At this location the understorey includes small-leaved milktree, putaputaweta, pate, hangehange, mahoe, nikau, ponga, kiekie, hen and chicken fern, gully fern, and tradescantia.

- (a) The majority of the remnants are totara forest. Kanuka is common, kahikatea is frequent, and a diverse range of species are occasional including rewarewa, tanekaha, kauri, ti kouka, puriri, pukatea, mahoe, ponga, taraire, tawa, nikau, and radiata pine.
- (b) Near the southern end of the largest remnant the hillslope supports a diverse podocarp-broadleaf forest with totara, taraire, and kanuka more or less equally common and frequent kahikatea and rewarewa. Occasional species include tanekaha, titoki, kauri, mamaku, ponga, nikau, tawa, puka, lancewood, ti kouka, kohekohe, mapou, pate, and mahoe.
- (c) On a ridge above forest type (b) is a small kauri ricker stand with frequent kanuka and occasional rewarewa, totara, ponga, and kiekie.

Fauna

Kukupa (Gradual Decline), shining cuckoo, tui, North Island fantail, and Australasian harrier were recorded during this survey.

Significance

The vegetation in this site has a diverse, healthy canopy, and at the southern end, has an established understorey. There is an infestation of tradescantia within part of the largest remnant. The remnants provide riparian protection to a tributary of the Tauraroa River, and link Q07/114 with Q07/137 and Q07/116. The remnants provide habitat for one threatened bird species (kukupa).

POHUENUI RIVER FOREST REMNANTS

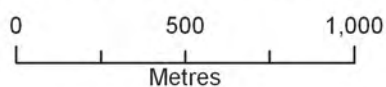
Survey no.	Q07/163
Survey date	15 November 2006
Grid reference	Q07 389830 (21 remnants)
Area	49.1 ha
Altitude	20–40 m asl

Ecological units

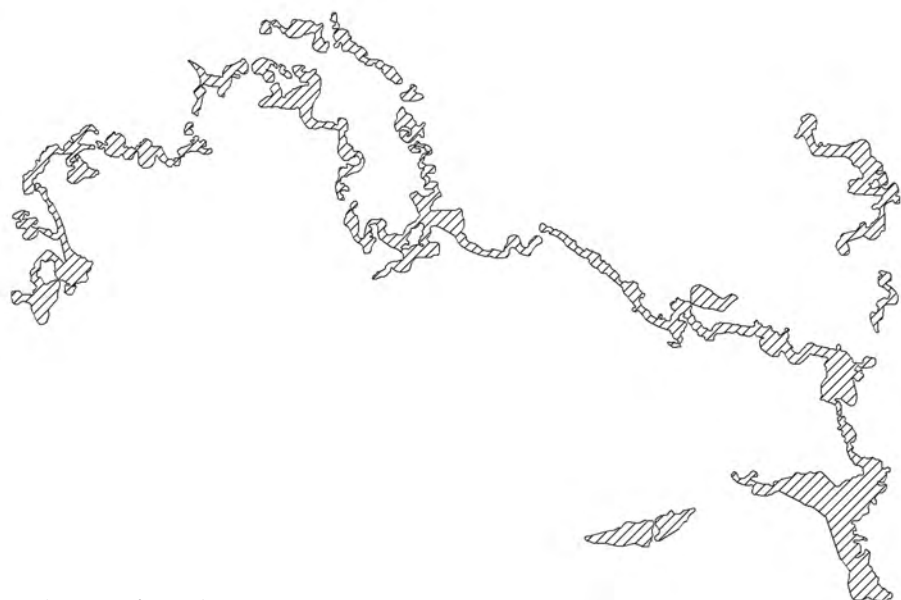
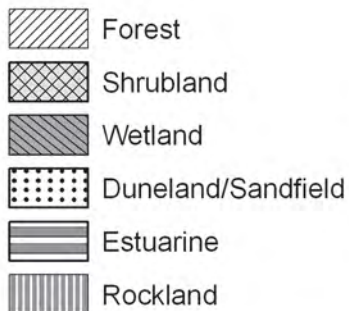
- (a) Totara treeland on alluvium (88%)
- (b) Totara-kanuka forest on alluvium (8%)
- (c) Totara-taraire-kanuka treeland on alluvium (2%)
- (d) Puriri-totara treeland on alluvium (2%)



Q07/163 Pohuenui River Forest Remnants



Habitat Type



Landform/geology

Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

This site comprises a group of riparian forest remnants in the Pohuenui River and North River catchments. The remnants are typically narrow and linear in shape with a grazed understorey dominated by exotic pasture grasses and herbaceous weeds.

(a) Most of the remnants are treeland with abundant totara and frequent kanuka. A diverse range of indigenous species are occasional including titoki, manatu, kowhai, ti kouka, puriri, karaka, *Haloragis erecta*, and karaka. Occasional exotic species present include hawthorn, Chinese privet, crack willow, poplar, radiata pine, Kahili ginger and elephant's ear. On the edges of this forest type, or where the canopy is sparse, wild carrot, creeping buttercup, tall fescue, and kikuyu grass are frequent. One small area of this forest type is fenced to exclude cattle.

(b) To the south of McKay Road is a small remnant of totara-kanuka forest with occasional ponga.

(c) A small area is totara-taraire-kanuka treeland with occasional manatu, poplar, karaka, and puriri. Perennial ryegrass is common in well-lit areas.

(d) The northern edge of the southernmost remnant grades into a thin band of indigenous treeland. Mature puriri are abundant, totara is common, and kohekohe, karaka, ti kouka, and coral tree are occasional.

Significant flora

Manatu (regionally significant).

Fauna

Not surveyed.

Significance

The remnants are mostly grazed and narrow, resulting in an understorey dominated by pasture grasses and herbaceous weeds. Localised infestations of exotic weeds such as hawthorn, crack willow, poplar, and kahili ginger occur throughout the site, however forest on alluvium is a rare habitat type in this ED. The remnants are habitat for one regionally significant plant species (manatu). A small area of one remnant (0.2 ha) is included within an esplanade reserve (WDC-administered).

NORTHLAND PORT CORPORATION PONDS

Survey no.	Q07/164
Survey date	17 November 2006
Grid reference	Q07 443945
Area	3.8 ha
Altitude	sea level

Ecological units

(a) Lake clubrush reedland in constructed pond (85%)

(b) *Juncus pallidus* rushland in constructed pond (10%)

(c) Open water in constructed pond (5%)

Landform/geology

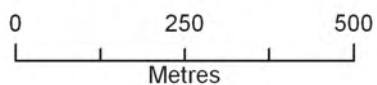
Human-made (on Holocene coastal dunefield).

Vegetation

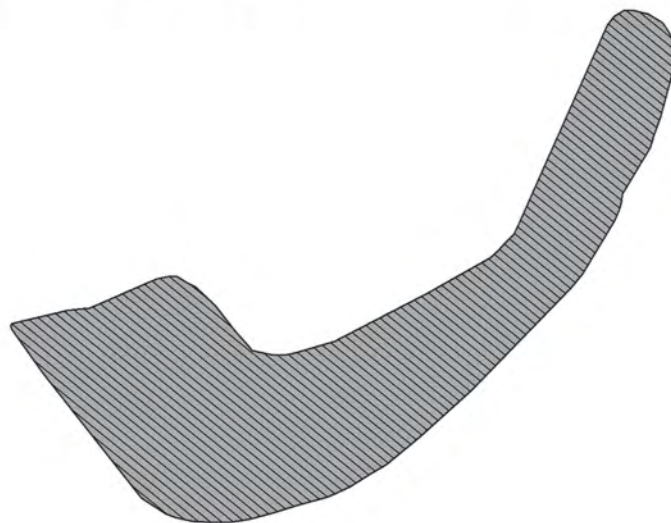
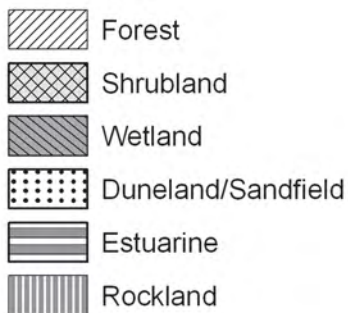
This site is a recently constructed pond built for the treatment of stormwater from the adjacent port facilities. The surrounding land is mown grassland and a recreational reserve with mown lawns and recent plantings of indigenous trees and shrubs. Water levels in the pond were low at the time of survey and only a small area was open water. Comparison of the site at the time of survey with the aerial photographs flown in



Q07/164 Northland Port Corporation Ponds



Habitat Type



January 2004 indicates that the water levels of the site fluctuate significantly, and when the pond is full of water all of the vegetation types recorded in this survey would be submerged. The site was surveyed from the adjacent reserve; additional species are likely to be recorded by a detailed, walk-through survey.

(a) The majority of the pond is covered in lake clubrush reedland, with frequent or occasional *Juncus pallidus* and occasional *Eleocharis acuta*. Recently established manuka less than 1 m tall are present on the higher margins.

(b) *Juncus pallidus* rushland with occasional tarweed occurs within a small area of the pond.

(c) Near the western end of the pond is a small area of open water (a black-backed gull standing in the water indicated that the water was very shallow).

Fauna

Black shag (Sparse), black-backed gull, welcome swallow, white-faced heron and Australasian harrier were recorded during this survey. Two Australasian bitterns (Nationally Endangered) were observed here in 2006 (Margaret Hicks pers. comm.). Flocks of up to 68 grey teal (regionally significant) have been seen on these ponds (Beauchamp and Parrish 1999).

Significance

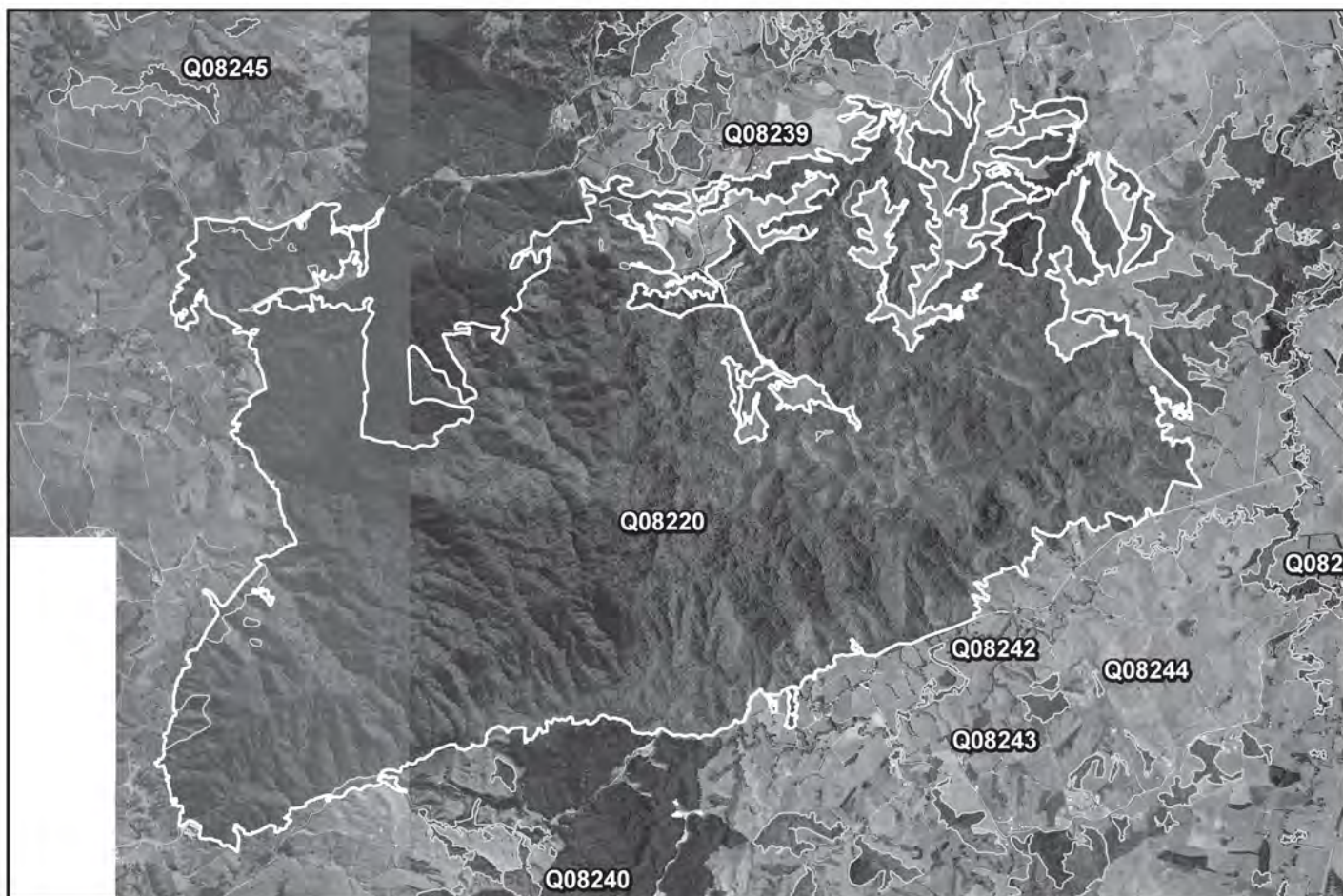
The site provides important habitat for three threatened bird species (Australasian bittern, black shag, and grey duck). The ponds have been recently constructed and are subject to extreme fluctuations in water level. However, the vegetation is dominated by indigenous species, and is representative for the ecological unit (a) lake clubbrush reedland in constructed pond.

MARERETU FOREST

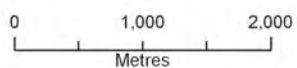
Survey no.	Q08/220
Survey date	8/14 November 2006
Grid reference	Q08 326767 (10 remnants)
Area	2,820.3 ha (2,779.1 ha forest, 41.2 shrubland, 0.1 ha wetland)
Altitude	26–280 m asl

Ecological units

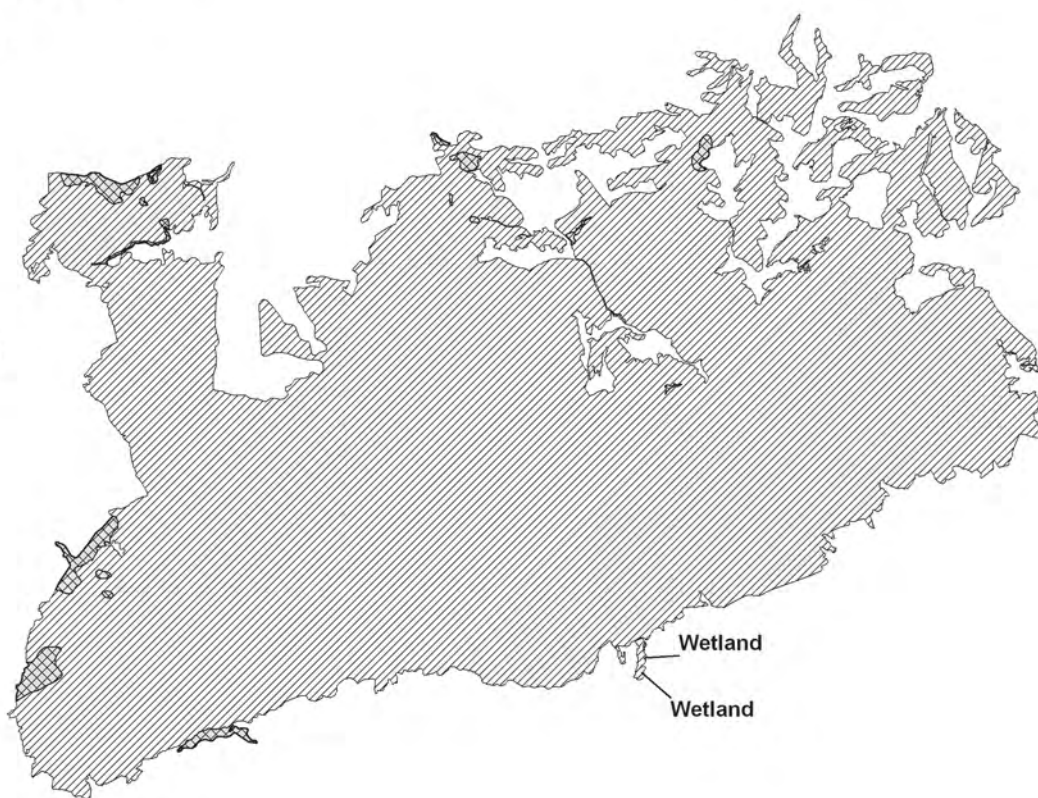
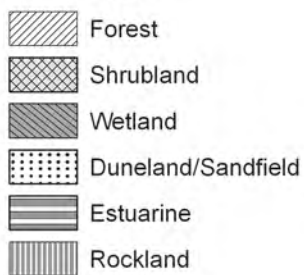
- (a) Kanuka forest on moderate hillslope (35%)
- (b) Rimu forest on ridge (20%)
- (c) Taraire–mamaku–rimu–rewarewa–totara forest on steep to moderate hillslope (20%)
- (d) Kauri–kanuka forest on moderate hillslope (4%)
- (e) Mamaku–mahoe shrubland in gully (3%)
- (f) Taraire forest on moderate hillslope and in gully (3%)
- (g) Tanekaha forest on moderate hillslope (2%)
- (h) Mapou–mingimingi–ponga shrubland on ridge (2%)
- (i) Manuka shrubland on ridge (2%)
- (j) Totara forest on moderate hillslope (2%)
- (k) Taraire–totara forest on moderate hillslope (2%)
- (l) Towai forest on gentle hillslope (2%)
- (m) Mamaku forest on moderate hillslope (1%)
- (n) Kanuka–manuka shrubland on ridge (<1%)
- (o) Mapou–manuka shrubland on steep hillslope (<1%)
- (p) Kahikatea forest on alluvium (<1%)
- (q) Raupo reedland on alluvium (<1%)



Q08/220 Mareretu Forest



Habitat Type



Landform/geology

Dissected hill country predominantly underlain by Mesozoic greywacke (Waipapa Terrane), with Eocene glauconitic sandstone (Ruatangata Sandstone, Te Kuiti Group) and Miocene sandy mudstone (Waitemata Group) present locally. Small areas of Holocene alluvium are present in this site at the base of a prominent fault scarp running along the northern side of Finlayson's Brook and Kaikowhiti Stream (e.g., Q08 338748, Q08 301741).

Vegetation

This site is the largest contiguous area of indigenous vegetation remaining in Waipu ED.* The eastern side of the forest where it adjoins Ahuroa Road Forest, and the northern side of the forest, between the 350 and 338 m highpoints and Millbrook Road, is primarily kanuka forest (a) with frequent mamaku and occasional kauri, puriri, rimu, mapou, tanekaha, totara, kahikatea, pate, and kohuhu. This vegetation type probably regenerated following attempts to farm the area. Interspersed throughout the northern and eastern areas of the forest, on steeper slopes or in gullies, are patches of kauri-kanuka forest (d), tanekaha forest (g), and taraire forest (f), and adjacent to the roads or on ridges there are areas of kanuka-manuka shrubland (n), mapou-mingimingi-ponga shrubland (h) and manuka shrubland (i). The highest altitude ridges, particularly along the tops of the southern face, often comprise remnants of the original forest cover, typically rimu forest (b) with frequent kauri, totara, and kahikatea. Taraire, mamaku, rewarewa, pate, and large emergent northern rata are occasional. The rimu are also large emergent trees.

On the western and north western slopes of Mareretu Forest are patches of secondary totara forest (j) with occasional kahikatea, rewarewa, nikau, and ponga, and on the steep south-western slopes are patches of mapou-manuka shrubland (o) with frequent mamaku and totara and occasional kanuka, ti kouka, rewarewa, and tanekaha. On the lower south-western slopes are small areas of taraire-totara forest (k) with frequent rewarewa and tanekaha, and occasional miro, nikau, mamaku, rimu, and kauri.

The moderate to steep hillslope of the southern face, between the 350 and 338 m high points and Finlayson's Brook Road, is mostly covered in diverse podocarp-broadleaf forest (c). Taraire, mamaku, rewarewa, rimu and totara are frequent, and northern rata, nikau, kauri, pate, puka, towai, pukatea, kohekohe, and ponga are occasional. The southern face also has small areas of mamaku forest (m) and taraire forest (f). Towai forest (l) with frequent kahikatea or mamaku-mahoe shrubland (e) is present on the gentler lower slopes adjacent to Finlayson's Brook Road. On the alluvial flats adjacent to Finlayson's Brook, and sometimes contiguous with the larger forest remnant, are small areas of raupo reedland (q) and kahikatea forest (p).

Significant flora

Northern rata (regionally significant) was recorded during the present survey. Mida (Gradual Decline), kawaka (Sparse), *Nematoceras rivulare* (Data Deficient), gully tree fern (regionally significant), and *Coprosma rigida* (regionally significant) were recorded in 2001 (SSBI Q08/H001). *Hebe macrocarpa* var. *macrocarpa* (regionally significant) was recorded in 1999 (AK 248072). There are also reports of hard beech (regionally significant) in this area (Lisa Forester, NRC, pers. comm.).

* Whilst the Brynderwyn Hills Forest Complex (Q08/225) is slightly larger (3,278.1 ha), it comprises many separate areas of indigenous vegetation linked by pine plantations.

Fauna

Kukupu (Gradual Decline), Australasian harrier, grey warbler, silvereye, and tui were recorded during this survey. Tomtit (regionally significant), NZ kingfisher, North Island fantail, kauri snail (Gradual Decline), longfin eel (Gradual Decline), banded kokopu (regionally significant), common bully, torrentfish, koura, freshwater limpet, Hochstetter's frog (Sparse) and cave weta were recorded in 2000/2001 (SSBI Q08/H001). Pukeko, morepork, welcome swallow, the beetle *Uloma tenebrionoides*, carabid beetles, tree weta, the spider *Cambridgea* sp., and the land snails *Liarea turriculata*, *Therapsiella* sp. (*T. celinde* or *T. tamora*), *Cytora torquilla*, and *Cytora cytora* were recorded in 1992 (SSBI Q08/H001). Grey duck (Nationally Endangered) were present in 1978 (SSBI Q08/H001) but have not been recorded since. There are recent records of the land snails *Schizoglossa worthyae* (Serious Decline) (Brook 2002) and *Amborhytida dunniiae* (Gradual Decline) (Fred Brook pers. comm. 2007).

Surveys of Hochstetter's frog in Mareretu Forest in 1992 and 1994, found frogs at 25 sites (up to 16 frogs present at each site) (DOC 2007). Hochstetter's frog was most abundant in a tributary of Finlayson's Brook draining a steep, southern-east facing slope and at this site four frogs were found per 100 m of stream (Parrish 1993b).

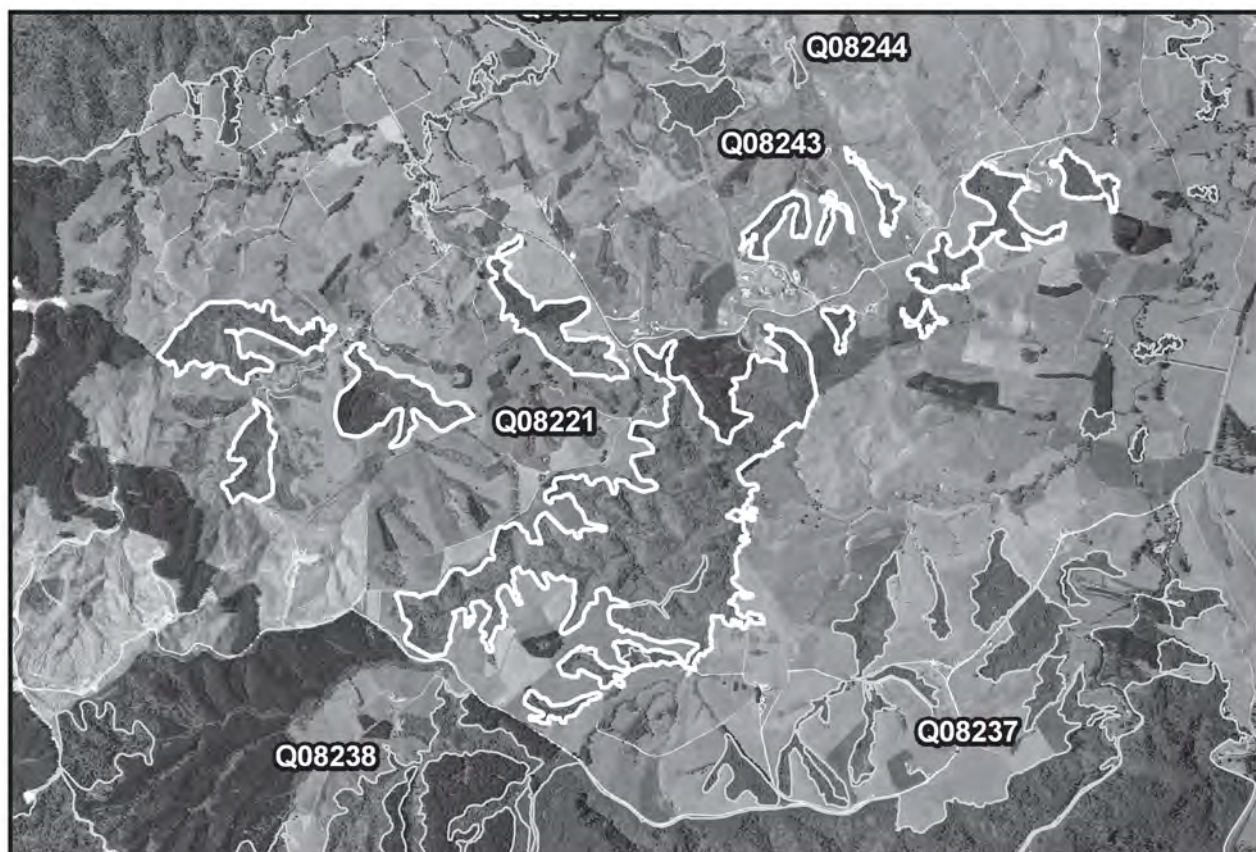
Longfin eel (Gradual Decline) and koura have been recorded in streams throughout Mareretu Forest between 1981 and 2004. Common bully was present in a tributary of Mill Brook in 1994, and Cran's bully and redfin bully were present in a tributary of Finlayson's Brook in 1992 and 2004 respectively (NIWA 2007).

Significance

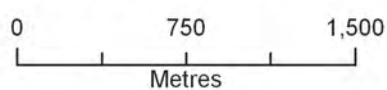
Mareretu Forest contains the largest area of indigenous forest and the third largest area of indigenous shrubland in Waipu ED. The site has a diverse, healthy canopy, and includes areas of mature forest with emergent podocarps. Grazing by stock appears to be restricted to the edges of the remnant adjacent to pasture. The site is representative for all of its ecological units except (p) kahikatea forest on alluvium. This ecological unit was on the edge of the site, was very small in extent, and grazed by stock. The site is habitat for seven threatened fauna species (kukupu, kauri snail, longfin eel, Hochstetter's frog, grey duck, *Schizoglossa worthyae*, *Amborhytida dunniiae*), two regionally significant fauna species (tomtit, banded kokopu), three threatened plant species (mida, kawaka, *Nematoceras rivulare*), and five regionally significant plant species (northern rata, gully tree fern, *Coprosma rigida*, *Hebe macrocarpa* var. *macrocarpa*, and hard beech). Mareretu Forest provides linkages between many smaller remnants around its periphery, and provides catchment protection for several rivers and streams. 1321.3 ha of this site is within the Mareretu Conservation Area (DOC-administered) and 0.8 ha is within a Marginal Strip (DOC-administered).

BROOKS ROAD FOREST AND SHRUBLAND

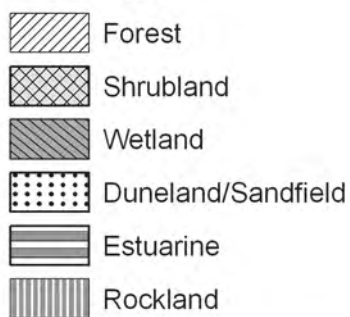
Survey no.	Q08/221
Survey date	12 November 2006
Grid reference	Q08 355733 (18 remnants)
Area	168.8 ha (165.6 ha forest, 3.2 ha shrubland)
Altitude	40-160 m asl



Q08/221 Brooks Road Forest and Shrubland



Habitat Type



Ecological units

- (a) Mamaku forest on moderate hillslope (66%)
- (b) Totara-mamaku forest on moderate hillslope (10%)
- (c) Totara-kahikatea forest on moderate hillslope (10%)
- (d) Kanuka forest on moderate hillslope (8%)
- (e) Kanuka-rimu forest on moderate hillslope (3%)

- (f) Manuka shrubland on moderate hillslope (2%)
- (g) Ti kouka–putaputaweta–manuka shrubland in gully (<1%)
- (h) Raupo reedland in gully (<1%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane) and Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This site comprises one large and many small forest and shrubland remnants in the Ahuroa River catchment. The majority of the site is secondary forest with extensive areas of mamaku forest (a), and smaller patches of totara mamaku forest (b), totara–kahikatea forest (c), kanuka forest (d), and kanuka–rimu forest (e). Occasional taraire, puriri, nikau, rimu, kahikatea and rewarewa scattered throughout the younger forest are presumably survivors from the former vegetation. A small area of manuka shrubland (f) has frequent ponga and totara, and occasional kanuka, kahikatea, rimu, to kouka, and mamaku. In a gully in the easternmost remnant is a small raupo reedland (h) with occasional kahikatea and gorse. Adjacent to this wetland is a small area of ti kouka–putaputaweta–manuka shrubland (g) with occasional kahikatea and wheki. Most of the remnants appear to be grazed.

Fauna

Shining cuckoo was recorded during this survey. This site is located between Mareretu Forest (Q08/220), Waipu Gorge Forest Remnants (Q08/222), and the Brynderwyn Hills Forest Complex (Q08/225), which are all important Hochstetter's frog habitats, and it may contain Hochstetter's frogs in the more unmodified parts of the Ahuroa River catchment (Peter Anderson, DOC, pers. comm.).

Significance

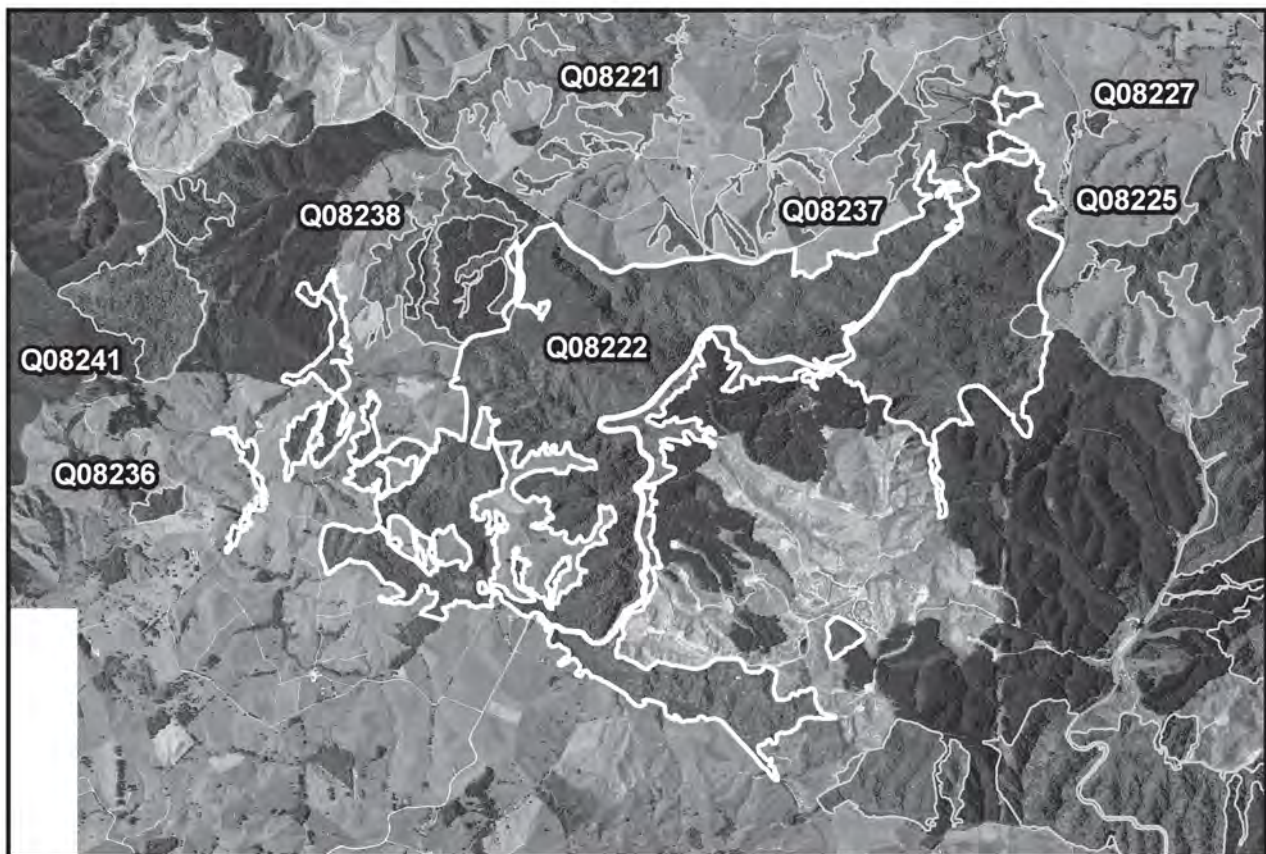
This site is representative for three ecological units: (a) mamaku forest on moderate hillslope, which covered the majority of the site, (c) totara–kahikatea forest on moderate hillslope, and (g) ti kouka–putaputaweta–manuka shrubland in gully, which has not been recorded elsewhere in Waipu ED. Most of the remnants are grazed and there are localised infestations of gorse on the edges. The remnants provide riparian protection to the upper reaches of streams in the Ahuroa River catchment.

WAIPU GORGE FOREST REMNANTS

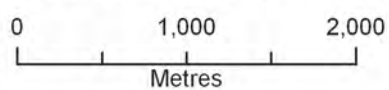
Survey no.	Q08/222
Survey date	12 November 2006
Grid reference	Q08 361708 (15 remnants)
Area	543.7 ha (539.1 ha forest, 4.5 ha shrubland, 0.1 ha wetland)
Altitude	40–280 m asl

Ecological units

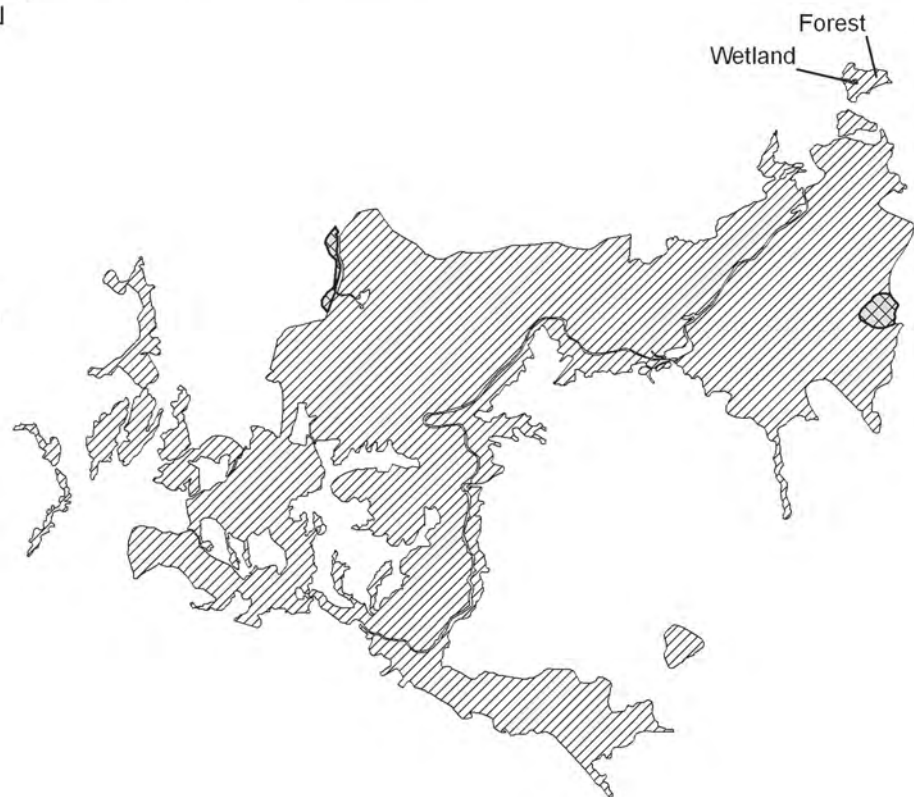
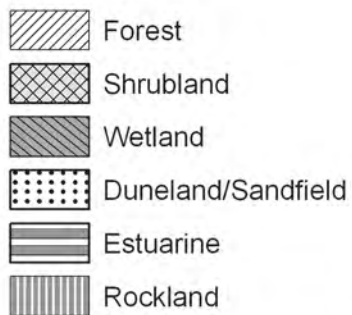
- (a) Kanuka–mamaku forest on moderate hillslope (25%)
- (b) Taraire forest on moderate hillslope and in gully (25%)
- (c) Mamaku–mapou forest on moderate hillslope and in gully (10%)
- (d) Kanuka–rimu forest on ridge (10%)
- (e) Totara forest on moderate hillslope (8%)
- (f) Kauri–tanekaha forest on moderate hillslope (5%)



Q08/222 Waipu Gorge Forest Remnants



Habitat Type



- (g) Mahoe-mamaku forest in gully (5%)
- (h) Kanuka-tanekaha forest on gentle hillslope (5%)
- (i) Kanuka-tanekaha-rewarewa forest on moderate hillslope (2%)
- (j) Kauri forest on gentle hillslope (2%)
- (k) Manuka shrubland on ridge (2%)
- (l) Nikau forest on alluvium (<1%)
- (m) *Carex lessoniana*-kahikatea sedgeland on alluvium (<1%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane) and Miocene sandstone and mudstone (Waitemata Group), with Holocene alluvium on the valley floor in the lower part of Waipu Gorge.

Vegetation

This site comprises forest and shrubland remnants in the upper Ahuroa River catchment in the area known as Waipu Gorge. The site contains many vegetation types, according to topography, aspect and disturbance history. The remnants are connected by radiata pine forest to the Brynderwyn Hills Forest Complex (Q08/225) to the east.

Most of the vegetation is secondary, with kanuka-rimu forest (d) or manuka shrubland (k) often occurring on ridges or hillslopes, and mamaku-mapou forest (c) in gullies or where the forest adjoins radiata pine forestry. On the south and east facing slopes to the west of Waipu Gorge Road are areas of kanuka-mamaku forest (a), kauri-tanekaha forest (f), and taraire forest (b). Taraire forest (b), with frequent pukatea, rewarewa, tawa and nikau, is also common on the banks of the Ahuroa River; and disturbed areas beside the river and road are often mahoe-mamaku forest (g), with frequent pate and kanuka. Nikau-forest (l), with frequent pigeonwood, pate, ponga, and mahoe, occurs in places on the small alluvial flats that are adjacent to the river. The northern most remnant is mostly kanuka dominated forest, but the flat-bottomed gully floor is *Carex geminata*-kahikatea sedgeland (m). Wheki is frequent, and occasional species include mamaku, pate, ti kouka, kiekie, kanuka, tree fuchsia, tradescantia, and arum lily. The wetland and forest is fenced to exclude stock and has a dense understorey.

Significant flora

Kawaka (Sparse), *Brachyglottis kirkii* var. *angustior* (regionally significant), tree fuchsia (regionally significant), and *Hebe macrocarpa* var. *macrocarpa* (regionally significant) recorded in 1997 (DOC internal files 1997). Northern rata (regionally significant) recorded in 1992 (SSBI Q08/H020), *Doodia mollis* (Sparse) recorded in 1985 (AK 175781), *Halocarpus kirkii* (Sparse) in 2006 (AK 295324), *Loxsonoma cunninghamii* (regionally significant) in 1985 (AK 176354), carmine rata (regionally significant) in 1933 (AK 102216), and *Epacris pauciflora* var. *pauciflora* (regionally significant) in 2006 (AK 295325). *Oxalis magellanica* (regionally significant) was recorded in the current survey (AK 297992).

Fauna

Kukupu (Gradual Decline), morepork, NZ kingfisher, grey warbler, North Island fantail, silvereye, tui, Hochstetter's frog (Sparse), banded kokopu (regionally significant), *Peripatus* sp. (Range Restricted), giraffe weevil, giant cave weta, tree weta, green chafer beetle, carabid beetles, spiders (*Aranea* sp. and *Cambridgea* sp.),

common bully and koura were recorded in 1992 (SSBI Q08/H020). Additionally, Australasian harrier was recorded in 1997 (DOC internal files 1997). *Schizoglossa worthyae* (Serious Decline) and *Punctidae* sp. 164 (Range Restricted) recorded by Brook (2002), and *Amborhytida dunni* (Gradual Decline) has also been recorded (Fred Brook pers. comm. 2007). Auckland green gecko (Gradual Decline) recently seen by road workers while clearing vegetation (DOC internal files 1997). Surveys for Hochstetter's frog in 1992 and 1993 found frogs at 13 sites in Waipu Gorge (up to 7 frogs at each site) (DOC 2007).

Banded kokopu (regionally significant), koura, and unidentified eel and bully species were recorded in an eastern tributary of Ahuroa River in 1992 and 1993 (NIWA 2007).

Significance

The site is representative for nine ecological units: (a) kanuka-mamaku forest on moderate hillslope, (c) mamaku-mapou forest on moderate hillslope and in gully, (d) kanuka-rimu forest on ridge, (f) kauri-tanekaha forest on moderate hillslope, (g) mahoe-mamaku forest in gully (h) kanuka-tanekaha forest on gentle hillslope, (i) kanuka-tanekaha-rewarewa forest on moderate hillslope, (l) nikau forest on alluvium, and (m) *Carex lessoniana*-kahikatea sedgeland on alluvium. Natural freshwater wetlands which were present in the ED have been drained or modified, and now only approximately 45 ha of natural or semi-natural wetland remains. The remnants have a diverse, healthy canopy, and the remnants appear to only be grazed where the edges adjoin pasture. The site provides catchment protection for the upper reaches of the Ahuroa River, and links many smaller natural area remnants around its periphery. Waipu Gorge is habitat for seven threatened fauna species (kukupa, Hochstetter's frog, *Peripatus* sp., *Schizoglossa worthyae*, *Punctidae* sp. 164, *Amborhytida dunni*, Auckland green gecko), one regionally significant fauna species (banded kokopu), three threatened plant species (kawaka, *Doodia mollis*, *Halocarpus kirkii*), and eight regionally significant plant species (*Brachyglottis kirkii* var. *angustior*, tree fuchsia, *Hebe macrocarpa* var. *macrocarpa*, northern rata, *Loxsoma cunninghamii*, carmine rata, *Oxalis magellanica*, and *Epacris pauciflora* var. *pauciflora*). Approximately 45% of the site is formally protected: 145.2 ha is in the Waipu Gorge Conservation Area (DOC-administered), 85.7 ha is in the Waipu Gorge Scenic Reserve (DOC-administered), 12.8 ha is in Queen Elizabeth II Open Space Covenants, 1.2 ha is within Marginal Strips (DOC-administered), and 0.02 ha is within a local purpose reserve (WDC-administered).

GLENMOHR ROAD WETLAND

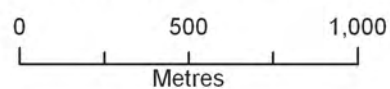
Survey no.	Q08/223
Survey date	15 November 2006
Grid reference	Q08 411731 (6 remnants)
Area	9.3 ha (5.0 ha forest, 4.4 ha wetland)
Altitude	20-100 m asl

Ecological units

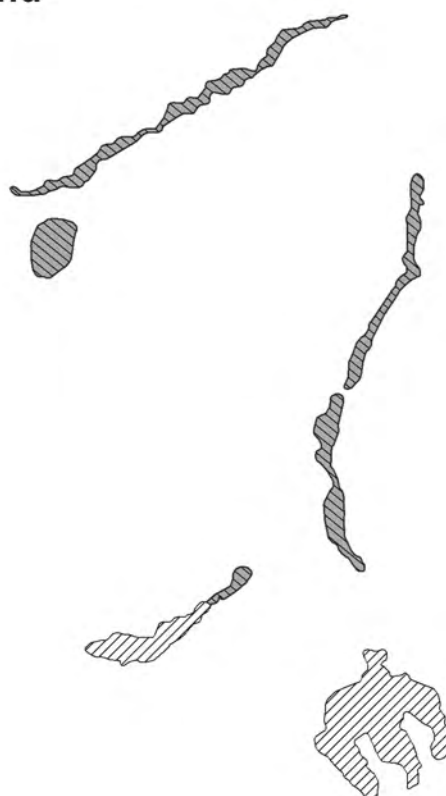
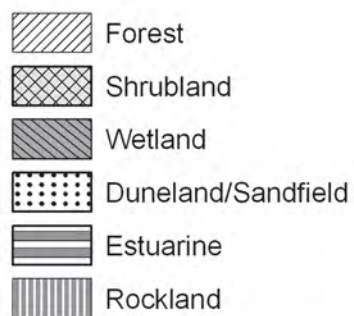
- (a) Raupo reedland in gully (68%)
- (b) Kanuka forest in gully head (20%)
- (c) Kanuka-totara treeland in gully head (7%)
- (d) Open water (constructed pond) (5%)



Q08/223 Glenmohr Road Wetland



Habitat Type



Landform/geology

Valley floor on Holocene alluvium, with Miocene sandstone and mudstone (Waitemata Group) in the headwater gully.

Vegetation

This site comprises a narrow, northeast-draining wetland gully system to the north of Glenmohr Road, which is surrounded by grazed pasture, and radiata pine and eucalyptus plantations (which appear to provide some shelter). The principal vegetation type within the gully is raupo reedland (a), which occurs scattered along the waterway, interspersed with stretches of Yorkshire fog grassland (which are generally excluded from the site). The total length of the gullies in the site is approximately 2 km, making this one of the largest raupo reedlands in the Ecological District. There is a small constructed pond (d) at the head of the westernmost gully. At the head of another gully there is a tiny area of kanuka-totara treeland (c) with frequent kahikatea and occasional karaka, mahoe, ti kouka, mamaku, ponga, tanekaha, and nikau. Finally, in the southernmost gully head there is a small, fenced stand of kanuka forest (b) with frequent rimu, tanekaha and kahikatea, and occasional rewarewa.

Fauna

Pukeko.

Significance

This site contains the third largest area of natural freshwater wetland remaining in Waipu ED, although it is recognised that some damming of the waterway has occurred. Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. It has the best representative and largest area of (a) raupo reedland in gully in the ED.

AHUROA ROAD FOREST REMNANTS

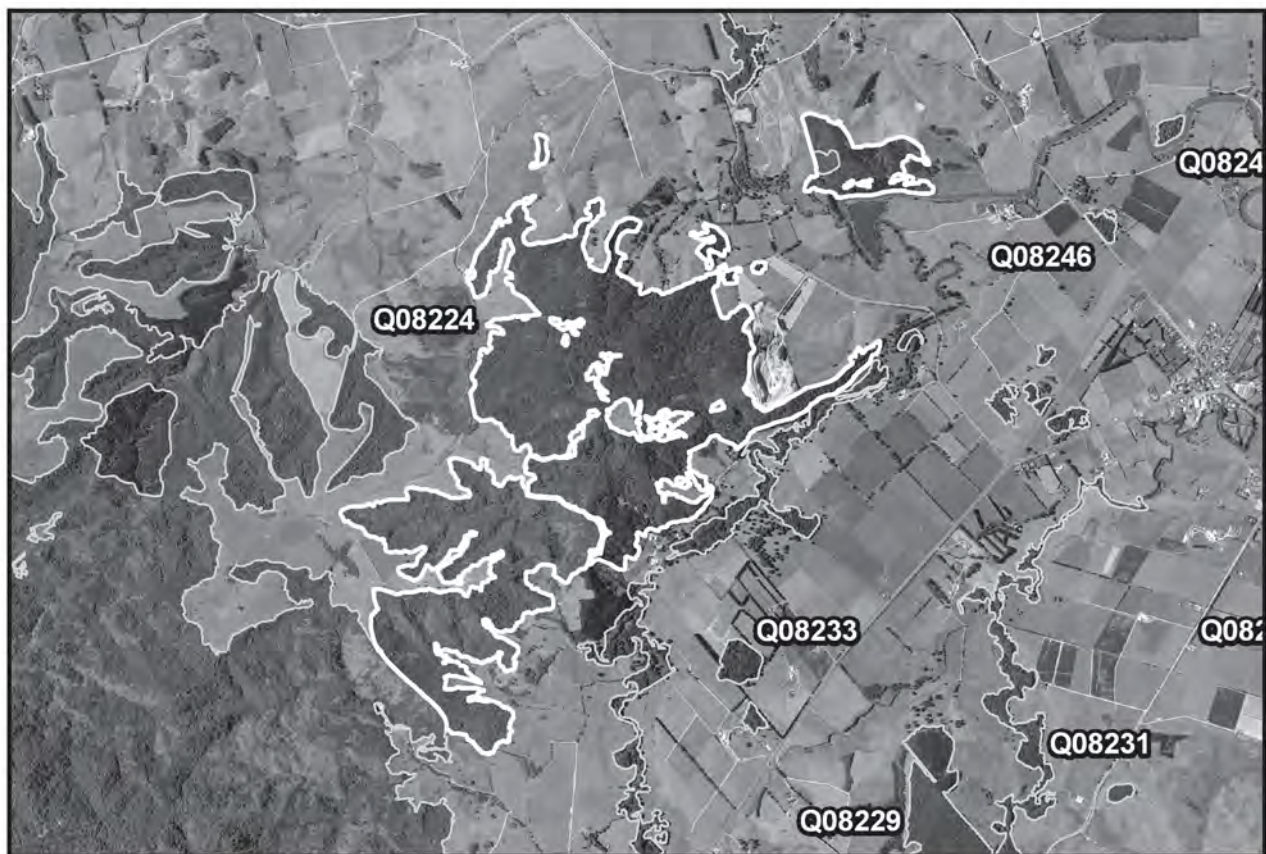
Survey no.	Q08/224
Survey date	15 November 2006
Grid reference	Q08 376786 (8 remnants)
Area	198.9 ha (197.3 ha forest, 1.6 ha shrubland)
Altitude	18-160 m asl

Ecological units

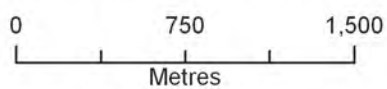
- (a) Kanuka forest on gentle to moderate hillslope (80%)
- (b) Kanuka-tanekaha forest on gentle to moderate hillslope (10%)
- (c) Tanekaha forest on ridge (5%)
- (d) Taraire forest on steep hillslope (2%)
- (e) Kahikatea forest on alluvium (<1%)
- (f) Manuka-kanuka shrubland in gully (2%)
- (g) Kohekohe forest in gully head (<1%)

Landform/geology

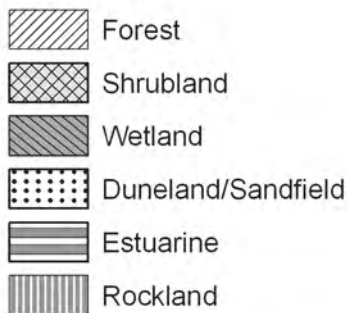
Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane) and Miocene sandstone and mudstone (Waitemata Group); with a small area of Late Pleistocene (last interglacial) alluvial and/or estuarine deposits in the vicinity of Q08/384794.



Q08/224 Ahuroa Road Forest Remnants



Habitat Type



Vegetation

This site comprises eight forest remnants. The large, western remnant is on gentle to moderate hillslopes to the north of Ahuroa Road and forms an eastern extension of

the much larger Mareretu Forest (Q08/220). The small, eastern remnant is on a moderate hillslope beside the Ahuroa River. All of the remnants are mostly secondary, with small areas of mature broadleaf forest in the gullies. The remnants have an established understorey where stock are excluded, such as on roadsides, and a depleted understorey where stock regularly graze.

The eastern remnant is either kanuka forest (a) with frequent tanekaha, or kanuka-tanekaha forest (b). Totara is frequent in both of these forest types, along with occasional rewarewa, kauri, kahikatea, rimu, puriri, karaka, towai, tarata, pate, mamaku, and ponga. On some of the steeper ridges of the largest remnant are areas of tanekaha forest (c), with frequent kanuka and occasional rewarewa and kauri. Adjacent to Ahuroa Road on a south-facing steep hillslope, is a patch of mature taraire forest (d) with frequent kohekohe and ponga, and occasional puriri, rewarewa, kanuka, totara, and karaka. The taraire are up to c. 1 m diameter and nikau and ponga are common in the subcanopy. In one of the gully heads on the southern side is a tiny remnant of mature kohekohe forest (g) with frequent taraire and occasional tawa and pate. This area is heavily grazed and has no understorey. On the forest edge below the kohekohe forest there is a small area of pasture reverting to kanuka forest and a group of manatu trees growing beside a seepage.

The northern and eastern edges of the western remnant, visible from Millbrook Road and Walters Road, are mostly grazed kanuka forest, with a small area of manuka-kanuka shrubland (f) near Walters Road with frequent pampas and gorse, and occasional radiata pine. A small patch of secondary kahikatea forest (e) near the Millbrook Road quarry is fenced to exclude stock.

The smaller eastern remnant is grazed kanuka forest except for a small area of manuka-kanuka shrubland on its western edge.

Significant flora

Manatu (regionally significant) is present.

Fauna

Shining cuckoo, NZ kingfisher, grey warbler, tui, and North Island fantail recorded in this survey.

Significance

The remnants are almost entirely secondary, and except for steeper, more remote areas or adjacent to Ahuroa Road are grazed with a sparse understorey. Localised infestations of pampas, gorse, and radiata pine occur on the edges of the remnants. The larger western remnant is contiguous with the extensive Mareretu Forest (Q08/220) and provides riparian protection for a small tributary of the Ahuroa River. The site is habitat for one regionally significant plant species (manatu).

BRYNDERWYN HILLS FOREST COMPLEX

On the Brynderwyn Hills there is a complex mosaic of indigenous forest and radiata pine plantations spread over approximately 8,300 ha, of which approximately 5,600 ha is in Waipu ED and 2,700 ha is in Rodney ED (around Cattlemount and out to Pukeareinga). The Waipu ED portion comprises 3,278.1 ha of indigenous forest and shrubland, linked by approximately 2,300 ha radiata pine plantations and pasture. The indigenous vegetation in Waipu ED is described here. Currently plantation forest plays an important role in this area by providing connectivity between indigenous forest remnants.

The indigenous vegetation was divided into ten sub-sites (labelled A to J from west to east) for field survey, and a separate description of ecological units and representativeness is provided for each of these. Significant flora and fauna is discussed for the whole complex (page 167), followed by an assessment of the overall significance (page 169).

BRYNDERWYN HILLS FOREST COMPLEX – PART A

Survey no.	Q08/225a
Survey date	16 November 2006
Grid reference	Q08 393684 (7 remnants)
Area	236.0 ha (229.6 ha forest, 6.2 ha shrubland, 0.2 ha wetland)
Altitude	100–320 m asl

*Ecological units**

- (a) Taraire–tawa forest on steep hillslope
- (b) Taraire–tawa–rewarewa–mamaku[†] forest on steep hillslope
- (c) Taraire–kanuka[‡] forest on steep hillslope
- (d) Tanekaha–rewarewa–kanuka forest on steep hillslope
- (e) Mapou–ponga–mamaku forest on steep hillslope
- (f) Mapou–mamaku forest on steep hillslope
- (g) Rimu–rewarewa–tanekaha forest on ridge
- (h) Tanekaha–kanuka forest on ridge
- (i) Kahikatea forest on ridge
- (j) Kanuka forest on steep hillslope and ridge
- (k) Mamaku forest on steep hillslope
- (l) Taraire forest on alluvium
- (m) Kahikatea forest on alluvium
- (n) Mamaku–kanuka–gorse shrubland on steep hillslope
- (o) Pate–mamaku shrubland on steep hillslope and in gully head

* Percentage cover for each type could not be determined because of the steepness of the terrain and the size of the site.

[†] These species individually comprise less than 20% of the canopy each, however they are most frequently occurring species in this diverse forest type.

[‡] Taraire and kanuka individually comprise less than 20% of the canopy each, however they are most frequently occurring species in this diverse forest type.

(p) Kanuka–manuka shrubland on steep hillslope and ridge

(q) Open water (constructed pond)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane), with an area of Holocene alluvium at the base of a fault scarp at Q08/375683.

Vegetation

Part A comprises several remnants of mostly mature secondary indigenous forest on the steep southern side of the Brynderwyn Hills, and within the Piroa Stream catchment. The Piroa Stream follows the southern boundary of the site. State Highway 1 (SH1) winds up through the middle of the largest forest remnant. Adjacent land uses/land covers include a large stone quarrying operation, extensive radiata pine plantations, pastoral farming and valleys with indigenous forest.

This site is characterised by a high diversity of forest types and high plant species richness. Overall, taraire is the most common tree species in mature forest on hillslopes, although it is never solely dominant, and associated species change subtly depending on topographic position and factors such as disturbance and local seed dispersal. Tanekaha and rimu tend to be more frequent associates on upper slopes, while kohekohe and nikau are frequent on lower slopes. Most of the eastern part of the site was not visible and is therefore not described here. The following detailed ecological units were recorded:

(a) Taraire–tawa forest includes common to frequent taraire and tawa in various proportions with frequent rimu, nikau, and rewarewa, and occasional tanekaha, miro, kahikatea, mamaku, kanuka, puka, kahakaha, kohekohe, five-finger, totara, puriri, and hinau. Rimu and miro are often emergent trees.

(b) Taraire–tawa–rewarewa–mamaku forest includes occasional nikau, kauri, lancewood, miro, and kahikatea.

(c) Taraire–kanuka forest was recorded on a steep, disturbed, colluvial hillslope above the Piroa Stream. It has many occasional associates including rimu, rewarewa, five-finger, kohekohe, putaputaweta, akepiro, houhere, lancewood, heketara, mapou, kohuhu, totara, and radiata pine.

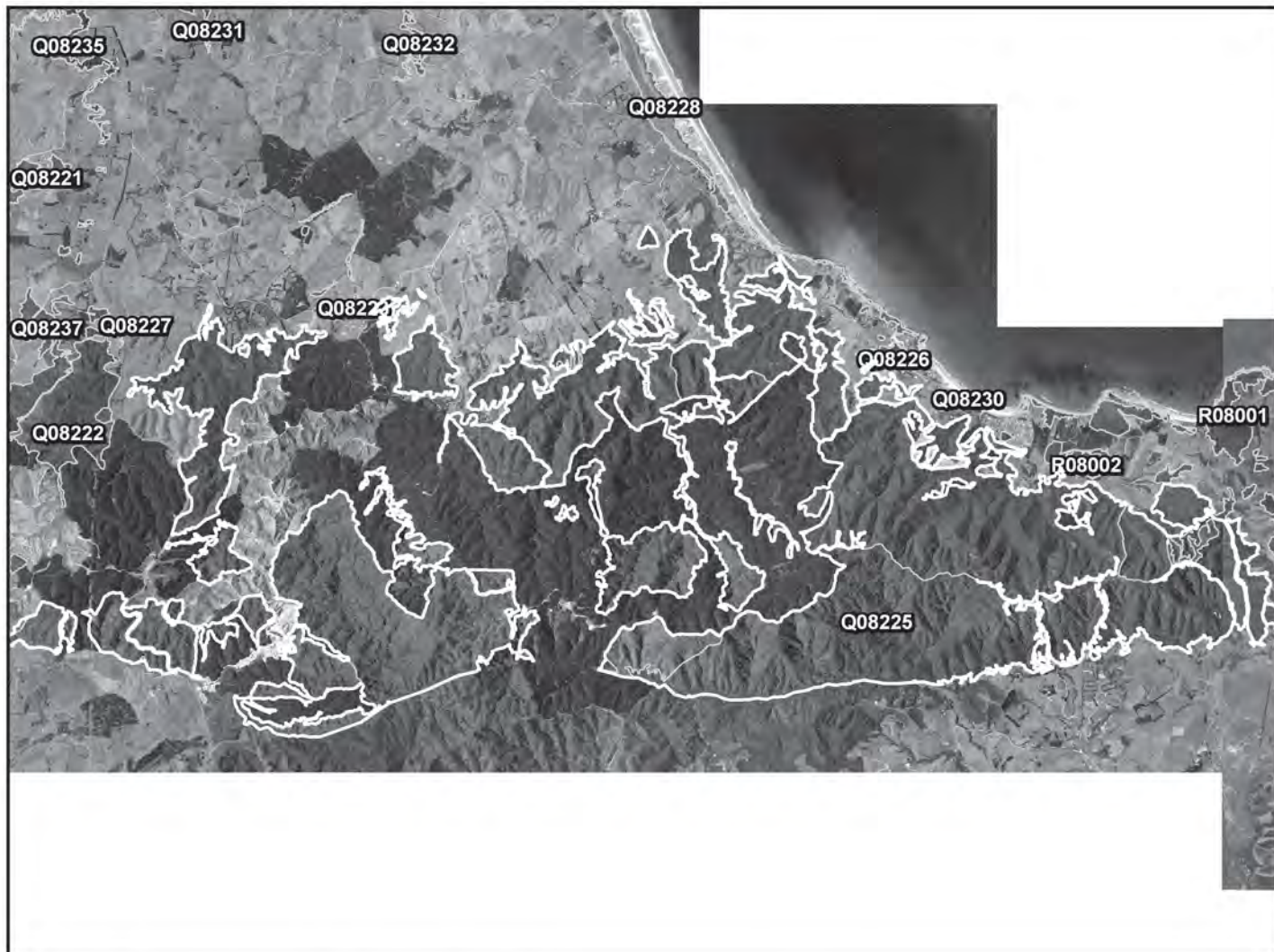
(d) Tanekaha–rewarewa–kanuka forest occurs on steep hillslopes above SH1, where it is associated with frequent kohuhu and mapou, and occasional ti kouka, lancewood, five-finger, manuka, akepiro, kauri, and pohutukawa (this single tree may have been planted as it was immediately adjacent to the highway, and was not seen elsewhere at this site).

(e) Mapou–ponga–mamaku forest occupies a similar position to (d) above, and has very similar associated species, along with kahikatea, kauri, and rimu. Young northern rata can be observed regenerating on the ground within this forest type.

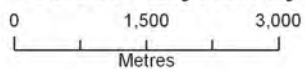
(f) Mapou–mamaku forest occurs on very steep hillslopes near the open pit. This type includes frequent rewarewa, mahoe, and kohuhu, and occasional pigeonwood, ti kouka, pate, rimu, *Metrosideros fulgens*, and large-leaved mahoe.

(g) Rimu–rewarewa–tanekaha forest occurs on some ridges, with frequent lancewood, and occasional ti kouka and mapou.

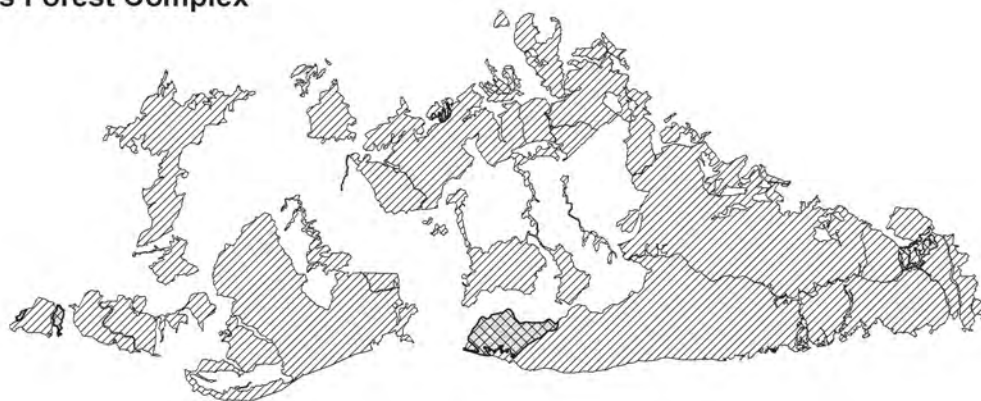
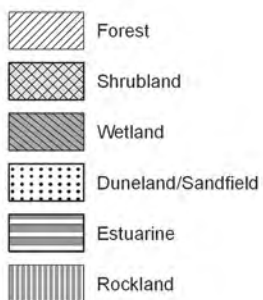
(h) Tanekaha–kanuka forest is a younger forest type that is present on ridges within the westernmost remnant. It also contains frequent rewarewa and totara, and occasional miro and mamaku.



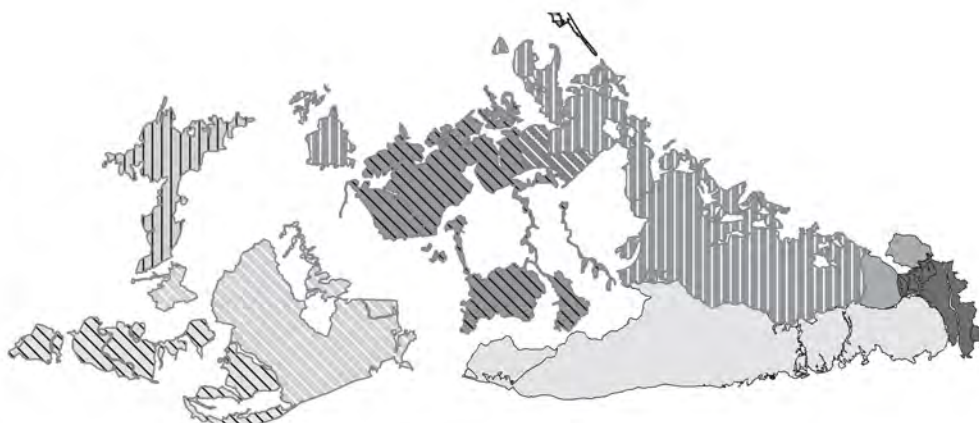
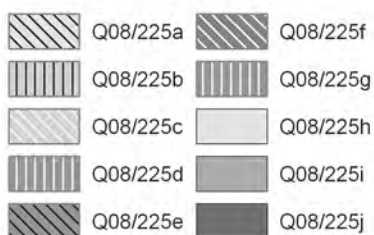
Q08/225 Brynderwyn Hills Forest Complex



Habitat Type



Brynderwyn Hills Forest Complex Components



- (i) Kahikatea forest occurs on a ridge in the westernmost remnant. Its most frequent associates are rimu and mamaku, and it also has occasional miro, ti kouka and taraire.
- (j) Kanuka forest is present on some disturbed slopes and ridges, mainly in the west of the site. Tanekaha is a frequent associate.
- (k) Mamaku forest occurs in small patches on recently disturbed hillslopes. Frequent hangehange and mahoe, and occasional karamu, kahikatea, tanekaha, mapou, and ti kouka are present.
- (l) On the Piroa Stream alluvial terrace there is a small stand of taraire trees, some of which have very large diameter trunks, with occasional rewarewa, totara, and large-leaved mahoe. The subcanopy has scattered nikau and mapou, and tradescantia dominates the ground cover.
- (m) A small stand of kahikatea forest, with frequent supplejack, tanekaha, totara, and rewarewa, also occurs on the alluvium of the Piroa Stream.
- (n) Mamaku-kanuka-gorse shrubland, with frequent mahoe, occurs at the extreme western end of the site.
- (o) Pate-mamaku shrubland with frequent mahoe and occasional ti kouka, manuka, kanuka, and lancewood, is present in steep, wet gully heads at the disturbed western end of the site.
- (p) Kanuka-manuka shrubland with occasional totara, pate, and mamaku, is contiguous with the previous shrubland type, but on drier terrain.
- (q) There is a small constructed pond on the southern side of the State Highway which may provide quite good habitat for water birds. It is currently used by the owners for duck shooting (Lisa Forester, NRC, pers. comm.).

Representative ecological units

Nine units are considered representative: (a), (b), (c), (d), (e), (f), (g), (l), and (o).

BRYNDERWYN HILLS FOREST COMPLEX – PART B

Survey no.	Q08/225b
Survey date	15 November 2006
Grid reference	Q08 395715 (3 remnants)
Area	189.1 ha
Altitude	40–260 m asl

Ecological units

- (a) Kanuka forest on moderate to steep hillslope and ridge (50%)
- (b) Unknown forest type on steep hillslope and in gully (20%)
- (c) Kauri forest on ridge (7%)
- (d) Kauri-tanekaha-rimu-kanuka forest on steep hillslope (5%)
- (e) Totara forest on moderate hillslope (5%)
- (f) Taraire-nikau forest in gully (5%)
- (g) Rimu forest on ridge (3%)
- (h) Tanekaha forest on ridge (3%)
- (i) Taraire-totara-rimu* forest in gully head (2%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane), with Holocene valley floor alluvium present in the eastern headwater of Waihoihoi River.

Vegetation

Part B is located in the steeply sloping upper to mid-headwaters of the Waihoihoi River, on the northern side of the Brynderwyn Hills, east of State Highway 1 and south of Glenmohr Road. It is a relatively compact forest remnant, surrounded by pasture and radiata pine plantations, and is part of the larger Brynderwyn Hills indigenous forest mosaic. Some indigenous forest on the eastern boundary of the site was clear-felled around 1977 to make way for the plantations (SSBI Q08/H021). Due to the steepness of the valley and lack of access, not all forest types could be seen from vantage points. Some of the forest types and percentage cover were estimated from aerial photography flown in January 2004.

The principal vegetation type on ridges and hillslopes is young kanuka forest (a), which has frequent mamaku and occasional tanekaha and totara. Within the matrix of kanuka forest there are localised stands of regenerating podocarps and kauri. For example, near Glenmohr Road, at the lower end of the remnant, there is a striking sequence from totara forest (e) on the edge, through rimu forest (g) on the hillslope to kauri forest (c) on the ridge. Some of the finest stands of young kauri in the Brynderwyn Hills can be found on ridges within this site. Pure tanekaha forest (h) and kauri-tanekaha-rimu-kanuka forest (d) are variations of this pattern.

In the depths of the upper Waihoihoi River valley only two forest types were observed: taraire-nikau forest (f) with frequent rewarewa and occasional pukatea and mamaku, and a particularly diverse forest type comprising frequent taraire, totara, and rimu (i), none of which exceeded 20% canopy cover, mixed with smaller amounts of nikau, ponga, mamaku, kohekohe, lancewood, kahikatea, ti kouka, kohuhu, mapou, and mahoe. Another possibly similar broadleaf forest type (b), probably dominated by taraire, is present in the upper valley, however this was not visible.

Representative ecological units

Five ecological units are considered representative: (c), (d), (f), (g) and (i).

BRYNDERWYN HILLS FOREST COMPLEX – PART C

Survey no.	Q08/225c
Survey date	17 November 2006
Grid reference	Q08 416690 (4 remnants)
Area	481.9 ha
Altitude	90–340 m asl

Ecological units[†]

- (a) Tawa-taraire forest on steep hillslope
- (b) Tawa-nikau forest on steep hillslope
- (c) Taraire forest on steep hillslope

* Taraire, totara, and rimu individually comprise less than 20% canopy cover, however they are the most frequent species in this diverse forest type.

† Percentage cover for each type could not be determined because of the steepness of the terrain and the size of the site.

- (d) Rewarewa-mamaku-tarata forest on ridge
- (e) Totara-mamaku-puriri forest on steep hillslope
- (f) Rimu-totara-kanuka forest on steep hillslope
- (g) Totara forest on steep hillslope
- (h) Totara-kauri-kanuka forest on ridge
- (i) Kanuka forest on ridge
- (j) Nikau-mamaku forest in gully head
- (k) Mamaku-pate shrubland in gully head
- (l) Miro-tawa-rewarewa forest on steep hillslope
- (m) Kohekohe forest in gully
- (n) Kauri-rimu forest on ridge
- (o) Kohuhu forest on hillslope

Landform/geology

Steep, dissected hill country underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

Part C comprises relatively old indigenous forest in the Waihoihoi Stream catchment of the Brynderwyn Hills, which flows into the Waihoihoi River on the northern side. The site is contiguous with similar indigenous forest in the Waionehu and Piroa Stream catchments, but is also bordered by an open-cast stone quarry in the southwest and radiata pine plantations at various stages of harvest. The terrain is deeply dissected and difficult to access, therefore only parts of the site were visible, some of which were viewed from a considerable distance. As a result, all the diversity in the forest composition many not have been recorded, particularly for the deepest parts of the gullies. The forest types described below are some of the most diverse that were observed in Waipu ED. This is probably due to their relative maturity, which is at least 100 hundred years older than the typical kanuka-dominant forest types in much of the lower Brynderwyn Hills. Occasional very old, mature kahikatea are present in gully heads. Some old northern rata are present also, but dead limbs and some lack of foliage indicate possum browse is taking a toll. A distinctive feature of the site is the high occurrence of large tarata.

The main forest type on steep hillslopes appears to be tawa-taraire forest (a) with frequent hinau, rewarewa, and nikau, and occasional tarata, karaka, puka, pigeonwood, supplejack, rimu, *Metrosideros perforata*, and *M. fulgens*. Another common forest type is taraire forest (c) which has frequent tawa, puriri, and rewarewa, and occasional kohekohe, mamaku, puka, and kanuka. On steep hillslopes there are also the following types: tawa-nikau forest (b) with frequent totara and mamaku, and occasional miro, tarata, kohekohe, rewarewa, pigeonwood and rimu; totara-mamaku-puriri forest (e) with frequent nikau and occasional rimu and tarata; rimu-totara-kanuka forest (f) with frequent rewarewa and occasional kauri and lancewood; and totara forest (g) with frequent tarata, rewarewa, tawa, and occasional kanuka, kauri, tanekaha and mamaku.

Ridges within this site support very diverse communities. For example, a type was recorded in which no species exceeds 20% of the canopy cover, but in which rewarewa, mamaku, and tarata were the most frequent species (d). At this location large akepiro and kanuka are also frequent, with occasional mahoe, lancewood, tanekaha, rimu, kauri, mapou, and ti kouka. Also recorded on a nearby ridge was

totara-kauri-kanuka forest (h) with occasional miro, kahikatea, and rewarewa. On disturbed edges (often next to pine plantations) there are small examples of young kanuka forest on ridges (i).

Nikau-mamaku forest (j) with occasional pukatea, and mamaku-pate shrubland (k) with frequent tarata, mahoe, and akepiro were recorded in some of the steep gully heads near the quarry.

In addition to the types described above, the following forest types within the extreme eastern part of the catchment are described in a 1997 DOC internal report (SSBI Q08/H021):

(l) Miro-tawa-rewarewa forest occurs at the top of the headwaters, with frequent rimu and mamaku, and occasional taraire, northern rata, kawaka, hinau, puka, and nikau. (m) Kohekohe forest is common in side gullies, associated with frequent karaka and nikau, with occasional pigeonwood.

(n) Semi-mature or ricker kauri-rimu forest was recorded on ridges.

(o) Young, secondary kohuhu forest with frequent wheki and occasional ti kouka, mamaku, manuka, mingimingi, mahoe, hangehange, and heketara.

Representative ecological units

Nine ecological units are considered representative: (a), (b), (d), (f), (j), (k), (l), (m), and (o).

BRYNDERWYN HILLS FOREST COMPLEX – PART D

Survey no.	Q08/225d
Survey date	15 November 2006
Grid reference	Q08 421721 (6 remnants)
Area	56.5 ha
Altitude	40–160 m asl

Ecological units

- (a) Kanuka forest on moderate to steep hillslope (60%)
- (b) Kauri forest on ridge (15%)
- (c) Kauri-rimu forest on ridge (10%)
- (d) Kanuka-rimu-tanekaha forest on moderate hillslope (8%)
- (e) Taraire-puriri forest in gully (5%)
- (f) Kahikatea-puriri forest in gully (2%)

Landform/geology

The main remnant comprises hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane); the northern outlying sites are underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

Part D, also known as 'Matheson's Forest', is situated around one of the headwater tributaries of the Waionehu Stream, on the northern side of the Brynderwyn Hills, between Massey Road and Glenmohr Road. It is surrounded by pasture and radiata pine plantations, and lies just to the northwest of Part E (Q08/225e).

This site includes one main forest remnant and several smaller ones along the same tributary. Secondary kanuka forest (a) with occasional tanekaha and rimu is the main

forest type throughout. Nestled within the kanuka forest (especially on ridges) are patches of young kauri forest (b), kauri-rimu forest (c) and kanuka-rimu-tanekaha forest (d). Around waterways, the forest is dominated by taraire, with puriri common (e), and frequent rewarewa, kanuka, and totara, and occasional matai. In one of the smaller remnants, a gully forest type with common kahikatea and puriri (f) was recorded.

BRYNDERWYN HILLS FOREST COMPLEX – PART E

Survey no.	Q08/225e
Survey date	15 November 2006
Grid reference	Q08 444709 (12 remnants)
Area	481.3 ha (478.7 ha forest, 2.6 ha shrubland)
Altitude	40–339 m asl

*Ecological units**

- (a) Kanuka forest on moderate to steep hillslope and ridge
- (b) Kanuka-mamaku forest on steep hillslope and ridge
- (c) Kanuka-mamaku-puriri forest in gully head
- (d) Kanuka-totara forest on moderate hillslope
- (e) Kauri forest on steep hillslope and ridge
- (f) Tanekaha-rewarewa forest on steep hillslope
- (g) Puriri-nikau forest in gully
- (h) Mamaku-ponga shrubland in gully head

Landform/geology

Steep, dissected hill country predominantly underlain by Mesozoic greywacke (Waipapa Terrane), with Miocene sandstone and mudstone (Waitemata Group) present in the vicinity of Q07 450727.

Vegetation

This site encompasses indigenous forest and shrubland within the upper Waionehu Stream catchment, on the northern side of the Brynderwyn Hills. The lower, northern end of the site between Cullen and Massey Roads has been reduced in size through roading, and pastoral and residential development. The upper, southern end of the site is surrounded by radiata pine plantations, and extends almost to the crest of the hills. Many narrow stream corridors between pine plantations are included. None of the uppermost areas could be seen during the present survey, however some information exists from surveys carried out in 1992 (SSBI Q08/H021) and in 2002 (Wildland Consultants 2004b), and general vegetation patterns could be described using aerial photography flown in January 2004.

Kanuka forest (a) appears to be the main forest type, especially in the lower remnants. This varies from very young kanuka forest (bordering on shrubland) with occasional mahoe and manuka in the canopy (including a densely regenerating understorey of ponga, mamaku, mapou, hangahanga, tarata, pigeonwood, and *Metrosideros perforata*) to slightly older kanuka forest with occasional mamaku,

* Percentage cover for each type could not be determined because of the steepness of the terrain and the size of the site.

totara, rewarewa, kauri, rimu, and tanekaha in the canopy. On the sides of steep road cuttings through kanuka forest there is *Hebe macrocarpa* var. *macrocarpa*, akepiro, kiokio, large-leaved mahoe, mingimingi, ti ngahere, heketara, *Gaultheria antipoda*, *Dracophyllum latifolium*, and tawheowheo. Other species previously recorded as associates of kanuka forest in this area include pate, *Rubus cissoides*, lancewood, karamu, wheki, ti kouka, mingimingi, makamaka, *Gabnia* sp., rangiora, *Blechnum discolor*, and koromiko (Wildland Consultants 2004b, 'Massey Road 1' – WP432). Variations of this type include kanuka–mamaku forest (b) on steep, eroding hillslopes, kanuka–mamaku–puriri forest (c) in the heads of gullies, and kanuka–totara forest (d) on moderate hillslopes. Stands of young kauri (e) occur locally on ridges and steep hillslopes. Small areas of young mamaku–ponga shrubland (h) with occasional mahoe, tanekaha, kanuka, and totara are present in gully heads.

One example of more mature podocarp–broadleaf secondary forest is visible from Massey Road. The upper hillslope and ridge supports tanekaha–rewarewa forest (f) with frequent nikau, kahikatea, totara, kanuka, ponga, and mamaku, and occasional tawa, ti kouka, kohekohe, rimu and kauri. The gully below has puriri–nikau forest (g) with frequent rewarewa, and occasional kiekie, supplejack, lancewood and tanekaha. It is obvious that species diversity is high within older secondary forest on steep, dissected terrain. It appears that forest remnants on the upper slopes are similar in age and structure to these two types described.

Representative ecological units

Three ecological units are considered representative: (f), (g) and (h).

BRYNDERWYN HILLS FOREST COMPLEX – PART F

Survey no.	Q08/225f
Survey date	14 November 2006
Grid reference	Q08 458718 (2 remnants)
Area	55.3 ha
Altitude	60–180 m asl

Ecological units

- (a) Unknown indigenous forest types on steep hillslope and in gully (45%)
- (b) Kanuka forest on moderate to steep hillslope and ridge (25%)
- (c) Rimu–kanuka forest on ridge (10%)
- (d) Rewarewa–tanekaha forest on steep hillslope (10%)
- (e) Nikau–rewarewa forest on steep hillslope and in gully (10%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

Part F comprises two gullies covered in secondary indigenous forest at the end of Cullen Road on the northern side of the Brynderwyn Hills. The western gully is in the headwaters of the Waionehu Stream, and the eastern gully drains out to Waipu Cove. These gullies have slightly older secondary indigenous forest than the surrounding areas, i.e. >100 years old, vs. approximately 50 years old for adjoining parts of the same site (Q08/225g and Q08/225e).

Around 45% of this part was not entirely visible during the survey; therefore some of the forest types present could not be described. However it is clear that the site supports very diverse secondary podocarp-broadleaf forest, as well as younger kanuka forest (b), which is typical of ridges in the lower Brynderwyn Hills. Three distinctive forest types recorded in the present survey were:

(c) Forest with abundant rimu, common kanuka, frequent tanekaha and occasional northern rata, miro, puka, and rewarewa, occurs on one of the central ridges in the western part.

(d) Just below this ridge, on a steep upper hillslope, there is rewarewa-tanekaha forest with frequent puriri, kanuka, mamaku, and mapou, and occasional northern rata, tarata, lancewood, supplejack, puka, totara, towai, kolekohe, and *Metrosideros perforata*.

(e) In the gully below (d) and (c) there is forest with common nikau and rewarewa, frequent puriri, supplejack, and mamaku, and occasional kahikatea, kahakaha, kiekie and ponga.

The western part of this site has previously been described as secondary forest with a mixed canopy of tanekaha, rimu, kahikatea, totara, taraire, tawa, rewarewa, and northern rata, and dense understorey composed of ponga, mamaku, pigeonwood, mahoe, mapou, lancewood, kanuka, manuka, pate, kolekohe, towai, puriri, tutu, tarata, puka, kohuhu, ti kouka, *Rubus cissoides*, *Clematis paniculata*, *Metrosideros fulgens*, *Metrosideros perforata*, hangehange, bracken, gorse, and *Gabnia* sp. (Wildland Consultants 2004b; 'Cullen Road Forest' - WP423).

Representative ecological units

Three ecological units are considered representative: (c), (d), and (e).

BRYNDERWYN HILLS FOREST COMPLEX – PART G

Survey no.	Q08/225g
Survey date	14 November 2006
Grid reference	Q08 482708 (13 remnants)
Area	813.0 ha
Altitude	15–280 m asl

Ecological units

- (a) Kanuka forest on ridge, moderate to steep hillslope and in gully (82%)
- (b) Kanuka-mamaku forest on gentle, moderate and steep hillslope (5%)
- (c) Taraire-puriri forest in gully (3%)
- (d) Totara forest on moderate to steep hillslope (2%)
- (e) Kanuka-rimu-tanekaha forest on ridge (2%)
- (f) Kanuka-rimu forest on ridge (1%)
- (g) Kanuka-kauri forest on ridge (1%)
- (h) Totara-kanuka forest on moderate hillslope (1%)

Landform/geology

Steep, dissected hill country predominantly underlain by Mesozoic greywacke (Waipapa Terrane), with Miocene sandstone and mudstone (Waitemata Group) in the vicinity of Q07 453733.

Vegetation

This site comprises indigenous forest and shrubland remnants in the catchment around Lang's Beach (Q08/230), on the northern side of the Brynderwyn Hills. It includes a series of small, forested northeast-draining streams, and extends out to the steep, rocky coastline north and south of Lang's Beach. In the lower catchment the indigenous vegetation is dissected by residential dwellings and pastoral land, and in the upper catchment areas of indigenous vegetation are interspersed with small radiata pine and eucalyptus plantations, disturbed dirt clearings, new private roads, and new dwellings.

The main vegetation type is kanuka forest (a), which spans the topographic range from gully to hillslope to ridge. This forest is young, even-aged (perhaps 50 years old) and vigorously regenerating. Its associates change depending on the amount of moisture in the soil. Species such as mamaku, puriri, rewarewa, nikau, houhere, putaputaweta, pate, and karaka are present in kanuka forest on gullies, while on hillslopes and ridges kauri, totara, rimu, tanekaha, pohutukawa, miro, mahoe, mamangi, mingimingi, ponga, akepiro, and radiata pine are more likely to be present. Road cuttings provide habitat for light-loving species such as bracken, akepiro, *Clematis paniculata*, *Paesia scaberula*, karamu, shining karamu, and *Coprosma parviflora*. Kanuka-mamaku forest (b) occurs on some steep hillslopes which are prone to slipping and also on more gentle terrain with greater moisture. On ridges there are local patches of kanuka-rimu-tanekaha forest (e), kanuka-rimu forest (f), and kanuka-kauri forest (g), which stand out against the skyline.

Small remnants and disturbed forest edges, especially in the lower catchment, often comprise totara forest (d) associated with frequent puriri and kanuka, and occasional nikau, kahikatea, and taraire. Totara-kanuka forest (h) occupies a similar niche.

Representative ecological units

Two ecological units are considered representative: (a) and (c).

BRYNDERWYN HILLS FOREST COMPLEX – PART H

Survey no.	Q08/225h
Survey date	14 November 2006
Grid reference	Q08 484686 (4 remnants)
Area	796.4 ha (733.5 ha forest, 62.9 ha shrubland)
Altitude	20–380 m asl

Ecological units

- (a) Kanuka forest on moderate to steep hillslope and ridge (35%)
- (b) Taraire-puriri forest on steep hillslope (20%)
- (c) Puriri-taraire-rewarewa-totara-nikau-mamaku forest on steep hillslope (15%)
- (d) Mamaku-mahoe-kanuka-hangehange shrubland on steep hillslope (10%)
- (e) Puriri forest in gully (5%)
- (f) Totara-tanekaha-rewarewa forest on steep hillslope and ridge (3%)
- (g) Mamaku forest in gully (3%)
- (h) Tanekaha-kanuka forest on moderate hillslope (3%)
- (i) Kauri-kanuka forest on ridge (3%)
- (j) Kauri-tanekaha forest on steep hillslope (2%)

(k) Tawa-rewarewa-mamaku-ponga-nikau-kohekohe forest in gully head (1%)

Landform/geology

Steep, dissected hill country underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

Part H comprises a large, diverse tract of secondary indigenous forest and shrubland on the steep, deeply dissected south-facing slopes of the southeastern Brynderwyn Hills. This part of the site is approximately 8 km wide, and extends from the northern side of the Hakaru River catchment (draining into the Kaipara Harbour) in the west, across headwaters of the Tara Creek (draining into the Mangawhai Harbour), to the boundary of the Part J (Q08/225) in the east. The southern boundary is formed by the Waipu ED boundary (except where forest has been cleared further up into the hills). At the crest of the hills this sub-site is contiguous with Part G (Q08/225g).

The pattern of vegetation type, age, and stature varies with levels of recent disturbance and types of land management. Probably the oldest, most diverse and healthiest vegetation exists within the Marunui Queen Elizabeth II Open Space Covenant, a c. 432 ha area of forest (with approximately half in Waipu ED) in which threats to flora and fauna are actively managed (Wildland Consultants 2003). Brynderwyn Hills Scenic Reserve has younger, less diverse forest, and the remaining privately owned areas of indigenous vegetation tend to be more modified, with a mosaic of vegetation ages and condition.

Due to the rapid survey methods used and the large and complex nature of the site, many parts of the site could not be seen. For these areas, vegetation types and percentage cover were estimated using 2004 aerial photographs. The following general patterns occur:

Kanuka-dominant forest (a) is the most common vegetation type. This tends to occur on ridges and steep hillslopes but not in gullies, and probably varies between 30 and 80 years old. Mamaku is a frequent associate, and several future canopy species are starting to emerge through the kanuka, including puriri, rewarewa, totara, kauri, tanekaha, and rimu. The sub-canopy and shrub tiers in such areas are dense with regenerating trees and shrubs, e.g. kanono, *Coprosma rhamnoides*, ti kouka, lancewood, mamangi, mapou, mingimingi, mahoe, kohuhu, harakeke, hangehange, kiokio, ponga, makomako, *Gabnia lacera*, tree fuchsia, large-leaved mahoe, rangiora, and pigeonwood. On some ridges kanuka forest merges into various combinations of kanuka with young kauri, tanekaha and rimu, e.g. tanekaha-kanuka forest (h), kauri-kanuka forest (i), and kauri-tanekaha forest (j).

Next in extent is a species-rich secondary podocarp-broadleaf forest, which has been recorded variously as taraire-puriri forest (b) or puriri-taraire-rewarewa-totara-nikau-mamaku forest (c). Many variations in canopy composition along these lines are possible. For example in the upper Marunui Queen Elizabeth II Open Space Covenant an area of tawa-rewarewa-mamaku-ponga-nikau-kohekohe forest (k) was recorded in the gully head, and directly adjacent on the ridge there was totara-tanekaha-rewarewa forest (f) with mature emergent northern rata. No species in either of these types comprised more than 20% of the canopy cover. Totara includes both *Podocarpus totara* and *P. hallii*. Large northern rata and miro are scattered throughout the Marunui Queen Elizabeth II Open Space Covenant.

On the western end of the site there is a distinct diagonal line of vegetation change between tall forest (on the Marunui block to the east) and mamaku-mahoe-kanuka-hangehange shrubland (d), which is an early stage of regeneration following

clearance of radiata pines. Currently mamaku is the dominant cover (with frequent mahoe and hangehange, and occasional mapou), but kanuka is beginning to break through, along with young rewarewa and kauri. A local landowner commented that this area was previously covered in gorse and pampas.

Lower altitude gullies often have forest with common puriri (c), frequent taraire, kohekohe, karaka, nikau, rewarewa, and mahoe, and occasional totara and puka. Gullies in the upper reaches of the catchment, which may suffer frequent slips, often contain forest with a high proportion of mamaku (g) along with frequent puriri, nikau, mahoe, rewarewa, and kanuka, and occasional kiekie, lancewood, and karaka.

Representative ecological units

Four ecological units are considered representative: (b), (c), (d), and (f).

BRYNDERWYN HILLS FOREST COMPLEX – PART I

Survey no.	Q08/225i
Survey date	14 November 2006
Grid reference	Q08 514699 (2 remnants)
Area	73.5 ha
Altitude	60–220 m asl

Ecological units

(a) Kanuka forest on moderate to steep hillslope and ridge (85%)

(b) Taraire–puriri forest in gully (15%)

Landform/geology

Hillslopes and gullies predominantly underlain by Mesozoic greywacke (Waipapa Terrane), with Miocene sandy mudstone (Waitemata Group) in the northernmost part.

Vegetation

Part I comprises indigenous forest within the Bream Tail Scenic Reserve and small areas of forest immediately outside the reserve boundaries. The reserve is divided into two remnants separated by Cove Road and a narrow strip of private land covered in young kanuka forest, residential areas and pasture. The southern part of the reserve extends up steep, rugged slopes to the crest of the main Brynderwyn Hills and is mainly north-facing, while the northern part is on moderately sloping terrain. Only limited areas of the reserve were visible during this survey because of persistent inclement weather, therefore the vegetation description may overlook some of the diversity in forest types.

Most of this part is covered in young kanuka forest (a) (probably no older than 50 years) with frequent emergent kauri rickers and occasional emergent rimu and tanekaha poles. This is the most widespread community on the Brynderwyn Hills, which usually has frequent mamaku, and a dense, regenerating understorey of species such as mamangi, hangehange, ponga, mapou, mingimingi, putaputaweta, ti kouka, akepiro, houhere, *Coprosma rhamnoides*, *Metrosideros perforata*, bracken, pate and kohuhu. Gullies and gully heads draining northwards from crest of the range support mature taraire–puriri forest (b) with frequent mamaku and ti kouka, and occasional very large puka.

Representative ecological units

Ecological unit (b) is considered representative.

BRYNDERWYN HILLS FOREST COMPLEX – PART J

Survey no.	Q08/225j
Survey date	14 November 2006
Grid reference	Q08 523694 (3 remnants)
Area	95.0 ha (82.9 ha forest, 12.1 ha shrubland)
Altitude	20–200 m asl

Ecological units

(a) Kanuka–tanekaha–kauri forest on steep hillslope and in gully (85%)

(b) Manuka–kanuka shrubland on ridge (15%)

Landform/geology

Steep hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

Part J comprises indigenous forest and shrubland within and adjacent to the Robert Hastie Memorial Scenic Reserve in the south-eastern Brynderwyn Hills. The site is dissected by Cove Road, which is cut into steep banks above a narrow, winding gully, with permanently flowing water that drains towards the south. There is no stock access to the scenic reserve, but forest on more gentle terrain on adjoining private land appears to be grazed.

Most of the area is covered by secondary kanuka–tanekaha–kauri forest (a), which includes occasional rewarewa, ti kouka, mamaku, towai, miro, rimu, taraire, puriri, totara, mapou, rangiora, five-finger, and several mature emergent kauri (especially on ridge lines), mature emergent northern rata and radiata pine. This forest type, whilst similar to many others areas of kanuka forest in the Brynderwyn Hills, is clearly more mature and more diverse than neighbouring Part I (Q08/225i) and Part G (Q08/225g). Ridges in the west of the site, both within and outside the reserve support a younger community of manuka–kanuka shrubland with occasional tanekaha (b), indicating burning or another form of clearance within the last few decades. Some ecological units are likely to have been omitted from this description, as not all areas were visible during the field survey.

Representative ecological units

Both ecological units are considered representative.

Significant flora of the Brynderwyn Hills Forest Complex

The following table presents a summary of the three threatened and 11 regionally significant plant species recorded in different parts of the Brynderwyn Hills Forest Complex (Q08/225a – Q08/225j). Background information on these records is provided below the table.

Significant plant species	Parts of Brynderwyn Hills Forest Complex (Q08/225)									
	A	B	C	D	E	F	G	H	I	J
Mida (Gradual Decline)	✓		✓	✓				✓		
Kawaka (Sparse)	✓			✓	✓		✓			
<i>Anzybas rotundifolius</i> (Sparse)								✓		
<i>Brachyglottis kirkii</i> var. <i>angustior</i> (reg. sig.)				✓						
Carmine rata (reg. sig.)	✓									
<i>Coprosma parviflora</i> (reg. sig.)				✓						
<i>Grammitis ciliata</i> (reg. sig.)										✓
Gully tree fern (reg. sig.)	✓		✓							
<i>Hebe macrocarpa</i> var. <i>macrocarpa</i> (reg. sig.)				✓	✓					✓
Northern rata (reg. sig.)	✓		✓			✓		✓		
<i>Pelargonium inodorum</i> (reg. sig.)									✓	
<i>Pratia angulata</i> (reg. sig.)				✓						
<i>Schizaea bifida</i> (reg. sig.)									✓	
Tree fuchsia (reg. sig.)			✓		✓			✓		

Notes on significant flora

Q08/225a: Single kawaka and several northern rata noted (current survey). Mida, carmine rata and gully tree fern noted in 1993 (SSBI Q08/H021).

Q08/225c: Northern rata in average to poor condition (current survey). Mida, kawaka, tree fuchsia, and gully tree fern recorded in 1997 (SSBI Q07/H021).

Q08/225d: Mida, kawaka, *Brachyglottis kirkii* var. *angustior*, *Pratia angulata*, *Coprosma parviflora* and possibly *Hebe macrocarpa* var. *macrocarpa* recorded in 2006 (Kendrick and Young 2006).

Q08/225e: Kawaka present (Peter Anderson, DOC, pers. comm.). Tree fuchsia (SSBI Q08/H021) and *Hebe macrocarpa* var. *macrocarpa* present (AK 298338, current survey).

Q08/225f: One mature northern rata and several juveniles noted (current survey).

Q08/225g: Kawaka recorded in 1992 (SSBI Q08/H053). *Coprosma parviflora* (current survey).

Q08/225h: Jones (1991) recorded 135 indigenous plant species in part of Marunui Queen Elizabeth II Open Space Covenant, including mida, *Anzybas rotundifolius*, and tree fuchsia (regionally significant). Northern rata noted in the Marunui QEII Covenant (current survey).

Q08/225i: *Pelargonium inodorum* recorded in Bream Tail Scenic Reserve in 1993 (DOC Bioweb 2007). *Schizaea bifida* collected in 1999 (AK 244703).

Q08/225j: *Grammitis ciliata* (AK 121745) and *Hebe macrocarpa* var. *macrocarpa* (AK 121839) collected in 1965.

Fauna of the Brynderwyn Hills Forest Complex

Non-threatened fauna species recorded in this site include the following: North Island fantail, grey warbler, tui, paradise shelduck, NZ kingfisher, Australasian harrier, pukeko, silvereye, shining cuckoo, morepork, welcome swallow, forest gecko, copper skink, shortfin eel, Cran's bully, redfin bully, common bully, inanga, torrentfish, *Cambridgea* spider species, and species of weta and stick insect.

The following table presents a summary of the ten threatened and five regionally significant fauna species recorded in different parts of the Brynderwyn Hills Forest Complex (Q08/225a – Q08/225j). Background information on these records is provided below the table.

Significant fauna species	Parts of Brynderwyn Hills Forest Complex (Q08/225)									
	A	B	C	D	E	F	G	H	I	J
Grey duck (Nationally Endangered)	✓									
North Island kaka (Nationally Endangered)								✓		
North Island long-tailed bat (Nationally Vulnerable)								✓		
Bush falcon (Nationally Vulnerable)							✓			
Auckland green gecko (Gradual Decline)			✓						✓	✓
<i>Amborhytida dunniae</i> (Gradual Decline)	✓						✓			
Long-tailed cuckoo (Gradual Decline)							✓			
Longfin eel (Gradual Decline)		✓	✓				✓			✓
Kukupu (Gradual Decline)	✓		✓	✓	✓	✓	✓	✓		
Hochstetter's frog (Sparse)	✓	✓	✓		✓	✓	✓	✓		✓
Banded kokopu (reg. sig.)		✓	✓				✓	✓		✓
Tomtit (reg. sig.)			✓		✓	✓	✓	✓		
Giant bully (reg. sig.)							✓			
Bellbird (reg. sig.)								✓		
Red-crowned kakariki (reg. sig.)								✓		

Notes on significant fauna

Q08/225a: Hochstetter's frog populations recorded in 17 of 19 creeks within Piroa Stream catchment, totalling 111 individuals (Parrish 1993). From 1993 to 2003, frogs were regularly recorded in relatively high numbers (e.g. 1–24 individual per stream) by various surveyors (DOC Bioweb 2007). Kukupu recorded 1993 (SSBI Q08/H021). Grey duck seen on Piroa Stream (current survey). The land snail *Amborhytida dunniae* has been recorded at this site (Fred Brook pers. comm.).

Q08/225b: Hochstetter's frog present in every surveyed stream in 1977 (SSBI Q08/H021); 12 frogs in the upper Waihoihoi River in 1993 (Parrish 1993). Longfin eel and banded kokopu recorded at various points along the Waihoihoi River between 1999 and 2003 (NIWA 2007).

Q08/225c: Kukupu and tomtit (regionally significant) recorded recently (Wildland Consultants 2004b; SSBI Q08/H021). Hochstetter's frog recorded on numerous occasions between 1977 and 2001, generally in the upper catchment, with counts of up to 16 individuals in one location (Parrish 1993; Q08/H021; DOC Bioweb 2007). Longfin eel and banded kokopu recorded in 1998 (NIWA 2007). Unconfirmed reports of Auckland green gecko in the vicinity (SSBI Q08/H021).

Q08/225d: Kukupu recorded in 1992 (SSBI Q08/H052). A specific search for Hochstetter's frog in the stream in 1993 was unsuccessful (Parrish 1993).

Q08/225e: Kukupu and tomtit recorded during current survey. North Island kaka reported in 1989 (SSBI Q08/H021). Hochstetter's frog populations present; surveyed in 1977, 1992, 1993, and 1997, with counts reaching 19–21 individuals (Parrish 1993; SSBI Q08/H021; DOC Bioweb 2007).

Q08/225f: Kukupu and Hochstetter's frog recorded in 1986 (SSBI Q08/H019). Kukupu and tomtit recorded in 2002 (Wildland Consultants 2004b). Hochstetter's frogs are still likely to be present (Peter Anderson, DOC, pers. comm.).

Q08/225g: Kukupu, Hochstetter's frog, long-tailed cuckoo, banded kokopu and the snail *Amborhytida dunniae* recorded in 1992 (SSBI Q08/H053). Hochstetter's frog records from 1992, 1993, and 2004, each with low numbers (1–2 individuals) in the upper catchment (Parrish 1993; DOC Bioweb 2007). Tomtit and bush falcon reported (date unknown) (SSBI Q08/H053). Recent (1992–2006) records for longfin eel, banded kokopu, and giant bully in lower reaches of small streams entering Lang's Beach and Waipu Cove (southern end) (NIWA 2007).

Q08/225h: Kukupu and tomtit are resident; North Island kaka, bellbird, and red-crowned kakariki are occasional visitors (Wildland Consultants 2003). Increased numbers of resident tomtit and tui were reported in the Marunui Queen Elizabeth II Open Space Covenant in 2002 (Catherine Hawley pers. comm.). Hochstetter's frog (Sparse) known from four streams in this part (13 individuals recorded), however four other streams searched had no frogs (Parrish 1993). Hochstetter's frog re-recorded in 2004 (DOC Bioweb 2007). Wide range of freshwater fish species is present (Wildland Consultants 2003). Bats have been sighted at Marunui Queen

Elizabeth II Open Space Covenant recently and are likely to be North Island long-tailed bats, which have been reported from Mangawhai (Wildland Consultants 2003).

Q08/225i: Female Auckland green gecko with two offspring recorded in a mingimingi bush on edge of Cove Road in 1980 (DOC Bioweb 2007).

Q08/225j: Hochstetter's frog recorded in 1982 (SSBI R08/H001). Probable record of Auckland green gecko from private land just outside Robert Hastie Memorial Scenic Reserve (Desmond Hetherington pers. comm. 2006). Longfin eel, banded kokopu, Cran's bully, inanga, redfin bully, and koura recorded in 1993 (NIWA 2007).

Significance of the Brynderwyn Hills Forest Complex

Collectively all the parts of this site form the largest indigenous forest area in Waipu ED. In terms of forest and shrubland diversity, this site is the most ecologically diverse in Waipu ED, with 60 different ecological units recorded, of which 38 are considered representative of their types. The ten parts of the site are currently linked together by plantation forest, which plays an important role in this area by providing wildlife habitat and connectivity between indigenous forest remnants (e.g. for Hochstetter's frog, tomtit, invertebrates). Ten threatened fauna species (grey duck, North Island kaka, North Island long-tailed bat, bush falcon, Auckland green gecko, the land snail *Amborhytida dunni*, long-tailed cuckoo, longfin eel, kukupa, and Hochstetter's frog) and five regionally significant fauna species (banded kokopu, giant bully, tomtit, bellbird, and red-crowned kakariki) have been recorded in this site. The Brynderwyn Hills are considered to be the northern stronghold for Hochstetter's frog (Avi Holzapfel pers. comm.). Three threatened plant species (mida, kawaka, and *Anzobas rotundifolius*) and 11 regionally significant plant species (*Brachyglottis kirkii* var. *angustior*, carmine rata, *Coprosma parviflora*, *Grammitis cilata*, gully tree fern, *Hebe macrocarpa* var. *macrocarpa*, northern rata, *Pelargonium inodorum*, *Pratia angulata*, *Schizaea bifida*, and tree fuchsia) have been recorded in this site. This site is contiguous with a large area of indigenous forest and radiata pine plantations to the south, within Rodney ED (c.2,700 ha). Approximately 22.2% (726.0 ha) of the site has some form of legal protection as follows: Brynderwyn Hills Scenic Reserve (c.251.5 ha), Bream Tail Scenic Reserve (c.68.6 ha), Robert Hastie Memorial Scenic Reserve (c.28.3 ha), and Brynderwyn (Purchase) Scenic Reserve (61.9 ha), Waionehu Stream Marginal Strip (c.1.8 ha), WDC Reserve (c.21.8 ha), WDC local purpose reserve (c.0.9 ha), recreation reserve (c.2.4 ha), and QEII Covenant (c.289.6 ha).

LANG'S BEACH COASTAL FOREST AND SHRUBLAND

Survey no.	Q08/226
Survey date	14 November 2006
Grid reference	Q08 484723
Area	29.7 ha (29.2 ha forest, 0.5 ha shrubland)
Altitude	0–50 m asl

Ecological units

- (a) Pohutukawa–rimu forest on ridge (50%)
- (b) Pohutukawa forest on steep hillslope and cliff (25%)
- (c) Pohutukawa treeland on steep hillslope and cliff (13%)
- (d) Kanuka forest on moderate hillslope (10%)
- (e) Kanuka shrubland on steep hillslope (2%)

Landform/geology

Steep coastal hillslopes predominantly underlain by Mesozoic greywacke (Waipapa Terrane), with Oligocene flaggy limestone (Whangarei Limestone, Te Kuiti Group) along the coast northwest of Lang's Beach.

Vegetation

This site comprises small remnants of indigenous coastal forest, treeland, and shrubland spread along Lang's Beach and the rocky coast to the north, extending to the southern end of Waipu Cove.

The largest piece of forest in the site is in a Queen Elizabeth II Open Space Covenant on a ridge extending 500 m inland northwest of the road into Lang's Beach. It comprises distinctive forest type unrecorded elsewhere in Waipu ED. Pohutukawa and rimu are common in the canopy, with frequent totara and puriri, and occasional kauri, kowhai, kahikatea, and rewarewa (a).

The majority of the rest of the site comprises small, narrow remnants of pohutukawa forest (b) or grazed pohutukawa treeland (c) along the steep rocky coastline. To the northwest of Lang's Beach these remnants are often on 'spectacular limestone rock formations running down to the sea' (Forester 2007). A detailed survey of one part of this site has been undertaken (Q07 475731) and the forest was noted to be vigorously regenerating, with no environmental weeds of concern (Forester 2007). Indigenous trees planted here include karaka, karo, totara, and taupata, and part of the site had been fenced (Forester 2007). It was noted that grazing had probably eliminated some palatable species which would have grown there previously, e.g. taraire, coastal maire, and wharangi (Forester 2007). Pohutukawa forest on limestone at the northern end of Lang's Beach is particularly lush, with an understorey of kohekohe, houpara, nikau, mamaku, kawakawa, hangehange, and kiekie, however dense infestations of many weed species, including ginger, garden nasturtium, cotoneaster, agapanthus, tuber ladder fern, arum lily, and hydrangea are also present.

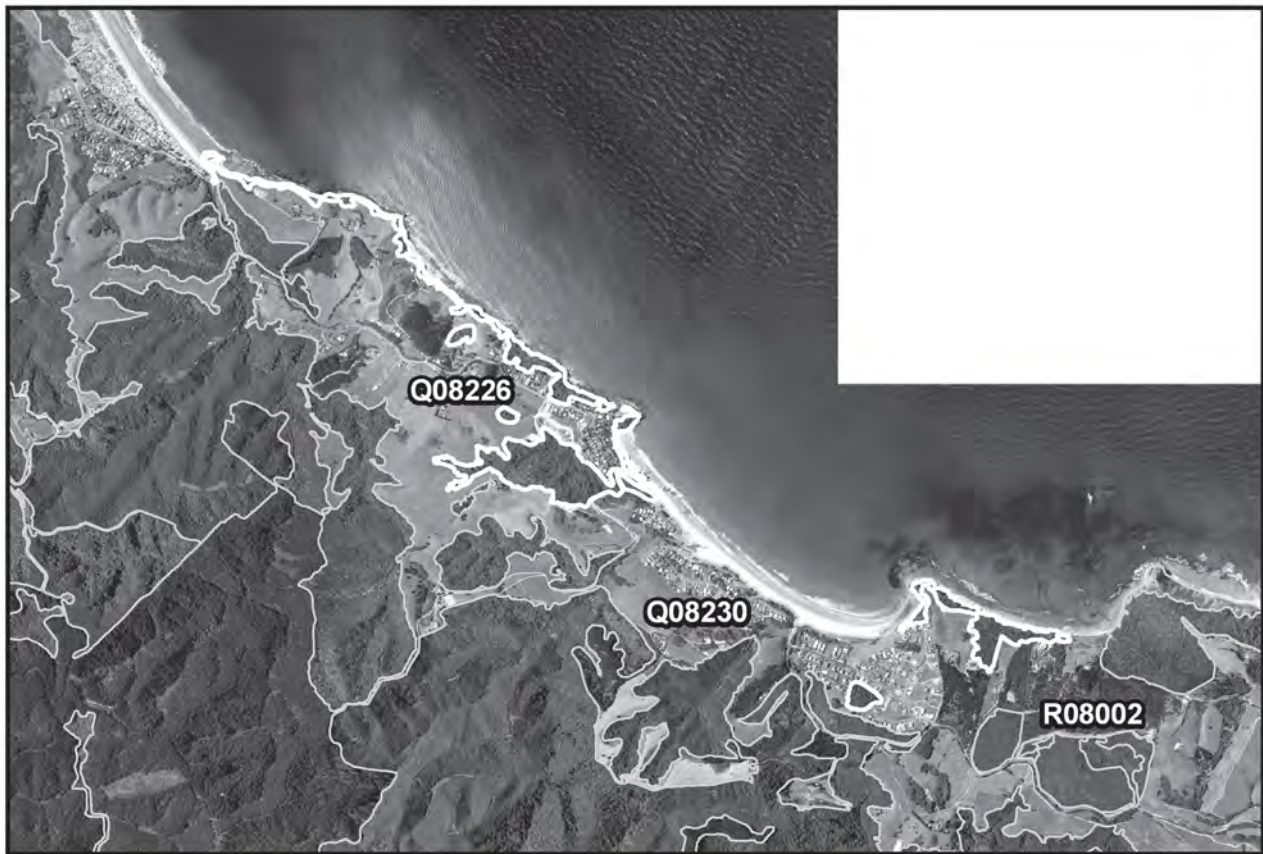
On the southern side of Lang's Beach there are small areas of pohutukawa forest, kanuka forest (d), and in a recently disturbed part, kanuka shrubland (e) with frequent karaka and pampas, and occasional ti kouka and pohutukawa. Large tracts of young kanuka forest extend down to this site from the Brynderwyn Hills Forest Complex (Q08/225).

Fauna

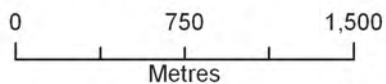
During the current survey an Australasian gannet was seen flying out of pohutukawa forest on the headland at the southern end of Waipu Cove to fish at sea.

Significance

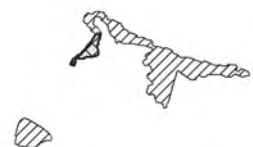
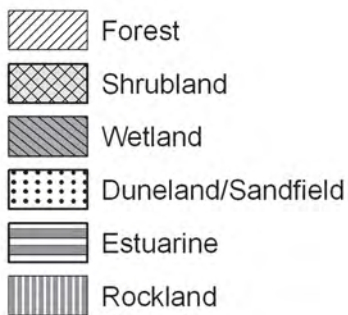
This site contains small examples of coastal forest in variable condition. Parts of the site are ungrazed with a closed canopy with few weeds, while others have a relatively sparse canopy, and are weed-infested and grazed. Ecological unit (a), pohutukawa-remu forest on ridge, was not recorded elsewhere in the ED and is a good quality, representative type. Two representative examples of coastal vegetation on limestone, (b) pohutukawa forest on steep hillslope cliff and (c) pohutukawa treeland on steep hillslope and cliff, occur on the coast north of Lang's Beach. Kenny and Hayward (1996) ranked the geology of this coast (which they named Waipu Cove Oligocene-Miocene sediments) as regionally important because it 'shows the clear relationship between Waitemata flysch, Te Kuiti Group limestone and basement.' Approximately a third of this site is formally protected: 9.9 ha is protected within three different Queen Elizabeth II Trust Open Space Covenants and 0.3 ha is within a recreation reserve administered by WDC at the southern edge of Waipu Cove.



Q08/226 Lang's Beach Coastal Forest and Shrubland



Habitat Type



WAIPU RIVER ESTUARY AND SANDSPIT

Survey no.	Q08/228
Survey date	13 November 2006
Grid reference	Q08 447762
Area	220.5 ha (73.9 ha duneland, 144.6 ha estuary, 2.1 ha forest)
Altitude	0-10 m asl

Ecological units

- (a) Mudflat and sandflat in estuary (40%)
- (b) Sandfield habitat on beach and sand dune (20%)
- (c) Estuarine open water (15%)
- (d) Spinifex grassland on sand dune (7%)
- (e) Purple groundsel-South African iceplant herbfield on sand dune (2%)
- (f) Sea rush rushland in estuary (2%)
- (g) Sea rush-*Austrostipa stipoides* rushland in estuary (1%)
- (h) Oioi rushland in estuary (1%)
- (i) Knobby clubrush-tall fescue sedgeland in estuary (1%)
- (j) Mangrove shrubland and forest in estuary (1%)
- (k) Saltwater paspalum grassland in estuary (1%)
- (l) Sea primrose-remuremu herbfield in estuary (1%)
- (m) Seagrass grassland in estuary (1%)
- (n) Marsh clubrush sedgeland in brackish seepage (1%)
- (o) Buffalo grass-South African iceplant grassland on sand dune (1%)
- (p) Buffalo grass-pohuehue-knobby clubrush shrubland on sand dune (1%)
- (q) South African iceplant-harestail-shore bindweed herbfield on sand dune (1%)
- (r) Pingao sedgeland on sand dune (1%)
- (s) *Carex pumila* sandfield on beach (1%)
- (t) Pohutukawa treeland on steep hillslope and cliff (1%)

Landform/geology

Holocene dune barrier, and estuarine sandy intertidal flats and channels to landward, with a low ridge of Pleistocene consolidated dune sand on the western side of the estuary between Q08 453747 and Q08 458742.

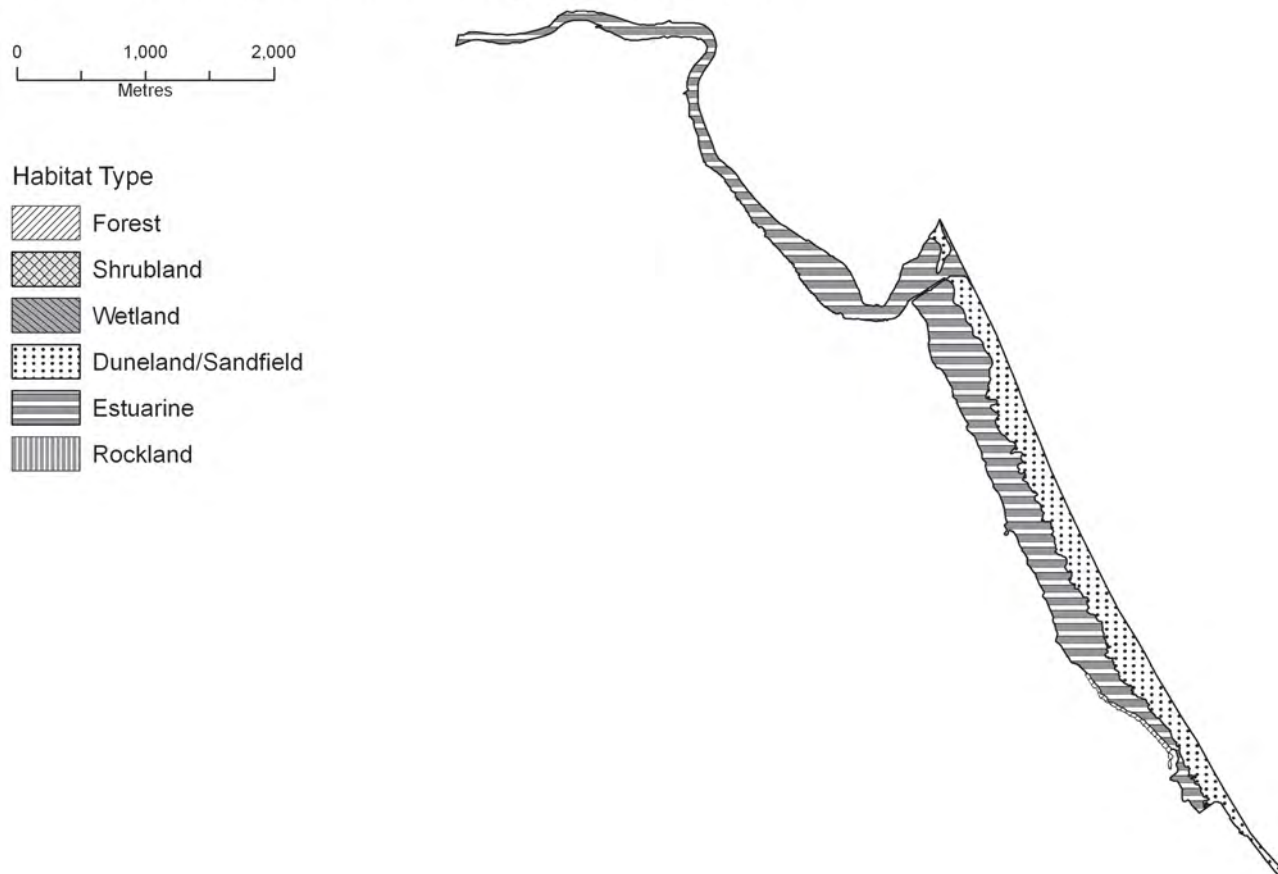
Vegetation

This site comprises a stretch of approximately 5 km of estuarine mudflats, sandflats, open water, and saltmarsh vegetation enclosed by an approximately 5 km long sandspit. The site extends from the southernmost point of the sandy beach at Waipu Cove up to the northern boundary of the river mouth,* and follows the waterway inland to about 0.5 km. There is little vegetation within the main river channel, the majority of it being in the southern area of the estuary. The sandspit is entirely wild habitat except for its extreme southern end where the natural dune vegetation is restricted to the front 1-20 m of the dune (the rest of the dunes here are now a campground within the Waipu Cove Domain Recreation Reserve). Where natural dune vegetation has been removed entirely there is kikuyu grassland (which is not included in this site). On the landward side, the estuary is bordered mainly by flat pastoral land and residential dwellings, with a consolidated dune sand ridge with pohutukawa treeland (t) that stretches along part of the southern margin. Although residential development restricts it to a very narrow strip, the pohutukawa treeland has a diverse range of indigenous understorey species, including kawakawa, karaka, karo, hangehange, *Coprosma macrocarpa*, mamaku, houpara, and harakeke.

* The northern side of Waipu Government Purpose Wildlife Refuge is included within site Q07/128.



Q08/228 Waipu River Estuary and Sandspit



This site includes the most extensive intertidal mudflats and sandflats (a) in Waipu Ecological District. Complementary to these are large areas of mobile beach and dune sands (b) and meandering estuarine channels and pools with open water (c), all of which provide important habitat for birds and marine invertebrates (see below). The only sea grass beds (m) within Waipu ED occur in this site, distributed in several patches along the southern side of the main channel of the southern area of the estuary.

Saltmarsh vegetation increases in stature with distance from the estuary mouth. At Johnson Point Road (inside the rock wall, near the mouth), there are low mats of sea primrose-remuremu herbfield (l), *Carex pumila* sandfield (s) and saltwater paspalum grassland (k) covering parts of the intertidal mudflats. Where freshwater seepages join the estuary there are narrow strips of marsh clubbrush sedgeland (n). Moving further into the estuary there are large contiguous areas of sea rush tussockland (f) and sea rush-*Austrostipa stipoides* tussockland (g) on the inner sandspit margin. In the upper reaches there is a small grove of mangrove shrubland and forest (j) in a mosaic with oioi rushland (h), mudflats with mangrove seedlings, and knobby clubbrush-tall fescue sedgeland (i). Harakeke and saltmarsh ribbonwood are dotted around the edges, along with occasional native celery.

The vegetation cover also varies considerably along the length of the sandspit. At its base there are heavily exotic communities such as buffalo grass-South African iceplant grassland (o) and buffalo grass-pohuehue-knobby clubbrush shrubland (p), which adjoin the campground. Purple groundsel, sand wind grass and spinifex are all frequent within these two types, and there are occasional catsear, harakeke, lupin, shore bindweed, *Oxalis rubens*, ripgut brome, pohuehue, and knobby clubbrush. Akeake, taupata, karo, pohutukawa, harakeke, pingao and two plants of *Austrofestuca littoralis* appear to have been planted in this dune vegetation. Also, recent planting of pingao, spinifex, *Carex testacea* and *Libertia* sp. has been carried out on bare areas of the foredune where buildings are very close to the beach. At the southern end of the Wildlife Refuge, behind the crest of the dune, there is South African iceplant-haretail-shore bindweed herbfield (q) which appears to have been burnt or sprayed recently, perhaps to control the iceplant. Spinifex grassland (d) clothes most of the foredune from base to tip, but towards the tip its density increases and its associated species change. At the base it is associated with frequent haretail and buffalo grass, but moving northwards these species decrease in abundance and purple groundsel becomes frequent. The most common vegetation type at the back of the foredune in middle to northern areas of the spit is a distinctly purple-coloured herbfield with abundant purple groundsel and common South African iceplant (e). There are several large patches of pingao sedgeland (r) sprawling over the seaward slope of the foredune. Marram was recorded on the sandspit in 1991 (SSBI Q08/H018), but was not noted during this rapid survey.

Significant flora

Pingao (Gradual Decline) and *Coprosma acerosa* (regionally significant) were recorded in 1991 (SSBI Q08/H018). *Triglochin striata* (regionally significant) was recorded in 2006 (Wilcox 2006).

Fauna

NZ fairy tern (Nationally Critical), Caspian tern (Nationally Vulnerable), wrybill (Nationally Vulnerable), northern NZ dotterel (Nationally Vulnerable), reef heron (Nationally Vulnerable), banded dotterel (Gradual Decline), white-fronted tern

(Gradual Decline), red-billed gull (Gradual Decline), black shag (Sparse), pied shag, little shag, bar-tailed godwit (Migrant), lesser knot (Migrant), turnstone (Migrant), red-necked stint (Migrant), white-faced heron, royal spoonbill, pied oystercatcher, variable oystercatcher (regionally significant), pied stilt, Australasian harrier, black-backed gull, NZ kingfisher, welcome swallow, spur-winged plover, paradise shelduck and little tern have all been recorded recently in the area (Katrina Hansen pers. comm. 2005 – SSBI Q08/H018). Eastern curlew (Migrant), Pacific golden plover (Migrant), Arctic skua (Migrant), Pomarine skua (Migrant), sharp-tailed sandpiper (Migrant), and possibly Hudsonian godwit (Migrant) are occasional visitors (Katrina Hansen pers. comm. 2005). Small groups of little black shag (Range Restricted) are often seen feeding on the Waipu River (Ray Pierce pers. comm.).

A terek sandpiper (Migrant) was seen here in 2005 (John Kendrick pers. comm. 2006). Whimbrels (Migrant) have been recorded once in the 1990s (Ray Pierce pers. comm.). A pectoral sandpiper was seen in 1992 (CSN *Notornis* 41). Two curlew sandpipers (Migrant) were seen in 1994 (CSN *Notornis* 43). A western sandpiper was recorded in 1999 (CSN *Notornis* 47). A greenshank (Vagrant) was observed in 2001 (Richard Parrish pers. comm.). A little tern (Migrant) was observed in 2001 (CSN *Notornis* 49). Individual banded rails (Sparse) were recorded only twice in the last 15 years, in 1992 (CSN *Notornis* 41) and 1999 (CSN *Notornis* 47). There are anecdotal records of northern little blue penguin (Gradual Decline) on the beach at Waipu Cove in the 1990s (Ray Pierce pers. comm.), but not since. Occasional solitary white herons (Nationally Critical) have been recorded in 1990 (CSN *Notornis* 39), 1993 (CSN *Notornis* 41) and 1995 (Burt et al. 1995). Australasian shoveler (regionally significant) was recorded in 1977, and grey duck (Nationally Endangered) was recorded in 1977 and again in 1991 (SSBI Q08/H018). NZ pipit was observed on the sandspit in the 1980s (Richard Parrish pers. comm.). NZ shore plover (Nationally Critical) have appeared in this site twice in the late 1990s following their release on Motuora Island, near Warkworth (Richard Parrish pers. comm.). A southern elephant seal (Nationally Critical) was present at Waipu Cove in January 1996 during the National Beach Volleyball Championship (Richard Parrish pers. comm.).

NZ fairy tern, northern NZ dotterel, and variable oystercatcher are the main shorebird species which nest here, their breeding sites being concentrated around the end of the spit (Hansen 2005). White-fronted terns breed here occasionally (Katrina Hansen and Richard Parrish in CSN *Notornis* 50). This is the only breeding site for NZ fairy tern in Waipu ED, and one of only four breeding sites for the species nationwide (three pairs at Waipu, four pairs at Mangawhai, two pairs at Papakanui, and one pair at Pakiri in 2005–2006 season). NZ fairy tern has a population of approximately 35 adult individuals, plus seven chicks (including three from Waipu) fledged in the 2005–2006 season (Williams 2006). This site is considered to be a 'key breeding site' for northern NZ dotterel, with 14–16 pairs recorded in recent times (Dowding and Moore 2006). There has been a shorebird protection programme on the spit since 1997/1998, with seasonal rangers who erect temporary fencing, trap rats, cats, mustelids, and hedgehogs and carry out advocacy (Hansen 2005).

Dead and live yellow-bellied sea snakes have washed up at Waipu Cove in 1931 and 1965 (DOC Bioweb 2007). Shore skinks were found to be quite common on the sandspit in 1999 (16 individuals found in 1 hour) (DOC Bioweb 2007).

Significance

This site has the largest river estuary in Waipu ED, and the second largest area of duneland habitats in Waipu ED. Within the ED the sandspit is unique; it is the only

relatively isolated stretch of duneland that is not bordered by housing or other development, and is entirely legally protected for the purpose of wildlife conservation. The spit is a nationally important breeding site for the most threatened bird species in New Zealand, the NZ fairy tern. A further eleven threatened bird species (Caspian tern, wrybill, northern NZ dotterel, reef heron, banded dotterel, white-fronted tern, red-billed gull, black shag, grey duck, white heron, and little black shag) and one regionally significant bird species (variable oystercatcher) are present, as well as a high diversity (and often very high numbers) of international migrant waders (including bar-tailed godwit, lesser knot, turnstone, and red-necked stint). Nesting and feeding shorebirds are threatened by predation, storm-related events, quad bikes, jet-skiers, and other inconsiderate recreational use. Large numbers of people visit and dwell near this important area. This site is quite different to the other duneland site in Waipu ED (Ruakaka Dunelands Q07/128), and most of the ecological units are considered representative (15 of 20): (a) mudflat and sandflat in estuary, (b) sandfield habitat on beach and sand dune, (c) estuarine open water, (d) spinifex grassland on sand dune, (f) sea rush rushland in estuary, (g) sea rush–*Austrostipa stipoides* rushland in estuary, (h) oioi rushland in estuary, (j) mangrove shrubland and forest in estuary, (i) knobby clubrush–tall fescue sedgeland in estuary, (l) sea primrose–remuremu herbfield in estuary, (m) seagrass grassland in estuary, (r) pingao sedgeland on sand dune, (s) *Carex pumila* sandfield on beach, and (t) pohutukawa treeland on steep hillslope and cliff. 69% (152 ha) of this site is formally protected, as follows: 115.9 ha in Waipu Government Purpose Wildlife Refuge (DOC-administered), 30.3 ha in Waipu Wildlife Refuge (DOC-administered), 3.3 ha in Waipu Cove Domain Recreation Reserve (DOC-administered), 0.3 ha in Waipu River Marginal Strip (DOC-administered) and 2.2 ha in a WDC-administered esplanade reserve.

LANG'S BEACH

Survey no.	Q08/230
Survey date	14 November 2006
Grid reference	Q08 491716
Area	7.9 ha (7.9 ha duneland)
Altitude	0–20 m asl

Ecological units

- (a) Sandfield habitat on beach (95%)
- (b) Haretail–spinifex grassland on sand dune (1%)
- (c) *Carex pumila* sandfield on beach (1%)
- (d) Marsh clubrush sedgeland in brackish seepage (1%)
- (e) Pingao sedgeland on sand dune (1%)
- (f) Sickie grass grassland on sand dune (1%)

Landform/geology

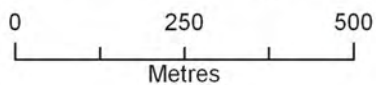
Holocene beach sands.

Vegetation

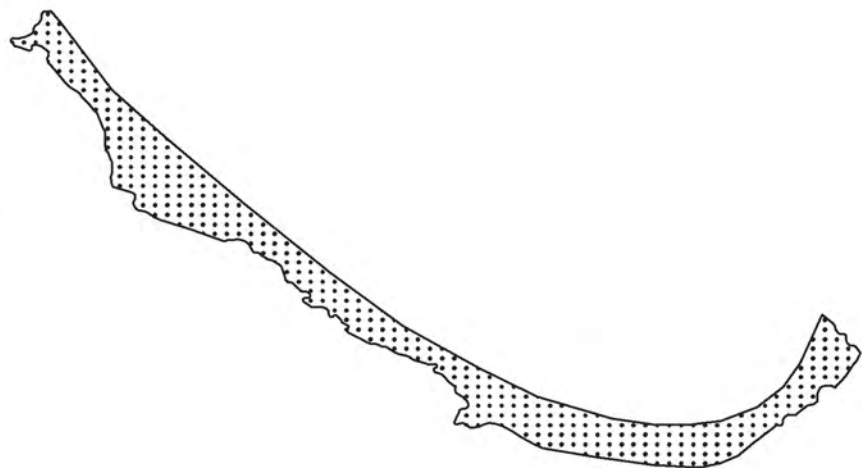
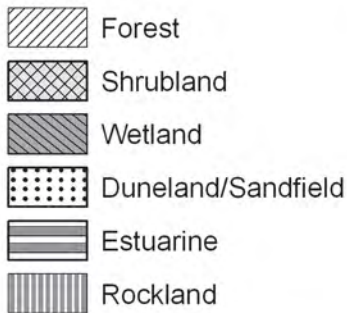
This site comprises a 1.8 km sandy beach enclosed by rocky headlands, including a small sand dune at the outflow of an unnamed stream into McKenzie Cove. Residential areas, exotic grassland and scattered trees (including pohutukawa) border the beach,



Q08/230 Lang's Beach



Habitat Type



and at either end there are forested headlands. Lang's Beach Coastal Forest and Shrubland (Q08/226) nearby provide a broken ecological sequence through to the Brynderwyn Hills Forest Complex (Q08/225).

The majority of this site is fine beach sand (a), which is a bird roost and also a popular recreational area. Occasional sea rocket (*Cakile maritima*) are scattered along the strand line. The small sand dune is vegetated with pingao sedgeland (c) (possibly planted). The main vegetation type on the dune is haretail-spinifex grassland (b)

which has a high diversity of associated species including frequent catsear, vulpia hair grass, King Island melilot, and shore bindweed, and occasional pingao, ripgut brome, allseed, catchfly, bur medick, milkweed, hawkbit, South African iceplant, hairy birdsfoot trefoil, sand wind grass, prairie brome, buffalo grass, large quaking grass, white clover, puha, purple-top, veldt grass, Yorkshire fog, cleavers, periwinkle, annual poa, *Agave* sp., tall fescue, rye grass, dock, and fathen. Around the stream outflow there are very small areas of *Carex pumila* sandfield (c), marsh clubrush sedgeland (d), and sickle grass grassland (f).

Significant flora

Pingao (Gradual Decline).

Fauna

Red-billed gulls (Gradual Decline) were observed roosting on the beach in the current survey. There are anecdotal records of northern blue penguin (Gradual Decline) coming up onto Lang's Beach, but they probably do not breed here (Ray Pierce pers. comm.).

Significance

Lang's Beach is a small, naturally formed sandy beach with high recreational use, bordered by residential housing and amenity areas. Aside from its obvious recreational and aesthetic values, it is also ecologically significant as a bird roost, including two threatened species (red-billed gull and northern blue penguin). One small dune within the site supports a threatened plant species (pingao), though this may be planted. In general the dune and strand vegetation is relatively degraded, with a high proportion of exotic species. The beach is loosely connected with forest remnants within the catchment (Q08/226), which include some overhanging pohutukawa forest on cliffs.

WAIHOIHOI RIVER FOREST REMNANTS

Survey no.	Q08/231
Survey date	15 November 2006
Grid reference	Q08 396773 (2 remnants)
Area	19.3 ha
Altitude	10–40 m asl

Ecological units

- (a) Totara-taraire forest on alluvium (70%)
- (b) Taraire forest on alluvium (20%)
- (c) Totara-kahikatea forest on moderate hillslope (10%)

Landform/geology

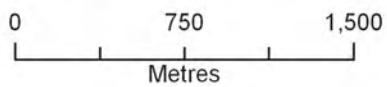
Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits, and hillslopes underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

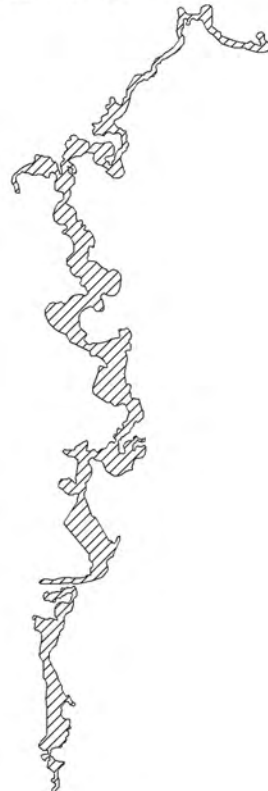
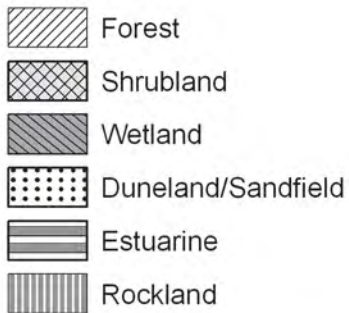
This site comprises two remnants of riparian forest in the Waihoihoi River catchment. The remnants, whilst narrow, follow the course of the river for approximately 2 km. A small area that has been fenced has an understorey of karaka seedlings and tradescantia. The surrounding land use is pastoral farming except for where the



Q08/231 Waihoihoi River Forest Remnants



Habitat Type



largest Braigh Forest remnant (Q08/229) adjoins the western edge of the southern remnant. The remnants are approximately 2 km to the east of the extensive Mareretu and Ahuroa Road forest areas.

(a) In the majority of the remnants totara and taraire are common, and there are occasional kowhai, manatu, ti kouka, kanuka, karaka, mahoe, mapou, ponga, and tarata. Chinese privet is occasional along the forest edge.

(b) One part of the remnant is taraire forest with frequent rewarewa and kahikatea and occasional puriri, kowhai, and kohekohe.

(c) Where an east-facing hillslope abuts the central part of the remnants the forest is dominated by totara and taraire and rewarewa and karaka are occasional.

Significant flora

Manatu (regionally significant).

Fauna

North Island fantail and NZ kingfisher recorded in this survey.

Significance

The site is representative for two ecological units: (a) totara-taraire forest on alluvium, which was found nowhere else in Waipu ED, and (b) taraire forest on alluvium. The canopy is diverse and healthy, but most of the site is grazed with a sparse understorey and there are localised infestations of tradescantia and Chinese privet. The remnants, which are narrow in shape, provide riparian protection for the lower Waihoihoi River. One regionally significant plant species is present (manatu).

WAIONEHU STREAM FOREST REMNANTS

Survey no.	Q08/232
Survey date	15 November 2006
Grid reference	Q08 419768 (17 remnants)
Area	19.7 ha
Altitude	10–30 m asl

Ecological units

(a) Totara treeland on alluvium (65%)

(b) Totara-kanuka forest on alluvium (20%)

(c) Totara-puriri-kanuka forest on gentle hillslope (15%)

Landform/geology

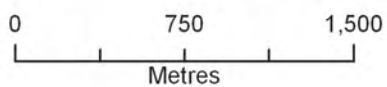
Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits, and hillslopes underlain by melange of undifferentiated Mangakahia and Motatau Complex lithologies; northern outlier on Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

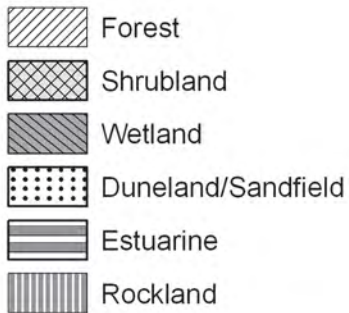
This site comprises a series of narrow riparian forest and treeland remnants distributed along the alluvial flats of the Waionehu Stream. The remnants are set within a landscape of intense pastoral agriculture, and none appear to be fenced. The main vegetation type is totara treeland (a) with frequent crack willow and occasional kanuka, ti kouka, kahikatea, mapou, coral tree, mamaku, titoki and pigeonwood. Severe weed impacts are evident in the understorey, which is smothered by tradescantia and also has infestations of cotoneaster, garden nasturtium, *Calystegia sylvatica*, arum lily and Jerusalem cherry. Indigenous understorey species include *Muehlenbeckia australis*, mapou, mahoe, *Haloragis erecta*, leather-leaf fern,



Q08/232 Waionehu Stream Forest Remnants



Habitat Type



hangehange, and *Coprosma rigida*, which is regionally significant. Other vegetation types present are totara-kanuka forest (b) which is located at the northern end of the site, in the vicinity of Waipu township. This remnant has frequent Chinese privet and

occasional kauri and gorse. A gentle hillslope adjoining one of the alluvial flats supports totara–puriri–kanuka forest (c) with occasional karaka, rewarewa, and poplar.

Significant flora

Coprosma rigida (regionally significant) was recorded in this survey (AK 297990).

Fauna

Shining cuckoo, NZ kingfisher, grey warbler, and North Island fantail.

Significance

This site contains small examples of uncommon habitat types (forest on alluvium) however they are not considered representative due to small size and general degradation. Nonetheless, these are the only remaining vegetation remnants along the lower Waionehu Stream, and they provide riparian protection as well as probably acting as a wildlife corridor between the Brynderwyn Hills and the Waipu River estuary. There is one regionally significant plants species present (*Coprosma rigida*), however the majority of the site is so heavily weed infested that its natural character is under threat of disappearing.

STATE HIGHWAY 1 FOREST REMNANTS

Survey no.	Q08/233
Survey date	15 November 2006
Grid reference	Q08 390782 (8 remnants)
Area	7.4 ha
Altitude	10–11 m asl

Ecological units

- (a) Kanuka–kahikatea forest on alluvium (50%)
- (b) Kahikatea forest on alluvium (45%)
- (c) Kahikatea–puriri–ryegrass–creeping buttercup treeland on alluvium (5%)

Landform/geology

Terrace on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits.

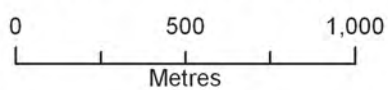
Vegetation

This site comprises eight small forest remnants on the alluvial plain formed by the Ahuroa and Waihoihoi Rivers. The remnants are in two groups, with two in the south to the west of SH1 and six in the north near the SH1 turnoff to Waipu. The remnants are grouped as one site due to the similarity of their vegetation and landform; the eight remnants were presumably part of the extensive forests that formerly covered this alluvial plain. The surrounding land use is pastoral farming, roads and residential gardens. The southernmost remnant is adjacent to a garden and is severely infested with weeds including tuber ladder fern, Madeira vine, Japanese spindle tree, jasmine, arum lily, tradescantia, monkey apple, Chinese privet, and velvet groundsel. Native species in the understorey included ponga, pigeonwood, mapou, nikau, kohekohe, mahoe, kohuhu, and karaka. All of the remnants are within c. 1 km of the extensive Mareretu and Ahuroa Road forest remnants.

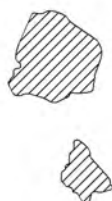
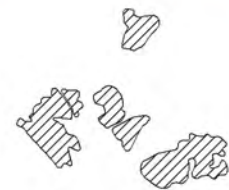
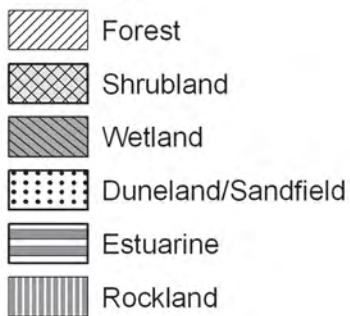
- (a) In the two southern remnants kanuka is abundant, kahikatea is common, and totara is frequent. The smaller and southernmost remnant is fenced to exclude stock and has kahikatea trees up to 70 cm diameter.



Q08/233 SH1 Forest Remnants



Habitat Type



(b) In the six northern remnants kahikatea is abundant, totara is frequent, and kauri, rimu and puriri are occasional. Chinese privet is common or abundant in the understorey.

(c) On the southern edge of one of the northern remnants is an area of kahikatea-puriri treeland. Chinese privet is frequent and occasional species include pukatea, karamu, tree privet, ti kouka, rewarewa and kahakaha. The grazed pasture under the trees is perennial ryegrass and creeping buttercup with frequent wild carrot.

Significant flora

Coprosma rigida (regionally significant) occurs in the understorey of the southernmost remnant (AK 298333).

Fauna

North Island fantail and NZ kingfisher recorded in this survey.

Significance

This site is representative for the ecological unit (a) kanuka-kahikatea forest on alluvium. This ecological unit was not found elsewhere in Waipu ED and covers approximately 3.7 ha. The remnants have a healthy canopy, but are mostly grazed with severe weed infestations. One regionally significant plant species (*Coprosma rigida*) occurs in the understorey of the southernmost remnant.

AHUROA RIVER FOREST REMNANTS

Survey no.	Q08/235
Survey date	12 November 2006
Grid reference	Q08 379766 (18 remnants)
Area	53.8 ha
Altitude	10–60 m asl

Ecological units

- (a) Totara forest on alluvium (88%)
- (b) Kahikatea-totara forest on alluvium (10%)
- (c) Taraire forest on alluvium (2%)

Landform/geology

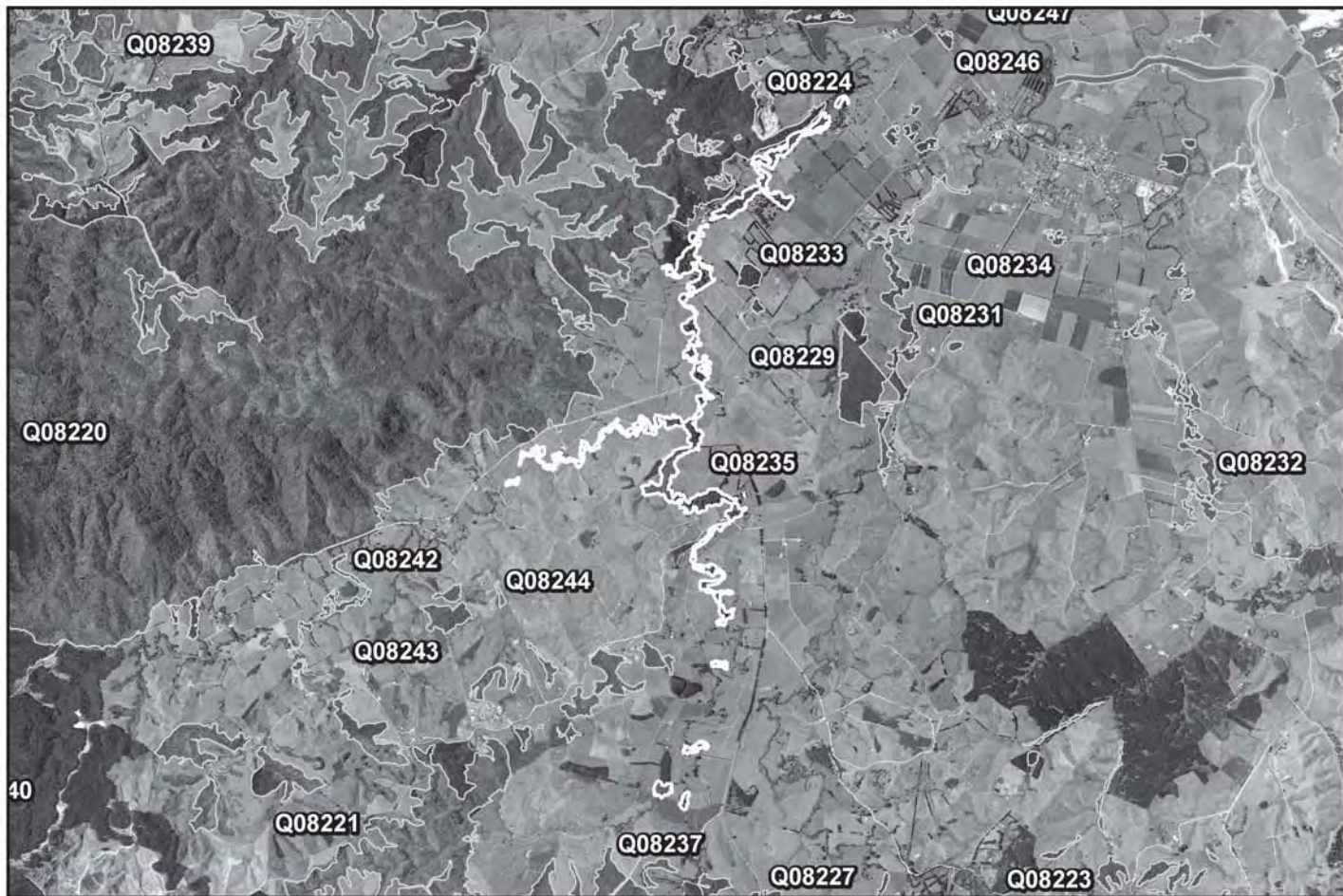
Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

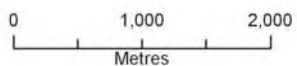
This site comprises riparian forest remnants in the Ahuroa River catchment between Durham Road and Millbrook Road. The southern remnants are grazed with little or no understorey, the largest central remnant has an area from which stock are excluded adjacent to Brooks Road, and the northernmost remnants are grazed. Tradescantia is common throughout.

(a) The majority of the site, including the largest central remnant, has abundant totara with occasional taraire, kanuka, kahikatea, manatu, kowhai, ti kouka, titoki, karaka, and crack willow.

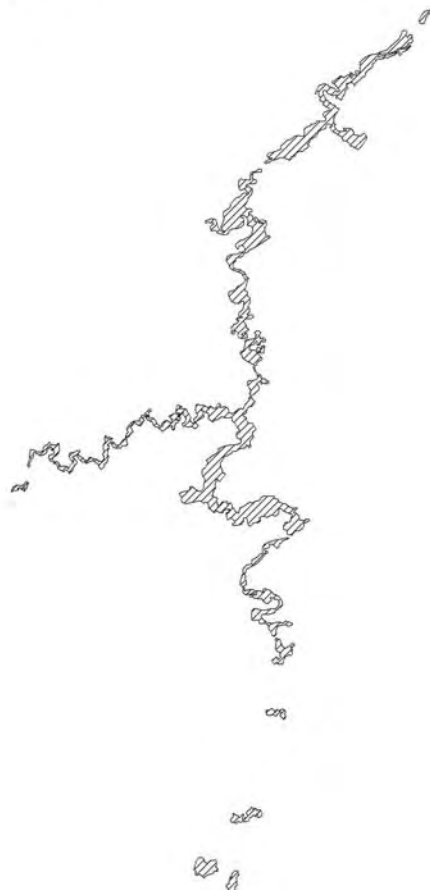
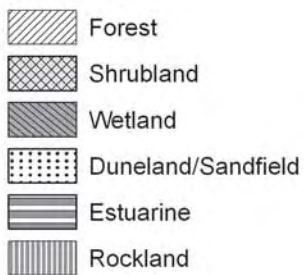
(b) In the northernmost remnants, adjacent to Ahuroa Road, kahikatea and totara are common, and titoki, puriri, taraire, kowhai, manatu, matai, mamangi, pohuehue and turepo are occasional. In the vicinity of the water pumping station at the end of Ahuroa Road, the remnant is only lightly grazed and mature taraire and manatu are locally abundant.



Q08/235 Ahuroa River Forest Remnants



Habitat Type



(c) The small, southeasternmost remnant is mature taraire forest with occasional titoki, kahikatea, totara, rewarewa, and kahakaha.

Significant flora

Manatu (regionally significant).

Fauna

North Island fantail, kukupa (Gradual Decline), NZ kingfisher, paradise shelduck, shining cuckoo were recorded in this survey. Cran's bully, common bully and an unidentified eel species were recorded in 1999 (NIWA 2007).

Significance

This site is representative for the ecological units: (a) totara forest on alluvium, and (b) kahikatea–totara forest on alluvium; this site contains the largest areas of each of these ecological units in Waipu ED. Most of the remnants are grazed with a sparse understorey, and there are localised weed infestations of crack willow and tradescantia. One regionally significant plant species (manatu) and one threatened bird species (kukupa) are present. The remnants provide riparian protection for the Ahuroa River, and provide linkages between remnants in the upper and lower Ahuroa River catchment. 1.0 ha of this site is within an esplanade reserve (WDC-administered).

DODD ROAD FOREST REMNANT

Survey no.	Q08/236
Survey date	12 November 2006
Grid reference	Q08 330702
Area	4.5 ha
Altitude	80–160 m asl

Ecological units

(a) Taraire forest on moderate hillslope (80%)

(b) Tanekaha–rewarewa forest on steep hillslope (20%)

Landform/geology

Hillslope underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This forest remnant is on a moderate to steeply sloping, south-facing hillslope in the headwaters of the Waikopikopiko Stream. The western end of the remnant adjoins radiata pine forest, and the remaining three sides are surrounded by pasture. The canopy is in good health but cattle have access throughout and the understorey is likely to be sparse. No mature, emergent podocarps or kauri are present.

(a) The majority of the remnant is taraire forest with frequent rewarewa, kahikatea, and nikau. Totara, tawa, ponga, mamaku, ti kouka, mahoe, pukatea, rimu, and puka are occasional.

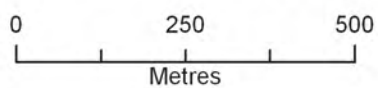
(b) On the steep, upper hillslopes of the eastern half of the remnant, tanekaha is abundant, rewarewa is common, kanuka is frequent, and ti kouka, kauri, kohuhu, and mamaku are occasional.

Fauna

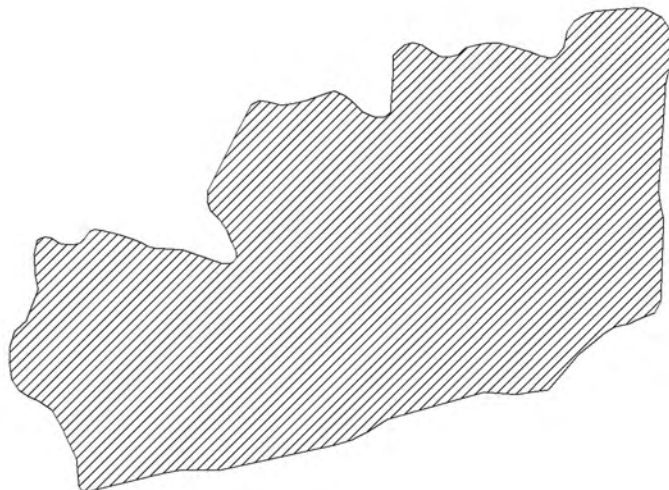
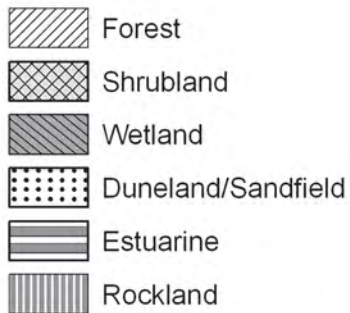
Not surveyed.



Q08/236 Dodd Road Forest Remnant



Habitat Type



Significance

This site is representative for the ecological unit (b) tanekaha-rewarewa forest on steep hillslope, which is found at only two locations in Waipu ED. The remnant has a diverse canopy, is of compact shape, and extends from a ridge to a gully. Cattle have

access to the remnant and the understorey is likely to be sparse. The remnant adjoins plantation forests on its northwestern side.

DURHAM ROAD FOREST AND SHRUBLAND

Survey no.	Q08/237
Survey date	12 November 2006
Grid reference	Q08 369723 (11 remnants)
Area	41.7 ha (40.2 ha forest, 1.5 ha shrubland)
Altitude	40–140 m asl

Ecological units

- (a) Rimu-kanuka forest on moderate hillslope (60%)
- (b) Kanuka forest on moderate hillslope (30%)
- (c) Taraire forest on moderate hillslope (5%)
- (d) Kanuka-manuka shrubland on moderate hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane) and Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This site comprises forest and shrubland remnants on the north facing slopes adjacent to Durham Road. All of the remnants are in close proximity to the northern edge of Waipu Gorge.

- (a) The two largest remnants on the eastern side and the westernmost remnant are fenced to exclude stock, and have a canopy dominated by rimu and kanuka, with occasional manuka, mamangi, mahoe, mapou, tanekaha, kauri, totara and nikau. In the two largest eastern remnants the understorey is well established and includes kiokio, mapou, ponga, pate, kohuhu, turutu, karamu, tanekaha, hangehange, and mida. In the westernmost remnant, the understorey is dominated by mahoe and pate.
- (b) The central remnants mostly comprise kanuka forest. Kahikatea is frequent, with occasional rimu, kauri, rewarewa, and totara. These remnants are probably grazed.
- (c) The remnant at Q08 362718 (on the western side of the site) is mature taraire forest with frequent rewarewa and nikau, and occasional puka, rimu, karaka, mahoe, kanuka, and pate.
- (d) On the upper slopes of the central remnants are two areas of kanuka-manuka shrubland. Mamaku is frequent, with occasional kahikatea, pigeonwood, mapou, nikau, karaka, ponga, ti kouka, and gorse. The shrubland areas are grazed.

Significant flora

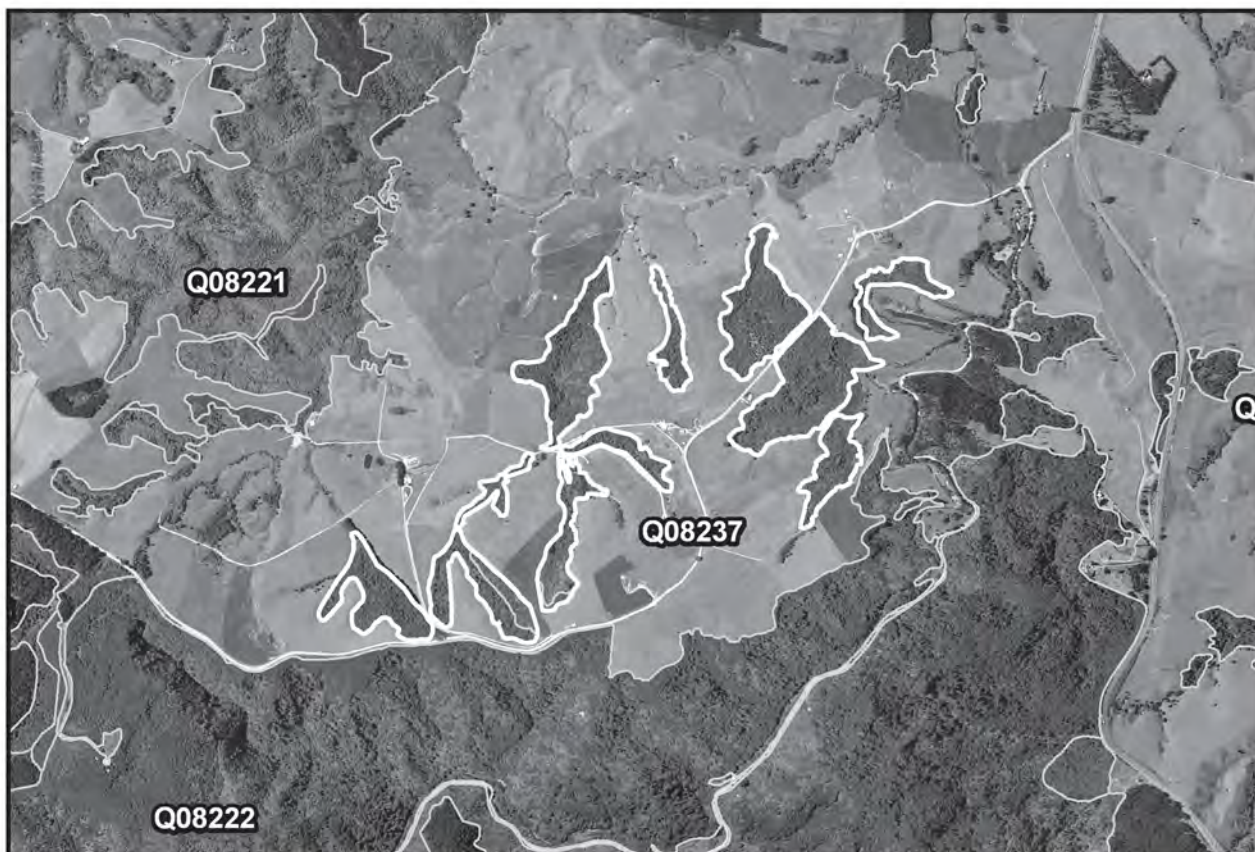
Mida (Gradual Decline) was found in the understorey of the easternmost remnant during this survey.

Fauna

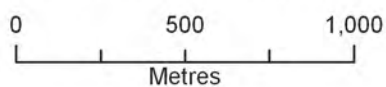
North Island fantail, NZ kingfisher, and shining cuckoo were recorded in this present survey.

Significance

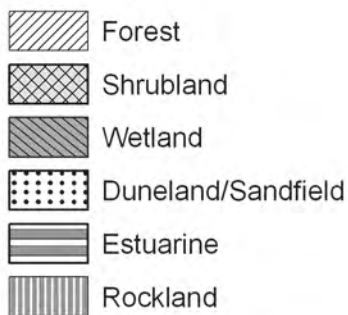
These remnants have a diverse, healthy canopy, and areas that are fenced have an established understorey. The site is representative for (a) rimu-kanuka forest on



Q08/237 Durham Road Forest and Shrubland



Habitat Type



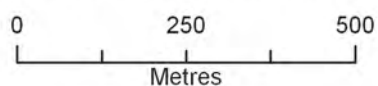
moderate hillslope; this ecological unit is not found elsewhere in Waipu ED and covers approximately 25 ha. The remnants form northerly extensions to the extensive Waipu Gorge Forest Remnants (Q08/222), and provide linkages between the Waipu Gorge and other forest remnants in the vicinity of Brooks Road. The site is habitat for one threatened plant species (*mida*).

MAXWELL CREEK FOREST REMNANT

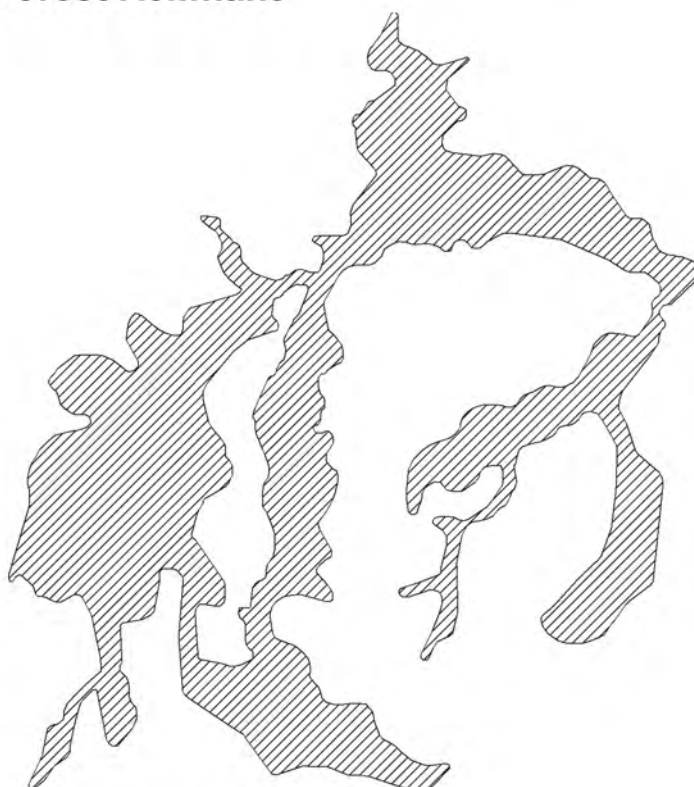
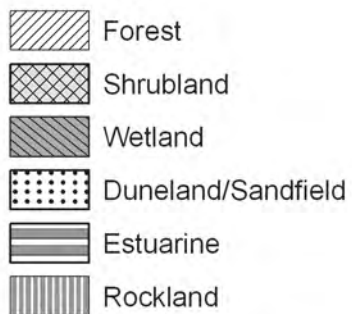
Survey no.	Q08/238
Survey date	Not surveyed
Grid reference	Q08 346717
Area	31.5 ha
Altitude	140-207 m asl



Q08/238 Maxwell Creek Forest Remnant



Habitat Type



Ecological unit(s)

(a) Mamaku forest on moderate hillslope and in gully (100%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This remnant is in gullies in the headwaters of Maxwell Creek. The intervening ridges are radiata pine forest, the western edge of the remnant is bordered by pasture, and the eastern edges are contiguous with the extensive Waipu Gorge Forest Remnants (Q08/222). Due to lack of site access and visibility, the vegetation cover was estimated from recent aerial photography (January 2004) to be mamaku-kanuka forest (a). Whilst probably entirely secondary, the remnant was included because of its proximity or linkages to other remnants, and because of its significant size.

Fauna

Longfin eel (Gradual Decline), and shortfin eel were recorded in 2003 (NIWA 2007).

Significance

Interpretation of 2004 aerial photography indicates that this site supports a similar forest type to that present in Brooks Road Forest and Shrubland (Q08/221), immediately to the north, but this could not be confirmed during the current survey due to lack of site access and visibility. The dominance of mamaku reflects its disturbance by forestry operations, and the western edges of the remnant are probably grazed. However, the site is contiguous with Waipu Gorge, and provides riparian protection for Maxwell Creek that flows into Waipu Gorge and the Ahuroa River. Maxwell Creek is habitat for one threatened fauna species (longfin eel).

HELMSDALE ROAD FOREST AND SHRUBLAND

Survey no.	Q08/239
Survey date	14 November 2006
Grid reference	Q08 333801 (21 remnants)
Area	85.2 ha (75.8 ha forest, 9.5 ha shrubland)
Altitude	40–151 m asl

Ecological units

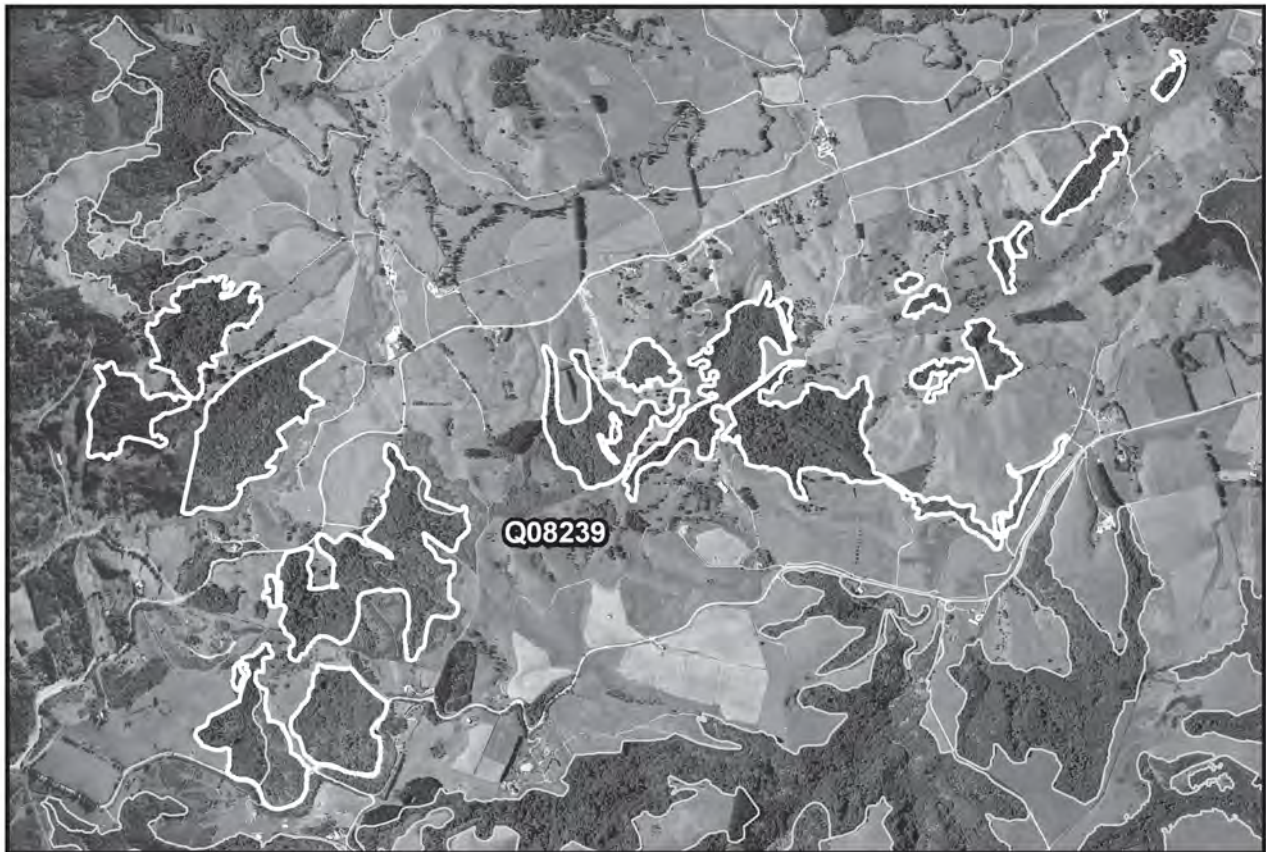
- (a) Kanuka forest on moderate hillslope (79%)
- (b) Manuka-kanuka shrubland on moderate hillslope (10%)
- (c) Rimu-kauri-kanuka forest on ridge (5%)
- (d) Kanuka-mamaku forest in gully (5%)
- (e) Kanuka shrubland on gentle hillslope (1%)

Landform/geology

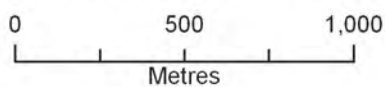
Hillslopes and gullies underlain by Oligocene flaggy limestone (Whangarei Limestone, Te Kuiti Group) and Miocene sandy mudstone (Waitemata Group).

Vegetation

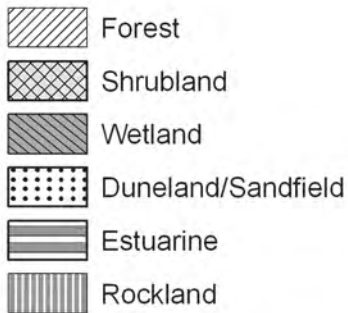
This site comprises a group of forest and shrubland remnants in the vicinity of Helmsdale Road and Millbrook Road. The surrounding and intervening land is primarily covered in pasture but some of the remnants are linked by gorse shrubland.



Q08/239 Helmsdale Road Forest and Shrubland



Habitat Type



The remnants are on the northern edge of Mareretu Forest (Q08/220), and provide a stepping stone between this forest and the North River Forest (Q07/117). The southwestern remnants, which include cave entrances (Ian Fox pers. comm.), have recently been subdivided and the adjacent areas of indigenous forest have been

covenanted and fenced to exclude stock. These remnants have an established understorey, indicative of only light grazing prior to recent stock exclusion. Pest control is now occurring in one of these remnants; a landowner has recently placed over 80 kg of poison in bait stations in it, with all of the poison being consumed. The same landowner reports the presence of kauri snails (Pav Stacey pers. comm.).

The majority of the remnants, including the forest areas to the north of Helmsdale Road, are kanuka forest (a) with frequent kauri, rimu, kahikatea and totara. The kanuka is mature with juvenile podocarps emergent through the canopy, and there are occasional ponga, nikau, puriri, taraire, mamaku, puka, pukatea, lancewood, rewarewa, and miro. Smaller areas of rimu-kauri-kanuka forest (c), with occasional kohuhu, ponga, tanekaha, lancewood and mahoe, occur on ridges where the forest is more mature. In these areas the largest kauri are c. 70 cm diameter. In remnants adjacent to Millbrook Road, there are areas of manuka-kanuka shrubland (b) with frequent mamaku, and occasional ponga, totara, radiata pine, pampas and gorse. On the eastern edge of one of the central remnants there is a small area of kanuka shrubland (e), with occasional ponga, rimu, mahoe, putaputaweta, and lancewood. The narrow southeastern area comprises mainly kanuka-mamaku forest (d), with frequent totara, kahikatea, and mahoe, and occasional ponga, tanekaha, and gorse.

Significant flora

Mida (Gradual Decline) is present in the understorey.

Fauna

North Island fantail and shining cuckoo were present in this present survey. Kauri snail (Gradual Decline) has been reported from the westernmost remnant (Pav Stacey pers. comm.).

Significance

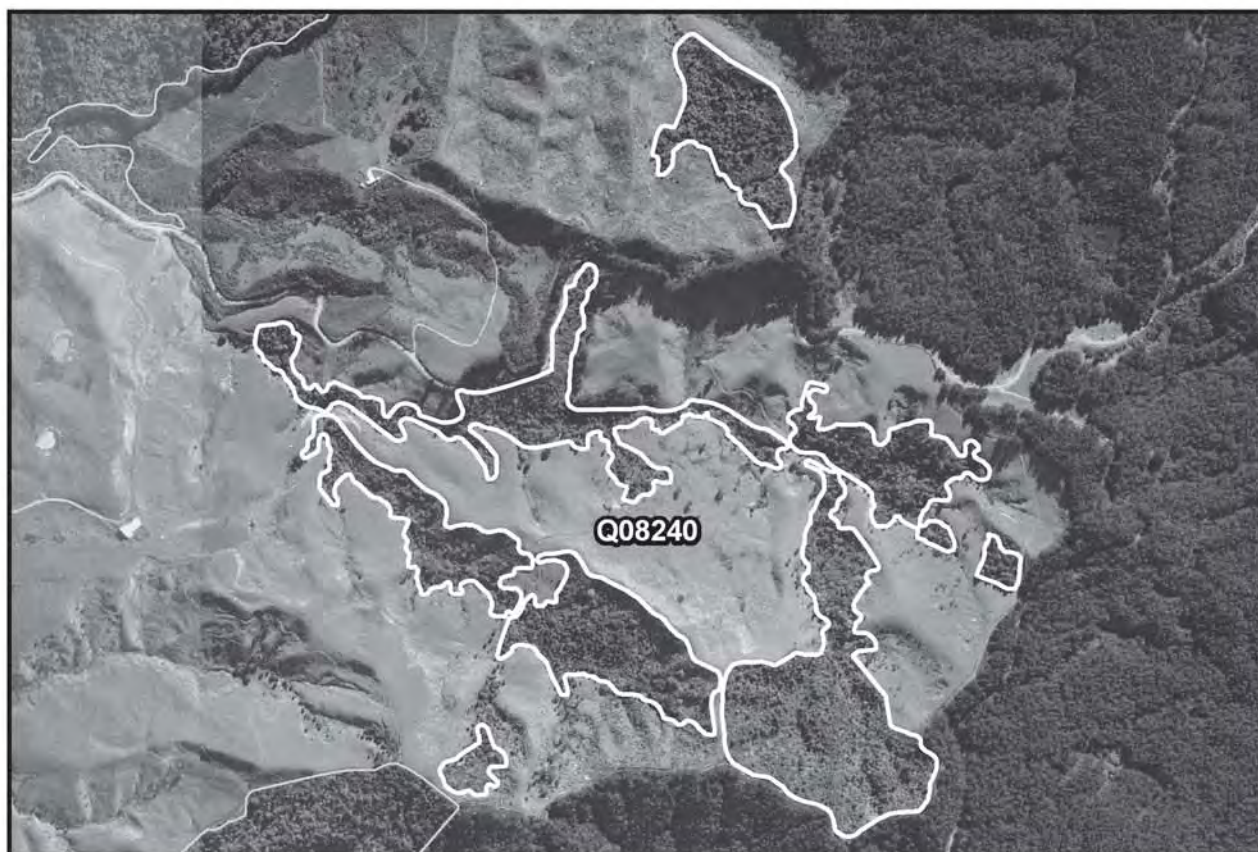
This site is representative for three ecological units: (a) kanuka forest on moderate hillslope,

(b) manuka-kanuka shrubland on moderate hillslope, and (c) rimu-kauri-kanuka forest on ridge, which was not found elsewhere in Waipu ED. The remnants have a healthy canopy and an established understorey in the older, fenced remnants; kauri up to c.70 cm diameter are present in the rimu-kauri-kanuka forest. The site is habitat for one threatened fauna species (kauri snail) and one threatened plant species (mida). Caves are present within the remnants, and limestone geology and the vegetation it supports is regionally distinctive.

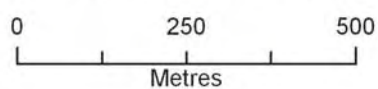
The remnants provide riparian protection to streams in the upper North River catchment, and provide some linkages between Mareretu Forest (Q08/220) and forest remnants in the North River catchment (Q07/117). Parts of the site have recently been fenced and covenanted in exchange for consent to subdivide.

KAIKOWHITI STREAM FOREST REMNANTS

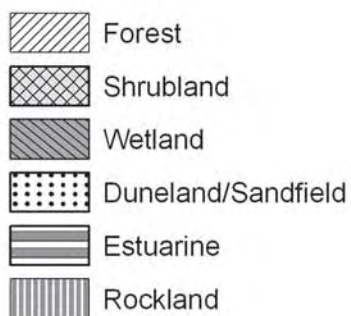
Survey no.	Q08/240
Survey date	14 November 2006
Grid reference	Q08 313737 (8 remnants)
Area	25.3 ha
Altitude	100–240 m asl



Q08/240 Kaikowhiti Stream Forest Remnants



Habitat Type



Ecological units

(a) Totara-rewarewa-taraire forest in gully (47%)

(b) Mamaku-rewarewa forest on moderate hillslope (40%)

(c) Towai-mamaku forest on steep hillslope (10%)

(d) Kahikatea forest in gully head (3%)

Landform/geology

Gullies in Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This site comprises a group of eight small forest remnants in the headwaters of Kaikowhiti Stream. Most if not all of the remnants are grazed by sheep and severe possum browse is evident on mamaku adjacent to Finlayson Brook Road. In the southernmost remnant a patch of totara trees are dead. The northernmost remnant, on a northwest-facing hillslope, was not visible from the road and the vegetation of this remnant was estimated from the aerial photographs. All of the remnants are within 1.1 km of the extensive Mareretu Forest (Q08/220).

(a) In the gully of the southernmost remnant totara, rewarewa and taraire are common. Mamaku and manuka are frequent, and there are occasional rimu, mapou, aka, kauri, karaka, and ponga.

(b) On moderate hillslopes mamaku and rewarewa are common, totara is frequent, with occasional nikau, kauri, kohuhu, and taraire.

(c) On the steep, south-facing hillslope adjacent to Finlayson Brook Road, towai and mamaku are common, and totara and tawa are frequent. Occasional species include rewarewa, nikau, ponga, pigeonwood, pate and hangehange. The roadside edges of this remnant are not grazed by stock.

(d) The small, easternmost remnant is in a gully head. Kahikatea is abundant with occasional rewarewa, nikau, totara, mamaku, and ti kouka.

Fauna

North Island fantail and grey warbler were recorded in this survey.

Significance

These remnants are in poor health, with significant dieback of canopy trees, severe possum browse, and grazing of the understorey by sheep. However, three ecological units are not found elsewhere in Waipu ED, and the site is considered representative for these units: (a) totara-rewarewa-taraire forest in gully, (b) mamaku-rewarewa forest on moderate hillslope, and (c) towai-mamaku forest on steep hillslope. The remnants are linked by radiata pine plantations to Mareretu Forest (Q08/220) and Smales Road Forest Remnants (Q08/241). They also provide riparian protection to the upper reaches of Kaikowhiti Stream.

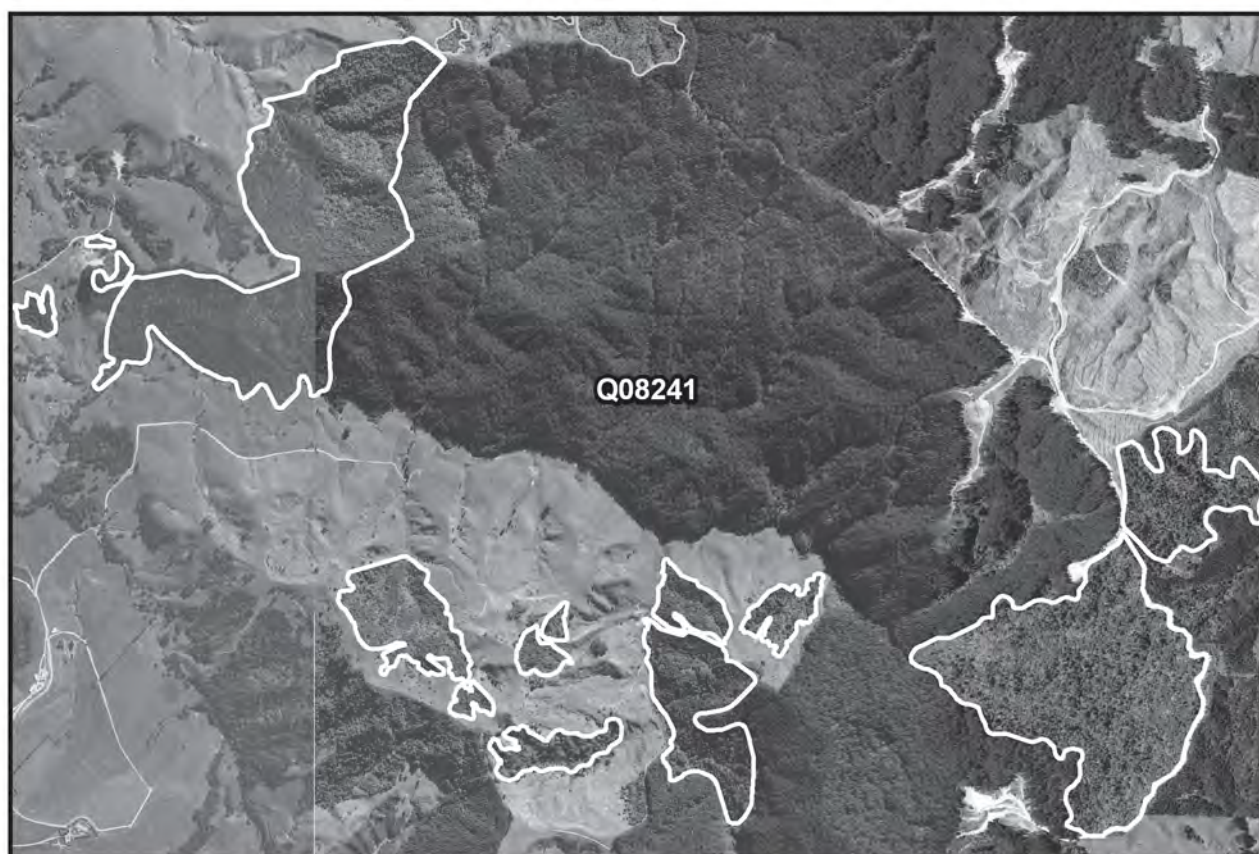
SMALES ROAD FOREST REMNANTS

Survey no.	Q08/241
Survey date	15 November 2006
Grid reference	Q08 317720 (14 remnants)
Area	126.1 ha
Altitude	60-260 m asl

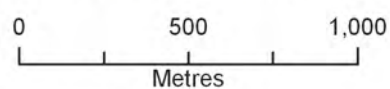
Ecological units

(a) Kanuka-mamaku forest on moderate hillslope (40%)

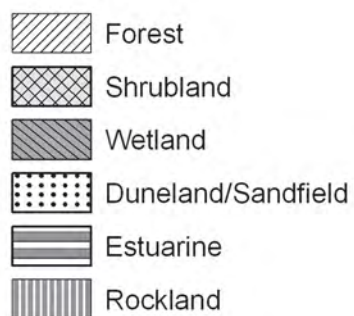
(b) Unknown podocarp-broadleaf forest type on moderate to steep hillslope (33%)



Q08/241 Smale's Road Forest Remnants



Habitat Type



(c) Totara-taraire forest on moderate hillslope (25%)

(d) Tanekaha forest on ridge (2%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

This site comprises 14 forest remnants in the headwaters of Waipoaka and Kaikowhiti Streams. The surrounding land use is pastoral farming and radiata pine forestry and the largest remnant is c. 1 km south of Mareretu Forest (Q08/220). The four westernmost remnants were surveyed from an adjacent farm race. The vegetation of the eastern remnants was surveyed in 2003 for an assessment of natural areas in Carter Holt Harvey Forests (Wildland Consultants 2004b). Information from this previous survey was used because of their remoteness from any public access points.

(a) On west or south-facing moderate hillslopes, totara is abundant, taraire is common, and kanuka and mamaku are frequent. The forest is very diverse and a wide range of species are occasional, including kauri, rimu, kahikatea, rewarewa, tanekaha, tawa and emergent northern rata. More recently disturbed areas have occasional manuka, lancewood, mahoe, pate, tutu, karamu, and ti kouka. The south-facing slope of the largest western remnant is fenced with an established understorey.

(b) The easternmost remnant is podocarp-broadleaf forest. The previous survey identified two vegetation types; secondary forest with frequent mamaku and kanuka and emergent kauri and northern rata, and secondary forest with frequent kauri, northern rata, rimu, kahikatea, and totara. The 2003 survey did not estimate the extent of each forest type.

(c) On the northwest-facing slope of the northernmost remnant, kanuka and mamaku are common, totara, kahikatea and towai are frequent, and rimu and puka are occasional.

(d) A small area on a ridge is tanekaha forest with frequent kanuka and occasional kauri.

Significant flora

Northern rata (regionally significant).

Fauna

Shining cuckoo was recorded during this survey. Australasian harrier was recorded in 2003 (Wildland Consultants 2004b).

Significance

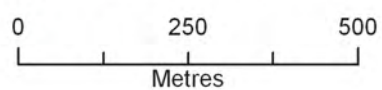
The remnants have a diverse, healthy canopy and, where stock are excluded an established understorey. The large, westernmost remnant has occasional emergent northern rata, which is a regionally significant species. The remnants provide riparian protection to parts of the upper Waipoaka Stream, and are linked by forestry to extensive forest remnants to the north.

BROOKS ROAD WETLAND

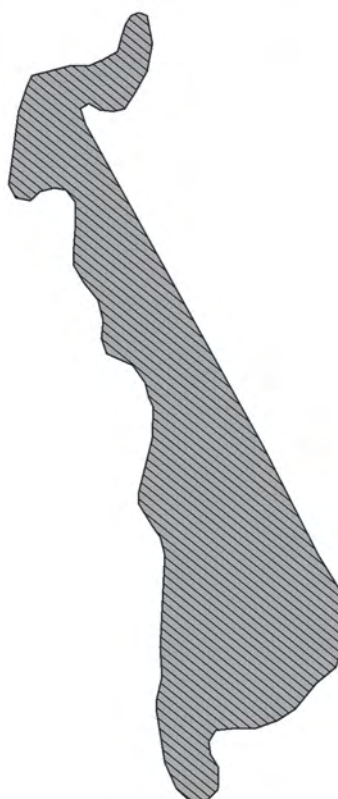
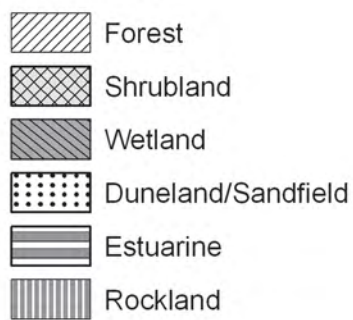
Survey no.	Q08/244
Survey date	15 November 2006
Grid reference	Q08 363750
Area	0.7 ha
Altitude	38-40 m asl



Q08/244 Brooks Road Wetland



Habitat Type



Ecological units

(a) Manuka shrubland on alluvium (50%)

(b) Raupo reedland on alluvium (50%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

This site is a wetland in the Finlayson's Brook catchment. The wetland, which is grazed, is surrounded by pasture and gorse shrubland. A recent intensification of land use in the catchment has resulted in the clearance of gorse shrubland that formerly linked this site with the Brooks Road Forest Remnants (Q08/243). Manuka shrubland (a) covers approximately half of the wetland. Gorse and harakeke are frequent with occasional ti kouka, kanuka, mamaku, mahoe and ponga. The remainder of the wetland is raupo reedland (b).

Fauna

Not surveyed.

Significance

Manuka shrubland on alluvium (a), which covers approximately half of the area of the site, is a representative ecological unit. The site is grazed with frequent gorse. The site provides some riparian protection for a tributary of Finlayson's Brook, and is near the Brooks Road Forest Remnants (Q08/243). Most natural freshwater wetlands which were present in the ED have been drained or modified, and now only approximately 45 ha of natural or semi-natural wetland remains.

SHOEMAKER ROAD FOREST REMNANT 2

Survey no.	Q08/247
Survey date	15 November 2006
Grid reference	Q08 402780
Area	1.1 ha
Altitude	16–17 m asl

Ecological unit(s)

(a) Kahikatea forest on alluvium (100%)

Landform/geology

Stream channel containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

This site is a tiny remnant of kahikatea forest (a) on a bend of the Ahuroa River near Shoemaker Road. Some of the older kahikatea are developing round-headed crowns suggesting that the stand is older than most of the kahikatea remnants on the Waipu alluvial plains. Occasional kowhai, manatu, mamaku, ti kouka, matai, mahoe, puriri, and gorse occur on the edges of the remnant.

Significant flora

Manatu (regionally significant).

Fauna

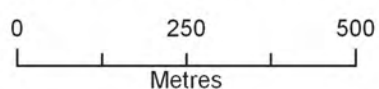
Not surveyed.

Significance

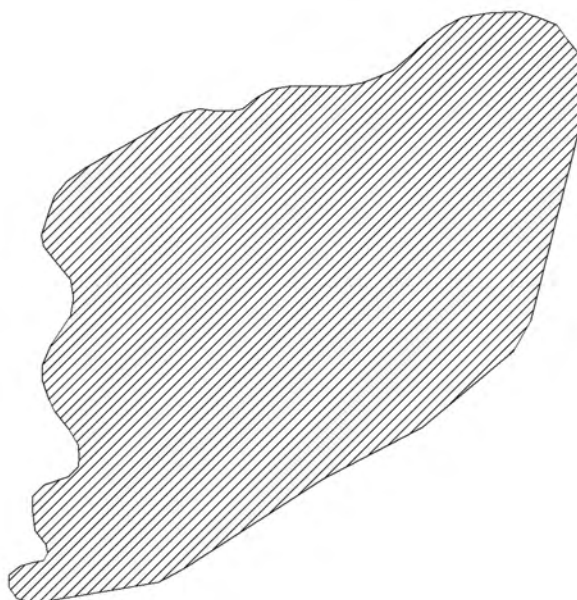
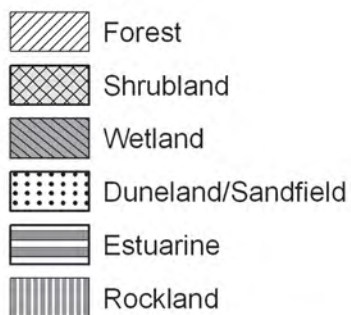
This site is a small, isolated stand of alluvial forest, a vegetation class that has been severely reduced in extent within Waipu ED. The canopy is relatively diverse and



Q08/247 Shoemaker Road Forest Remnant 2



Habitat Type



includes kahikatea developing rounded crowns, which may be some of the oldest now remaining in the ED. The remnant may be grazed and has gorse infestations on its edges, however it is habitat for one regionally significant plant species (manatu).

BREAM TAIL COASTAL HEADLAND

Survey no.	R08/001
Survey date	08 November 2006 and 14 November 2006
Grid reference	Q08 530706 (18 remnants)
Area	260.7 ha (2.4 ha duneland, 221.5 ha forest, 25.5 ha rockland, 7.2 ha shrubland, 4.1 ha wetland)
Altitude	0–160 m asl

Ecological units

- (a) Kanuka forest on gentle, moderate and steep hillslope, and on ridge (20%)
- (b) Taraire forest on steep hillslope (12%)
- (c) Nikau–karaka–pohutukawa–mahoe treeland* on steep hillslope (12%)
- (d) Nikau forest on moderate hillslope and in gully (10%)
- (e) Rocky outcrop and cliff habitat (5%)
- (f) Taraire–totara–puriri forest in gully (5%)
- (g) Kauri–kanuka forest on moderate hillslope and ridge (5%)
- (h) Kanuka–tawa forest on moderate hillslope (5%)
- (i) Puriri–rewarewa–pohutukawa forest in gully head (3%)
- (j) Kanuka–totara forest on ridge (2%)
- (k) Kanuka–puriri–pohutukawa forest on moderate to steep hillslope (2%)
- (l) Kanuka–totara treeland in gully (2%)
- (m) Kahikatea forest in gully head (2%)
- (n) Pohuehue–buffalo grass shrubland on gentle hillslope (2%)
- (o) Bracken–kikuyu–tall fescue–Yorkshire fog grassland on moderate hillslope (2%)
- (p) Puriri forest on moderate and steep hillslope (1%)
- (q) Pohutukawa forest on steep hillslope (1%)
- (r) Kanuka shrubland on steep hillslope (1%)
- (s) Harakeke–pampas flaxland on steep hillslope (1%)
- (t) Harakeke–kawakawa flaxland on moderate hillslope (1%)
- (u) Hangehange–harakeke shrubland on steep hillslope (1%)
- (v) Raupo reedland in gully (1%)
- (w) Manuka–harakeke–ti kouka shrubland in gully (1%)
- (x) *Cyperus ustulatus* tussockland in gully (1%)
- (y) *Baumea* sp. and *Juncus* sp. reedland in gully (1%)
- (z) Sandfield habitat on beach (1%)

Landform/geology

Coastal hillsides and gullies underlain by Mesozoic greywacke (Waipapa Terrane); Miocene sandstone and sandy mudstone (Waitemata Group); Miocene dacite intrusions (Waitakere Group); and Holocene beach sands.

Vegetation

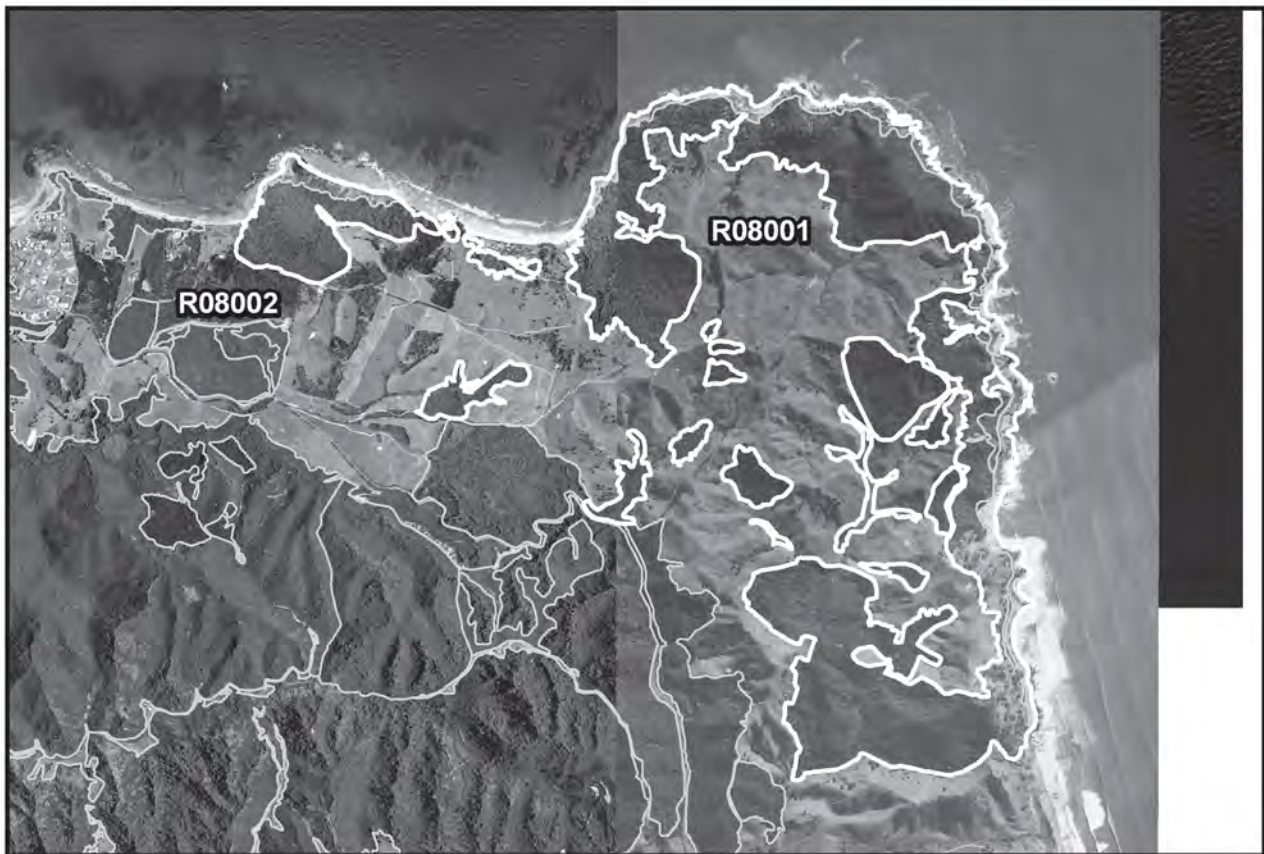
This site encompasses all indigenous forest, shrubland and rockland habitats on the coastal headland of Bream Tail, extending from the western point of Anderson's Cove

* Named after species in the 'frequent' category (i.e. 5–20% canopy cover).

around to a point on the south coast corresponding to the Waipapa Group geological boundary. The site extends inland to the Robert Hastie Memorial Scenic Reserve, which is at the eastern end of the Brynderwyn Hills Forest Complex (Q08/225). Through a history of pastoral farming and pest herbivory (especially possums) the indigenous vegetation has been reduced to numerous separate areas, which tend to occupy gullies, steep land and coastal cliffs, i.e. the least productive farmland. Gentle, alluvial land tends to be in pasture. Until recently, the majority of forest remnants and wetlands have been unfenced allowing them to be heavily grazed and trampled by livestock, however an extensive restoration project has recently begun (as part of a large residential subdivision affecting most of this site) which aims to protect all forest remnants throughout the site through covenanting and fencing. This project will also involve extensive revegetation to link forest remnants, animal pest control and coastal dune planting. Since approximately 2003 small areas of plantings have been established, including both ecosourced and non-ecosourced native plants (these are not included in this site). During 2003 a comprehensive study of the vegetation of Bream Tail Farm (part of the site is in this farm) was carried out (Boffa Miskell 2003). The entire vegetation of the site is coastally influenced and has affinities with that of Taranga (Hen) Island (Wright 1978), which lies only 14.3 km offshore to the northeast. On steep, upper, and east- and north-facing coastal hillslopes there are substantial areas of nikau-karaka-pohutukawa-mahoe treeland (c), which includes large patches of exotic grasses (kikuyu and Yorkshire fog are the dominant species) associated with indigenous ferns (such as *Pteris comans*, rasp fern and kiokio) and shrubs (such as kawakawa, mingimingi, houpara and mapou). Treeland is what remains from formerly continuous coastal forest cover (linking through to forest on the Brynderwyn Hills) that has suffered stock disturbance and severe possum impacts over several decades. However this type retains much of its former diversity, including the following species: ti kouka, kawakawa, kohekohe, puka, puriri, taraire, harakeke, kahakaha, kahikatea, and totara. Coastal maire (regionally significant) is present on the northern side of Bream Tail and tawapou (regionally significant) has been previously recorded from the site and is likely to be present (SSBI R08/H008). There are perhaps only a few individuals of these two species, which are much more common in similar habitat on Taranga Island which has no introduced mammals (Wright 1978).

Interspersed with the treeland there are patches of dense nikau forest in gullies and on moderate hillslopes (d), kanuka-puriri-pohutukawa forest with frequent kowhai and totara on moderate to steep hillslopes (k), puriri forest with frequent totara, kowhai and nikau on moderate hillslopes (p), and one small area of pure pohutukawa forest on a steep hillslope (q) at the southern end of the site. The latter has an understorey thick with houpara, harakeke, hangehange and nikau, and is the only healthy area of pohutukawa forest within the site. Dead or dying pohutukawa form an occasional component of many open coastal forest and treeland types. A distinctive forest type on the open coast is kanuka-tawa forest with frequent puriri and occasional rimu and kauri (h) which occurs mainly within a Queen Elizabeth II Open Space Covenant on the northern side of Bream Tail.

Further inland (i.e. over the brow of exposed coastal hillslope) there is a different set of forest types. Kanuka forest (a) with frequent kauri is present on steep hillslopes which have undergone recent or more intense disturbance, whereas highly diverse forest dominated by taraire (b) occupies the same position on the least disturbed steep hillslopes. The latter usually contains frequent puriri, nikau and kohekohe and occasional puka, rewarewa, kahakaha, mamaku, karaka and *Metrosideros*



R08/001 Bream Tail Coastal Headland

0 750 1,500
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



perforata. Gullies support the greatest diversity in species and forest types. In some gullies there is taraire-totara-puriri forest with frequent kahikatea and occasional pukatea, karaka, tawa, white maire, lancewood, rewarewa, ti kouka and mapou (f). In other gully areas nikau and mahoe are common in association with frequent puriri, kahikatea, pate, supplejack and mamaku, and occasional puka, pukatea, miro,

ponga, karaka, tawa and *Metrosideros perforata*. Several gully heads in the larger remnants have mature puriri-rewarewa-pohutukawa forest with occasional emergent northern rata and kauri (i). This is a distinctive forest type within the Ecological District, as it includes pohutukawa and northern rata in the same vegetation community. Gully heads in smaller forest patches are often dominated by kahikatea (m), with frequent rewarewa, puriri and nikau, and occasional pukatea, miro, and puka. Ridges generally support kanuka forest (a), kauri-kanuka forest with occasional tanekaha, totara, rimu, puriri and mamaku (g) or kanuka-totara forest (j), though these types are not restricted to ridge topography. Narrow strips of kanuka-totara treeland (l) occur along stream margins surrounded by pasture. Forest and treeland dominated by kanuka is the most widespread type within the site, which is indicative of frequent disturbance over the past century. A previous more detailed survey found that there is a high diversity of associated species, and differing quality of understorey within kanuka forest (Boffa Miskell 2003).

There is one large indigenous wetland within a gully at the centre of the site (and a smaller subsidiary one to the west which was not visible). Raupo reedland (v) is prominent with several types present on the wetland margins, including *Baumea* sp. and *Juncus* sp. reedland with occasional *Carex secta* and *C. virgata* (y) and *Cyperus ustulatus* tussockland (x). A small area of manuka-harakeke-ti kouka shrubland with frequent kahikatea (w) occurs at the lower end of the main wetland gully. A recent survey found that the smaller wetland was in very poor condition due to stock degradation, but the larger one was slightly better, being at least partially fenced (Boffa Miskell 2003).

Steep, rocky cliffs and numerous small, isolated outcrops rising above intertidal rock platforms (e) form the distinctive Bream Tail coastline. Harakeke and pampas are the two most common species, occurring locally along with coastal rockland plant species, including frequent *Chionochloa bromoides* (Range Restricted) and *Astelia banksii*, and occasional *Tetragonia tetragonoides* (Sparse), *Peperomia urvilleana*, *Lachnagrostis* sp., *Pimelea prostrata*, sea primrose, *Thelymitra pauciflora*, *T. longifolia*, mingimingi, leather-leaf fern, native iceplant, taupata, knobby clubbrush, mapou, lancewood, lotus, hairy birdsfoot trefoil, and tarweed. At the northern end of a small sandy bay there are pillar-like rock formations shaded by overhanging pohutukawa which support scattered coastal herbs such as rengarenga, remuremu, native celery, *Lobelia anceps* and *Peperomia urvilleana*.

Several shrubland, flaxland and grassland types occur in a narrow band along the less steeply sloping areas of the open coast. Kanuka shrubland (r) with frequent pampas and occasional mamaku, mingimingi, ti kouka, harakeke, puriri, karaka and mahoe represents an early stage of succession towards coastal forest on steep hillslope. Hangehange-harakeke shrubland with frequent ti kouka and pampas (u) occurs on a steep, wet hillslope. Dotted along the coast there are small patches of harakeke-pampas flaxland on steep, rocky hillslopes (s) and harakeke-kawakawa flaxland on moderate hillslopes (t). On gentle toeslopes there is pohuehue-buffalo grass shrubland (n) and bracken-kikuyu-tall fescue-Yorkshire fog grassland (o). Coastal shrublands at the northern extremity of Bream Tail Farms support *Corokia buddleioides* (Boffa Miskell 2003).

There are minor areas of sandfield vegetation (z) on small beaches spread along the site. This vegetation comprises mostly shore bindweed with small local populations of *Carex pumila*, fathen, and sea rocket (*Cakile edentula* and *C. maritima*). *Austrofestuca littoralis* and pingao (both ranked Gradual Decline) have been planted but are not well established.

Significant flora

Streblus ?banksii x *S. heterophyllus* (*Streblus banksii* is listed as Sparse) (AK 298332), *Tetragonia tetragonoides* (Sparse) and *Chionochloa bromoides* (Range Restricted) were observed during the current survey. Mida (Gradual Decline), hard beech (regionally significant), wharariki (regionally significant), coastal maire (regionally significant), and tawapou (regionally significant) were recorded in 1993 (SSBI R08/H008), and have all been reconfirmed present in 2001, along with *Doodia mollis* (Sparse) (Lisa Forester, NRC, pers. comm.). There is one record of parapara (Sparse) at R08 541 692 in 1994 (DOC Bioweb database). *Coprosma rigida* (regionally significant) was noted in 2003 (Boffa Miskell 2003).

Fauna

North Island kaka (Nationally Endangered) and red-crowned kakariki (regionally significant) were recorded in 1993 (SSBI R08/H008) and are likely to be regularly visitors from the Hen and Chicken Islands (Taranga and Marotere Islands). Caspian tern (Nationally Vulnerable), red-billed gull (Gradual Decline) and variable oystercatcher (regionally significant) are present on the coast (Boffa Miskell 2003). This is a probable nesting area for grey-faced petrel (regionally significant) (Andrea Booth pers. comm. 2006). There are anecdotal northern blue penguin (Gradual Decline) records from 1990s (Ray Pierce pers. comm.), but not in very recent times. There are regular and repeated records of kukupa (Gradual Decline), including the present survey. Tui, NZ kingfisher, Australasian harrier, pied shag, shining cuckoo, North Island fantail and grey warbler were also recorded in the present survey.

Longfin eel (Gradual Decline), shortfin eel, banded kokopu (regionally significant), redfin bully, inanga, and koura were recorded in the main stream running south into the Mangawhai Harbour off Bream Tail in 2003 (Boffa Miskell 2003; NIWA 2007). A good diversity of sensitive aquatic macroinvertebrate taxa was also observed in this main stream (Boffa Miskell 2003). There is also a 1980 banded kokopu recorded from a small stream on the northern side of Bream Tail (NIWA 2007).

There is one record of a forest gecko from 1980, and one record of shore skink from 1984 (DOC Bioweb 2007). The land snail *Amborhytida dunni* (Gradual Decline) is known from this site (Fred Brook pers. comm.).

Significance

Bream Tail Coastal Headland comprises a unique set of habitats in Waipu ED, being the only steep rocky coastal headland with extensive cliffs and steep coastal forest. It includes a geological site of regional importance: the best exposed Miocene dacite dome of the group around Bream Tail is at R08 540 705, just south of the tip (Kenny & Hayward 1996). As a result of unique landform and geology, twenty of the twenty-six ecological units recorded are considered representative (all except (j) kanuka-totara forest, (l) kanuka-totara treeland, (n) pohuehue-buffalo grass shrubland, and (z) sandfield habitat). Condition of the forest remnants is variable, but likely to improve as more of them are fenced to exclude stock, and connected through revegetation. However there is a risk that the natural character of the site will be degraded if revegetation work is carried out with non-ecosourced plant stock, which has already occurred in small areas. High numbers of threatened flora and fauna have been recorded from this site, including the following: six threatened flora species (mida, parapara, *Doodia mollis*, *Streblus ?banksii* x *S. heterophyllus*, *Tetragonia tetragonoides*, *Chionochloa bromoides*), five regionally significant flora species (hard beech, wharariki, coastal maire, tawapou, *Coprosma rigida*), seven threatened fauna species (North Island kaka, Caspian tern, red-billed gull, kukupa, longfin eel,

Amborhytida dunni), and northern blue penguin), and four regionally significant fauna species (red-crowned kakariki, variable oystercatcher, banded kokopu and possibly grey-faced petrel). The freshwater wetlands in this site are some of the largest remaining in the ED and are one of only five natural coastal freshwater wetland sites remaining in Waipu ED (Q07/131, Q07/141, Q07/127, Q07/129 and R08/001). Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. Queen Elizabeth II Open Space Covenants on the northern coast protect 24.1 ha of forest or 9.2% of the total site area.

COVE ROAD SHRUBLAND AND FOREST

Survey no.	R08/002
Survey date	14 November 2006
Grid reference	Q08 504708 (2 remnants)
Area	20.2 ha (3.7 ha forest, 16.5 ha shrubland)
Altitude	40–80 m asl

Ecological units

- (a) Manuka shrubland on gentle hillslope (85%)
- (b) Kanuka–tanekaha forest on ridge and gentle hillslope (15%)

Landform/geology

Gentle hillslope underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises mainly manuka shrubland on gentle southwest-facing hillslopes (a) with a small area of kanuka–tanekaha forest on a low hilltop (b) near the eastern end of the site. The manuka shrubland canopy stands approximately 4 m tall and shelters a dense understorey of typical ‘gumland’ species which is dominated by tangle fern, *Schoenus tendo*, *Baumea rubiginosa*, *Gabnia xanthocarpa*, mingimingi, hangehange, and gorse. Other species present in this mixture include turutu, *Lepidosperma australe*, kumarahou, *Pomaderris amoena*, *Pratia angulata*, *Gabnia setifolia*, hound’s tongue fern and mapou. There is strong regeneration of forest trees such as kauri, tanekaha and kanuka, which occasionally pierce the canopy to 10 m height. On clay banks exposed by the Cove Road cutting there are numerous orchid species, including *Thelymitra pauciflora*, *T. longifolia*, *Orthoceras novae-zeelandiae*, *Petalochilus* sp., and *Microtis unifolia*. The site is dissected by a private road leading to a residential dwelling on the northeastern corner of the site; otherwise it is mainly bordered by pasture. A small area of similar shrubland to the north has been excluded from this site because it has been overplanted with radiata pine. Large areas of kanuka-dominant forest (within the Brynderwyn Hills Forest Complex – Part G, Q08/225g) lie nearby to the south.

Significant flora

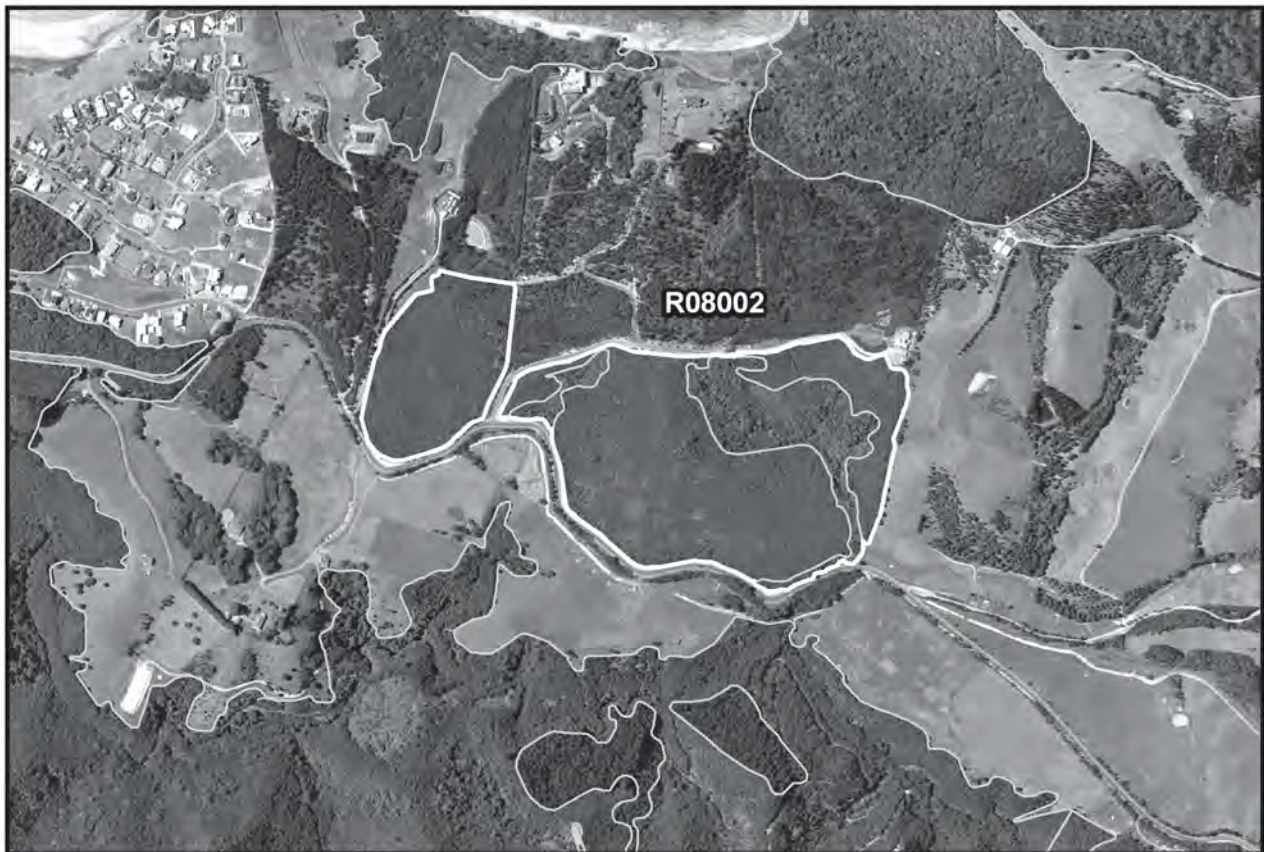
Pratia angulata (regionally significant) recorded in current survey.

Fauna

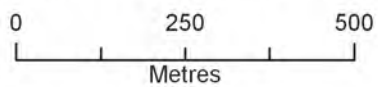
Not surveyed.

Significance

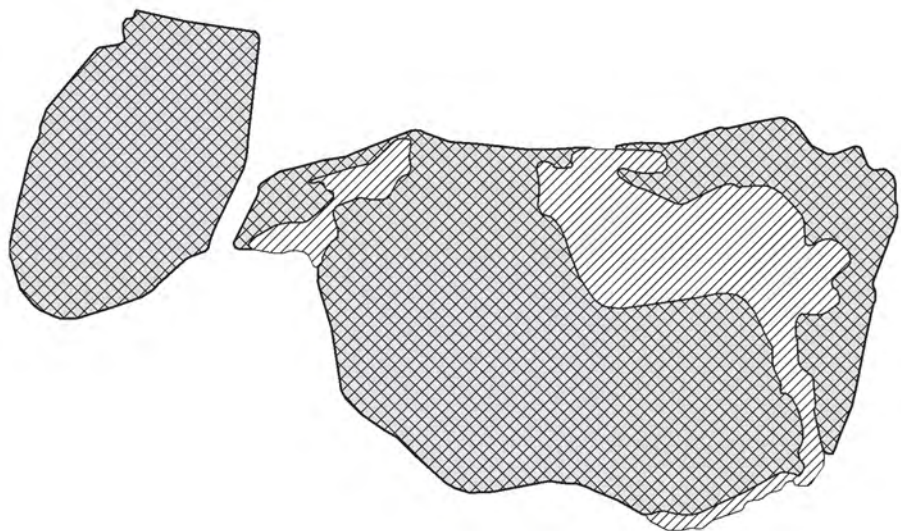
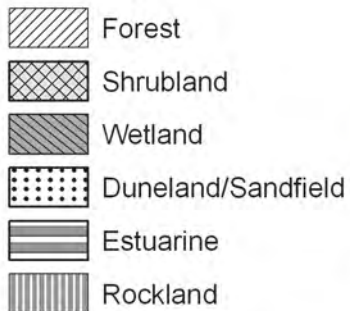
This site contains a unique and distinctive example of manuka shrubland with gumland vegetation affinities including high numbers of orchid species and a



R08/002 Cove Road Shrubland and Forest



Habitat Type



regionally significant plant species (*Pratia angulata*). Both ecological units present are considered representative: (a) manuka shrubland on gentle hillslope and (b) kanuka-tanekaha forest on ridge and gentle hillslope. Destruction of similar vegetation has occurred on the periphery of this site through overplanting with pines, and there is a private road passing through the site which divides it into two separate remnants.

4.2 LEVEL 2 SITES

The following were assessed to be Level 2 sites. These are listed in Table C, and described and mapped in the ensuing sections.

TABLE C: LIST OF LEVEL 1 SITES.

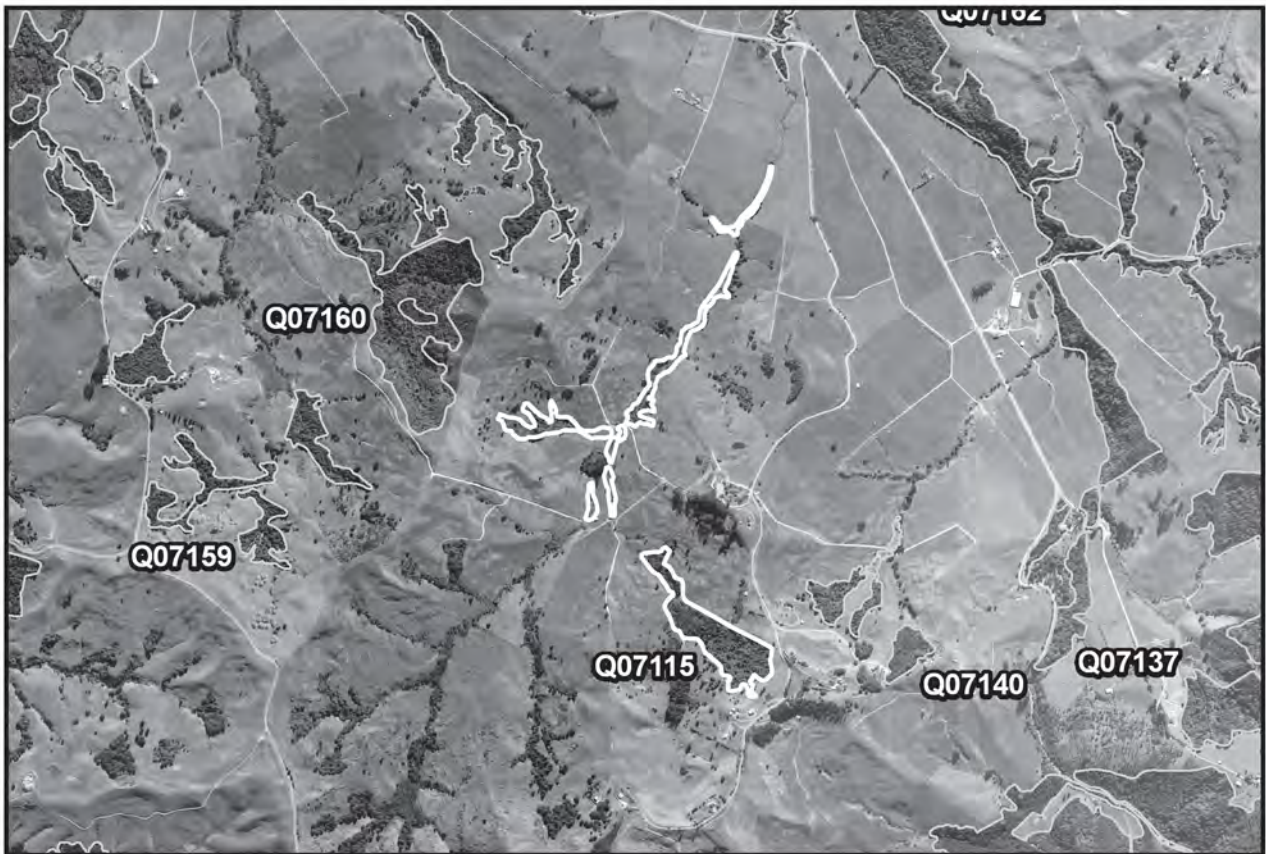
SITE NAME	SURVEY NO.	GRID REF.
Ngatoka Wetland Catchment	Q07/115	Q07 279901
Pakouhokio Knoll Forest	Q07/122	Q07 359958
Waipu Caves Road Wetland	Q07/123	Q07 364835
Crutcher Road Forest Remnants	Q07/133	Q07 252870
Reid Road Forest Remnants	Q07/134	Q07 280826
Hewlett QEII Covenant	Q07/136	Q07 371909
Mangapai Caves Road Wetland	Q07/140	Q07 285898
Sandford Road Forest Remnants	Q07/142	Q07 401875
Hayward Road Forest Remnant	Q07/146	Q07 223929
Moewhare Forest and Shrubland	Q07/147	Q07 228904
Paparoa Road Dam Forest Remnants	Q07/151	Q07 235900
Ruarangi Road Forest Remnants 3	Q07/153	Q07 259887
Ruarangi Road Wetland	Q07/154	Q07 256931
Ruarangi Mangapai Forest Remnants	Q07/155	Q07 259926
Ruarangi Road Forest Remnants 2	Q07/156	Q07 256901
Graham Road Riparian Forest Remnants	Q07/157	Q07 259910
Graham Road Forest Remnant	Q07/159	Q07 266903
Graham Road Forest and Shrubland	Q07/160	Q07 272909
Mangapai Riparian Forest Remnants	Q07/161	Q07 266936
Mill Brook Forest Remnants	Q07/165	Q07 369808
McLeod Road Forest Remnants	Q07/166	Q07 391841
Takahiwai Saltmarsh and Shrubland	Q07/167	Q07 379958
Northern Brynderwyn Hills Remnants	Q08/227	Q08 384725
Braigh Forest Remnants	Q08/229	Q08 392768
Argyll Street Forest Remnant	Q08/234	Q08 408779
Finlayson's Brook Forest Remnants	Q08/242	Q08 349749
Brooks Road Forest Remnants	Q08/243	Q08 358749
Millbrook Dam and Forest Remnants	Q08/245	Q08 284799
Shoemaker Road Forest Remnant 1	Q08/246	Q08 399796

NGATOKA WETLAND CATCHMENT

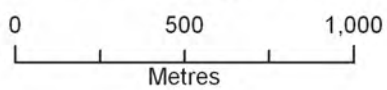
Survey no.	Q07/115
Survey date	13 November 2006
Grid reference	Q07 279901 (7 remnants)
Area	8.5 ha (5.7 ha forest, 2.8 ha wetland)
Altitude	100–162 m asl

Ecological units

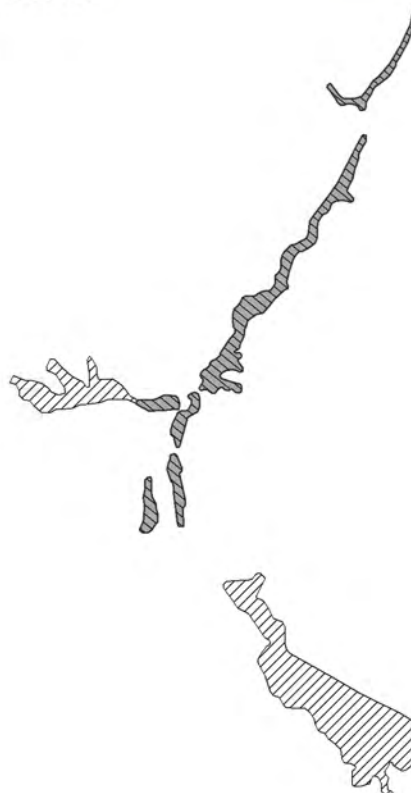
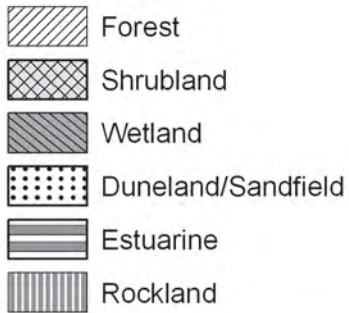
- (a) Totara forest on moderate hillslope and in gully (65%)
- (b) Raupo reedland in gully (20%)
- (c) Crack willow treeland in gully (10%)
- (d) Harakeke flaxland in gully (5%)



Q07/115 Ngatoka Wetland Catchment



Habitat Type



Landform/geology

Gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises a narrow band of vegetation adjacent to an upper tributary of the Tauraroa River. Two small forest remnants in the catchment are included in the site, the largest of which is at least partly fenced to exclude stock. The upper wetland area is covered in crack willow treeland (c) and is grazed; the lower wetland area has been fenced and planted, primarily in harakeke (d). The site was surveyed from Ngatoka Road, which allowed views of the totara forest (a) and raupo reedland (b); descriptions of the remaining vegetation types were derived from discussions with the landowner.

Fauna

Grey duck (Nationally Endangered) and grey duck-mallard hybrids reportedly breed on the farm pond adjacent to Mangapai Caves Road to the north, and may also utilise the wetland habitat within the site. Pukeko, tui and pied stilt are also present (landowner pers. comm.). Paradise shelduck, Australasian harrier, NZ kingfisher, grey warbler, North Island fantail and grey duck were recorded in 1978 (SSBI Q07/R07/H 053).

Significance

This site is one of only a very few natural or semi-natural wetlands remaining in the ED which in total cover c. 45 ha. Although still in a semi-natural state, this wetland has been modified by planting, weed invasion, and grazing, and is therefore a Level 2 site. The totara forest and crack willow treeland are grazed by cattle, and the harakeke flaxland has developed from recent plantings. The site provides some riparian protection to a tributary of the Tauraroa River. Grey duck (a threatened bird species) may use the site, but this has not been confirmed.

PAKOUHOKIO KNOLL FOREST

Survey no.	Q07/122
Survey date	15 November 2006
Grid reference	Q07 359958 (6 remnants)
Area	65.7 ha (63.1 ha forest, 2.6 ha wetland)
Altitude	2-120 m asl

Ecological units

- (a) Kanuka forest on moderate hillslope (88%)
- (b) Kanuka treeland on moderate hillslope (10%)
- (c) Raupo reedland in gully (2%)
- (d) Open water in constructed pond (<1%)

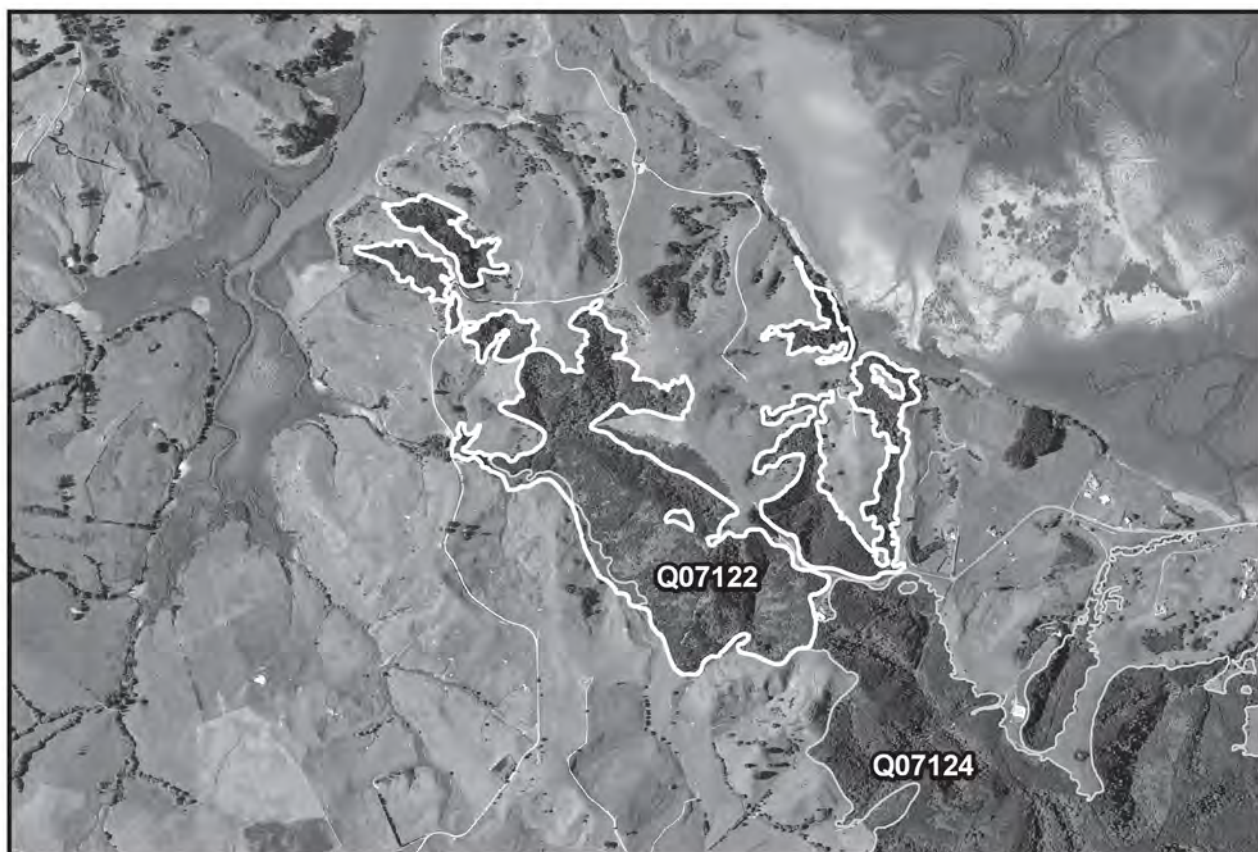
Landform/geology

Dissected hill country on Mesozoic greywacke (Waipapa Terrane).

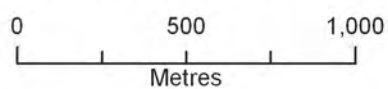
Vegetation

This site comprises a kanuka-dominant forest remnant with contiguous wetland. The site is grazed by stock and has only a sparse understorey. The wetland was created when a small stream was dammed, and includes reedland and open water.

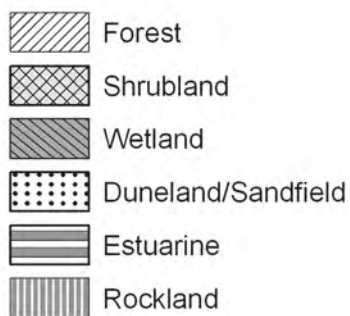
- (a) The majority of the site is secondary forest. Kanuka is dominant with frequent mamaku and occasional kauri, tanekaha, kowhai, ti kouka, rimu, kahikatea, kohekohe, rewarewa, and tarata. The kauri and tanekaha are ricker-sized trees



Q07/122 Pakouhokio Knoll Forest



Habitat Type



emergent through the kanuka canopy, and no mature podocarps or kauri are present. There are occasional exotics including woolly nightshade, radiata pine, and maritime pine.

(b) On the edges of the remnant, particularly on its northern edge in the vicinity of the road and pa sites, the kanuka forest grades into kanuka treeland. Gorse is frequent here, with occasional puriri, totara, kahikatea, rewarewa, mahoe, and ti kouka. The grazed pasture underneath and adjacent to the treeland is primarily kikuyu grass and soft brome, with occasional ratstail and paspalum.

(c) Raupo reedland occurs on the edges of the constructed pond and in the wetland that feeds into the pond. Giant spike sedge, *Polygonum* sp., and *Azolla* sp.* are frequent, with occasional ti kouka, harakeke, soft rush, and crack willow.

(d) The deeper, central areas of the constructed pond are open water with occasional *Azolla* sp.

Fauna

Paradise shelduck, welcome swallow and NZ kingfisher were present in the wetland in this present survey. A taped recording of spotless crane was played adjacent to the wetland and there was no response.

Significance

The site is not representative for any ecological unit. All of the forest and wetland areas are grazed, and emergent radiata pines are scattered throughout the site, hence Level 2 status. However, freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. The site is contiguous with the much larger Takahiwai Forest (Q07/124) and provides riparian protection for several small streams that drain into Whangarei Harbour. Three pa sites are present on the upper ridges.

WAIPU CAVES ROAD WETLAND

Survey no.	Q07/123
Survey date	15 November 2006
Grid reference	Q07 364835 (2 remnants)
Area	0.4 ha
Altitude	40 m asl

Ecological unit

(a) Raupo reedland in gully (100%)

Landform/geology

Valley floor wetlands on Holocene alluvium.

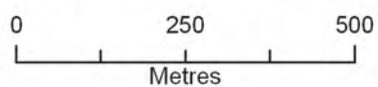
Vegetation

This site comprises two small wetland remnants in a small tributary of North River. The larger remnant, on the southern side of Mountfield Road, extends parallel to the road. A smaller remnant lies approximately 100 m northeast of this remnant, on the northern side of Mountfield Road. This site appears to have been severely reduced in extent since it was surveyed in 1978 (SSBI Q07/R07/060) and the two surviving remnants were probably once part of one large wetland. Raupo reedland (a) forms the vegetation cover with occasional wheki, karamu, and *Carex virgata*.

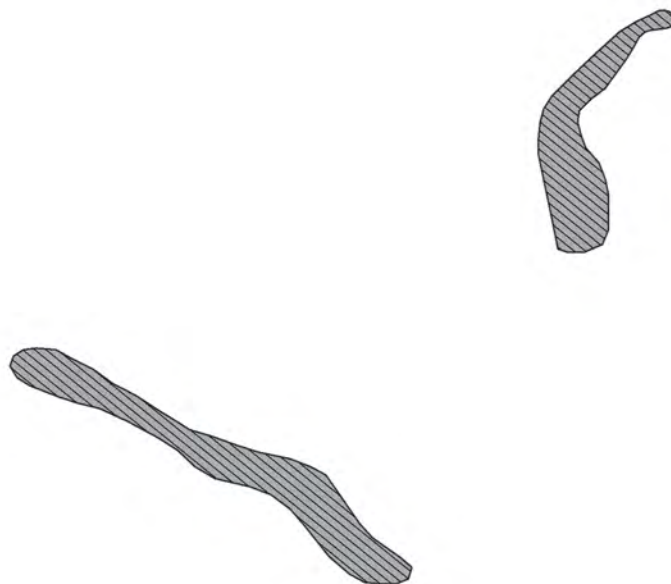
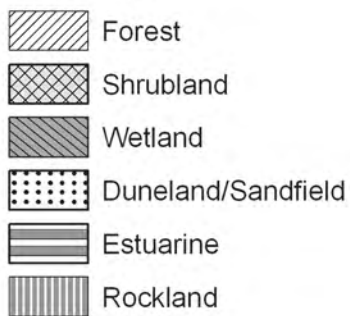
* This could be either the indigenous floating fern species (*Azolla filiculoides*) or the exotic species (*Azolla pinnata*).



Q07/123 Waipu Caves Road Wetland



Habitat Type



Fauna

Spotless crane (Sparse), marsh crane (Sparse), banded rail (Sparse), Australasian harrier, pukeko, welcome swallow, grey warbler, and North Island fantail recorded in 1978 (SSBI Q07/R07/060). A taped recording of spotless crane was played at the site during this survey and there was no response. However, the wetlands are of sufficient size to be used by spotless crane, which can move between wetlands at night (John Kendrick pers. comm.).

Significance

These two areas of raupo reedland are the small, grazed remnants of a formerly larger wetland. Freshwater wetlands have been greatly reduced in extent throughout New Zealand, and only approximately 45 ha of natural or semi-natural wetland remains in Waipu ED. The site is near the extensive forest remnants in the North River catchment (Q07/117). The site supported three threatened bird species at the time of a survey in 1978 (spotless crane, marsh crane, and banded rail) but the continued presence of these species to the present day could not be confirmed. In their current state and with current management these wetlands are not sustainable over time therefore this site is ranked as Level 2.

CRUTCHER ROAD FOREST REMNANTS

Survey no.	Q07/133
Survey date	12 November 2006
Grid reference	Q07 252870 (2 remnants)
Area	7.2 ha
Altitude	95–122 m asl

Ecological unit

(a) Totara forest on moderate hillslope and in gully (100%)

Landform/geology

Hillslope underlain by melange (undifferentiated Mangakahia and Motatau Complex lithologies).

Vegetation

The site comprises small remnants of totara forest on south-facing hillslopes and gullies above a tributary of the Waiotira Stream. Totara is abundant, with frequent nikau and kahikatea, and occasional kanuka, rewarewa, ti kouka, kauri, pukatea, mamaku and ponga. This site is not fenced and appears heavily grazed underneath. Because it is more resistant to stock impacts, totara tends to line the edges of the forest, while other more sensitive species are found behind the protective totara margin; especially within gullies, which are harder for stock to access.

Fauna

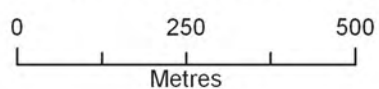
Not surveyed.

Significance

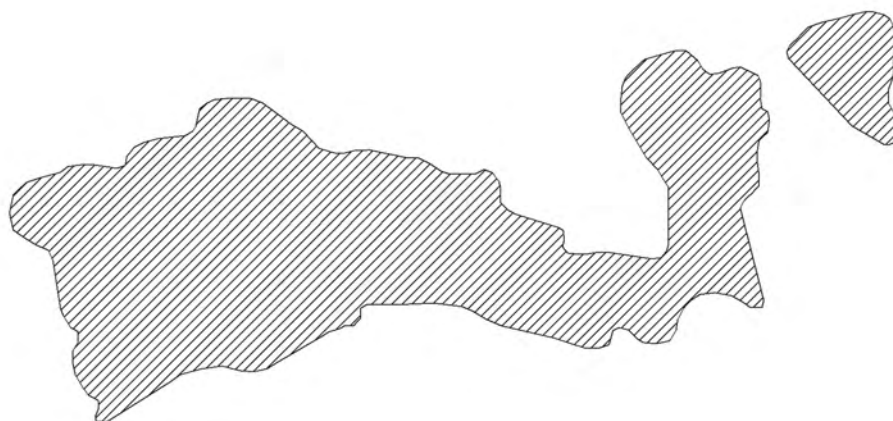
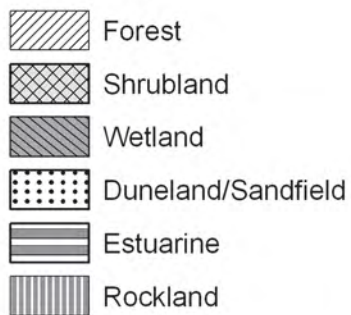
This is a relatively small, isolated site with a forest type that is relatively common. It may be part of a habitat network for mobile bird species such, as kukupa, which are able to move between multiple dispersed remnants of indigenous forest in search of food. The western hill country of Waipu ED has been mostly cleared of forest, therefore this site is at least of Level 2 significance.



Q07/133 Crutcher Road Forest Remnants



Habitat Type

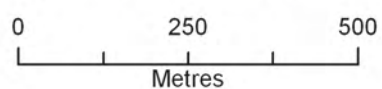


REID ROAD FOREST REMNANTS

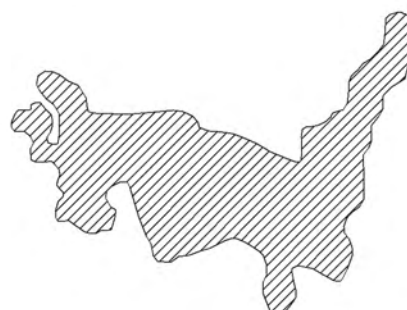
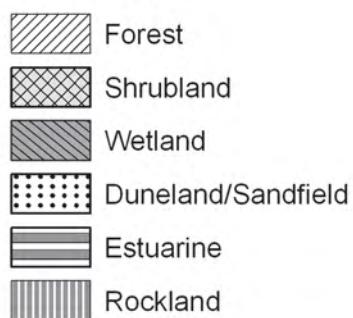
Survey no.	Q07/134
Survey date	12 November 2006
Grid reference	Q07 280826 (2 remnants)
Area	11.3 ha
Altitude	80-160 m asl



Q07/134 Reid Road Forest Remnants



Habitat Type



Ecological unit

(a) Totara-kahikatea forest on moderate hillslope and in gully (100%)

Landform/geology

Hillslopes and gully underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises two small remnants of indigenous forest on rolling hill country north of Reid Road and south of McConnell Road, set within a mosaic of open pasture and pasture with scattered totara and gorse. The northern remnant was not visible during the survey, but was judged similar to the southern remnant on the basis of aerial photographs flown in 2004. Totara and kahikatea form the main forest canopy, with frequent nikau and occasional taraire, puriri, pukatea, ti kouka, kiekie, kahakaha, *Metrosideros perforata*, and northern rata. Stock and possum impacts were visible in the southern remnant, for example the single northern rata observed was largely defoliated and almost dead.

Significant flora

Northern rata (regionally significant).

Fauna

Grey warbler.

Significance

This is a small, isolated site comprising a relatively common forest type. The western hill country of Waipu ED has been mostly cleared of forest and these remnants may be part of a habitat network for mobile bird species, such as kukupa, which are able to move between multiple dispersed remnants of indigenous forest in search of food. A regionally significant plant species (northern rata) was recorded, but it was a single individual in very poor condition which is unlikely to persist in the site under current pressures (i.e. evidently severe possum browse).

HEWLETT QEII COVENANT

Survey no.	Q07/136
Survey date	10 November 2006
Grid reference	Q07 371909
Area	2.1 ha
Altitude	20–20 m asl

Ecological unit

(a) Kahikatea treeland on alluvium (100%)

Landform/geology

Terrace on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits.

Vegetation

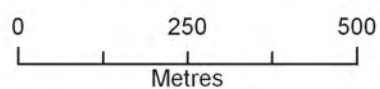
The Hewlett Queen Elizabeth II Open Space Covenant is an isolated stand of kahikatea trees with frequent puriri and totara, and occasional ti kouka, located on an alluvial terrace of the Ruakaka River. It is fenced with a five-wire post fence (no battens). The understorey appears to be largely exotic grasses and wild carrot, with frequent *Coprosma rhamnoides*, occasional arum lilies, and limited regeneration of puriri and totara. It appears that the site was fenced to exclude stock only recently.

Fauna

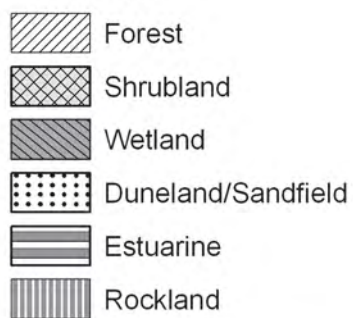
Not surveyed.



Q07/136 Hewlett QEII Covenant



Habitat Type



Significance

This is very small example of an uncommon habitat type (indigenous alluvial vegetation), but it is relatively small and the understorey is sparse. The density of the understorey is likely to increase over the next 10–20 years following recent fencing. Its location near the Ruakaka River Forest Remnants (Q07/119) will assist vegetation recovery, for example through seed dispersal by birds as they travel along the river. 82% (1.7 ha) of the site is formally protected under a Queen Elizabeth II Open Space Covenant, and the remaining unprotected trees are on the periphery.

MANGAPAI CAVES ROAD WETLAND

Survey no.	Q07/140
Survey date	13 November 2006
Grid reference	Q07 285898 (4 remnants)
Area	3.6 ha (3.2 ha forest, 0.4 ha wetland)
Altitude	120–160 m asl

Ecological units

- (a) Totara forest in gully (75%)
- (b) Raupo reedland in gully (24%)
- (c) Open water in constructed pond (1%)

Landform/geology

Gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

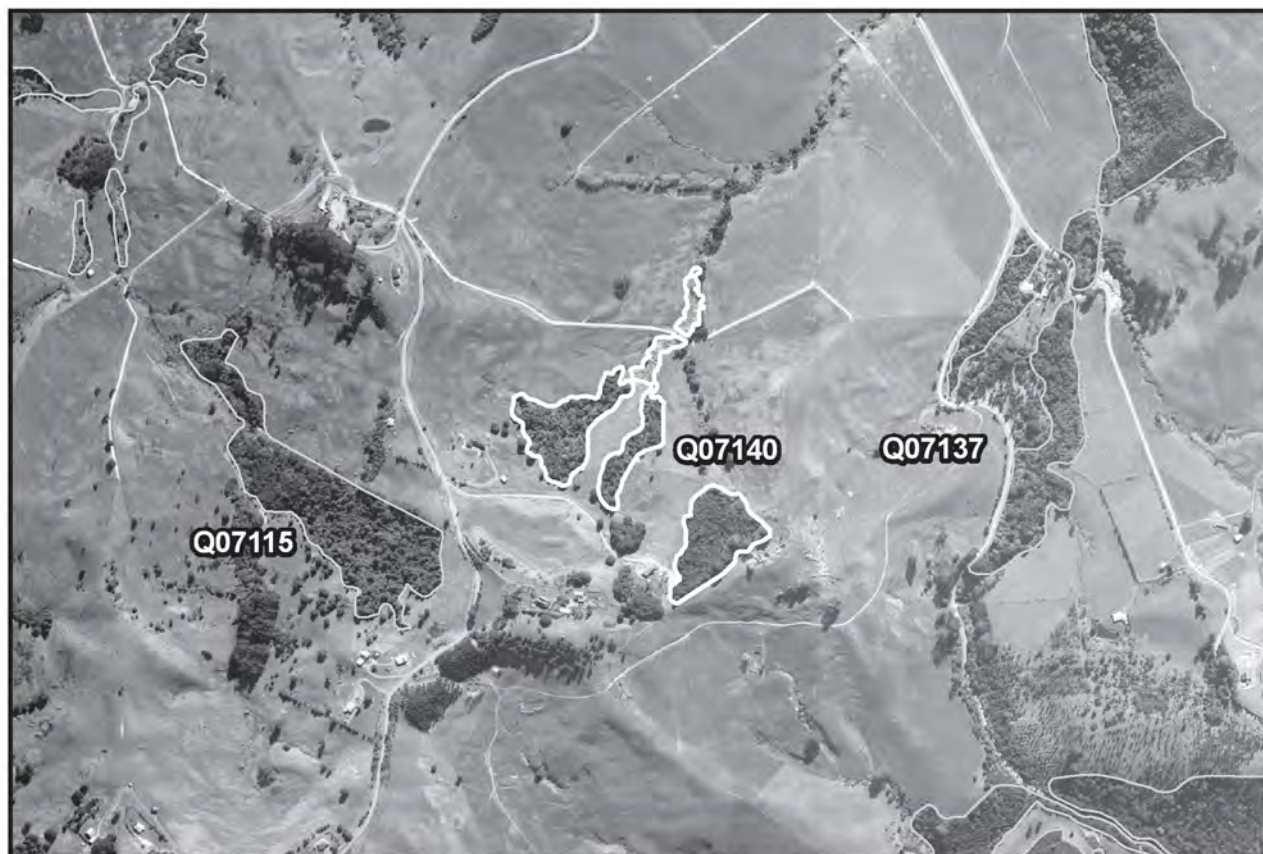
This site is a small wetland with three adjacent forest remnants in gullies surrounded by pasture. The forest remnants are at least partly fenced to exclude stock, and the raupo reedland is probably also fenced. There are three remnants of totara forest (a) in the gullies that feed into the wetland. Kanuka is frequent, with occasional ti kouka, rimu, pukatea, mamaku, kiokio, rewarewa, kauri, gorse, dally pine, macrocarpa, and radiata pine. The wetland, which includes a small area of open water (c), is covered in raupo reedland (b) with occasional arum lily, Japanese honeysuckle, ti kouka, and manuka.

Fauna

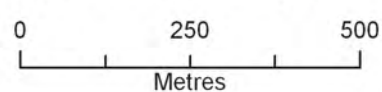
Not surveyed.

Significance

Although this site contains freshwater wetland (which is a rare habitat type in the ED), it is a Level 2 site because it is small, isolated, partly grazed by stock, and weed-infested. The wetland provides some riparian protection for a tributary of the Tauraroa River.

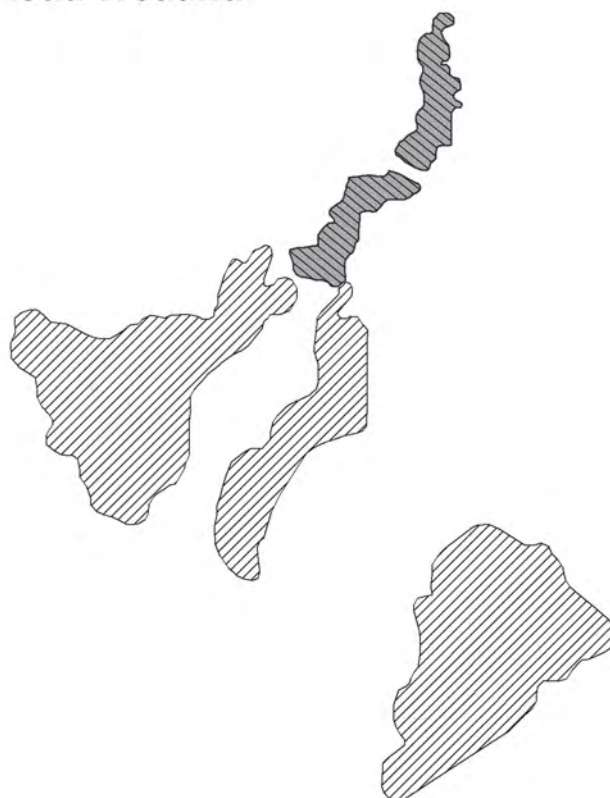


Q07/140 Mangapai Caves Road Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland

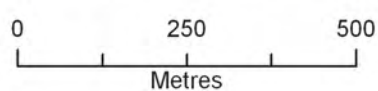


SANDFORD ROAD FOREST REMNANTS

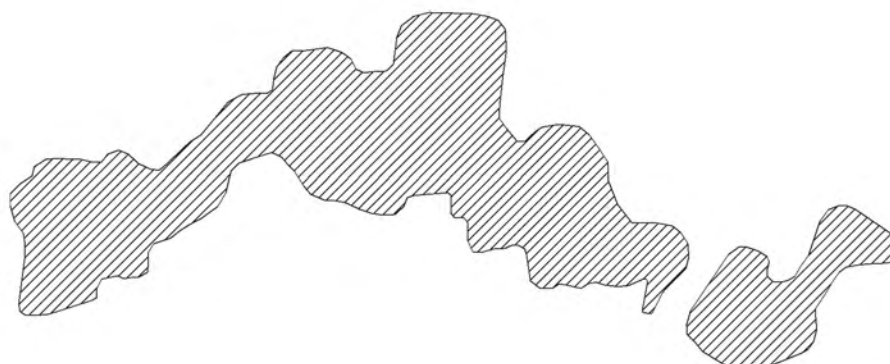
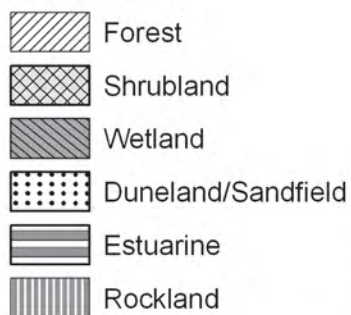
Survey no.	Q07/142
Survey date	14 November 2006
Grid reference	Q07 401875 (2 remnants)
Area	2.8 ha
Altitude	20 m asl



Q07/142 Sandford Road Forest Remnants



Habitat Type



Ecological units

(a) Totara treeland on alluvium (95%)

(b) Kahikatea-totara treeland on alluvium (5%)

Landform/geology

Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

This site comprises several small indigenous treeland remnants on the alluvial floodplain of an unnamed stream flowing through agricultural land into Doctor's Hill Road Wetland (Q07/127) and ultimately into the Ruakaka River Estuary (Q07/130). Two treeland types are present: totara treeland (a) with frequent kahikatea and puriri, and occasional karaka, kowhai, mapou, ti kouka and woolly nightshade; and kahikatea-totara treeland (b) with frequent puriri. Stock damage is evident throughout, e.g. pugging of soil and lack of understorey. Die-back of puriri crowns is also noticeable. Domesticated geese are kept in part of the site.

Fauna

Grey warbler, pukeko.

Significance

This site contains small examples of treeland on alluvium. However, whilst indigenous vegetation is now very uncommon on alluvial flats in the ED, these areas are not considered representative due to small size and general degradation. This site is one of the only forest remnants on alluvial flats near Ruakaka township, and may provide an ecological linkage between the coast and the larger forested hill country areas inland (such as Ruakaka Forest Q07/121). Approximately half the site (1.36 ha) is within a WDC-administered esplanade reserve.

HAYWARD ROAD FOREST REMNANT

Survey no.	Q07/146
Survey date	10 November 2006
Grid reference	Q07 223929
Area	1.9 ha
Altitude	60–100 m asl

Ecological unit

(a) Totara forest on moderate hillslope (100%)

Landform/geology

Hillslope underlain by melange (undifferentiated Mangakahia and Motatau Complex lithologies).

Vegetation

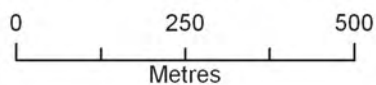
This site is an isolated forest remnant in the Tauraroa River catchment. The canopy is dominated by totara and there are occasional taraire and rewarewa. The stand probably regenerated following Maori or European clearance as no emergent podocarps are present. It is not clear whether the remnant is grazed or fenced to exclude stock.

Fauna

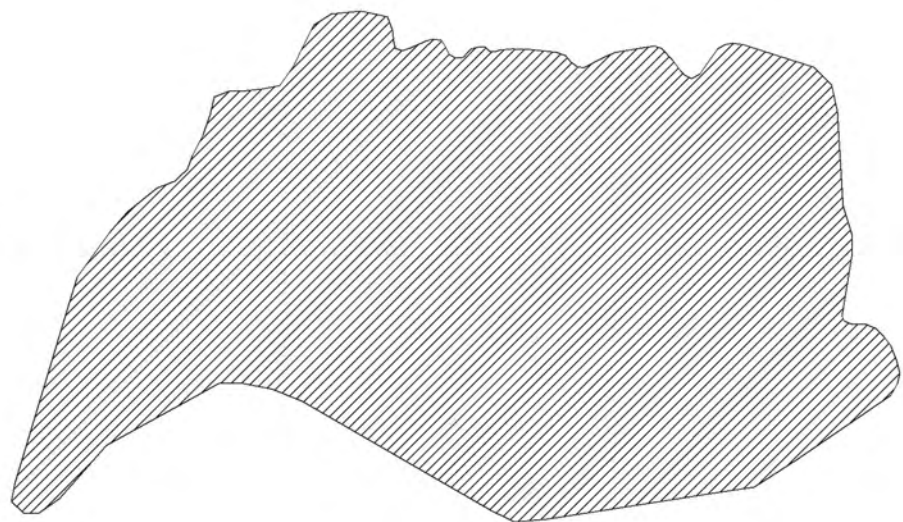
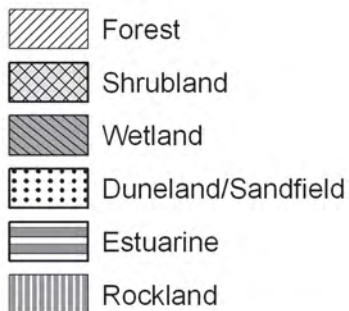
Not surveyed.



Q07/146 Hayward Road Forest Remnant



Habitat Type

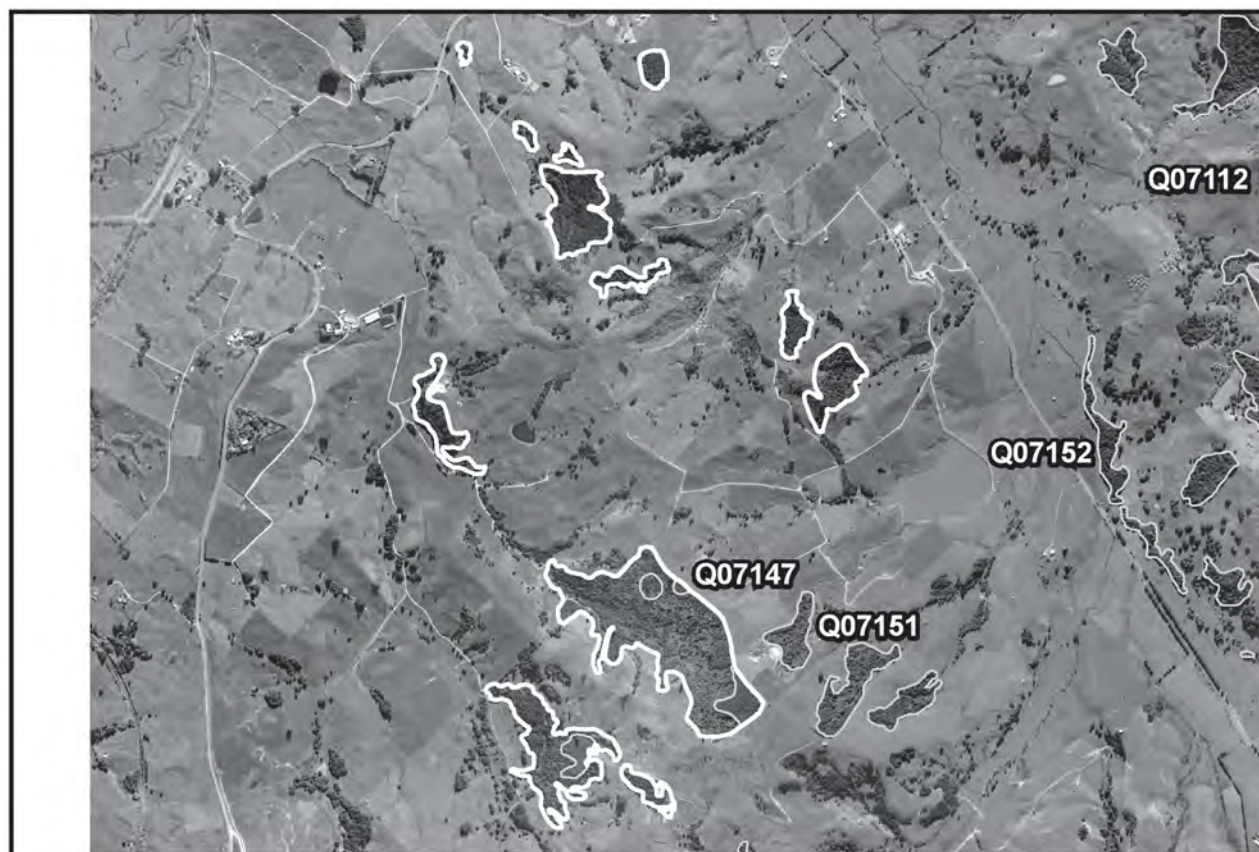


Significance

The remnant is small, secondary, and probably grazed. However, the site may be important as part of a habitat network for mobile species such as kukupa, acting as a link between the small forest remnants of the northwestern Waipu ED and larger forest areas to the west such as the Tangihua Range. The western hill country of Waipu ED has been mostly cleared of forest, therefore this site has therefore been assigned Level 2 significance, in recognition of its value as a habitat stepping stone.

MOEWHARE FOREST AND SHRUBLAND

Survey no.	Q07/147
Survey date	10 November 2006
Grid reference	Q07 228904 (13 remnants)
Area	33.6 ha (31.2 ha forest, 2.4 ha shrubland)
Altitude	60-140 m asl



Q07/147 Moewhare Forest and Shrubland

0 500 1,000
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological units

- (a) Totara-kanuka forest on moderate hillslope (50%)
- (b) Totara forest on moderate hillslope and on ridge (30%)
- (c) Manuka shrubland on gentle hillslope (11%)
- (d) Kanuka-totara forest on moderate hillslope (5%)
- (e) Kanuka forest on gentle hillslope (2%)
- (f) Manuka-ponga shrubland on moderate hillslope (1%)
- (g) Kahikatea forest in gully head (1%)
- (h) Kahikatea forest on alluvium (<1%)

Landform/geology

Hillslopes and gullies underlain by ?Mangakahia Complex mudstone.

Vegetation

This site comprises 13 forest and shrubland remnants bordered by Paparoa Road, Waiotira Road and Russek Road. The surrounding land use is pastoral farming and all of the remnants appeared to be grazed with a sparse understorey. Totara-kanuka forest (a), totara forest (b), kanuka-totara forest (d), and kanuka forest (e) occurs on hillslopes, and kahikatea forest occurs in gully heads (g) or on alluvium (h). Within these forest types, ponga, kohuhu, kanuka, ti kouka, and radiata pine are frequent or occasional. Manuka shrubland (c) and manuka-ponga shrubland (f) is present on the hill slopes, and these areas have localised infestations of pampas and black wattle. A small area of totara forest occurs on a ridge (b).

Fauna

Australasian harrier and pukeko were recorded in this survey.

Significance

This site comprises small, widely scattered, grazed examples of common forest and shrubland types, and has localised infestations of pampas and black wattle, therefore none of the ecological units are considered representative. These remnants provide some riparian protection to small streams within the upper Tauraroa River catchment, and may be a corridor for wildlife movement in a highly deforested landscape.

PAPAROA ROAD DAM FOREST REMNANTS

Survey no.	Q07/151
Survey date	10 November 2006
Grid reference	Q07 235900 (3 remnants)
Area	5.8 ha
Altitude	81-135 m asl

Ecological unit

- (a) Totara forest on moderate hillslope (100%)

Landform/geology

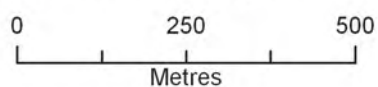
Gullies underlain by ?Mangakahia Complex mudstone.

Vegetation

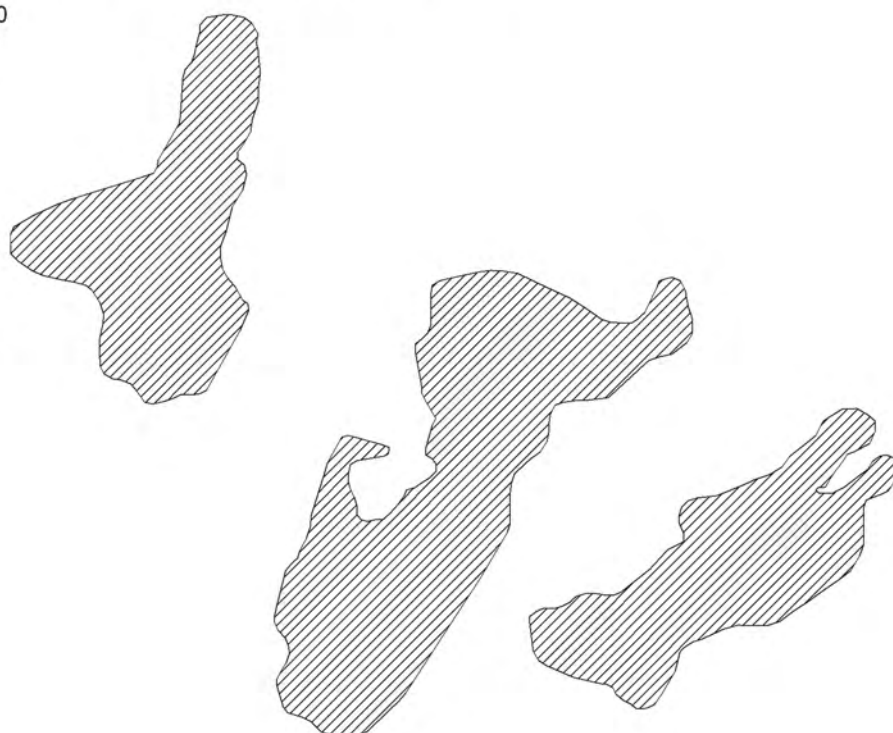
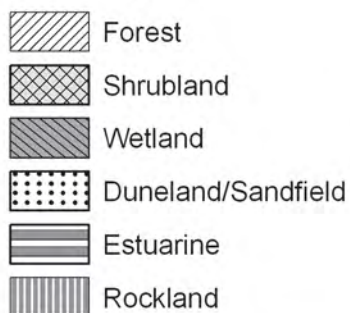
This site comprises three small forest remnants to the west of Paparoa Road near a dam. The land surrounding each of the remnants is covered in pasture. All of the



Q07/151 Paparoa Road Dam Forest Remnants



Habitat Type



remnants are totara forest (a) with frequent kahikatea and occasional tawa, rewarewa, mamaku, manuka, kanuka, kohuhu, and pampas. The site was surveyed from the road, approximately 700 m from the forest remnants, and it is not known if it is fenced.

Fauna

Not surveyed.

Significance

The site is relatively small and possibly grazed. It may be important as part of a habitat network for mobile species such as kukupa, acting as a link between the Moewhare Forest and Shrubland (Q07/147), and the Ruarangi Road Forest Remnants (Q07/112). The western hill country of Waipu ED has been mostly cleared of forest, therefore this site has therefore been assigned Level 2 significance, in recognition of its value as a habitat stepping stone.

RUARANGI ROAD FOREST REMNANTS 3

Survey no.	Q07/153
Survey date	11 November 2006
Grid reference	Q07 259887 (8 remnants)
Area	17.9 ha
Altitude	80–165 m asl

Ecological units

- (a) Totara forest in gully (50%)
- (b) Totara-radiata pine forest on moderate hillslope (20%)
- (c) Towai forest on steep hillslope (20%)
- (d) Nikau-ponga forest in gully (5%)
- (e) Nikau-ponga treeland in gully (3%)
- (f) Pukatea-kahikatea-totara forest in gully head (1%)
- (g) Kahikatea-totara forest on moderate hillslope (1%)

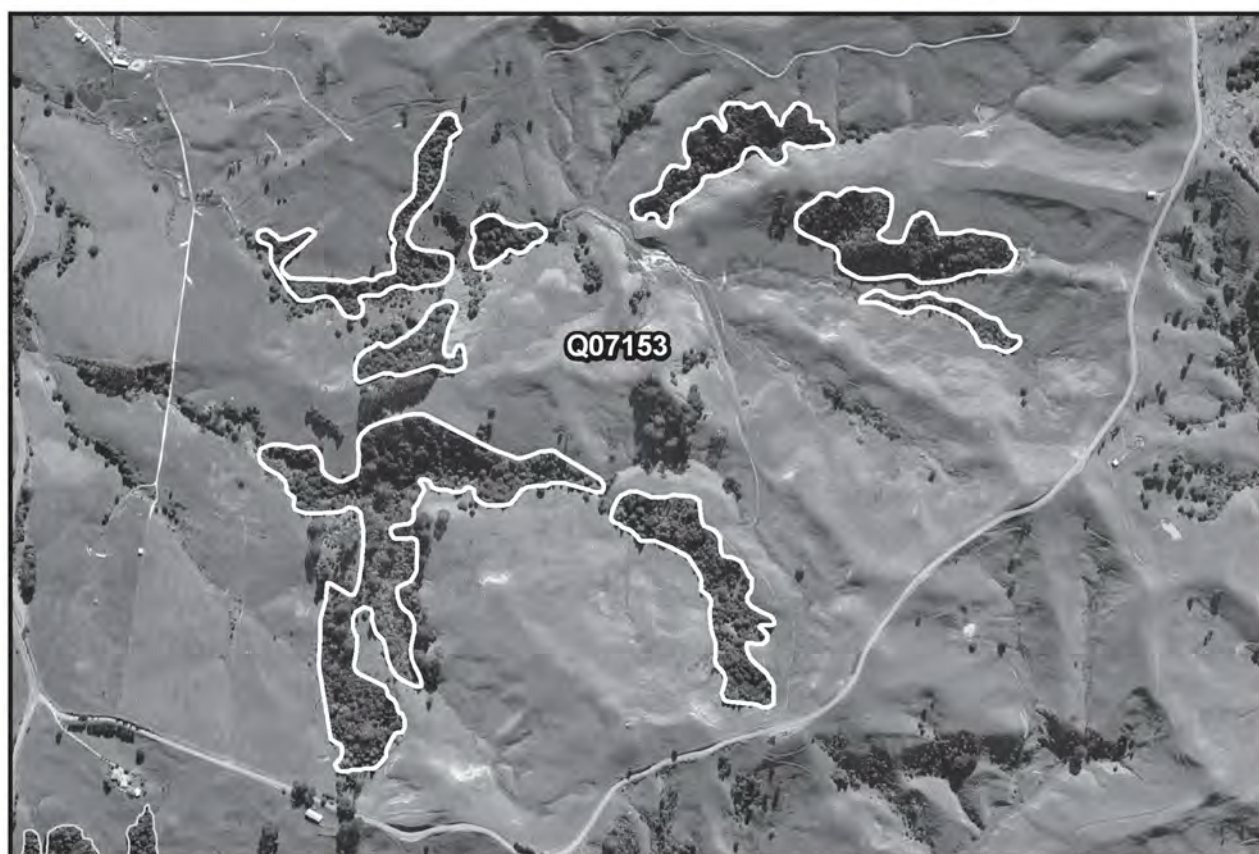
Landform/geology

Hillslopes and gullies of Mesozoic greywacke (Waipapa Terrane) and Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises eight forest remnants in the headwaters of a tributary of the Tauraroa River. The remnants are in gullies on moderately to steeply rolling farmland and all appear to be grazed. The remnants are diverse, with the dominant species changing according to topography and forest age. The absence of any mature, emergent podocarps suggests that all the remnants have regenerated following human clearance. In several places the forest remnants grade into treeland which provides important linkages between them.

- (a) The most common forest type is totara forest in gullies. Totara is abundant and kahikatea is frequent in this type. Kauri, radiata pine, ti kouka, kanuka, ponga, kohekohe, and puka are occasional.
- (b) The southwesternmost remnant is totara forest. Mature, emergent radiata pines are common, kahikatea is frequent, and rimu, towai, mamaku, ponga, and kanuka are occasional in this remnant.
- (c) The larger remnant in the east, on a steep hillslope, is towai forest with frequent totara and rewarewa. Puriri, ponga, tawa, and pukatea are occasional.
- (d) In the eastern gullies, ponga and nikau are the common forest dominants. Kanuka and pukatea are frequent, and rimu, rewarewa, and pate are occasional.

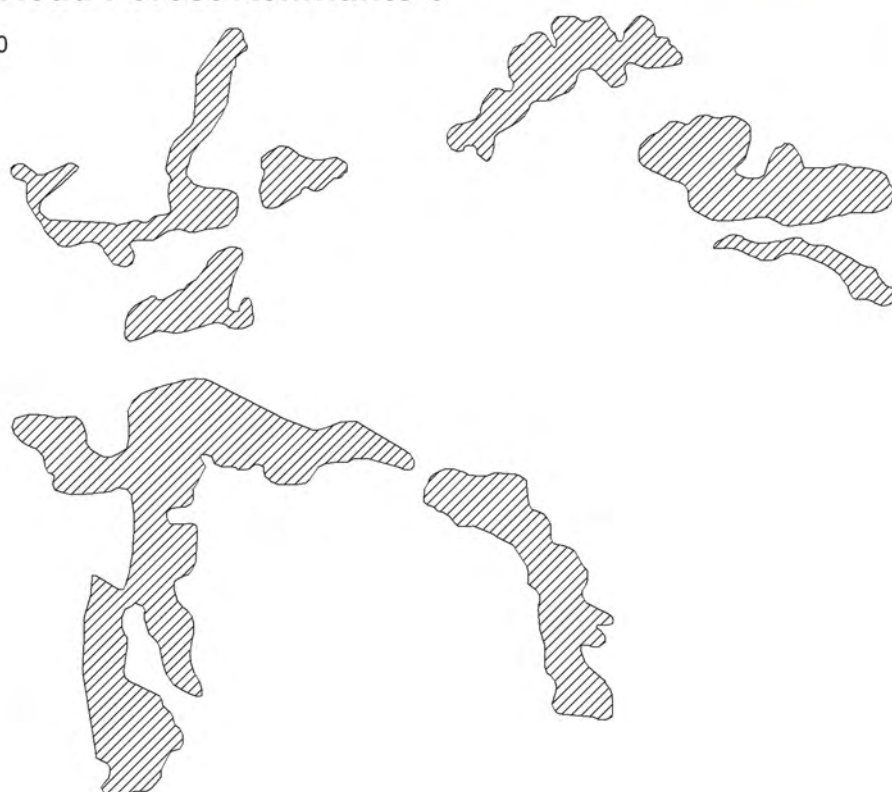


Q07/153 Ruarangi Road Forest Remnants 3

0 250 500
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



(e) The edges of the towai forest grade into ponga-nikau treeland with occasional kahikatea.

(f) In a gully head adjacent to Ruarangi Road is a small area dominated by pukatea, kahikatea and totara, with occasional nikau, ponga, lancewood, and supplejack.

(g) In the westernmost remnant, adjoining Ruarangi Road, is a small area with abundant kahikatea. Totara is common, kanuka is frequent, and mahoe, pukatea, and ponga are occasional.

Fauna

Australasian harrier was recorded in this survey.

Significance

The remnants on this site are all grazed and have been disturbed, and mature, emergent radiata pine are common in places. The linear shape of many of the individual remnants accentuates edge effects, and for these reasons this site is attributed Level 2 status. However, the present vegetation contains many elements of the diverse podocarp-broadleaf forest that formerly covered the catchment. Distinct changes in forest composition occur from gully to ridge, reflective of soil moisture and forest age. The remnants are also form part of a habitat network of forest patches that allow mobile forest bird species such as kukupa to move and feed across the landscape.

RUARANGI ROAD WETLAND

Survey no.	Q07/154
Survey date	11 November 2006
Grid reference	Q07 256931 (2 remnants)
Area	0.5 ha
Altitude	83–101 m asl

Ecological unit

(a) Raupo reedland in gully (100%)

Landform/geology

Gully in Miocene sandy mudstone (Waitemata Group), with Holocene alluvium on valley floor.

Vegetation

This site comprises two small areas of raupo reedland (a) with occasional pampas and gorse. The northern wetland is at least partly fenced. A small constructed pond, not included in the site, is located to the southwest of the southern wetland. The surrounding land is covered in pasture with occasional scattered trees including eucalyptus, ti kouka, mahoe, and macrocarpa.

Fauna

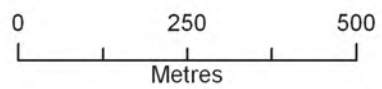
Not surveyed.

Significance

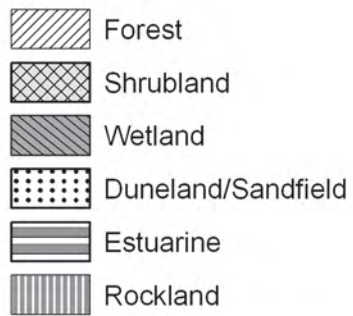
Few wetlands remain in the northwestern part of Waipu ED, and only two wetlands seen in this part of the ED were fenced or partly fenced to exclude stock. Most natural freshwater wetlands which were present in the ED have been drained or modified, and now only approximately 45 ha of natural or semi-natural wetland remains, but this wetland is small, isolated, and has infestations of pampas and gorse, and therefore is a Level 2 site. Only one part of the wetland has been fenced to exclude stock.



Q07/154 Ruarangi Road Wetland



Habitat Type

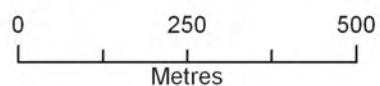


RUARANGI MANGAPAI FOREST REMNANTS

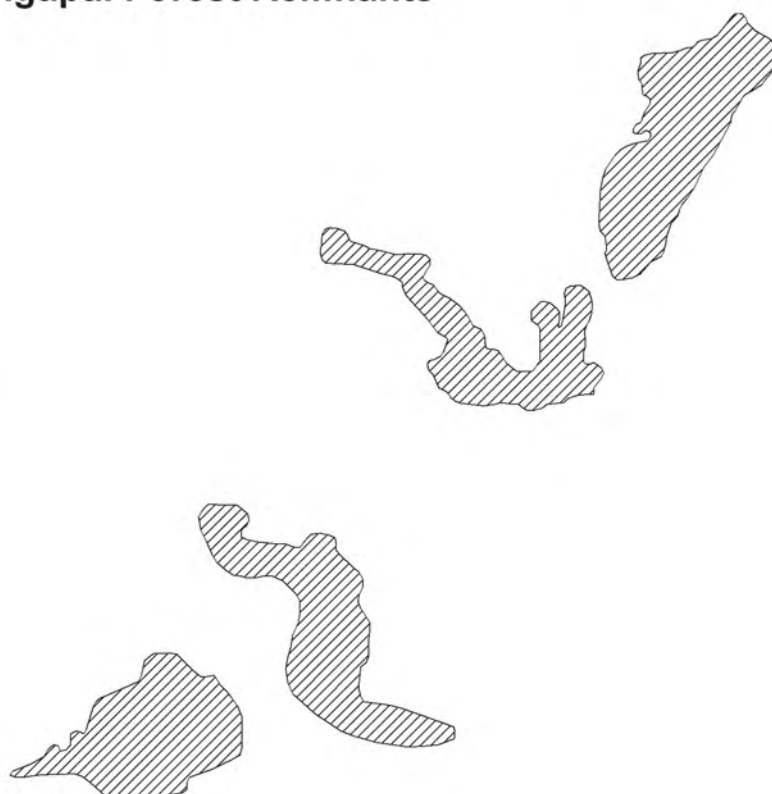
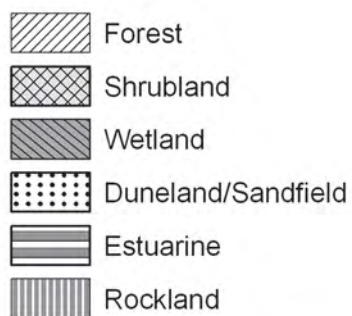
Survey no.	Q07/155
Survey date	11 November 2006
Grid reference	Q07 259926 (4 remnants)
Area	7.3 ha
Altitude	80-130 m asl



Q07/155 Ruarangi Mangapai Forest Remnants



Habitat Type



Ecological units

- (a) Totara-kanuka forest in gully (60%)
- (b) Totara-kahikatea forest on gentle hillslope (40%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises four forest remnants between Mangapai Caves Road and Ruarangi Road, in the catchment of a tributary of the Tauraroa River. The surrounding land use is primarily pastoral farming, but the two southern remnants are linked by a band of mixed indigenous and exotic treeland, and the northern remnants are similarly linked. Crack willows along the adjacent stream links the two southern remnants and the two northern remnants. The presence or absence of fencing to exclude stock could not be determined from the road.

(a) The three northernmost remnants are in gullies. Totara and kanuka are common, and mamaku is frequent. A diverse range of indigenous species are occasional, including taraire, rewarewa, rimu, tawa, nikau, mahoe, ponga, titoki, kowhai, kohuhu, and pate.

(b) The southernmost remnant, on a gentle hillslope, is dominated by totara and kahikatea, with occasional rimu, kanuka, ti kouka, and mahoe.

Fauna

Two kukupa (Gradual Decline) were seen in the northernmost remnant.

Significance

The indigenous forest remnants within this site and the surrounding exotic vegetation act as corridors for forest bird species moving between Q07/112, Q07/114, Q07/157, and Q07/161. Although two kukupa (a threatened bird species) have been recorded in this site, this site does not warrant Level 1 significance between it is not considered to be of sufficient quality to be a key habitat for this species. The remnants are small, probably grazed, and are not representative of their ecological units.

RUARANGI ROAD FOREST REMNANTS 2

Survey no.	Q07/156
Survey date	11 November 2006
Grid reference	Q07 256901 (5 remnants)
Area	6.4 ha
Altitude	100–160 m asl

Ecological units

- (a) Totara forest on moderate to steep hillslope (63%)
- (b) Taraire-kahikatea forest in gully head (25%)
- (c) Totara-taraire forest on moderate hillslope (12%)

Landform/geology

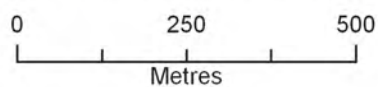
Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

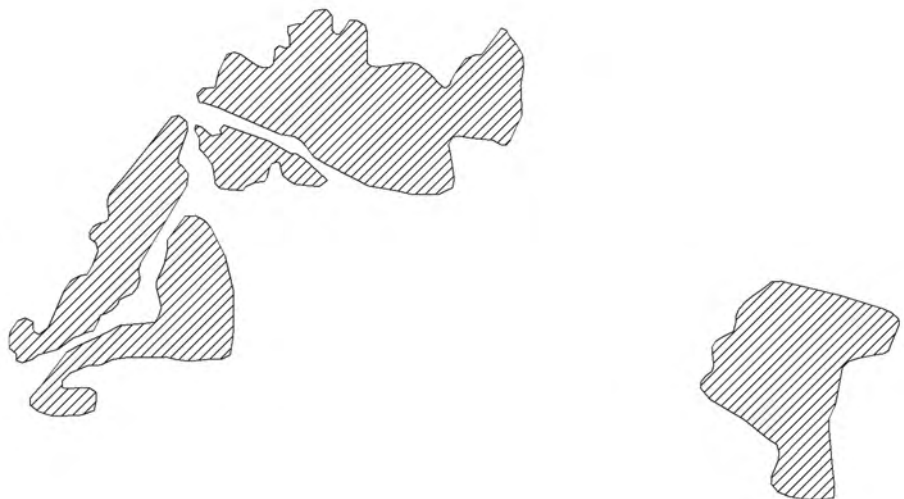
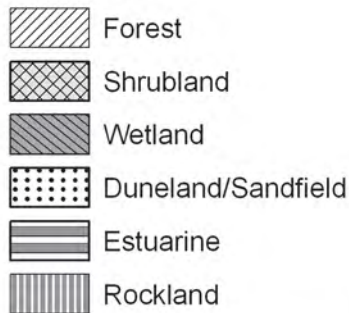
The site comprises five forest remnants located near the 179 m highpoint on Ruarangi Road. The forest remnants are within 1 km of the southernmost part of the Ruarangi



Q07/156 Ruarangi Road Forest Remnants 2



Habitat Type



Road Forest Remnants (Q07/112) and the northernmost remnant is very close to the head of the Graham Road Riparian Forest Remnants (Q07/157). All remnants are grazed with a sparse understorey, except where the Ruarangi Road passes through the northernmost remnant. On the roadside where stock are excluded is an established understorey of mahoe, ponga, nikau, houhere, kohekohe, taraire, lancewood, mapou, supplejack, and *Melicytus micranthus*. Kohekohe were heavily possum-browsed, with some of the trees having few leaves remaining. Except for the

easternmost remnant, which has emergent kahikatea, tree size and the lack of emergent podocarps suggests that most of the remnants regenerated following human clearance.

(a) The northernmost western remnant comprises totara forest with occasional puriri, kahikatea, and nikau. The remnant on the northern side of the road is also totara forest, with frequent kahikatea and taraire, and occasional houhere, mahoe, mapou, rewarewa, nikau, kohekohe, *Metrosideros fulgens*, rimu, and *Melicytus micranthus*.

(b) The southernmost of the two western remnants is totara forest within which taraire is common, puriri is frequent, and nikau, karaka, and titoki are occasional.

(c) The easternmost remnant is in a south-facing gully head. Taraire and kahikatea are common, pukatea is frequent, and tawa, rewarewa, ponga, nikau, kohekohe, and totara are occasional. There is some dieback of taraire, particularly on the edges of the remnant.

Fauna

Not surveyed.

Significance

All of the remnants are grazed with a sparse understorey, and dieback is occurring on some of the edges. However, one of the remnants has mature, emergent kahikatea which are very uncommon in Waipu ED, therefore this site has been assigned to Level 2 significance. The northernmost remnant is contiguous with the Graham Road Riparian Forest Remnant (Q07/157).

GRAHAM ROAD RIPARIAN FOREST REMNANTS

Survey no.	Q07/157
Survey date	11 November 2006
Grid reference	Q07 259910 (6 remnants)
Area	16.3 ha
Altitude	100–140 m asl

Ecological units

(a) Totara forest in gully (55%)

(b) Totara-kanuka-mamaku forest in gully (45%)

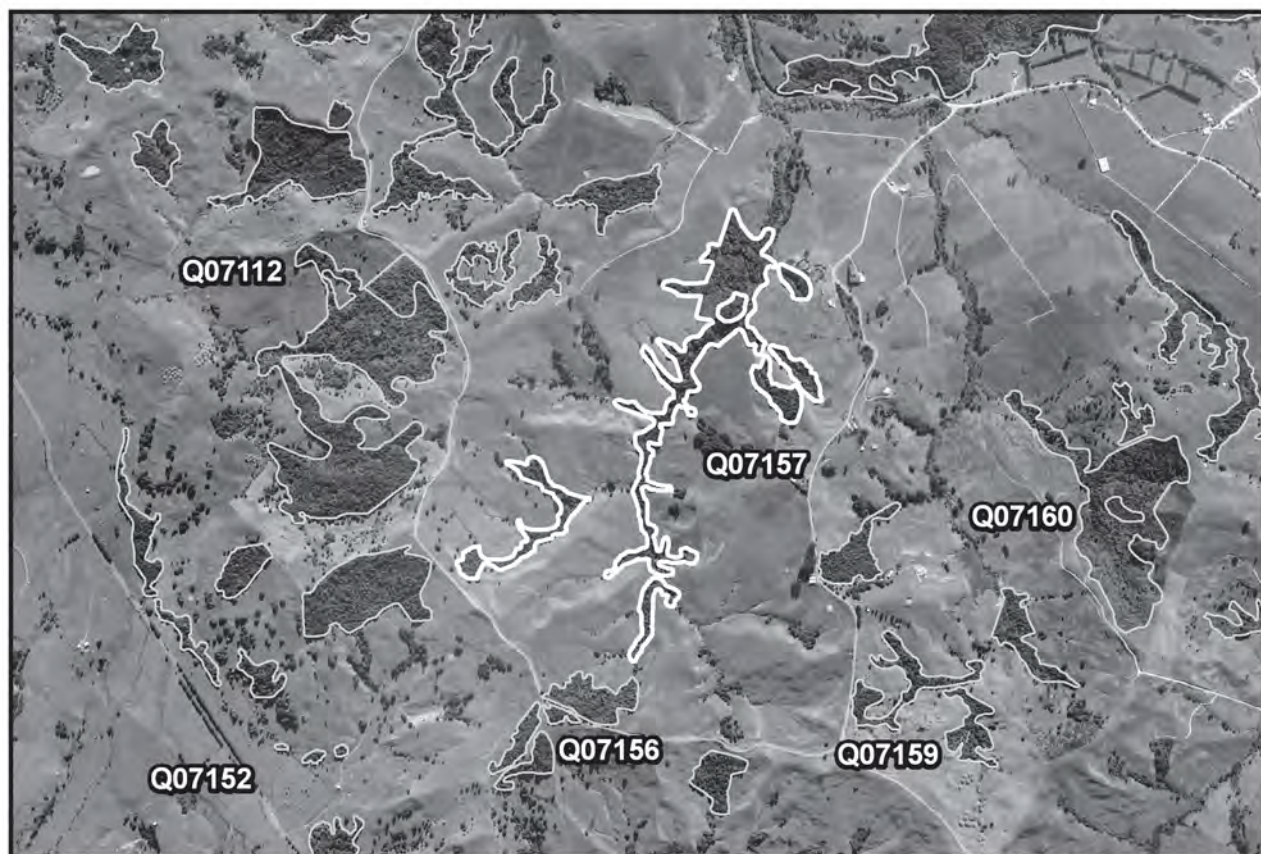
Landform/geology

Gullies underlain by Miocene sandy mudstone (Waitemata Group).

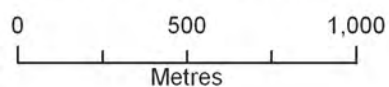
Vegetation

This site, which lies between Graham Road and Ruarangi Road, comprises a group of six forest remnants in a tributary of the upper Tauraroa River. The site is narrow in places, and runs for approximately 1.4 km alongside the stream, with 10–100 m sections of pasture between the remnants. Tongues of forest extend up into small adjacent gullies. The absence of mature, emergent podocarps suggests that the forest has regenerated following human clearance, and the entire remnant appears to be grazed.

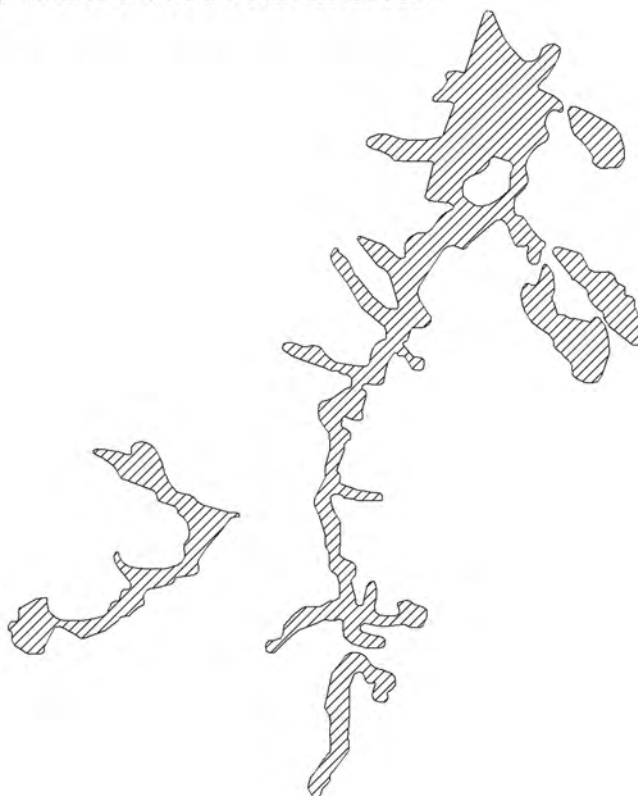
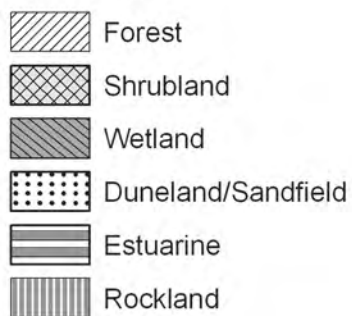
(a) Totara forest is dominant in the upper part of the gully with occasional kanuka, kahikatea, mamaku, ponga, rewarewa, pukatea, taraire, puriri, and puka.



Q07/157 Graham Road Riparian Forest Remnants



Habitat Type



(b) The lower (northern) end of the site is also dominated by totara, but is more diverse. Kanuka and mamaku are common, kahikatea is frequent, and rewarewa, pukatea, kauri, rimu, mahoe, radiata pine, crack willow, and black wattle are

occasional. Stands of macrocarpa within or adjacent to the remnant have been excluded from the site. The northern end of the site grades into a narrow band of crack willow-dominated vegetation that links to the Pokapu Hill Forest Remnant (Q07/114) and the Ruarangi Mangapai Forest Remnants (Q07/155).

Fauna

Australasian harrier was recorded during this survey.

Significance

All of the remnants are grazed and there are occasional radiata pine, crack willow, and black wattle. The remnants provide riparian protection to a tributary of the Tauraroa River, and are linked by crack willow alongside the tributary to Pokapu Hill Forest (Q07/114) and the Ruarangi Mangapai Forest Remnants (Q07/155).

GRAHAM ROAD FOREST REMNANTS

Survey no.	Q07/159
Survey date	11 November 2006
Grid reference	Q07 266903 (4 remnants)
Area	8.8 ha
Altitude	100–160 m asl

Ecological unit(s)

(a) Totara forest in gully head (100%)

Landform/geology

Gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

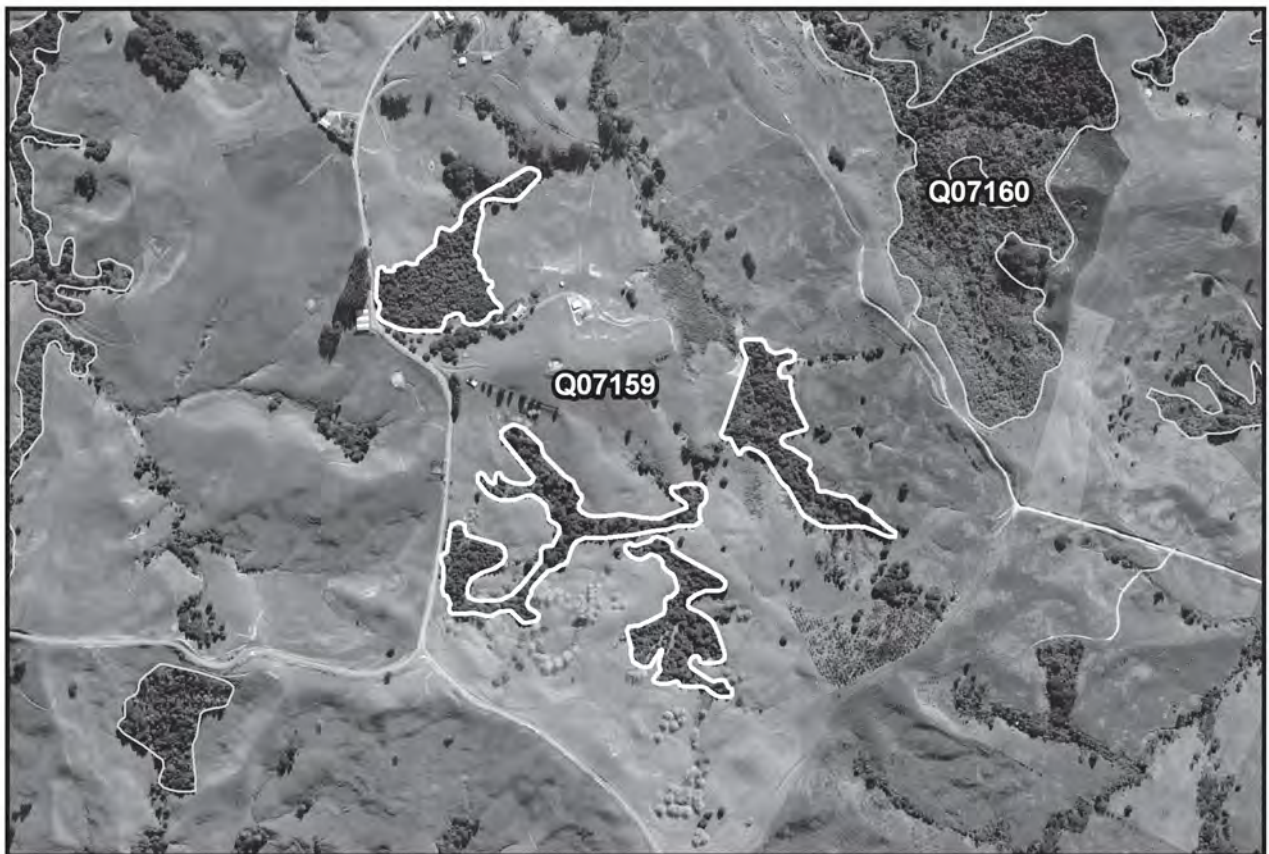
This site comprises four small remnants of totara forest (a) to the east of Graham Road. Kahikatea is common, and puriri, taraire, and rimu are occasional. The surrounding land is covered in pasture with occasional totara trees. The remnants are heavily grazed and have a sparse understorey.

Fauna

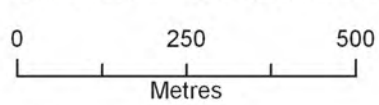
Shining cuckoo was recorded during this survey.

Significance

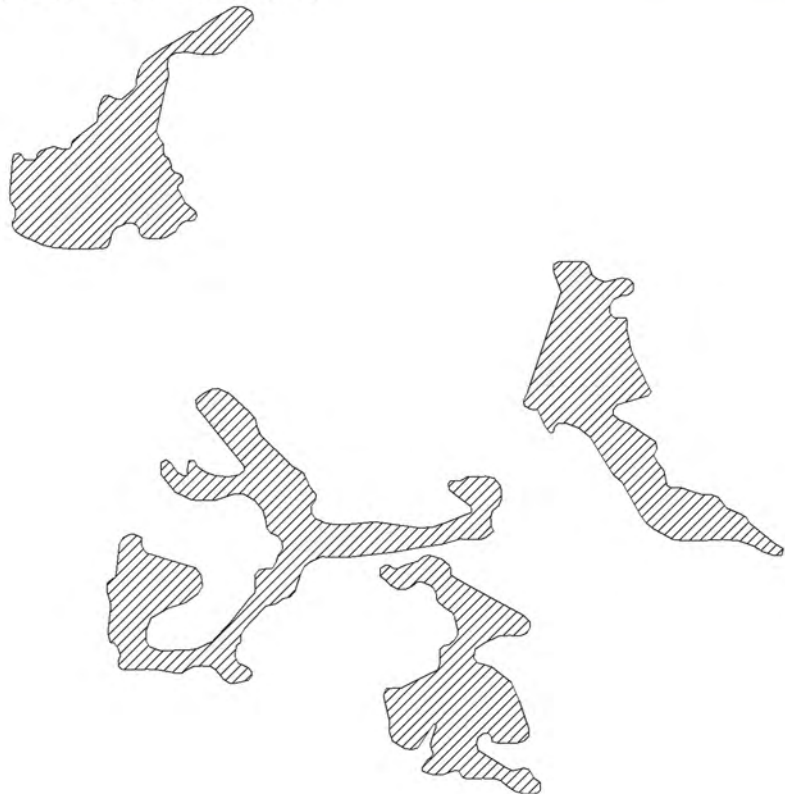
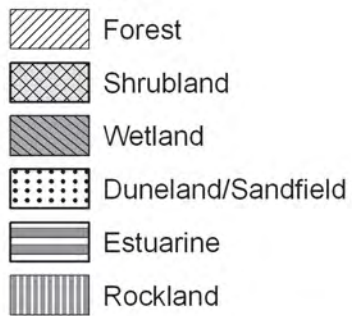
The remnants are grazed and have a sparse understorey. However, the site is linked by crack willow treeland to the Graham Road Riparian Forest Remnants (Q07/157), and Graham Road Forest and Shrubland (Q07/160) and may form part of a habitat network for mobile bird species such as kukupa.



Q07/159 Graham Road Forest Remnants



Habitat Type



GRAHAM ROAD FOREST AND SHRUBLAND

Survey no.	Q07/160
Survey date	11 November 2006
Grid reference	Q07 272909 (4 remnants)
Area	19.7 ha (19.3 ha forest, 0.4 ha shrubland)
Altitude	100–161 m asl

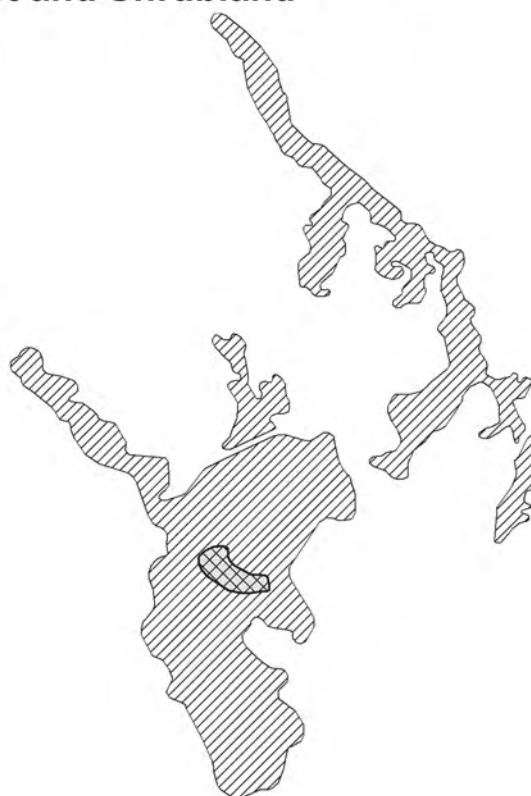


Q07/160 Graham Road Forest and Shrubland

0 500 1,000
Metres

Habitat Type

- Forest
- Shrubland
- Wetland
- Duneland/Sandfield
- Estuarine
- Rockland



Ecological units

- (a) Totara forest on moderate hillslope (72%)
- (b) Kahikatea forest in gully head (15%)
- (c) Totara-mamaku forest on moderate hillslope (8%)
- (d) Manuka shrubland on moderate hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site encompasses a group of forest remnants in a northwest facing gully. From the survey location, it was unclear if the site was fenced. The surrounding land is covered in pasture with scattered totara trees, a small radiata pine forest along the eastern edge of the remnant, and crack willow treeland in the gullies. The willows link the site with Pokapu Hill Forest (Q07/114) and other remnants to the north.

- (a) The majority of the remnants are totara forest with frequent mamaku, towai and radiata pine, and occasional kanuka, taraire, nikau, and ti kouka.
- (b) A gully head is dominated by kahikatea, with occasional taraire and ti kouka.
- (c) On the northern and southwestern edges totara is abundant, mamaku is common, puriri and kanuka are frequent, and kahikatea, ti kouka, and mahoe are occasional.
- (d) Scattered throughout are small areas of manuka shrubland with frequent totara and occasional mamaku and ponga.

Fauna

Not surveyed.

Significance

The largest remnant has a compact shape and covers the upper catchment of a stream that flows into the Tauraroa River. All of the remnants are probably grazed, and radiata pine occurs as a canopy emergent. The site is linked by exotic vegetation to larger forest remnants to the north, and may form part of a habitat network for mobile bird species such as kukupa.

MANGAPAI RIPARIAN FOREST REMNANTS

Survey no.	Q07/161
Survey date	13 November 2006
Grid reference	Q07 266936 (4 remnants)
Area	7.7 ha
Altitude	80–84 m asl

Ecological unit

- (a) Totara forest on alluvium (100%)

Landform/geology

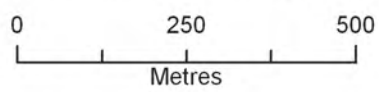
River flats on Holocene alluvium.

Vegetation

This site comprises a narrow band of riparian forest growing alongside a tributary of the Tauraroa River. The site is approximately 1.1 km long, and at its maximum width, approximately 100 m wide. The surrounding land is primarily covered in pasture,



Q07/161 Mangapai Riparian Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



except for the northern end which is adjacent to the sports fields of Mangapai Domain Recreation Reserve, and at the southern end, where the remnant runs alongside Mangapai Caves Road. The remnants are totara forest (a) with frequent titoki and kanuka. A diverse range of species are occasionally present including kowhai, small-leaved milktree, ti kouka, karaka, mapou, harakeke, houhere, mahoe and ponga. Hawthorn, Japanese honeysuckle and crack willow are occasional, as are large, presumably planted, macrocarpa and eucalyptus. The only area from which stock are excluded is the southern end between the river and the road. At this location the understorey has a dense carpet of tradescantia, and small-leaved milktree is common in the subcanopy.

Fauna

Australasian harrier and pukeko were recorded during this survey.

Significance

Forest on alluvium is under-represented in Waipu ED, but this site is a Level 2 site because the remnants are grazed, and the understorey is sparse. The one exception is a small roadside area that has an established understorey, but there is a dense weed infestation of tradescantia. All of the remnants are narrow with strong edge effects. The vegetation provides riparian protection to a tributary of the Tauraroa River, and crack willow alongside this tributary links the site to forest remnants upstream (Q07/114, Q07/155). 0.4 ha is in a recreation reserve (DOC-administered) and 0.3 ha is in an esplanade reserve (WDC-administered) (together these comprise c.10% of the remnant).

MILL BROOK FOREST REMNANTS

Survey no.	Q07/165
Survey date	15 November 2006
Grid reference	Q07 369808 (3 remnants)
Area	34.2 ha
Altitude	20–100 m asl

Ecological unit

(a) Totara forest on alluvium (100%)

Landform/geology

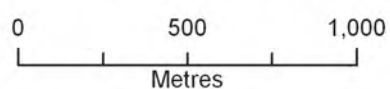
Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

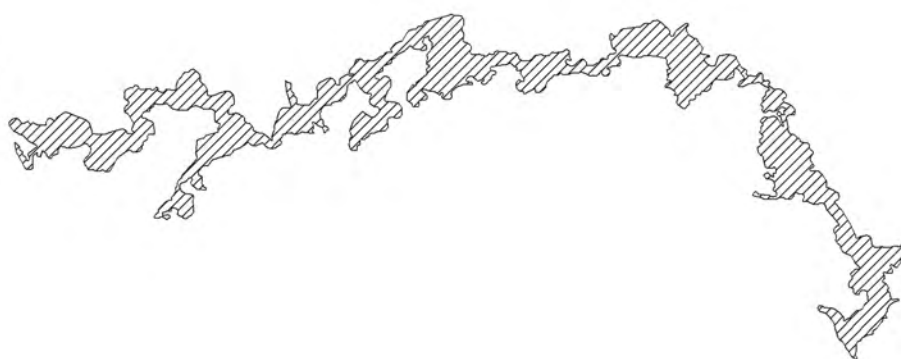
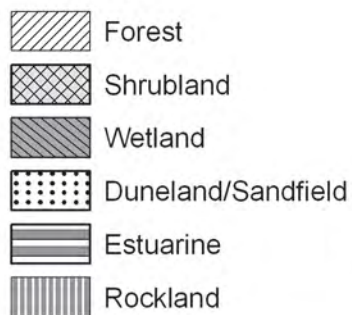
The Mill Brook forest remnants form a band of totara forest (a) that follows the course of Mill Brook for approximately 3 km upstream of Millbridge Road. Kanuka is frequent with occasional taraire, ti kouka, matai, manuka, puriri, kowhai, houhere, mapou, rimu, ponga, crack willow, and radiata pine. The absence of mature, emergent podocarps suggests that the remnants are entirely secondary. The surrounding land use is pastoral farming and the remnants, except for some of the road side edges, are grazed. Stock are excluded from one remnant between the river and the road at the corner of Mill Brook Road and Millbridge Road; at this location the edge of the forest is severely infested with tradescantia, Chinese privet, and garden



Q07/165 Mill Brook Forest Remnants



Habitat Type



nasturtium. The remnants are approximately 700 m from the extensive Ahuroa Road Forest Remnants (Q08/224) and Mareretu Forest (Q08/220).

Fauna

Grey warbler, NZ kingfisher.

Significance

Alluvial forest is now severely reduced in extent in Waipu ED, and this site is the second largest area of totara forest on alluvium in the ED, but these remnants are grazed with a sparse understorey and localised infestations of weeds such as crack willow, radiata pine, Chinese privet, and tradescantia. 0.2 ha of the site is in an esplanade reserve (WDC-administered).

McLEOD ROAD FOREST REMNANTS

Survey no.	Q07/166
Survey date	Not surveyed
Grid reference	Q07 391841 (5 remnants)
Area	34.6 ha
Altitude	33-97 m asl

Ecological units

- (a) Kanuka forest on moderate hillslope and ridge
- (b) Kanuka-mamaku forest on moderate hillslope and in gully
- (c) Totara forest on moderate hillslope

Landform/geology

Hillslopes and gullies underlain by Mesozoic greywacke (Waipapa Terrane).

Vegetation

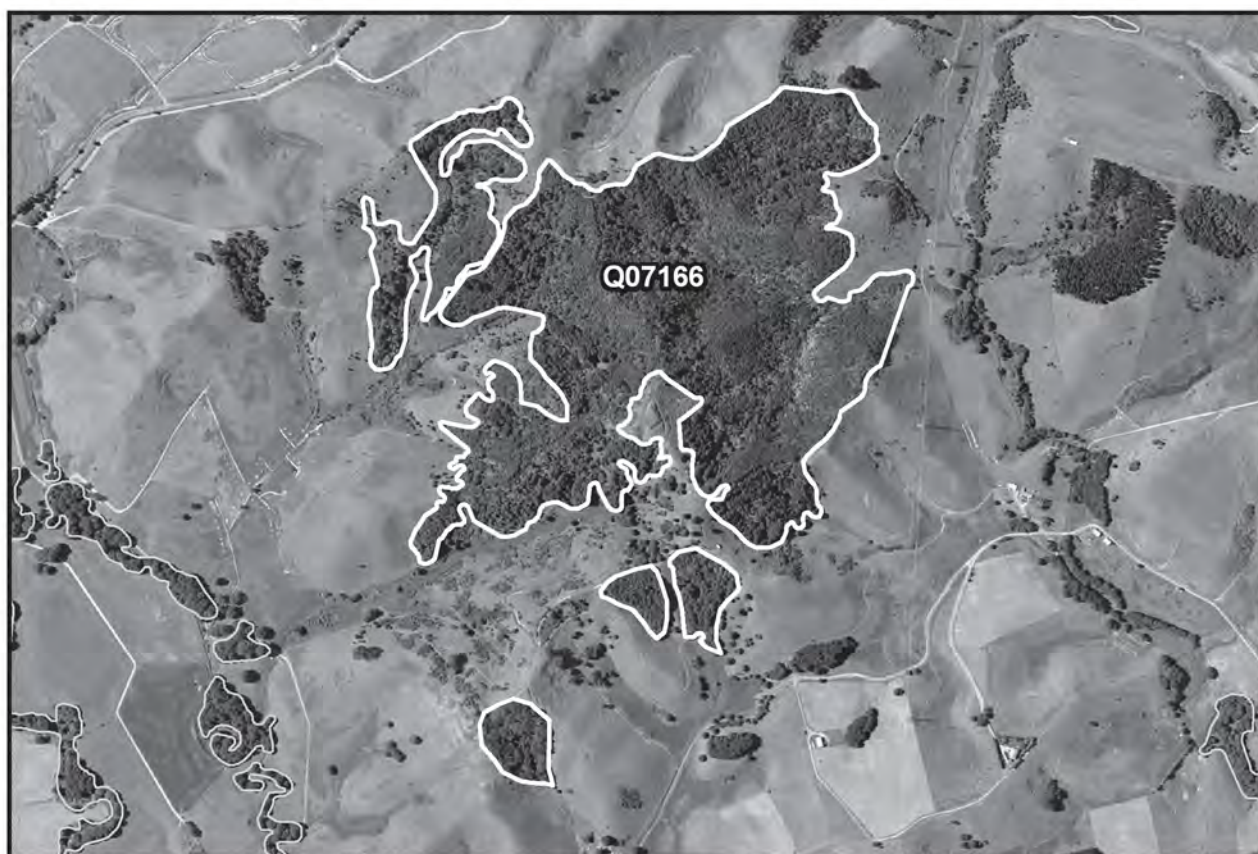
This site comprises secondary indigenous forest remnants centred on a 105 m asl peak to the south of Ruakaka Forest (Q07/121). It was not surveyed in the current study due to poor visibility and the vegetation types listed above have been estimated from aerial photography flown in January 2004. It appears that the main type is kanuka forest (a), with less common kanuka-mamaku forest (b) associated with gullies and shaded hillslopes. There also appear to be substantial areas of totara forest (c). In addition, broadleaved forest types such as taraire forest and puriri forest may be present. An area thought to be woolly nightshade scrub has been excluded.

Fauna

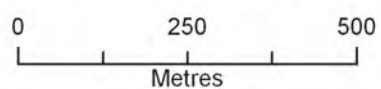
Not surveyed.

Significance

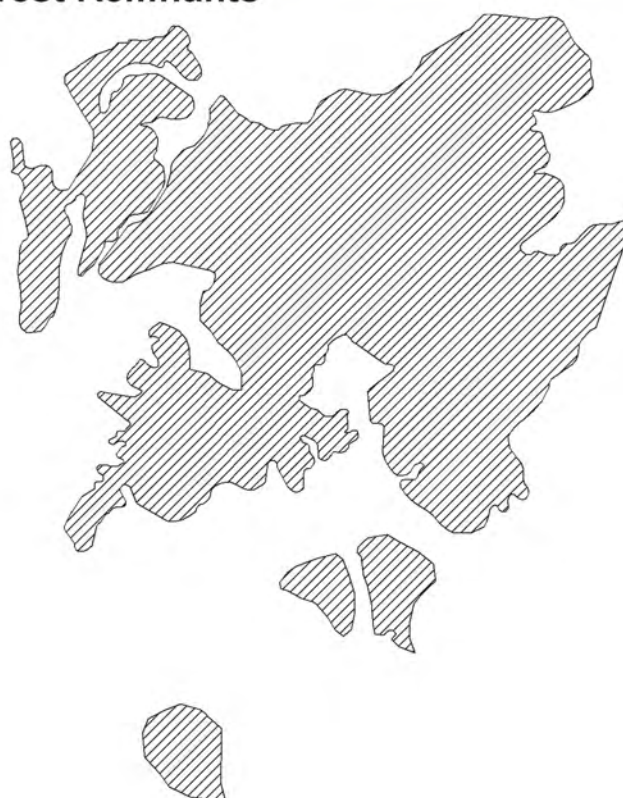
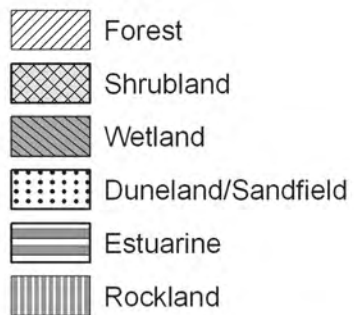
The site comprises one larger central remnant with several smaller remnants nearby. Larger examples of secondary forest occur on greywacke hillslopes and gullies in Waipu ED, and it is therefore unlikely that any of these ecological units are the best representative examples of their types. There is no information on fauna for this specific site. Topographic maps indicate two pa sites are present. Further information could lead to this site being upgraded to Level 1.



Q07/166 McLeod Road Forest Remnants



Habitat Type



TAKAHIWAI SALTMARSH AND SHRUBLAND

Survey no.	Q07/167
Survey date	26 March 2007
Grid reference	Q07 379958
Area	4.3 ha (1.7 ha shrubland, 2.6 ha estuary)
Altitude	0–2 m asl

Ecological unit(s)

- (a) Brush wattle–manuka shrubland on alluvium (40%)
- (b) Sea rush rushland in estuary (22%)
- (c) Mudflat in estuary (21%)
- (d) Glasswort herbfield in estuary (10%)
- (e) Saltmarsh ribbonwood shrubland in estuary (5%)
- (f) Mangrove shrubland in estuary (2%)

Landform/geology

Holocene estuarine intertidal muddy sediments, backed by a low terrace underlain by Late Pleistocene (last interglacial) sandy estuarine deposits.

Vegetation

Takahiwai Saltmarsh and Shrubland is a small area of estuarine vegetation with an adjoining shrubland on coastal alluvium. The western edge of the site is contiguous with an extensive area of mangroves, and the small, constructed tidal channels that extend eastwards into the site, are lined with mangrove shrubland (f) with occasional glasswort and saltmarsh ribbonwood. A complex mosaic of bare mudflat (c), sea rush rushland (b) with frequent mangrove and occasional oioi and *Austrostipa stipoides*, and glasswort herbfield (d) occurs between the mangroves and the saltmarsh ribbonwood shrubland (e) on the eastern terrestrial margin of the site. Brush wattle–manuka shrubland (a) with occasional willow, pampas, gorse, dally pine, and ti kouka occurs at the northern end of the site.

Fauna

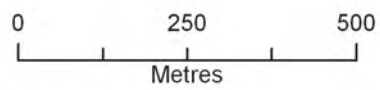
Australasian harrier, mallard, and grey warbler were recorded during this survey.

Significance

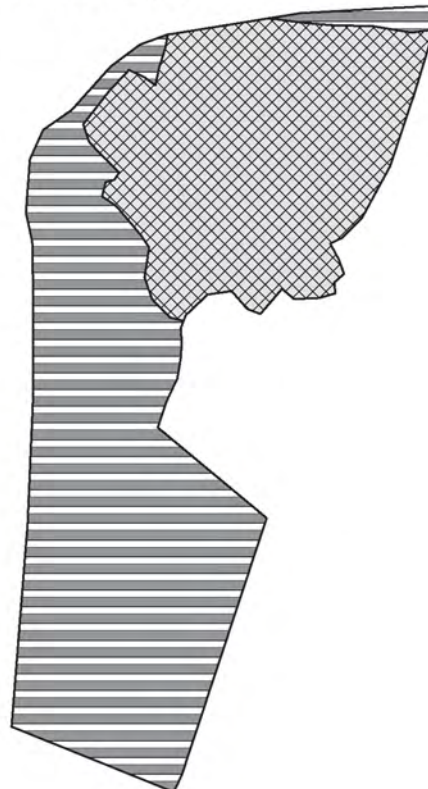
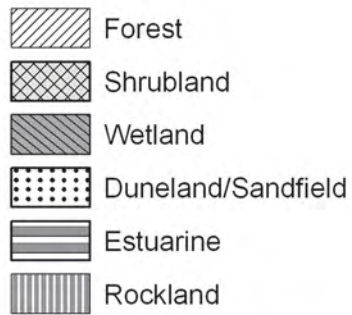
This site is small relative to other areas of estuarine vegetation and has been modified by drainage and weed invasion. However the site is contiguous with the extensive mangrove and saltmarsh areas along the Takahiwai shoreline of Whangarei Harbour, which has populations of banded rail (Sparse) and North Island fernbird (Sparse) (Wildland Consultants 2005), and these species may also be present here. Despite being modified, the site is an example of a vegetation sequence that was once much more extensive along the Takahiwai shoreline. Saltmarsh was probably formerly present as a nearly continuous band between this site and Takahiwai Stream Estuary (Q07/143) to the east.



Q07/167 Takahiwai Saltmarsh and Shrubland



Habitat Type



NORTHERN BRYNDERWYN HILLS REMNANTS

Survey no.	Q08/227
Survey date	26 March 2007
Grid reference	Q08 384725 (3 remnants)
Area	3.1 ha
Altitude	60-80 m asl



Q08/227 Northern Brynderwyn Hills Remnants

0 250 500
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological unit(s)

- (a) Kahikatea-rimu-totara treeland on moderate hillslope (65%)
- (b) Rimu forest on moderate hillslope (30%)
- (c) Kanuka forest on moderate hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Miocene sandy mudstone (Waitemata Group).

Vegetation

This site comprises two small mixed forest and treeland remnants on the northern slopes of the Brynderwyn Hills. The remnants are bisected by State Highway 1, and lie between the Waipu Gorge Forest Remnants (Q08/222) and Durham Road Forest and Shrubland (Q08/237) to the west, and the Brynderwyn Hills Forest Complex - Part B (Q08/225b) to the east. The western remnant is mostly secondary rimu forest (b), with frequent kanuka and kahikatea, and occasional tanekaha, rewarewa, totara, ti kouka, mapou, and kauri. A narrow area of kanuka forest (c) with occasional rimu, mapou, ponga and gorse extends southwards alongside the road, and this is the only part of the site from which stock are excluded. The two remnants on the eastern side of the road comprise kahikatea-rimu-totara treeland (a) with frequent kanuka and occasional ti kouka, kauri, and gorse. All of the remnants are very degraded, with large canopy gaps and weed infestations. With the exception of the roadsides, the remnants have a sparse understorey due to grazing by stock.

Fauna

Not surveyed.

Significance

These remnants are degraded examples of forest types which are relatively common on hillslopes within Waipu ED. Better quality examples of similar vegetation occur on either side of the site, within the Waipu Gorge Forest Remnants (Q08/222), Brynderwyn Hills Forest Complex (Q08/225) and Durham Road Forest and Shrubland (Q08/237). The remnants have a sparse understorey and their condition is declining due to heavy grazing and weed infestation, but they may provide a habitat stepping stone between the neighbouring Level 1 natural areas on the northern Brynderwyn Hills.

BRAIGH FOREST REMNANTS

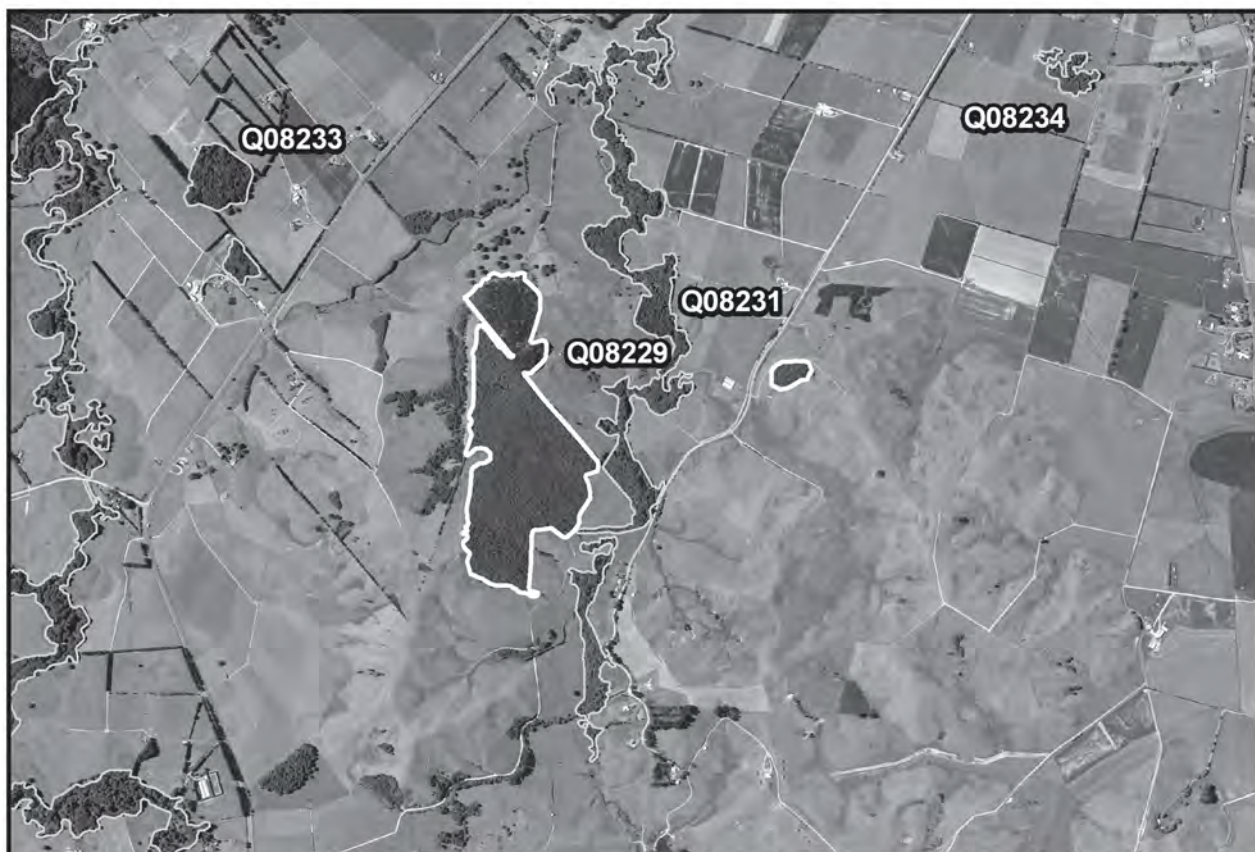
Survey no.	Q08/229
Survey date	15 November 2006
Grid reference	Q08 392768 (2 remnants)
Area	21.9 ha
Altitude	17-60 m asl

Ecological unit(s)

- (a) Kanuka forest on gentle hillslope (100%)

Landform/geology

Hillslopes underlain by Miocene sandstone and mudstone (Waitemata Group).



Q08/229 Braigh Forest Remnants

0 500 1,000
Metres

Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Vegetation

This site comprises two remnants of (a) kanuka forest near the southern end of St Mary's Road. The site is entirely secondary, and is the largest area of indigenous forest in the lower Waihoihoi River catchment. Kanuka is abundant, with frequent totara and tanekaha. Occasional species include kauri, rimu, kahikatea and manuka. The small remnant to the east of St Mary's Road is included in this site because its vegetation type and landform is similar to the larger remnant.

Fauna

Not surveyed.

Significance

These remnants, which are entirely secondary and probably grazed, comprise the largest area of indigenous forest in the lower Waihoihoi River catchment. The largest remnant is almost contiguous with the Waihoihoi River Forest Remnants (Q08/231) and there is likely to be significant movement of forest birds between these two sites.

ARGYLL STREET FOREST REMNANTS

Survey no.	Q08/234
Survey date	15 November 2006
Grid reference	Q08 408779 (2 remnants)
Area	1.2 ha
Altitude	12-13 m asl

Ecological unit(s)

(a) Kahikatea forest on alluvium (100%)

Landform/geology

Terrace on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits.

Vegetation

This site comprises two small and isolated remnants of kahikatea forest (a) on the alluvial plain to the south of Waipu township. The forest is dominated by kahikatea that probably regenerated following human clearance. One puriri and one karaka are present on the northern edge, and tree privet and Chinese privet occur on the edge of the remnants, and in the understorey. The remnants have been fenced recently, possibly to exclude cattle. The nearest areas of indigenous forest to the site are the narrow ribbons of forest alongside the Waihoihoi River and Waionehu Stream, approximately 1.1 km to the west and east, respectively.

Fauna

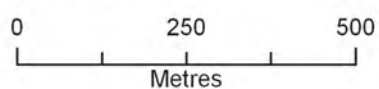
Not surveyed.

Significance

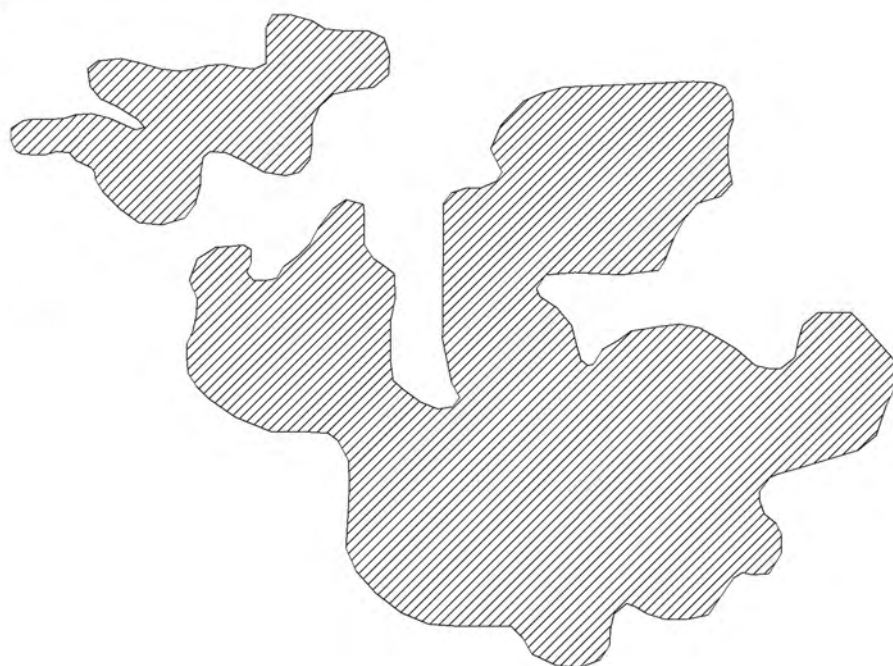
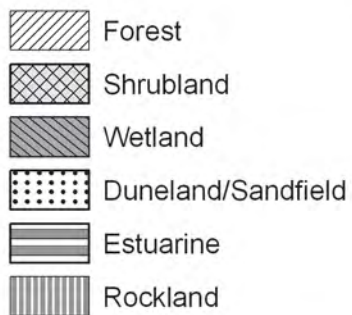
Forests on alluvium are now severely reduced in extent in Waipu ED, but the remnants in this site are small, isolated, have an understorey dominated by Chinese privet, and are either grazed or have been recently fenced to exclude stock. This site is therefore of Level 2 significance.



Q08/234 Argyll Street Forest Remnants

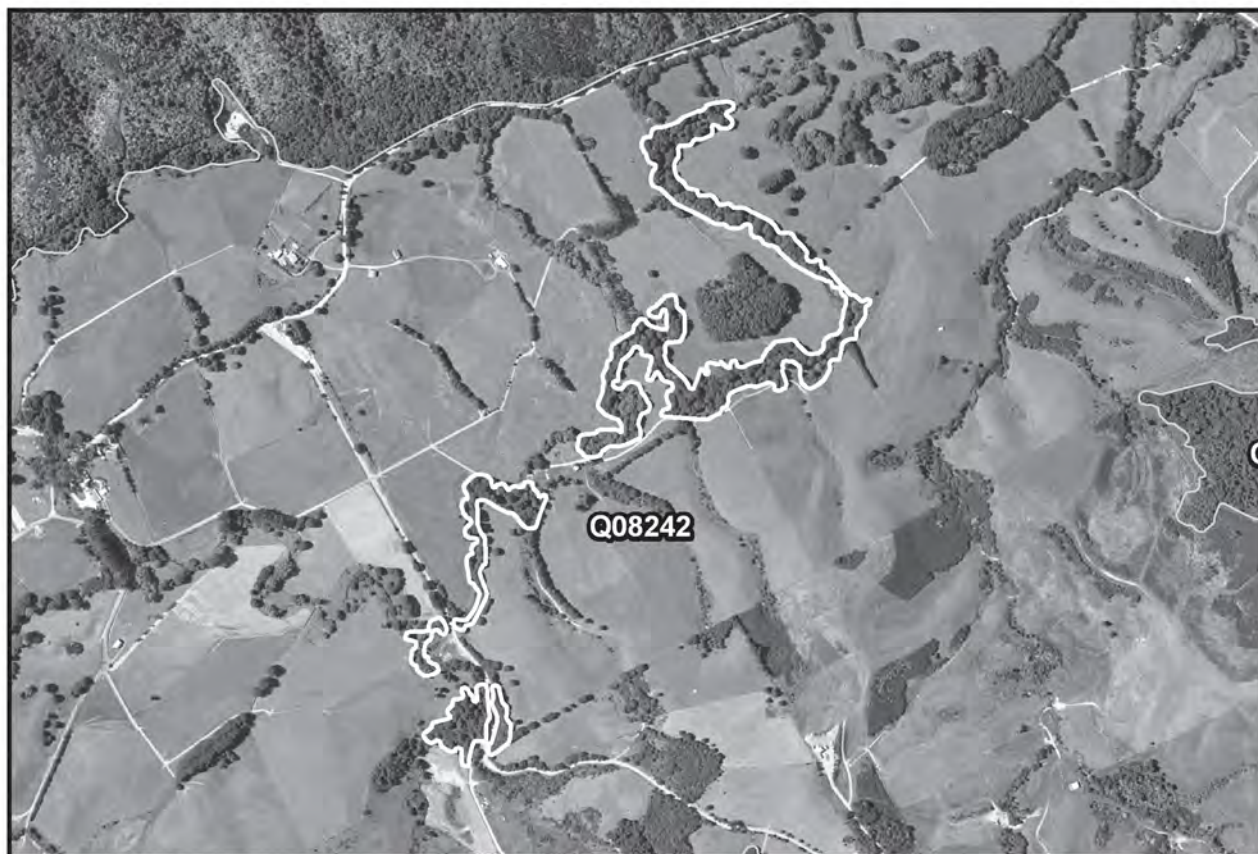


Habitat Type

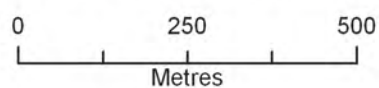


FINLAYSON'S BROOK FOREST REMNANTS

Survey no.	Q08/242
Survey date	15 November 2006
Grid reference	Q08 349749 (5 remnants)
Area	6.0 ha
Altitude	40–60 m asl



Q08/242 Finlayson's Brook Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Duneland/Sandfield
-  Estuarine
-  Rockland



Ecological unit(s)

(a) Totara forest on alluvium (100%)

Landform/geology

Stream channels containing Holocene alluvium, cut into Late Pleistocene (last interglacial) constructional terrace on alluvial and/or estuarine deposits.

Vegetation

This site comprises a group of small riparian forest remnants in the Finlayson's Brook catchment. The surrounding land use is largely pastoral farming but exotic and indigenous treeland links the remnants, both upstream and downstream, to Mareretu Forest (Q08/220). The remnants are totara forest (a) with frequent kahikatea, and occasional rimu, kanuka, mahoe, ponga, matai, titoki, crack willow, and woolly nightshade. The absence of emergent podocarps suggests the remnants are entirely secondary. All the remnants appear to be grazed and have a sparse understorey, except for tradescantia that forms a dense groundcover in places.

Fauna

Not surveyed.

Significance

Forests on alluvium are now severely reduced in extent in Waipu ED, but these remnants are small, grazed, and infested with crack willow, tradescantia, and woolly nightshade, and this site is of Level 2 significance. They provide riparian protection for a part of Finlayson's Brook, and are linked by scattered trees to Mareretu Forest (Q08/220).

BROOKS ROAD FOREST REMNANTS

Survey no.	Q08/243
Survey date	15 November 2006
Grid reference	Q08 358749 (2 remnants)
Area	7.9 ha
Altitude	43–80 m asl

Ecological unit(s)

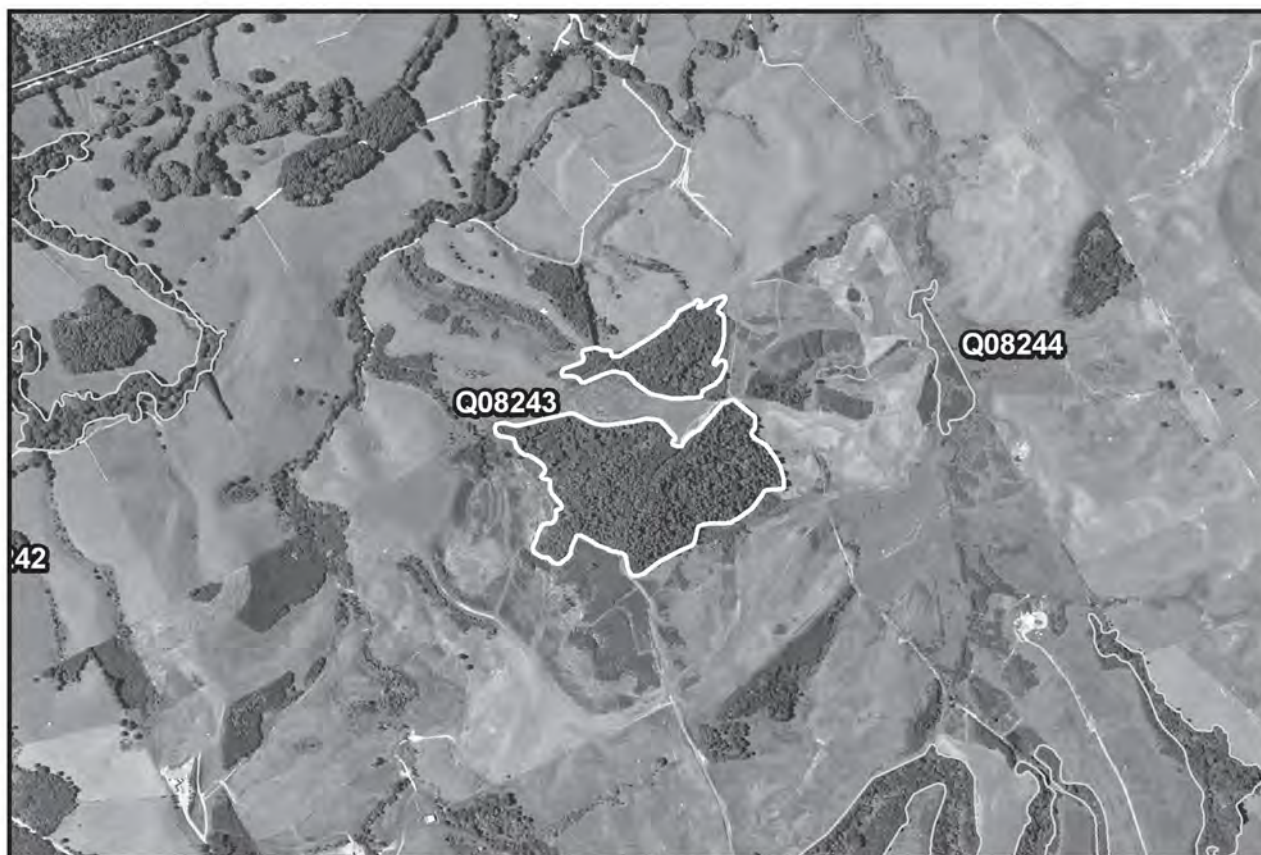
(a) Kauri-kanuka-rimu forest (100%)

Landform/geology

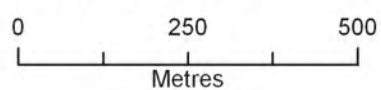
Hillslopes underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

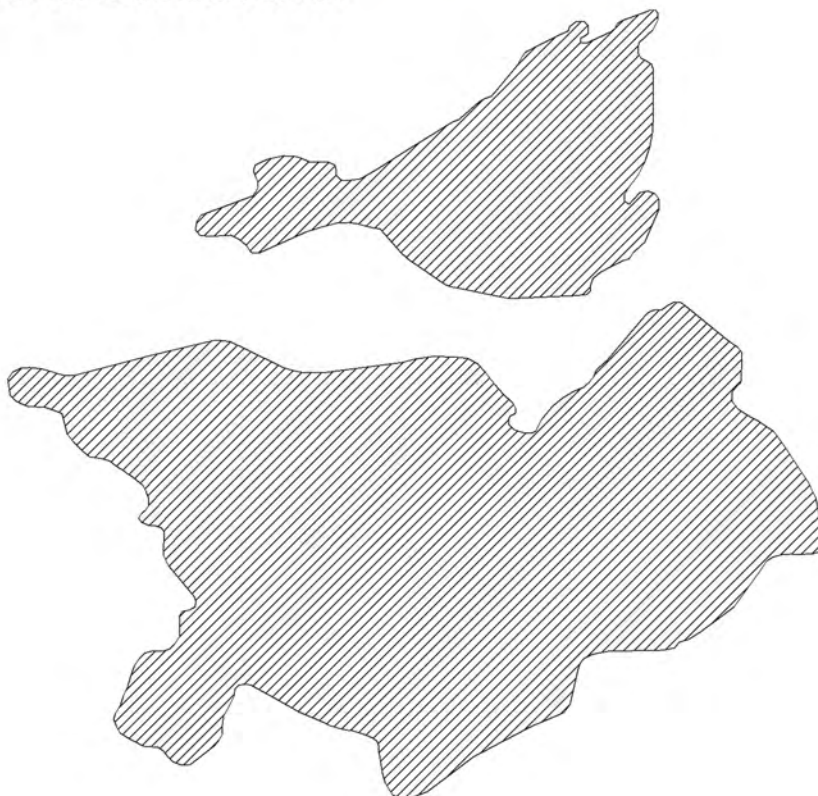
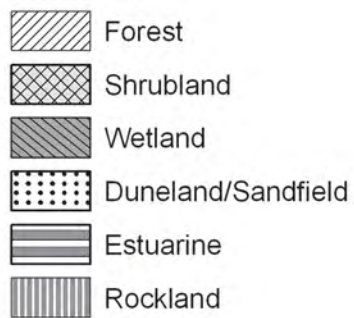
This site comprises two small remnants of kauri-kanuka-rimu forest (a) in the Finlayson's Brook catchment. The two remnants are separated by a thin band of pasture c. 50 m wide at its narrowest point, and the surrounding land is covered in either grazed pasture or gorse scrub. Kauri, kanuka and rimu are common, with kanuka more dominant on the edges of the remnant. Kahikatea and tanekaha are frequent, with occasional mamaku, puriri, towai, and manuka. The absence of mature kauri and podocarps suggests that both the remnants are secondary, but the largest kauri are now beginning to develop round-headed crowns. The remnants are probably grazed.



Q08/243 Brooks Road Forest Remnants



Habitat Type



Fauna

Not surveyed.

Significance

The site has a healthy canopy but is probably grazed with a sparse understorey. The remnants are centrally located in the midst of the pastoral landscape that separates Mareretu Forest (Q08/220), from the extensive forest remnants in the south of Waipu ED. Therefore the remnants may form part of a habitat network for mobile bird species such as kukupa.

MILLBROOK DAM AND FOREST REMNANTS

Survey no.	Q08/245
Survey date	12 November 2006
Grid reference	Q08 284799
Area	26.6 ha (13.2 ha forest, 13.4 ha wetland)
Altitude	60–102 m asl

Ecological units

- (a) Open water (constructed lake) (50%)
- (b) Totara forest on moderate hillslope (30%)
- (c) Totara treeland on moderate hillslope (10%)
- (d) Rimu forest on moderate hillslope (10%)

Landform/geology

Hillslopes underlain by Miocene sandstone and mudstone (Waitemata Group).

Vegetation

On the northern side of Millbrook Road there is a c. 800 m long by 200 m wide lake which has been created by damming a tributary of the Mangawai River. There are also two contiguous indigenous forest remnants. The valley in which the dam is situated appears to have been flooded within the last few decades, as there are still standing dead trees in the water at the eastern end. Apart from these, the dam is entirely open water (a) with no visible aquatic vegetation (the water appears somewhat turbid). Grazed pasture borders the entire southern margin and part of the northern margin. The largest forest remnant is on a south-facing slope on the northeastern shore. It comprises totara forest (b) with frequent kahikatea and taraire, and occasional rewarewa, matai, pukatea, nikau, rimu, pate, kohuhu, tawa, and kanuka. At the western end of this remnant the forest thins out to totara treeland (c) with occasional mamaku, kanuka, and kahikatea, probably as a result of grazing pressure. The small forest remnant on the western shore includes a stand of totara forest and a stand of rimu forest (d) with occasional kauri and totara, but this remnant is not clearly visible from any publicly accessible vantage point.

Fauna

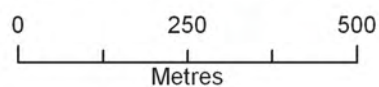
Grey warbler.

Significance

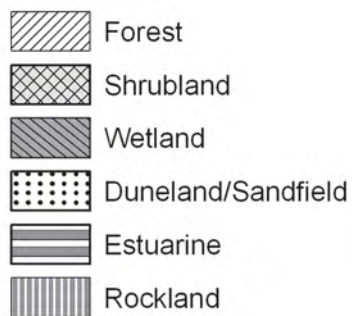
This dam is a substantial size for Waipu ED (second largest included in this study), and is bordered by some moderately-sized remnants of indigenous forest which may act as



Q08/245 Millbrook Dam and Forest Remnants



Habitat Type



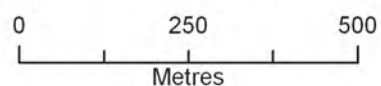
refuges for water birds using the open water habitat, although little information is known about wildlife use. None of the ecological units present are considered to be the representative examples of their types. Additional survey is recommended to determine the full ecological significance of this site.

SHOEMAKER ROAD FOREST REMNANT 1

Survey no.	Q08/246
Survey date	15 November 2006
Grid reference	Q08 399796 (2 remnants)
Area	1.1 ha
Altitude	15-17 m asl

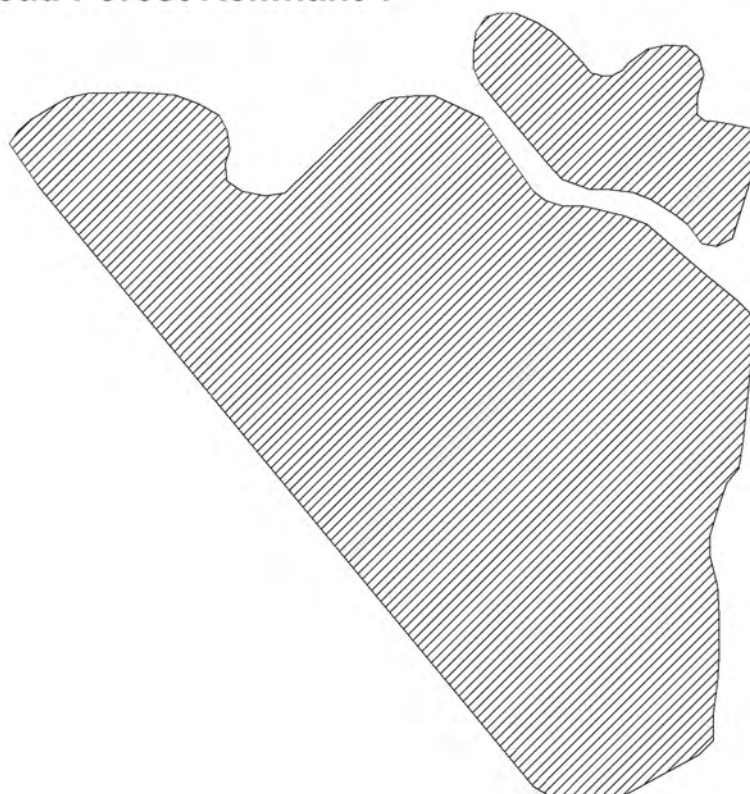


Q08/246 Shoemaker Road Forest Remnant 1



Habitat Type

- Forest
- Shrubland
- Wetland
- Duneland/Sandfield
- Estuarine
- Rockland



Ecological unit(s)

(a) Totara forest on alluvium (100%)

Landform/geology

Terrace on Late Pleistocene (last interglacial) alluvial and/or estuarine deposits.

Vegetation

This site comprises two small remnants of totara forest (a) adjacent to Shoemaker Road. The remnants have been incorporated into the garden associated with the house on the eastern edge. The canopy of the remnants is almost entirely dominated by totara trees (up to c. 1 m diameter), and is intact except for one large fishtail palm. The understorey has been severely modified and is now either ornamental gardens or mown lawn. Plants cultivated within the remnant include bromeliads, windmill palm, camellia, Brazilian plume *Philodendron* sp., *Draceana draco*, *Macrozamia communis*, and clivia. Invasive plants within the remnant include tuber ladder fern, velvet groundsel, Kahili ginger, palm grass and fairy crassula. Indigenous plants cultivated in the garden are often not native to the ecological district, such as Poor Knights lily, king fern, *Pseudopanax laetus*, and parapara. Surviving remnants of the natural understorey include karaka, mapou, ponga, totara, and pigeonwood. The hydrology of the remnants has also been altered, with a drain c. 1 m deep through the centre of the site.

Fauna

Kukupa (Gradual Decline) and North Island fantail reported by the landowner (2006).

Significance

This site is a heavily modified example of alluvial vegetation, of which very little remains in Waipu ED. The understorey is either mown lawns or exotic gardens, and the hydrology of the remnant has been altered through drainage. Although kukupa (a threatened bird species) has been reported from here, this site is unlikely to be an important habitat for this species, and does not warrant Level 1 significance because it has been so heavily modified.

5. Summary and conclusions

5.1 ANALYSIS OF EXISTING PROTECTED AREAS

5.1.1 Overview

Waipu Ecological District covers a total extent of 49,413 ha, of which natural areas cover 14,045 ha (28.4% of the ecological district). The natural areas comprise 12,699 ha forest, 708 ha shrubland, 116 ha freshwater wetland, 257 ha estuary, 239 ha duneland, and 26 ha rockland.

Approximately 31.4% (4,407 ha) of the natural areas are formally protected, which is equivalent to about 8.9% of the total extent of Waipu ED. The extent (ha) and type of protection status within each site is identified in Table 1.

A list of ecological units recorded in Waipu Ecological District and their current protection status is set out in Table 2 (page 266) and a summary of the site evaluations is given in Table 3 (page 298).

5.1.2 Ecological units protected

Approximately 31.4% of the identified natural areas is protected. A summary of the vegetation/habitat types with formal protection (as per Table 1) is presented in Table 1A. The following general patterns are evident:

Forest

Of the 12,699 ha of forest and treeland, 3,591 ha (28.3%) is protected.

Larger areas of forest and treeland at higher altitudes (i.e. above 100 m asl) are better protected than forest and treeland at lower altitudes. The largest protected area of forest is in Mareretu Forest (Q08/220), and the other protected areas of indigenous forest over 100 ha are Ruakaka Forest (Q07/121), Brynderwyn Hills Forest Complex (Q08/225), Waipu Gorge Forest Remnants (Q08/222), and North River Forest (Q07/117).

Forest on alluvial plains is extremely limited in extent and very little of what remains is formally protected. Eight alluvial forest or treeland units have some protection, although four of these are smaller than 1 ha.

Coastal forest is not well represented in protected natural areas. The only sites where coastal forest is protected are Bream Tail Coastal Headland (R08/001) in which four forest types are protected, Takahiwai Forest (Q08/124) in which two forest types are protected, and Lang's Beach Coastal Forest and Shrubland (Q08/226) in which three forest types are protected. Pohutukawa forest and treeland contiguous with the Ruakaka and Waipu River Estuaries is not protected. Only parts of the sequence of mixed broadleaf forest and treeland on Bream Tail Coastal Headland (R08/001) are protected.

TABLE 1. PROTECTED NATURAL AREAS NETWORK IN THE WAIPU ECOLOGICAL DISTRICT (AREAS IN ha).

Site	Survey no.	Private		Department of Conservation					
		QEII*	MS	SL	SB	GP	RR	SR	WR
Mangapai Caves Road Forest and Shrubland	Q07/116							23.2	
North River Forest	Q07/117	32.5						167.0	
Waipu Caves Forest	Q07/118							70.5	
Ruakaka River Forest Remnants	Q07/119		2.4						
Ruakaka Forest	Q07/121	6.5		294.3				442.0	
Takahiwai Forest	Q07/124							65.0	
Doctor's Hill Road Wetland	Q07/127			0.2					0.1
Ruakaka Dunelands	Q07/128		17.3	411.6	0.3	73.4	62.3		13.6
Ruakaka Racecourse Dune Lake	Q07/129			2.8					
Ruakaka River Estuary	Q07/130		0.2	22.8			0.5		50.1
Hewlett QEII Covenant	Q07/136	1.7							
Sandford Road Forest Remnant	Q07/142								
Takahiwai Stream Estuary	Q07/143				2.3				
Blacksmith's Creek Estuary	Q07/144				17.8	1.3			
Mangapai Riparian Forest Remnants	Q07/161						0.4		
Pohuenui River Forest Remnants	Q07/163								
Mill Brook Forest Remnants	Q07/165								
Mareretu Forest	Q08/220		0.8	1321.3					
Waipu Gorge	Q08/222	12.8	1.2	145.2				85.7	
Brynderwyn Hills Forest Complex - Part A	Q08/225a								
Brynderwyn Hills Forest Complex - Part B	Q08/225b	10.7						61.9	
Brynderwyn Hills Forest Complex - Part C	Q08/225c								
Brynderwyn Hills Forest Complex - Part D	Q08/225d	39.1							
Brynderwyn Hills Forest Complex - Part E	Q08/225e		1.8						
Brynderwyn Hills Forest Complex - Part G	Q08/225g	17.4						14.6	
Brynderwyn Hills Forest Complex - Part H	Q08/225h	222.9						236.8	
Brynderwyn Hills Forest Complex - Part I	Q08/225i							67.9	
Brynderwyn Hills Forest Complex - Part J	Q08/225j							28.4	
Lang's Beach Coastal Forest and Shrubland	Q08/226	9.9							
Waipu River Estuary and Sandspit	Q08/228		0.2			115.9	3.3		30.3
Ahuroa River Forest Remnants	Q08/235								
Bream Tail Coastal Headland	R08/001	24.1							
Grand total (ha)		377.6	23.8	2198.2	20.4	190.6	66.5	1263.0	94.1

* QEII = Queen Elizabeth II National Trust Open Space Covenant; RR = Recreation Reserve; SL = Stewardship Land; SR = Scenic Reserve; SB = Seabed; GP = Government Purpose Reserve; MS = Marginal Strip; WR = Wildlife Refuge; ER = Esplanade Reserve; LP = Local Purpose Reserve.

TABLE 1 (*continued*).

Site	Survey no.	Whangarei District Council					Total area protected	Total site area
		RR	SR	ER	LP	WR		
Mangapai Caves Road Forest and Shrubland	Q07/116						23.2	271.3
North River Forest	Q07/117						199.5	973.4
Waipu Caves Forest	Q07/118		3.2				73.7	370.8
Ruakaka River Forest Remnants	Q07/119	0.1			0.2		2.6	104.3
Ruakaka Forest	Q07/121				135.9		878.7	1699.3
Takahiwai Forest	Q07/124						65.0	641.2
Doctor's Hill Road Wetland	Q07/127						0.3	23.2
Ruakaka Dunelands	Q07/128			0.4			578.9	725.7
Ruakaka Racecourse Dune Lake	Q07/129						2.8	4.0
Ruakaka River Estuary	Q07/130			0.2		0.9	74.7	87.2
Hewlett QEII Covenant	Q07/136						1.7	2.1
Sandford Road Forest Remnant	Q07/142			1.4			1.4	2.8
Takahiwai Stream Estuary	Q07/143						2.3	11.1
Blacksmith's Creek Estuary	Q07/144						19.0	22.0
Mangapai Riparian Forest Remnants	Q07/161			0.3			0.7	7.7
Pohuenui River Forest Remnants	Q07/163			0.5			0.5	49.1
Mill Brook Forest Remnants	Q07/165			0.2			0.2	27.1
Mareretu Forest	Q08/220						1322.1	2820.3
Waipu Gorge	Q08/222				0.0		244.9	543.7
Brynderwyn Hills Forest Complex - Part A	Q08/225a				0.2		0.2	236.0
Brynderwyn Hills Forest Complex - Part B	Q08/225b						72.6	189.1
Brynderwyn Hills Forest Complex - Part C	Q08/225c				0.7		0.7	481.9
Brynderwyn Hills Forest Complex - Part D	Q08/225d						39.1	56.5
Brynderwyn Hills Forest Complex - Part E	Q08/225e		21.8				23.6	813.0
Brynderwyn Hills Forest Complex - Part G	Q08/225g	2.4			0.4		34.8	796.4
Brynderwyn Hills Forest Complex - Part H	Q08/225h						459.7	73.5
Brynderwyn Hills Forest Complex - Part I	Q08/225i						67.9	973.4
Brynderwyn Hills Forest Complex - Part J	Q08/225j						28.4	370.8
Lang's Beach Coastal Forest and Shrubland	Q08/226	0.3					10.2	109.9
Waipu River Estuary and Sandspit	Q08/228			2.2			152.0	220.5
Ahuroa River Forest Remnants	Q08/235			1.0			1.0	53.8
Bream Tail Coastal Headland	R08/001						24.1	260.7
Grand total (ha)		2.8	25.0	6.2	137.4	0.9	4406.6	13021.8

Shrubland

Of the 708 ha of shrubland within natural areas, 415 ha (58.6%) are protected.

Shrublands are protected at seven of the 30 sites where they occur.

The protected shrublands are either within large hill country forests or in the coastal dunelands (where they are dominated by exotic species).

Shrublands on low hills or on alluvial plains are not represented in protected areas.

Freshwater wetland

The total area of freshwater wetlands identified was 116 ha, of which 42 ha (36.6%) is protected. However, of the total, only 45 ha were considered to be 'natural' or 'semi-natural' wetlands (the remainder is constructed lakes, dams or ponds). Only 2 ha (4.4%) of the natural or semi-natural wetlands are protected.

Protected ecological units within natural or semi-natural wetlands include the following: 0.3 ha of reed sweetgrass grassland (exotic) at Doctor's Hill Road Wetland (Q07/127); very small areas of marsh clubrush sedgeland at the estuarine margins of Blacksmith's Creek Estuary (Q08/144) and Waipu River Estuary and Sandspit (Q08/228), and about half the lake and wetland habitat at the Ruakaka Racecourse Dune Lake site (Q07/129) (1.6 ha).

A 40 ha dam recently created for the purpose of town water supply (Wilson's Dam in Ruakaka Forest Q07/121) is fully protected as a local purpose reserve.

Estuarine

Of 257 ha of estuarine habitats, 175 ha (68.2%) are protected.

While the full range of estuarine habitats is under some form of legal protection, although very little of the indigenous vegetation adjacent to estuaries is formally protected.

Duneland

Of the 239 ha of duneland habitat identified (this includes all vegetation types on duneland except shrubland and forest on dunes), 185 ha (77.5%) is protected.

Every duneland ecological unit is represented in a protected area.

Rockland

There are two examples of significant rockland habitat in Waipu ED (0.5 ha of sandstone cliff on Waipu Caves Road Sandstone Knoll Q07/132 and 25.5 ha of coastal cliffs and rocky outcrops at Bream Tail Coastal Headland R08/001). 0.72 ha of coastal cliffs in the latter site are within a Queen Elizabeth II Open Space Covenant.

TABLE 1A: LIST OF VEGETATION/HABITAT TYPES WITHIN PROTECTED AREAS IN WAIPU ECOLOGICAL DISTRICT.

SITE	SURVEY NO.	VEGETATION/HABITAT TYPES WITHIN PROTECTED LAND STATUS
Mangapai Caves Road Forest and Shrubland	Q07/116	Kanuka forest, towai forest, kanuka-totara forest
North River Forest	Q07/117	Kanuka-rimu-tanekaha-kauri forest, kanuka-mamaku forest, taraire forest, tanekaha-kanuka forest, kanuka forest, puriri forest, kauri-kanuka forest, kanuka-rewarewa forest, totara forest, totara-taraire forest, rimu-tanekaha forest
Waipu Caves Forest	Q07/118	Totara forest, totara-taraire forest, kanuka forest, totara-mamaku forest, totara treeland, totara-hawthorn forest, kauri-kanuka forest
Ruakaka River Forest Remnants	Q07/119	Totara-kahikatea forest (alluvial)
Ruakaka Forest	Q07/121	Kanuka-rimu-tanekaha forest, kauri forest, totara forest, kanuka forest, towai forest, totara-mamaku forest, open water (constructed dam), taraire forest, tanekaha-kanuka forest, kanuka-mamaku forest, kahikatea-totara forest, kauri-rimu forest, nikau-ponga forest, kanuka shrubland, mahoe-kanuka shrubland, pate-ti kouka shrubland
Takahiwai Forest	Q07/124	Kanuka forest, kanuka-kauri forest
Doctor's Hill Road Wetland	Q07/127	Reed sweetgrass grassland
Ruakaka Dunelands	Q07/128	Gorse-pampas scrub, sandfield habitat, pohuehue shrubland, sweet vernal-haretail grassland, <i>Kunzea ericoides</i> var. <i>linearis</i> forest, maritime pine treeland, brush wattle-Chinese privet-mapou scrub, radiata pine forest, spinifex grassland, pingao sedgeland, tree privet-Chinese privet scrub, pohuehue- <i>Coprosma acerosa</i> shrubland, pampas-ginger scrub, sweet vernal grassland, knobby clubrush-pohuehue sedgeland, haretail-gazania-marram grassland, harakeke-gorse flaxland, glasswort herbfield
Ruakaka Racecourse Dune Lake	Q07/129	Open water (dune lake), gorse scrub, raupo-alligator weed reedland, ti kouka treeland, raupo reedland, lake clubrush-alligator weed reedland
Ruakaka River Estuary	Q07/130	Mudflat and sandflat, estuarine open water, mangrove shrubland and forest, oioi rushland, oioi-sea rush rushland, <i>Austrostipa stipoides</i> tussockland, glasswort-mangrove sandfield, glasswort herbfield, saltmarsh ribbonwood shrubland, manuka shrubland, gorse scrub
Hewlett QEII Covenant	Q07/136	Kahikatea treeland (alluvial)
Sandford Road Forest Remnant	Q07/142	Totara treeland (alluvial)
Takahiwai Stream Estuary	Q07/143	Mangrove shrubland
Blacksmith's Creek Estuary	Q07/144	Mangrove shrubland, searush-oioi rushland, glasswort herbfield, marsh clubrush sedgeland
Mangapai Riparian Forest Remnants	Q07/161	Totara forest (alluvial)
Pohuentui River Forest Remnants	Q07/163	Totara treeland (alluvial)
Mill Brook Forest Remnants	Q07/165	Totara forest (alluvial)
Mareretu Forest	Q08/220	Kanuka forest, rimu forest, taraire-mamaku-rimu-rewarewa-totara forest, kauri-kanuka forest, mamaku-mahoe shrubland, taraire forest, tanekaha forest, mapou-mingimingi-ponga shrubland, manuka shrubland, totara forest, taraire-totara forest, towai forest, mapou-manuka shrubland
Waipu Gorge	Q08/222	Kanuka-mamaku forest, taraire forest, mamaku-mapou forest, kanuka-rimu forest, totara forest, kauri-tanekaha forest, mahoe-mamaku forest, kanuka-tanekaha forest, kanuka-tanekaha-rewarewa forest, kauri forest, manuka shrubland, nikau forest (alluvial)
Brynderwyn Hills Forest Complex - Part A	Q08/225a	Taraire-tawa forest? (tiny area)
Brynderwyn Hills Forest Complex - Part B	Q08/225b	Unknown gully forest types, kanuka forest, kauri forest, kauri-tanekaha-rimu-kanuka forest, taraire-nikau forest, tanekaha forest
Brynderwyn Hills Forest Complex - Part C	Q08/225c	Tawa-taraire forest? (tiny area)
Brynderwyn Hills Forest Complex - Part D	Q08/225d	Kanuka forest, kauri forest, kauri-rimu forest, kanuka-rimu-tanekaha forest, taraire-puriri forest

SITE	SURVEY NO.	VEGETATION/HABITAT TYPES WITHIN PROTECTED LAND STATUS
Brynderwyn Hills Forest Complex - Part E	Q08/225e	Kanuka forest
Brynderwyn Hills Forest Complex - Part G	Q08/225g	Kanuka forest, kanuka-mamaku forest
Brynderwyn Hills Forest Complex - Part H	Q08/225h	Kanuka forest, taraire-puriri forest, puriri-taraire-rewarewa-totara-nikau-mamaku forest, puriri forest, totara-tanekaha-rewarewa forest, mamaku forest, tanekaha-kanuka forest, kauri-kanuka forest, kauri-tanekaha forest, tawa-rewarewa-mamaku-ponga-nikau-kohekohe forest
Brynderwyn Hills Forest Complex - Part I	Q08/225i	Kanuka forest, taraire-puriri forest
Brynderwyn Hills Forest Complex - Part J	Q08/225j	Kanuka-tanekaha-kauri forest, manuka-kanuka
Lang's Beach Coastal Forest and Shrubland	Q08/226	Pohutukawa-rimu forest, pohutukawa forest, pohutukawa treeland
Waipu River Estuary and Sandspit	Q08/228	Mudflat and sandflat, sandfield habitat, estuarine open water, spinifex grassland, purple groundsel-South African iceplant herbfield, sea rush rushland, sea rush- <i>Austrostipa stipoides</i> rushland, oioi rushland, knobby clubrush-tall fescue sedgeland, mangrove shrubland and forest, saltwater paspalum grassland, sea primrose-remuremu herbfield, sea grass grassland, marsh clubrush sedgeland, buffalo grass-South African iceplant grassland, buffalo grass-pohuehue-knobby clubrush shrubland, South African iceplant-haretail-shore bindweed herbfield, pingao sedgeland, <i>Carex pumila</i> sandfield
Ahuroa River Forest Remnants	Q08/235	Totara forest (alluvial)
Bream Tail Coastal Headland	R08/001	Kanuka-tawa forest, kanuka forest, puriri forest, taraire forest, rocky outcrop and cliff habitat

5.2 PRIORITY NATURAL AREAS FOR PROTECTION IN WAIPU ECOLOGICAL DISTRICT

The purpose of this section is to identify the unprotected natural areas documented in this report that best supplement the existing protected natural areas network, to make it more fully representative of Waipu Ecological District's ecological diversity and character.

The natural areas of Waipu ED comprise reasonably large areas of secondary forest in the upper hill country areas, a paucity of indigenous habitats on lower hills and lowland alluvial plains, and an extensive but highly modified coastal dune system. There is also one major coastal headland and a few freshwater wetlands (including a single remaining dune lake). In terms of legal protection, the upper inland hill country and dunelands have a relatively high level of protection compared with other parts of Waipu ED. Therefore the priorities for protection currently in the ED are:

1. Indigenous vegetation and habitats on alluvial plains.
2. Freshwater wetland vegetation and habitat, especially those sites supporting natural or semi-natural wetland. The full protection of Ruakaka Racecourse Dune Lake (Q07/129) (last remaining dune lake in the whole Eastern Northland Ecological Region) is a particularly high priority.
3. Level 1 forest and shrubland remnants below 100 m altitude, which provide linkages between upland indigenous forest and lowland alluvial forest remnants.
4. Forest and treeland adjacent to estuaries, especially pohutukawa forest and treeland on coastal scarps next to Ruakaka River Estuary (Q07/130) and Waipu River Estuary and Sandspit (Q08/228).
5. Coastal indigenous forest, treeland, shrubland, and rockland on Bream Tail Coastal Headland (R08/001).

An effective strategy to create an integrated protected areas network in Waipu ED would need to consider protection of priority natural areas and ecological restoration of wetlands, ecological corridors, linkages, and buffers to promote better connectivity between inland hill country, alluvial plains and the coastal dune system.

TABLE 2. ECOLOGICAL UNITS RECORDED IN WAIPU ECOLOGICAL DISTRICT AND PROTECTION STATUS.

Key: * = Level 2 site; bold pna numbers = representative ecological units; pt = site is partially protected, but not known if ecological unit falls within the protected area; QEII = Queen Elizabeth II National Trust Open Space Covenant; RR = Recreation Reserve; SL = Stewardship Land; SR = Scenic Reserve; SB = Seabed; GP = Government Purpose Reserve; MS = Marginal Strip; WR = Wildlife Refuge; ER = Esplanade Reserve; LP = Local Purpose Reserve.

GEOL. GROUP:†	A	B	C	D	E	F	G	H
Coastal Freshwater Wetland Vegetation and Habitats								
<i>Azolla filiculoides</i> herbfield		Q07/131						
<i>Azolla filiculoides</i> - burr reed herbfield		Q07/131						
<i>Baumea articulata</i> reedland		Q07/127 (ptSL, WR) Q07/141						
<i>Baumea</i> sp. and <i>Juncus</i> sp. reedland						R08/001 (ptQEII)		R08/001 (ptQEII)
<i>Baumea teretifolia</i> sedgeland		Q07/141						
Bracken fernland		Q07/127 (ptSL, WR)						
<i>Carex ovalis</i> sedgeland		Q07/141						
<i>Cyperus ustulatus</i> tussockland						R08/001 (ptQEII)		R08/001 (ptQEII)
<i>Eleocharis acuta</i> - <i>Azolla</i> <i>filiculoides</i> sedgeland		Q07/131						
<i>Eleocharis sphacelata</i> reedland		Q07/131 Q07/141						
<i>Juncus pallidus</i> rushland								
Lake clubrush reedland								
Lake clubrush-alligator weed reedland		Q07/129 (ptSL)						
Manuka shrubland		Q07/131						
Manuka-harakeke-ti kouka shrubland						R08/001 (ptQEII)		R08/001 (ptQEII)
Marsh clubrush sedgeland	Q07/144 (ptSB, GP) Q08/228 (ptMS, GP, RR, WR)							
Open water (constructed pond)								
Open water (dune lake)		Q07/129 (ptSL)						

- † A: Holocene estuarine sediments
 B: Holocene coastal dunefields
 C: Holocene alluvium
 D: Late Pleistocene (last interglacial) alluvial and/or estuarine deposits
 E: Pleistocene consolidated dune sand
 F: Miocene dacite intrusions (Waitakere Group)
 G: Miocene bluff-forming sandstone (Waitemata Group)
 H: Miocene sandstone and mudstone/sandy mudstone (Waitemata Group)

GEOL. GROUP:†	I	J	K	L	M	N	O	P
Coastal Freshwater Wetland Vegetation and Habitats								
<i>Azolla filiculoides</i> herbfield								
<i>Azolla filiculoides</i> - burr reed herbfield								
<i>Baumea articulata</i> reedland								
<i>Baumea</i> sp. and <i>Juncus</i> sp. reedland						R08/001 (ptQEII)		
<i>Baumea teretifolia</i> sedgeland								
Bracken fernland								
<i>Carex ovalis</i> sedgeland								
<i>Cyperus ustulatus</i> tussockland						R08/001 (ptQEII)		
<i>Eleocharis acuta</i> - <i>Azolla</i> <i>filiculoides</i> sedgeland								
<i>Eleocharis sphacelata</i> reedland								
<i>Juncus pallidus</i> rushland								Q07/164
Lake clubrush reedland								Q07/164
Lake clubrush-alligator weed reedland								
Manuka shrubland								
Manuka-harakeke-ti kouka shrubland						R08/001 (ptQEII)		
Marsh clubrush sedgeland							Q08/230	
Open water (constructed pond)								Q07/122* Q07/128 (ptMS,SL, SB,GP,RR, WR, ER) Q07/164
Open water (dune lake)								

- † I: Oligocene muddy limestone (Mahurangi Limestone, Motatau Complex)
J: ?Non-calcareous mudstone (?Mangakabia Complex)
K: Melange (undifferentiated Mangakahia and Motatau Complex lithologies)
L: Oligocene flaggy limestone (Whangarei Limestone, Te Kuiti Group)
M: Eocene glauconitic sandstone (Ruatangata Sandstone, Te Kuiti Group)
N: Mesozoic greywacke (Waipapa Terrane)
O: Holocene beach sands
P: Human-made

GEOL. GROUP:	A	B	C	D	E	F	G	H
Coastal Freshwater Wetland Vegetation and Habitats (continued)								
Open water in gully	Q07/127 (ptSL,WR)							
Raupo reedland	Q07/127 (ptSL,WR)		R08/001 (ptQEII)			R08/001 (ptQEII)		
	Q07/129 (ptSL) Q07/141							
Reed sweetgrass grassland	Q07/127 (ptSL,WR)							
Soft rush-Azolla filiculoides rushland	Q07/131							
Ti kouka treeland	Q07/129 (ptSL)							
Watercress-Polygonum sp.- bachelor's button-Baumea articulata herbfield	Q07/144 (ptSB,GP)							
Yorkshire fog grassland	Q07/131							
Inland Freshwater Wetland Vegetation and Habitats								
Carex geminata-kahikatea sedgeland			Q08/222 (ptQEII, MS, SL, SR,LP)					
Crack willow treeland	Q07/115							
Harakeke flaxland			Q07/138			Q07/115		
Kahikatea-harakeke treeland	Q07/138							
Open water (constructed dam)								
Open water (constructed lake)								
Open water (constructed pond)			Q07/126	Q07/126				
Raupo reedland	Q07/126	Q07/123 Q07/154* Q08/223 Q08/244	Q07/126		Q07/115 Q07/140* Q07/154* Q08/220 (ptMS,SL) Q08/221			
Reed sweetgrass grassland			Q07/138					
Willow weed herbfield			Q07/126	Q07/126				
Estuarine Vegetation and Habitats								
Austrostipa stipoides tussockland	Q07/130 (ptMS,SL, RR,WR)							
Estuarine open water	Q07/130 (ptMS,SL, RR,WR) Q08/228 (ptMS,GP, RR,WR)							

GEOL. GROUP:	I	J	K	L	M	N	O	P
Coastal Freshwater Wetland Vegetation and Habitats (continued)								
Open water in gully								
Raupo reedland						Q07/122* Q07/124 (ptSR) R08/001 (ptQEII)		
Reed sweetgrass grassland								
Soft rush- <i>Azolla filiculoides</i> rushland								
Ti kouka treeland								
Watercress- <i>Polygonum</i> sp.- bachelor's button- <i>Baumea articulata</i> herbfield								
Yorkshire fog grassland								
Inland Freshwater Wetland Vegetation and Habitats								
<i>Carex geminata</i> -kahikatea sedgeland								
Crack willow treeland								
Harakeke flaxland								
Kahikatea-harakeke treeland								
Open water (constructed dam)								Q07/121 (ptQEII,SL, SR,LP)
Open water (constructed lake)								Q07/121 (ptQEII,SL, SR,LP) Q07/124 (ptSR)
Open water (constructed pond)								Q08/223 Q07/120 Q07/140*
Raupo reedland		Q07/150			Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL) Q08/221		
Reed sweetgrass grassland								
Willow weed herbfield								
Estuarine Vegetation and Habitats								
<i>Austrostipa stipoides</i> tussockland								
Estuarine open water								

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Estuarine Vegetation and Habitats (continued)</i>								
Glasswort herbfield	Q07/130 (ptMS,SL, RR,WR) Q07/144 (ptSB,GP) Q07/167*	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)						
Glasswort-mangrove sandfield	Q07/130 (ptMS,SL, RR,WR)							
Gorse scrub	Q07/130 (ptMS,SL, RR,WR)							
Knobby clubrush-tall fescue sedgeland	Q08/228 (ptMS,GP, RR,WR)							
Mangrove shrubland	Q07/143 (ptSB) Q07/144 (ptSB,GP) Q07/167*							
Mangrove shrubland and forest	Q07/130 (ptMS,SL, RR,WR) Q08/228 (ptMS,GP, RR,WR)							
Manuka shrubland	Q07/130 (ptMS,SL, RR,WR)							
Mudflat and sandflat	Q08/228 (ptMS,GP, RR,WR) Q07/130 (ptMS,SL, RR,WR) Q07/167*							
Oioi rushland	Q08/228 (ptMS,GP, RR,WR) Q07/130 (ptMS,SL, RR,WR)							
Oioi-sea rush rushland	Q07/130 (ptMS,SL, RR,WR)							
Saltmarsh ribbonwood shrubland	Q07/130 (ptMS,SL, RR,WR) Q07/167*							
Saltwater paspalum grassland	Q08/228 (ptMS,GP, RR,WR)							
Sea grass grassland	Q08/228 (ptMS,GP, RR,WR)							

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Estuarine Vegetation and Habitats (continued)</i>								
Glasswort herbfield								
Glasswort-mangrove sandfield								
Gorse scrub								
Knobby clubrush-tall fescue sedgeland								
Mangrove shrubland								
Mangrove shrubland and forest								
Manuka shrubland								
Mudflat and sandflat								
Oioi rushland								
Oioi-sea rush rushland								
Saltmarsh ribbonwood shrubland								
Saltwater paspalum grassland								
Sea grass grassland								

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Estuarine Vegetation and Habitats (continued)</i>								
Sea primrose-remuremu herbfield	Q08/228 (ptMS,GP, RR,WR)							
Sea rush rushland	Q08/228 (ptMS,GP, RR,WR) Q07/167*							
Sea rush- <i>Austrostipa stipoides</i> rushland	Q08/228 (ptMS,GP, RR,WR)							
Sea rush-oioi rushland	Q07/143 (ptSB) Q07/144 (ptSB,GP)							
<i>Duneland Vegetation and Habitats</i>								
Brush wattle-Chinese privet-mapou scrub	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Gorse scrub	Q07/129 (ptSL)							
Gorse-pampas scrub	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Harakeke-gorse flaxland	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Pampas-ginger scrub	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Tree-privet-Chinese privet scrub	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
<i>Kunzea ericoides</i> var. <i>linearis</i> forest	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER) Q07/141							
Maritime pine treeland	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Radiata pine forest	Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)							
Buffalo grass-pohuehue-knobby clubrush shrubland	Q08/228 (ptMS,GP, RR,WR)							
Buffalo grass-South African iceplant grassland	Q08/228 (ptMS,GP, RR,WR)							

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Estuarine Vegetation and Habitats (continued)</i>								
Sea primrose-remuremu herbfield								
Sea rush rushland								
Sea rush- <i>Austrostipa stipoides</i> rushland								
Sea rush-oioi rushland								
<i>Duneland Vegetation and Habitats</i>								
Brush wattle-Chinese privet-mapou scrub								
Gorse scrub								
Gorse-pampas scrub								
Harakeke-gorse flaxland								
Pampas-ginger scrub								
Tree-privet-Chinese privet scrub								
<i>Kunzea ericoides</i> var. <i>linearis</i> forest								
Maritime pine treeland								
Radiata pine forest								
Buffalo grass-pohuehue-knobby clubrush shrubland								
Buffalo grass-South African iceplant grassland								

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Duneland Vegetation and Habitats (continued)</i>								
<i>Carex pumila</i> sandfield								
Haretail-gazania-marram grassland		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER)						
Haretail-spinifex grassland								
Knobby clubbrush-pohuehue sedgeland		Q07/128 (ptMS,SL, SB,GP, RR, WR, ER)						
Pingao sedgeland		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER) Q08/228 (ptMS,GP, RR, WR)						
Pohuehue shrubland		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER)						
Pohuehue-buffalo grass shrubland								
Pohuehue- <i>Coprosma acerosa</i> shrubland		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER)						
Purple groundsel-South African iceplant herbfield		Q08/228 (ptMS,GP, RR, WR)						
Sandfield habitat		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER) Q08/228 (ptMS,GP, RR, WR)						
Sickle grass grassland								
South African iceplant-haretail-shore bindweed herbfield		Q08/228 (ptMS,GP, RR, WR)						
Spinifex grassland		Q07/128 (ptMS,SL, SB,GP,RR, WR, ER) Q08/228 (ptMS,GP, RR, WR)						

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Duneland Vegetation and Habitats (continued)</i>								
<i>Carex pumila</i> sandfield							Q08/228 (ptMS,GP, RR,WR) Q08/230	
Haretail-gazania-marram grassland								
Haretail-spinifex grassland							Q08/230	
Knobby clubbrush-pohuehue sedgeland								
Pingao sedgeland							Q08/230	
Pohuehue shrubland								
Pohuehue-buffalo grass shrubland							R08/001 (ptQEII)	
Pohuehue- <i>Coprosma acerosa</i> shrubland								
Purple groundsel-South African iceplant herbfield								
Sandfield habitat							Q07/128 (ptMS,SL, SB,GP,RR, WR,ER) Q08/228 (ptMS,GP, RR,WR) Q08/230 R08/001 (ptQEII)	
Sickle grass grassland							Q08/230	
South African iceplant-haretail- shore bindweed herbfield								
Spinifex grassland							Q07/128 (ptMS,SL, SB,GP,RR, WR,ER) Q08/228 (ptMS,GP, RR,WR)	

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Duneland Vegetation and Habitats (continued)</i>								
Sweet vernal grassland		Q07/128 (ptMS,SL, SB,GP,RR, WR,ER)						
Sweet vernal-haretail grassland		Q07/128 (ptMS,SL, SB,GP,RR, WR,ER)						
<i>Coastal Alluvial Vegetation</i>								
Brush wattle-manuka shrubland				Q07/167*				
Kanuka shrubland	Q07/144 (ptSB,GP) Q07/143 (ptSB)							
Manuka-harakeke shrubland	Q07/144 (ptSB,GP)							
<i>Inland Alluvial Vegetation</i>								
Manuka shrubland			Q08/244					
Kahikatea forest			Q07/145 Q07/152 Q08/220 (ptMS,SL) Q08 225 Q08/247	Q07/125 Q08/224 Q08/233 Q08/234* Q08/247				
Kahikatea treeland				Q07/136 (ptQEII)				
Kahikatea-nikau forest			Q07/113					
Kahikatea-puriri treeland				Q08/233				
Kahikatea-totara forest			Q07/152 Q08/235 (ptER)	Q08/235 (ptER)				
Kahikatea-totara treeland			Q07/142* (ptER)	Q07/142* (ptER)				
Kanuka-kahikatea forest				Q08/233				
Kauri forest			Q07/148					
Kowhai-kahikatea forest			Q07/117 (ptQEII,SR)					
Nikau forest			Q08/222 (ptQEII, MS, SL, SR,LP)					
Puriri-totara treeland			Q07/163 (ptER)	Q07/163 (ptER)				
Taraire forest			Q08/225a (ptLP) Q08/231 Q08/235 (ptER)	Q08/231 Q08/235 (ptER)				
Titoki-kowhai-totara forest			Q07/145					
Titoki-totara forest			Q07/145					

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Duneland Vegetation and Habitats (continued)</i>								
Sweet vernal grassland								
Sweet vernal-haretail grassland								
<i>Coastal Alluvial Vegetation</i>								
Brush wattle-manuka shrubland								
Kanuka shrubland								
Manuka-harakeke shrubland								
<i>Inland Alluvial Vegetation</i>								
Manuka shrubland								
Kahikatea forest		Q07/147						
Kahikatea treeland								
Kahikatea-nikau forest								
Kahikatea-puriri treeland								
Kahikatea-totara forest								
Kahikatea-totara treeland								
Kanuka-kahikatea forest								
Kauri forest								
Kowhai-kahikatea forest								
Nikau forest								
Puriri-totara treeland								
Taraire forest								
Titoki-kowhai-totara forest								
Titoki-totara forest								

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Alluvial Vegetation (continued)</i>								
Totara forest			Q07/145 Q07/148 Q07/152 Q07/161* (ptRR,ER) Q07/165* (ptER) Q08/235 (ptER) Q08/242*	Q07/165* (ptER) Q08/235 (ptER) Q08/242* Q08/246 Q08/235 (ptER) Q08/242*				
Totara treeland			Q07/119 (ptMS, RR,LP) Q07/142* (ptER) Q07/163 (ptER) Q08/232	Q07/119 (ptMS, RR,LP) Q07/142* (ptER) Q07/163 (ptER) Q08/232				
Totara-kahikatea forest			Q07/119 (ptMS, RR,LP) Q07/145 Q07/148	Q07/119 (ptMS, RR,LP)				
Totara-kanuka forest			Q07/163 (ptER) Q08/232 Q08/231	Q07/163 (ptER) Q08/232 Q08/231				
Totara-taraire-kanuka treeland			Q07/163 (ptER)	Q07/163 (ptER)				
<i>Coastal Hill Vegetation</i>								
Bracken-kikuyu-tall fescue- Yorkshire fog grassland						R08/001 (ptQEII)		R08/001 (ptQEII)
Hangehange-harakeke shrubland						R08/001 (ptQEII)		R08/001 (ptQEII)
Harakeke-kawakawa flaxland						R08/001 (ptQEII)		R08/001 (ptQEII)
Harakeke-pampas flaxland						R08/001 (ptQEII)		R08/001 (ptQEII)
Kanuka shrubland						R08/001 (ptQEII)		R08/001 (ptQEII)
Manuka shrubland								R08/002
Rocky outcrop and cliff habitat						R08/001 (ptQEII)		R08/001 (ptQEII)
Kahikatea forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Kanuka forest						R08/001 (ptQEII)		R08/001 (ptQEII) Q08/225i (ptSR) Q08/225g (ptQEII,SR, RR,LP)

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Alluvial Vegetation (continued)</i>								
Totara forest								
Totara treeland								
Totara-kahikatea forest								
Totara-kanuka forest								
Totara-taraire-kanuka treeland								
<i>Coastal Hill Vegetation</i>								
Bracken-kikuyu-tall fescue- Yorkshire fog grassland						R08/001 (ptQEII)		
Hangehange-harakeke shrubland						R08/001 (ptQEII)		
Harakeke-kawakawa flaxland						R08/001 (ptQEII)		
Harakeke-pampas flaxland						R08/001 (ptQEII)		
Kanuka shrubland						Q08/226 (ptQEII, RR,LP) R08/001 (ptQEII)		
Manuka shrubland						Q07/124 (ptSR)		
Rocky outcrop and cliff habitat						R08/001 (ptQEII)		
Kahikatea forest						R08/001 (ptQEII)		
Kanuka forest						Q07/122* Q07/124 (ptSR) R08/001 (ptQEII) Q08/225i (ptSR)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Coastal Hill Vegetation (continued)</i>								
Kanuka forest (<i>continued</i>)								
Kanuka treeland								
Kanuka-puriri treeland								
Kanuka-puriri-pohutukawa forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Kanuka-tanekaha forest								R08/002
Kanuka-tawa forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Kanuka-totara forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Kanuka-totara treeland						R08/001 (ptQEII)		R08/001 (ptQEII)
Karaka-nikau-kanuka forest								
Kauri-kanuka forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Nikau forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Nikau-karaka-pohutukawa-mahoe treeland						R08/001 (ptQEII)		R08/001 (ptQEII)
Pohutukawa forest					Q07/130 (ptMS,SL,RR,WR)	R08/001 (ptQEII)		R08/001 (ptQEII)
Pohutukawa treeland					Q08/228 (ptMS,GP,RR,WR)			
Pohutukawa-rimu forest								
Puriri forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Puriri-rewarewa-pohutukawa forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Taraire forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Taraire-puriri forest								Q08/225i (ptSR)
Taraire-totara-puriri forest						R08/001 (ptQEII)		R08/001 (ptQEII)
Totara forest								
Totara treeland								

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Coastal Hill Vegetation (continued)</i>								
Kanuka forest (<i>continued</i>)						Q08/225g (ptQEII, SR,RR,LP) Q08/226 (ptQEII, RR, LP)		
Kanuka treeland						Q07/122*		
Kanuka-puriri treeland						Q07/124 (ptSR)		
Kanuka-puriri-pohutukawa forest						R08/001 (ptQEII)		
Kanuka-tanekaha forest								
Kanuka-tawa forest						R08/001 (ptQEII)		
Kanuka-totara forest						R08/001 (ptQEII)		
Kanuka-totara treeland						R08/001 (ptQEII)		
Karaka-nikau-kanuka forest						Q07/124 (ptSR)		
Kauri-kanuka forest						Q07/124 (ptSR) R08/001 (ptQEII)		
Nikau forest						R08/001 (ptQEII)		
Nikau-karaka-pohutukawa-mahoe treeland						R08/001 (ptQEII)		
Pohutukawa forest				Q08/226 (ptQEII, RR, LP)		Q08/226 (ptQEII, RR,LP) R08/001 (ptQEII)		
Pohutukawa treeland				Q08/226 (ptQEII, RR,LP)		Q08/226 (ptQEII, RR,LP)		
Pohutukawa-rimu forest						Q08/226 (ptQEII, RR,LP)		
Puriri forest						R08/001 (ptQEII)		
Puriri-rewarewa-pohutukawa forest						R08/001 (ptQEII)		
Taraire forest						R08/001 (ptQEII)		
Taraire-puriri forest								
Taraire-totara-puriri forest						R08/001 (ptQEII)		
Totara forest						Q07/124 (ptSR) Q07/127 (ptSL,WR)		
Totara treeland						Q07/127 (ptSL,WR)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Coastal Hill Vegetation (continued)</i>								
Totara-pohutukawa forest					Q07/130 (ptMS,SL, RR,WR)			
Totara-puriri forest								
<i>Inland Hill Vegetation</i>								
Bracken-tangle fern fernland								Q07/137
Kanuka shrubland								Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP) Q08/239
Kanuka-manuka shrubland								Q08/220 (ptMS,SL) Q08/237
Mahoe-kanuka shrubland								Q07/121 (ptQEII,SL, SR,LP)
Mahoe-totara-kohuhu shrubland								Q07/112
Mamaku-kanuka-gorse shrubland								
Mamaku-mahoe shrubland								Q08/220 (ptMS,SL)
Mamaku-mahoe-kanuka-hangehange shrubland								
Mamaku-pate shrubland								
Mamaku-ponga shrubland								Q08/225e (ptMS,SR)
Manuka shrubland								Q07/116 (ptSR) Q07/160* Q08/220 (ptMS,SL) Q08/221 Q08/222 (ptQEII,MS, SL,SR,LP)
Manuka-gorse-kanuka shrubland								
Manuka-kanuka shrubland							Q07/135	Q07/135 Q08/224
Manuka-kanuka-ponga shrubland								Q07/158
Manuka-ponga shrubland								
Mapou-manuka shrubland								Q08/220 (ptMS,SL)
Mapou-mingimangi-ponga shrubland								Q08/220 (ptMS,SL)
Pate-mamaku shrubland								

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Coastal Hill Vegetation (continued)</i>								
Totara-pohutukawa forest								
Totara-puriri forest						Q07/124 (ptSR)		
<i>Inland Hill Vegetation</i>								
Bracken-tangle fern fernland								
Kanuka shrubland				Q07/117 (ptQEII,SR) Q08/239		Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP) Q07/139		
Kanuka-manuka shrubland					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL) Q08/225a (ptLP) Q08/237		
Mahoe-kanuka shrubland						Q07/121 (ptQEII,SL, SR,LP)		
Mahoe-totara-kohuhu shrubland								
Mamaku-kanuka-gorse shrubland						Q08/225a (ptLP)		
Mamaku-mahoe shrubland					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL)		
Mamaku-mahoe-kanuka-hangehange shrubland						Q08/225h (ptQEII,SR)		
Mamaku-pate shrubland						Q08/225c (ptLP)		
Mamaku-ponga shrubland						Q08/225e (ptMS,SR)		
Manuka shrubland		Q07/147 Q07/150		Q08/220 (ptMS,SL)		Q07/116 (ptSR) Q08/220 (ptMS,SL) Q08/221 Q08/222 (ptQEII,MS, SL,SR,LP)		
Manuka-gorse-kanuka shrubland						Q07/139		
Manuka-kanuka shrubland						Q07/135 Q08/224 Q08/225j (ptSR)		
Manuka-kanuka-ponga shrubland								
Manuka-ponga shrubland		Q07/147						
Mapou-manuka shrubland					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL)		
Mapou-mingimangi-ponga shrubland					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL)		
Pate-mamaku shrubland						Q08/225a (ptLP)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Pate-ti kouka shrubland								Q07/121 (ptQEII,SL, SR,LP)
Totara-kanuka shrubland								
Rockland							Q07/132	
Kahikatea forest							Q07/113 Q07/120	Q07/112 Q07/113 Q07/120 Q07/160* Q08/240
Kahikatea treeland								
Kahikatea-pukatea forest								Q07/112
Kahikatea-puriri forest								Q08/225d (ptQEII)
Kahikatea-rimu-totara forest								
Kahikatea-rimu-totara treeland								Q08/227*
Kahikatea-totara forest							Q07/148	Q07/121 (ptQEII,SL, SR,LP) Q07/148 Q07/153*
Kahikatea-totara treeland								
Kanuka forest							Q07/120	Q07/137 Q07/116 (ptSR) Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/120 Q07/121 (ptQEII,SL, SR,LP) Q07/158 Q08/220 (ptMS,SL) Q08/221 Q08/223 Q08/224 Q08/229* Q08/225e (ptMS,SR) Q08/225g (ptQEII,SR, RR,LP) Q08/227* Q08/237 Q08/239
Kanuka-kahikatea forest								Q07/114
Kanuka-kauri forest								Q08/225g (ptQEII,SR, RR,LP)

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Pate-ti kouka shrubland						Q07/121 (ptQEII,SL, SR,LP)		
Totara-kanuka shrubland						Q07/139		
Rockland								
Kahikatea forest		Q07/147		Q07/120		Q07/120	Q07/113 Q08/225a (ptLP)	
Kahikatea treeland						Q07/127 (ptSL,WR)		
Kahikatea-pukatea forest								
Kahikatea-puriri forest						Q08/225d (ptQEII)		
Kahikatea-rimu-totara forest		Q07/150						
Kahikatea-rimu-totara treeland								
Kahikatea-totara forest	Q07/149		Q07/148			Q07/121 (ptQEII,SL, SR,LP) Q07/153*		
Kahikatea-totara treeland		Q07/150						
Kanuka forest	Q07/150 Q07/147		Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/120 Q08/225g (ptQEII,SR, RR,LP) Q08/239	Q08/220 (ptMS,SL)		Q07/166* Q07/116 (ptSR) Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/120 Q07/121 (ptQEII,SL, SR,LP) Q08/220 (ptMS,SL) Q08/221 Q08/224 Q08/225a (ptLP) Q08/225b (ptQEII,SR) Q08/225e (ptMS,SR) Q08/225f Q08/225h (ptQEII,SR) Q08/225g (ptQEII,SR, RR,LP) Q08/225c (ptLP) Q08/237		
Kanuka-kahikatea forest						Q07/114		
Kanuka-kauri forest				Q08/225g (ptQEII,SR, RR,LP)		Q08/225g (ptQEII,SR, RR,LP)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Kanuka-mamaku forest								Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP) Q08/222 (ptQEII,MS, SL,SR,LP) Q08/225e (ptMS,SR) Q08/225g (ptQEII,SR, RR,LP) Q08/239 Q08/241
Kanuka-mamaku-puriri forest								Q08/225e (ptMS,SR)
Kanuka-rewarewa forest								Q07/117 (ptQEII,SR)
Kanuka-rimu forest								Q08/221 Q08/222 (ptQEII,MS, SL,SR,LP) Q08/225g (ptQEII,SR, RR,LP)
Kanuka-rimu-tanekaha forest								Q07/121 (ptQEII,SL, SR,LP) Q08/225d (ptQEII) Q08/225g (ptQEII,SR, RR,LP)
Kanuka-rimu-tanekaha-kauri forest								Q07/117 (ptQEII,SR)
Kanuka-tanekaha forest								Q08/222 (ptQEII,MS, SL,SR,LP) Q08/224
Kanuka-tanekaha-kauri forest								
Kanuka-tanekaha-rewarewa forest								Q08/222 (ptQEII,MS, SL,SR,LP)
Kanuka-totara forest								Q07/114 Q07/116 (ptSR) Q08/225e (ptMS,SR)
Kanuka-totara treeland								Q08/223
Kanuka-totara-mamaku forest							Q07/113	Q07/113
Kanuka-towai forest								Q07/116 (ptSR)

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Kanuka-mamaku forest				Q07/117 (ptQEII,SR) Q08/225g (ptQEII,SR, RR,LP) Q08/239		Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP) Q07/166* Q08/222 (ptQEII,MS, SL,SR,LP) Q08/225c (ptMS,SR) Q08/225g (ptQEII,SR, RR,LP)		
Kanuka-mamaku-puriri forest						Q08/225c (ptMS,SR)		
Kanuka-rewarewa forest				Q07/117 (ptQEII,SR)		Q07/117 (ptQEII,SR)		
Kanuka-rimu forest				Q08/225g (ptQEII,SR, RR,LP)		Q08/221 Q08/222 (ptQEII,MS, SL, SR,LP) Q08/225g (ptQEII,SR, RR,LP)		
Kanuka-rimu-tanekaha forest				Q08/225g (ptQEII,SR, RR,LP)		Q07/121 (ptQEII,SL, SR,LP) Q08/225d (ptQEII)		
Kanuka-rimu-tanekaha-kauri forest				Q07/117 (ptQEII,SR)		Q07/117 (ptQEII,SR)		
Kanuka-tanekaha forest						Q08/222 (ptQEII,MS, SL,SR,LP) Q08/224		
Kanuka-tanekaha-kauri forest						Q08/225j (ptSR)		
Kanuka-tanekaha-rewarewa forest						Q08/222 (ptQEII,MS, SL, SR,LP)		
Kanuka-totara forest		Q07/147 Q07/150				Q07/114 Q07/116 (ptSR) Q08/225c (ptMS,SR)		
Kanuka-totara treeland								
Kanuka-totara-mamaku forest						Q07/113		
Kanuka-towai forest						Q07/116 (ptSR)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Kauri forest								Q07/116 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q07/162 Q08/222 (ptQEII,MS, SL,SR,LP) Q08/225d (ptQEII) Q08/225e (ptMS,SR)
Kauri-kanuka forest								Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q08/220 (ptMS,SL)
Kauri-kanuka-rimu forest								Q08/243*
Kauri-rimu forest							Q07/120 Q07/135	Q07/120 Q07/121 (ptQEII,SL, SR,LP) Q07/135 Q08/225d (ptQEII)
Kauri-tanekaha forest								Q08/222 (ptQEII,MS, SL,SR,LP)
Kauri-tanekaha-rimu- kanuka forest								
Kohekohe forest								Q08/224
Kohuhu forest								
Mahoe-mamaku forest								Q08/222 (ptQEII,MS, SL,SR,LP)
Mamaku forest								Q08/220 (ptMS,SL) Q08/221 Q08/238
Mamaku-mahoe forest								Q07/114
Mamaku-mapou forest								Q08/222 (ptQEII,MS, SL,SR,LP)

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Kauri forest	Q07/150					Q07/116 (ptSR) Q07/121 (ptQEII,SL,SR,LP) Q08/222 (ptQEII,MS,SL,SR,LP) Q08/225b (ptQEII,SR) Q08/225e (ptMS,SR)		
Kauri-kanuka forest				Q07/117 (ptQEII,SR) Q07/118 (ptSR)	Q08/220 (ptMS,SL)	Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q08/220 (ptMS,SL) Q08/225h (ptQEII,SR)		
Kauri-kanuka-rimu forest								
Kauri-rimu forest					Q07/120	Q07/120 Q07/121 (ptQEII,SL,SR,LP) Q07/135 Q08/225d (ptQEII) Q08/225c (ptLP)		
Kauri-tanekaha forest						Q08/222 (ptQEII,MS,SL,SR,LP) Q08/225h (ptQEII,SR)		
Kauri-tanekaha-rimu-kanuka forest						Q08/225b (ptQEII,SR)		
Kohekohe forest						Q08/224 Q08/225c (ptLP)		
Kohuhu forest						Q08/225c (ptLP)		
Mahoe-mamaku forest						Q08/222 (ptQEII,MS,SL,SR,LP)		
Mamaku forest					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL) Q08/221 Q08/225a (ptLP) Q08/225h (ptQEII,SR)		
Mamaku-mahoe forest						Q07/114		
Mamaku-mapou forest						Q08/222 (ptQEII,MS,SL,SR,LP)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Mamaku-rewarewa forest								Q08/240
Mapou-mamaku forest								
Mapou-ponga-mamaku forest								
Miro-tawa-rewarewa forest								
Nikau forest							Q07/120	Q07/120
Nikau-mamaku forest								
Nikau-ponga forest								Q07/121 (ptQEII,SL, SR,LP)
Nikau-rewarewa forest								
Ponga-nikau forest								Q07/153*
Ponga-nikau treeland								Q07/153*
Pukatea-kahikatea-totara forest								Q07/153*
Puriri forest								Q07/117 (ptQEII,SR)
Puriri-nikau forest								Q08/225e (ptMS,SR)
Puriri-taraire-rewarewa-totara-nikau-mamaku forest								
Rewarewa-mamaku-tarata forest								
Rewarewa-tanekaha forest								
Rimu forest								Q08/220 (ptMS,SL) Q08/245* Q08/227*
Rimu-kanuka forest								Q08/237
Rimu-kauri-kanuka forest								Q08/239
Rimu-rewarewa-tanekaha forest								
Rimu-tanekaha forest							Q07/120	Q07/117 (ptQEII,SR) Q07/120
Rimu-totara-kanuka forest								
Tanekaha forest								Q08/220 (ptMS,SL) Q08/224 Q08/241
Tanekaha-kanuka forest								Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP)

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Mamaku-rewarewa forest								
Mapou-mamaku forest						Q08/225a (ptLP)		
Mapou-ponga-mamaku forest						Q08/225a (ptLP)		
Miro-tawa-rewarewa forest						Q08/225c (ptLP)		
Nikau forest				Q07/120		Q07/120		
Nikau-mamaku forest						Q08/225c (ptLP)		
Nikau-ponga forest						Q07/121 (ptQEII,SL, SR,LP)		
Nikau-rewarewa forest						Q08/225f		
Ponga-nikau forest						Q07/153*		
Ponga-nikau treeland						Q07/153*		
Pukatea-kahikatea-totara forest						Q07/153*		
Puriri forest				Q07/117 (ptQEII,SR)		Q07/117 (ptQEII,SR) Q08/225h (ptQEII,SR)		
Puriri-nikau forest						Q08/225c (ptMS,SR)		
Puriri-taraire-rewarewa-totara-nikau-mamaku forest						Q08/225h (ptQEII,SR)		
Rewarewa-mamaku-tarata forest						Q08/225c (ptLP)		
Rewarewa-tanekaha forest						Q08/225f		
Rimu forest					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL) Q08/225b (ptQEII,SR)		
Rimu-kanuka forest						Q08/225f Q08/237		
Rimu-kauri-kanuka forest				Q08/239				
Rimu-rewarewa-tanekaha forest						Q08/225a (ptLP)		
Rimu-tanekaha forest				Q07/117 (ptQEII,SR) Q07/120		Q07/117 (ptQEII,SR) Q07/120		
Rimu-totara-kanuka forest						Q08/225c (ptLP)		
Tanekaha forest					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL) Q08/224 Q08/225b (ptQEII,SR)		
Tanekaha-kanuka forest				Q07/117 (ptQEII,SR)		Q07/117 (ptQEII,SR) Q07/121 (ptQEII,SL, SR,LP)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Tanekaha-kanuka forest (continued)								
Tanekaha-rewarewa forest								Q08/225e (ptMS,SR) Q08/236
Tanekaha-rewarewa-kanuka forest								
Taraire forest							Q07/120 Q07/132	Q07/112 Q07/114 Q07/117 (ptQEII,SR) Q07/120 Q07/121 (ptQEII,SL, SR,LP) Q08/220 (ptMS,SL) Q08/222 (ptQEII,MS, SL,SR,LP) Q08/224 Q08/236 Q08/237
Taraire-kahikatea forest								Q07/112 Q07/156*
Taraire-kanuka forest								
Taraire-mamaku-rimu-rewarewa-totara forest								Q08/220 (ptMS,SL)
Taraire-nikau forest								
Taraire-puriri forest								Q08/225d (ptQEII) Q08/225g (ptQEII,SR, RR,LP)
Taraire-tawa forest								
Taraire-tawa-rewarewa-mamaku forest								
Taraire-totara forest								Q07/121 (ptQEII,SL, SR,LP) Q08/220 (ptMS,SL)
Taraire-totara-rimu forest								
Tawa-nikau forest								
Tawa-rewarewa-mamaku-ponga-nikau-kohekohe forest								

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Tanekaha-kanuka forest (continued)						Q08/225a (ptLP) Q08/225h (ptQEII,SR)		
Tanekaha-rewarewa forest						Q08/225c (ptMS,SR)		
Tanekaha-rewarewa-kanuka forest						Q08/225a (ptLP)		
Taraire forest				Q07/117 (ptQEII,SR) Q07/120	Q08/220 (ptMS,SL)	Q07/114 Q07/117 (ptQEII,SR) Q07/120 Q07/121 (ptQEII,SL, SR,LP) Q08/220 (ptMS,SL) Q08/222 (ptQEII,MS, SL,SR,LP) Q08/224 Q08/225c (ptLP) Q08/237		
Taraire-kahikatea forest								
Taraire-kanuka forest						Q08/225a (ptLP)		
Taraire-mamaku-rimu- rewarewa-totara forest					Q08/220 (ptMS,SL)	Q08/220 (ptMS,SL)		
Taraire-nikau forest						Q08/225b (ptQEII,SR)		
Taraire-puriri forest				Q08/225g (ptQEII,SR, RR,LP)		Q08/225d (ptQEII) Q08/225h (ptQEII,SR) Q08/225g (ptQEII,SR, RR,LP)		
Taraire-tawa forest						Q08/225a (ptLP)		
Taraire-tawa-rewarewa- mamaku forest						Q08/225a (ptLP)		
Taraire-totara forest					Q08/220 (ptMS,SL)	Q07/121 (ptQEII,SL, SR,LP) Q08/220 (ptMS,SL)		
Taraire-totara-rimu forest						Q08/225b (ptQEII,SR)		
Tawa-nikau forest						Q08/225c (ptLP)		
Tawa-rewarewa-mamaku- ponga-nikau-kohekohe forest						Q08/225h (ptQEII,SR)		

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Tawa-taraire forest								
Ti kouka-putaputaweta-manuka shrubland								Q08/221
Totara forest								Q07/113 Q07/112 Q07/135 Q07/113 Q07/115 Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/121 (ptQEII,SL,SR,LP) Q07/135 Q07/140* Q07/153* Q07/156* Q07/157* Q07/160* Q08/220 (ptMS,SL) Q08/222 (ptQEII,MS,SL,SR,LP) Q08/225g (ptQEII,SR,RR,LP) Q08/245*
Totara treeland								Q07/113 Q07/113 Q07/135 Q07/118 (ptSR) Q07/118 (ptSR) Q07/135 Q08/245*
Totara-hawthorn forest								Q07/118 (ptSR)
Totara-kahikatea forest								Q07/112 Q07/134 Q07/155 Q07/159* Q08/221 Q08/231
Totara-kahikatea-kanuka forest								Q07/114
Totara-kahikatea-taraire forest								Q07/112
Totara-kanuka forest								Q07/120 Q07/120 Q07/135 Q07/135 Q07/155 Q07/162 Q08/225g (ptQEII,SR,RR,LP)
Totara-kanuka treeland								Q07/120 Q07/120
Totara-kanuka-kahikatea forest								
Totara-kanuka-mamaku forest								Q07/157*

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Tawa-taraire forest						Q08/225c (ptLP)		
Ti kouka-putaputaweta- manuka shrubland						Q08/221		
Totara forest	Q07/147 Q07/150 Q07/151*	Q07/133* Q07/146*	Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q08/225g (ptQEII,SR, RR,LP)	Q08/220 (ptMS,SL)		Q07/113 Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q07/135 Q07/139 Q07/153* Q07/166* Q08/220 (ptMS,SL) Q08/222 (ptQEII,MS, SL,SR,LP) Q08/225b (ptQEII,SR) Q08/225g (ptQEII,SR, RR,LP) Q08/225c (ptLP)		
Totara treeland			Q07/118 (ptSR)			Q07/113 Q07/118 (ptSR) Q07/135		
Totara-hawthorn forest			Q07/118 (ptSR)			Q07/118 (ptSR)		
Totara-kahikatea forest						Q08/221		
Totara-kahikatea-kanuka forest						Q07/114		
Totara-kahikatea-taraire forest						Q07/139		
Totara-kanuka forest	Q07/147		Q07/120 Q08/225g (ptQEII,SR, RR,LP)			Q07/120 Q07/135 Q08/225g (ptQEII,SR, RR,LP)		
Totara-kanuka treeland			Q07/120			Q07/120		
Totara-kanuka-kahikatea forest	Q07/150							
Totara-kanuka-mamaku forest								

GEOL. GROUP:	A	B	C	D	E	F	G	H
<i>Inland Hill Vegetation (continued)</i>								
Totara-kauri-kanuka forest								
Totara-mamaku forest								Q07/118 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q07/160* Q08/221
Totara-mamaku-puriri forest								
Totara-puriri-kanuka forest								
Totara-radiata pine forest								Q07/153*
Totara-rewarewa forest								Q07/121 (ptQEII,SL, SR,LP)
Totara-rewarewa-taraire forest								Q08/240
Totara-rimu forest								
Totara-tanekaha-rewarewa forest								
Totara-taraire forest								Q07/117 (ptQEII,SR) Q07/118 (ptSR) Q07/156* Q08/241
Totara-taraire-kanuka forest								Q07/162
Towai forest								Q07/116 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q07/153 Q08/220 (ptMS,SL)
Towai-mamaku forest								Q08/240
Unknown forest type								
Unknown forest type								
Unknown forest type								Q08/241

GEOL. GROUP:	I	J	K	L	M	N	O	P
<i>Inland Hill Vegetation (continued)</i>								
Totara-kauri-kanuka forest						Q08/225c (ptLP)		
Totara-mamaku forest				Q07/118 (ptSR)		Q07/118 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q08/221		
Totara-mamaku-puriri forest						Q08/225c (ptLP)		
Totara-puriri-kanuka forest			Q08/232					
Totara-radiata pine forest						Q07/153*		
Totara-rewarewa forest						Q07/121 (ptQEII,SL, SR,LP)		
Totara-rewarewa-taraire forest								
Totara-rimu forest	Q07/149							
Totara-tanekaha-rewarewa forest						Q08/225h (ptQEII,SR)		
Totara-taraire forest				Q07/117 (ptQEII,SR) Q07/118 (ptSR)		Q07/117 (ptQEII,SR) Q07/118 (ptSR)		
Totara-taraire-kanuka forest								
Towai forest					Q08/220 (ptMS,SL)	Q07/116 (ptSR) Q07/121 (ptQEII,SL, SR,LP) Q07/153 Q08/220 (ptMS,SL)		
Towai-mamaku forest								
Unknown forest type						Q08/225b (ptQEII,SR)		
Unknown forest type						Q08/225f		
Unknown forest type								

TABLE 3: SUMMARY OF SITE EVALUATIONS.

e.u.= ecological unit, reg.sig.= regionally significant

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS*	RARITY†/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Ruarangi Road Forest Remnants 1 Q07/112	Rep.site for 5 e.u.s	Fauna: 2 threatened	9 e.u.s	Diverse, healthy canopy; established understorey in remnants that are fenced; mature, emergent podocarpus; minimal weed infestation	Riparian protection	58.8 ha, 15 small remnants
Takatearea Stream Forest Q07/113	Rep.site for 2 e.u.s	Forest on alluvium	5 e.u.s	Highly disturbed and grazed; several weed infestations; broken into many separate remnants, therefore strong edge effects	Partial catchment protection	105.5 ha, 17 small remnants with convoluted edges
Pokapu Hill Forest Remnants Q07/114	Rep.site for 3 e.u.s	Flora: 1 threatened Fauna: 2 threatened	5 e.u.s	Diverse, healthy canopy; established understorey in parts that are fenced; minimal weed infestation	Riparian protection	82.8 ha, 1 large and 5 small remnants
Mangapai Caves Rd Forest and Shrubland Q07/116	Rep.site for 2 e.u.s	Flora: 1 threatened Fauna: 2 threatened	7 e.u.s	Diverse, healthy canopy; established understorey in parts that are fenced; minimal weed infestation	Catchment protection	271.3 ha, 2 large and 2 small remnants
North River Forest Q07/117	Rep.site for 9 e.u.s	Limestone geology; Flora: 4 threatened, 5 reg.sig. Fauna: 5 threatened, 2 reg.sig.	13 e.u.s	Large, continuous secondary forest area with diverse, healthy canopy; domestic stock and feral goat impacts in understorey; moderate recreational use; piecemeal clearance near summit and around edges	Near Q07/120 and Q08/239; catchment and riparian protection	960.3 ha, 2 large remnants divided by a track and 7 small remnants
Waipu Caves Forest Q07/118	Rep.site for 2 e.u.s	Limestone geology; Flora: 1 threatened, 2 reg.sig. Fauna: 4 threatened	7 e.u.s	Large, continuous forest area; diverse, healthy canopy; some ancient emergent podocarpus; severe stock impacts in understorey around limestone areas	Near Q07/120 and Q07/117; catchment and riparian protection	370.8 ha, 2 large remnants divided by a road and 3 small remnants
Ruakaka River Forest Remnants Q07/119	Rep.site for 2 e.u.s	Forest on alluvium; Flora: 1 reg.sig. Fauna: 4 threatened	2 e.u.s	Highly fragmented, disturbed and weed-infested lowland floodplain forest remnants spread over a wide area in a catchment largely cleared of original vegetation	Ecological linkage between Q07/124, Q07/121 and Q07/116	104.3 ha, 39 small, narrow remnants, sometimes widely separated
Caves Road Forest Q07/120	Rep.site for 1 e.u.	Limestone geology; northernmost Hochstetter's frogs; Flora: 1 reg.sig. Fauna 3 threatened, 1 reg.sig.	9 e.u.s	Highly disturbed and grazed forest remnants, though species and habitat diversity is moderate to high; weed infestations from contiguous residential areas; planting of non-ecosourced indigenous plant species	Near Q07/117, Q07/135 and Q07/118; riparian protection	171.9 ha, 1 major tract in west and 8 smaller remnants

* Note that most sites have more than one ecological unit present. This column indicates whether or not the site has been selected as being a representative site for one or more ecological units.

† The rapid quantitative method used in this survey did not cover survey for rare species; in most cases species information in this column has been collated from other databases. It is likely that specific species surveys for all sites would reveal additional data on threatened and rare species, and in the case of Level 2 sites, a change in ranking.

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Ruakaka Forest Q07/121	Rep.site for 17 e.u.s	Flora: 4 reg.sig. Fauna: 5 threatened, 2 reg.sig.	18 e.u.s	Very large (for the ED) and diverse secondary forest area; disturbance on edges; browsers, pigs and livestock all have negative impacts	Catchment protection, especially for Ruakaka River (Q07/119)	1699.3 ha, 2 major remnants and 17 smaller peripheral remnants
Takahiwai Forest Q07/124	Rep.site for 7 e.u.s	Flora: 5 reg.sig. Fauna: 3 threatened, 2 reg.sig.	9 e.u.s	Large, compact area of secondary forest; older broadleaf forest in gullies; some edges grazed with sparse canopy	Riparian protection	641.2 ha, 1 major and 10 smaller peripheral remnants
Tauroa Floodplain Forest Remnants Q07/125	Rep.site for 1 e.u.	Forest on alluvium	1 e.u.	One remnant fenced and in good condition; other remnant unfenced, sparse treeland, grazed, lacking regeneration	Near Q07/119; part of corridor along Ruakaka River	4.8 ha, 2 remnants 1 km apart
Mountfield Rd Wetlands Q07/126	Rep.site for 1 e.u.	Fauna: 2 threatened	3 e.u.s	Two constructed ponds and two semi-natural gully wet- lands with fringing indigenous vegetation; grazing and weed infestations; threatened birds not recorded for 19 years	Near a large forested site, Ruakaka Forest Q07/121	2.3 ha, 4 remnants
Doctor's Hill Rd Wetland Q07/127	Rep.site for 4 e.u.s	Fauna: 4 threatened	8 e.u.s	Largest natural wetland remaining in ED; fragmented, modified, extensively weed- infested, but provides habitat for threatened bird species	Near Q07/121 and contiguous with Q07/128 and Q07/130	23.2 ha, 8 relatively narrow remnants
Ruakaka Dunelands Q07/128	Rep.site for 8 e.u.s	Flora: 3 threatened, 1 reg.sig. Fauna: 5 threatened, 2 reg.sig.	19 e.u.s	Largest duneland site in Waipu ED (includes all un- developed duneland north of Waipu River); mostly exotic vegetation, but a high diversity of indigenous species is included; high human, animal pest and vehicle disturbance	Buffer between sea and land; international migrant wader site; near to or linked with several coastal wet- lands, e.g. Q07/131, Q07/141, Q07/127, Q07/130; contiguous with Q08/228; relatively isolated from large forested areas	723.3 ha, 2 major continuous stretches varying from 800 m to 30 m wide plus 4 smaller remnants
Ruakaka Racecourse Dune Lake Q07/129	Rep.site for 5 e.u.s	Only dune lake in ED. Flora: 1 reg.sig. Fauna: 7 threatened, 3 reg.sig.	6 e.u.s	Dune lake surrounded by gorse scrub and rank pasture; horse grazing and earth- moving disturbance down to margins; probably infilling of northern area in recent times; weed infestation (alligator weed) and apparent poor water quality	Near Q07/128 and Q07/130	4.0 ha, 2 remnants
Ruakaka River Estuary Q07/130	Rep.site for 11 e.u.s	Flora: 2 threatened, 1 reg.sig. Fauna: 16 threatened, 2 reg.sig.	13 e.u.s	Estuarine margins, raised islands and coastal scarp have multiple weed infest- ations but fully inundated habitats in better condition; high human and animal pest disturbance	Contiguous with Q07/128	83.5 ha, major area is estuary (77.6 ha) with 4 small peripheral forest remnants
McEwan Road Wetland Q07/131	Rep.site for 5 e.u.s	Flora: 2 reg.sig. Fauna: 1 threatened	7 e.u.s	Very small natural dune slack wetland surrounded by pasture and roads; weed infestations on margins mainly	Relatively isolated, but part of wetland bird habitat network including Q07/131, Q07/141, Q07/127, Q07/129, Q07/130 and Q07/164	0.7 ha compact area

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Waipu Caves Road Sandstone Knoll Q07/132	Rep.site for 1 e.u.	Flora: 2 reg.sig. Fauna not surveyed	2 e.u.s	Very small knoll and adjoining cliff face; grazed and trampled by stock	Isolated	2.4 ha forest remnant with narrow extension of sandstone cliff adjacent
Ormiston Road Forest and Shrubland Q07/135	Rep.site for 1 e.u.	Fauna: 1 threatened	5 e.u.s	Medium-sized, mostly un- fenced secondary forest remnants; possums regularly poisoned in one remnant, but feral cats, weasels, cattle, and goats present throughout	Links Q07/121, Q07/118 and Q07/120	31.6 ha, 3 remnants
McDonnell Road Forest and Shrubland Q07/137	Rep.site for 1 e.u.	Fauna: 2 threatened	2 e.u.s	Fenced and regenerating; minimal weed infestation	Riparian protection; near Q07/116 and Q07/162	3.4 ha, 2 remnants
Upper Mangawai River Wetlands Q07/138	Rep.site for 2 e.u.s	Flora: 1 reg.sig.	3 e.u.s	Two wetland patches dom- inated by harakeke and kahikatea; second largest natural freshwater wetland in ED; several weed infest- ations; not fully fenced	Isolated	6.8 ha, 2 remnants
Eastern Mangawai Catchment Q07/139	Rep.site for 2 e.u.s		5 e.u.s	Mosaic of regenerating forest and shrubland with a lot of surrounding gorse; appears grazed	Catchment protection; near Q07/117 and Q08/245; probably contribute to habitat network for mobile spp	117.6 ha, 1 large and 4 smaller remnants
Sime Road Wetland Q07/141	Rep.site for 3 e.u.s	Fauna: 1 threatened	6 e.u.s	Very small natural dune slack wetland surrounded by pasture and roads; some invasive weeds, but these are not dominant	Near Q07/128	0.7 ha
Takahiwi Stream Estuary Q07/143	Rep.site for 3 e.u.s	Fauna: 2 threatened	3 e.u.s	Contains complete transition from terrestrial to estuarine vegetation; no grazing; some weed infestation	Protective buffer to coastal fringe; contiguous with extensive Takahiwi tidal flats	11.1 ha, 1 larger central part and 2 smaller peri- pheral remnants
Blacksmith's Creek Estuary Q07/144	Rep.site for 4 e.u.s	Flora: 1 reg.sig. Fauna: 2 threatened	3 e.u.s	Diverse mosaic of estuarine and terrestrial vegetation; weed invasion on margins; increasingly urbanised surrounds; dumping of garden refuse; disturbance by dogs	Protective buffer to coastal fringe; contiguous with Marsden Bay tidal flats	22.0 ha, 2 remnants (one very tiny and peripheral)
Tauraroa River Forest Remnants Q07/145	Rep.site for 2 e.u.s	Forest on alluvium; Flora: 1 reg.sig.	5 e.u.s	Heavily grazed with no understorey, or fenced with understorey of harakeke	Isolated	1.2 ha, 5 remnants
Waiotira Stream Forest Remnants Q07/148	Rep.site for 2 e.u.s	Forest on alluvium; Fauna not surveyed	4 e.u.s	Grazed and disturbed; strong edge effects	Riparian protection	24.7 ha, 19 remnants, small and narrow
Russek Road Natural Area 1 Q07/149	Rep.site for 2 e.u.s	Limestone geology; Fauna not surveyed	2 e.u.s	Sparse understorey; possibly recently fenced		1.9 ha, 1 compact remnant
Russek Road Natural Area 2 Q07/150	Rep.site for 8 e.u.s		10 e.u.s	Diverse canopy; grazed; localised patches with established understorey	Riparian protection	30.3 ha, 14 remnants

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Paparoa Road Riparian Forest Remnants Q07/152	Rep.site for 1 e.u.	Forest on alluvium; Flora: 1 reg.sig.	3 e.u.s	Grazed and disturbed; localised weed infestation; strong edge effects	Riparian protection; near Q07/112	5.5 ha, 8 remnants, small and narrow
Ngatoka Forest and Shrubland Q07/158	Rep.site for 1 e.u.	Fauna not surveyed	2 e.u.s	Dense young forest and shrubland; gorse on edges and occasional pines	Riparian protection; each remnant contiguous with pine plantation	30.1 ha, 2 compact remnants
Parry Road Forest Remnants Q07/162		Fauna: 1 threatened	3 e.u.s	Diverse, healthy canopy; weed infestation (tradesantia); understorey present where browsing pressure is light	Riparian protection; provides linkage between Q07/114 and Q07/116	30.9 ha, 8 remnants, long and narrow
Pohuenui River Forest Remnants Q07/163	Rep.site for 1 e.u.	Forest on alluvium; Flora: 1 reg.sig. Fauna not surveyed	4 e.u.s	Grazed and disturbed; strong edge effects; understorey sparse or absent; weed infestation	Riparian protection	49.1, 21 remnants, long and narrow
Northland Port Corporation Ponds Q07/164	Rep.site for 1 e.u.	Fauna: 2 threatened, 1 reg.sig.	3 e.u.s	Recently constructed wet- land; dominated by indigenous species; extreme water level fluctuations	Water bird habitat; near Q07/144	3.8 ha
Mareretu Forest Q08/220	Rep.site for 13 e.u.s	Forest on alluvium; Flora: 3 threatened, 5 reg.sig. Fauna: 7 threatened, 2 reg.sig.	14 e.u.s	Large, continuous area of forest; diverse, healthy canopy; areas of mature, emergent podocarps; catchment protection; edges disturbed and grazed	Links many smaller remnants on its periphery; linked by forestry to North River and Smales Road Forest Remnants	2820.3 ha, 1 large continuous remnant and 9 smaller peripheral remnants
Brooks Road Forest and Shrubland Q08/221	Rep.site for 3 e.u.s		6 e.u.s	Mostly grazed; localised weed infestation (gorse)	Riparian protection	168.8 ha, 18 remnants (1 large)
Waipu Gorge Forest Remnants Q08/222	Rep.site for 9 e.u.s	Forest on alluvium; Flora: 3 threatened, 8 reg.sig. Fauna: 7 threatened, 1 reg.sig.	12 e.u.s	Diverse, healthy canopy; emergent podocarps and northern rata; localised weed infestation; some edges grazed and disturbed	Catchment protection; near Q08/237 and Q08/225	544.4 ha, 15 remnants (2 main rem- nants divided by road and 13 peripheral remnants)
Glenmohr Road Wetland Q08/223	Rep.site for 1 e.u.		4 e.u.s	Long stretches of raupo reedland in stream gully; probably grazed to edges; some damming	Near Q08/225d, but otherwise relatively isolated	9.3 ha, 6 remnants, very long and narrow
Ahuroa Road Forest Remnants Q08/224	Rep.site for 2 e.u.s	Forest on alluvium; Flora: 1 reg.sig.	4 e.u.s	Mostly grazed and disturbed; established understorey on roadsides; localised weed infestation (pampas, gorse, tradesantia, pines)	Riparian protection; contiguous with Q08/220; near Q08/235	198.9 ha, 2 large remnants divided by track and 6 smaller ones on edges
Brynderwyn Hills Forest Complex - Part A Q08/225a	Rep.site for 9 e.u.s	Forest on alluvium; Flora: 2 threatened, 3 reg.sig. Fauna: 4 threatened	16 e.u.s	Very diverse forest and shrub- land remnants separated by roads, pine plantations, quarrying and farming operations	Part of a complex mosaic of indigenous forest and pine plantations; catchment protection; near Q08/222	235.5 ha, 7 remnants

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Brynderwyn Hills Forest Complex - Part B Q08/225b	Rep.site for 5 e.u.s	Fauna: 2 threatened, 1 reg.sig.	9 e.u.s	Very diverse forest remnants, surrounded by pasture and plantation forest; pigs present	Part of a complex mosaic of indigenous forest and pine plantations; catchment protection	189.1 ha, 1 major and 1 minor remnant
Brynderwyn Hills Forest Complex - Part C Q08/225c	Rep.site for 9 e.u.s	Flora: 2 threatened, 3 reg.sig. Fauna: 4 threatened, 2 reg.sig.	15 e.u.s	Diverse, apparently healthy and relatively remote forested area with some mature forest types	Part of a complex mosaic of indigenous forest and pine plantations; catchment protection	481.9 ha, 1 major central remnant, 3 smaller remnants
Brynderwyn Hills Forest Complex - Part D Q08/225d		Flora: 2 threatened, 4 reg.sig. Fauna: 1 threatened	6 e.u.s	Small, moderately diverse forest remnants surrounded by pasture; formerly trampled by cattle, hence some damage to streams (Hochstetter's frog habitat)	Part of a complex mosaic of indigenous forest and pine plantations; extends into lowlands; catchment protection	56.5 ha, 1 large and 5 small remnants
Brynderwyn Hills Forest Complex - Part E Q08/225e	Rep.site for 3 e.u.s	Flora: 1 threatened, 2 reg.sig. Fauna: 3 threatened, 1 reg.sig.	8 e.u.s	Large area of diverse indigenous forest remnants set in mosaic of pine plantations; some damage from new roads, forest clearance and earthworks; pigs, goats, cattle present	Part of a complex mosaic of indigenous forest and pine plantations	481.3 ha, 12 remnants of various sizes and shapes, some compact, some narrow
Brynderwyn Hills Forest Complex - Part F Q08/225f	Rep.site for 3 e.u.s	Flora: 1 reg.sig. Fauna: 1 threatened, 1 reg.sig.	5 e.u.s	Diverse older secondary forest site contiguous with younger forested sites; probably not grazed	Part of a complex mosaic of indigenous forest and pine plantations	55.3 ha, 2 remnants of equal size divided by narrow road
Brynderwyn Hills Forest Complex - Part G Q08/225g	Rep.site for 2 e.u.s	Flora: 1 threatened, 1 reg.sig. Fauna: 6 threatened, 3 reg.sig.	8 e.u.s	Diverse forest site; many parts younger regeneration than surrounding sites; highly fragmented in lower catchment, with a lot of pasture edge; probably grazed in parts; domestic animals	Part of a complex mosaic of indigenous forest and pine plantations; extends towards coast near Q08/226; catchment protection	837.9 ha, 13 remnants of various sizes spread across catchment
Brynderwyn Hills Forest Complex - Part H Q08/225h	Rep.site for 4 e.u.s	Flora: 2 threatened, 2 reg.sig. Fauna: 4 threatened, 3 reg.sig.	11 e.u.s	Large, diverse, relatively healthy forest and shrub- land mosaic; large-scale pest management in western part over past 4 years; some tall emergent trees; development disturbance in eastern part	Part of a complex mosaic of indigenous forest and pine plantations; catchment protection	796.4 ha, 1 large continuous tract with 3 small peripheral remnants; eastern side penetrated by roads and housing
Brynderwyn Hills Forest Complex - Part I Q08/225i	Rep.site for 1 e.u.	Flora: 2 reg.sig. Fauna: 1 threatened	2 e.u.s	Diverse, high-quality forest remnant with dense under- storey; mostly protected therefore probably not grazed	Part of a complex mosaic of indigenous forest and pine plantations; near R08/001	73.5 ha, 2 remnants on either side of road
Brynderwyn Hills Forest Complex - Part J Q08/225j	Rep.site for 2 e.u.s	Flora: 3 reg.sig. Fauna: 3 threatened, 1 reg.sig.	2 e.u.s	Diverse, high-quality forest and shrubland; some older secondary forest; probably not grazed	Part of a complex mosaic of indigenous forest and pine plantations; near R08/001	95.0 ha, 3 remnants divided by road and farm track

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Lang's Beach Coastal Forest and Shrubland Q08/226	Rep.site for 3 e.u.s	Limestone geology	5 e.u.s	Small, diverse, coastal forest and shrubland remnants with some fenced, regenerating areas and some weed-infested and grazed areas; missing many palatable species	Buffer to Lang's Beach coastline, and linkage to Q08/225	29.7 ha, 9 small remnants
Waipu River Estuary and Sandspit Q08/228	Rep.site for 15 e.u.s	Flora: 1 threatened, 2 reg.sig. Fauna: 14 threatened, 2 reg.sig.	20 e.u.s	Most natural duneland vegetation in ED; largest estuary in ED; shorebird protection programme (pest control, fencing, patrolling by rangers); human disturbance along estuary margin, but spit relatively isolated from disturbance	Buffer between sea and land; contiguous with Q07/128; international migrant wader site; relatively isolated from large forested areas	194.6 ha, 5 km-long sandspit next to 5 km-long estuary
Lang's Beach Q08/230		Flora: 1 threatened Fauna: 2 threatened	6 e.u.s	Small, naturally formed beach with high recreational use; invasive plants present; abutted by residential housing	Contiguous with Q08/225g	7.9 ha, narrow elongated area
Waihoihoi River Forest Remnants Q08/231	Rep.site for 2 e.u.s	Forest on alluvium; Flora: 1 reg.sig.	3 e.u.s	Diverse, healthy canopy; mostly grazed and disturbed; weed infestation (tradescantia, Chinese privet)	Riparian protection; near Q08/229	19.3 ha, 2 remnants
Waionehu Stream Forest Remnants Q08/232		Forest on alluvium; Flora: 1 reg.sig.	3 e.u.s	Heavily weed-infested remnants of alluvial forest and treeland; mostly unfenced	Relatively isolated, but may act as wild-life corridor from Brynderwyn Hills to Waipu River estuary	19.7 ha, 17 small remnants
SH1 Forest Remnants Q08/233	Rep.site for 1 e.u.	Forest on alluvium; Flora: 1 reg.sig.	3 e.u.s	Healthy canopy; mostly grazed; severe weed infestation	Near Q08/224 and Q08/235	7.4 ha, 8 remnants in 2 groups 1.5 km apart (2 to SW and 6 to NE)
Ahuroa River Forest Remnants Q08/235	Rep.site for 2 e.u.s	Forest on alluvium; Flora: 1 reg.sig. Fauna: 1 threatened	3 e.u.s	Mostly grazed with understorey sparse or absent; weed infestation (crack willow, tradescantia)	Riparian protection	53.8 ha, 18 small remnants scattered along river banks
Dodd Road Forest Remnant Q08/236	Rep.site for 1 e.u.	Fauna not surveyed	2 e.u.s	Diverse, healthy canopy; grazed by cattle	Contiguous with pine plantation	4.5 ha compact area
Durham Road Forest and Shrubland Q08/237	Rep.site for 1 e.u.	Flora: 1 threatened	4 e.u.s	Diverse, healthy canopy; established understorey in fenced areas; minimal weed infestation	Riparian protection; near Q08/222	41.7 ha, 11 remnants
Maxwell Creek Forest Remnant	Q08/238	Fauna: 1 threatened	1 e.u.	Disturbed; probably grazed on western edge	Riparian protection; surrounds and is contiguous with pine plantation; contiguous with Q08/222	31.5 ha in one piece, though divided by plantation forest
Helmsdale Road Forest and Shrubland Q08/239	Rep.site for 3 e.u.s	Limestone geology; Flora: 1 threatened Fauna: 1 threatened	5 e.u.s	Healthy canopy; kauri up to c. 70 cm diameter; established understorey in older, fenced remnants	Riparian protection, provides some linkage between Q07/117 and Q08/220	87.9 ha, 21 remnants widely scattered

LEVEL 1 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Kaikowhiti Stream Forest Remnants Q08/240	Rep.site for 3 e.u.s		4 e.u.s	Disturbed and grazed; localised dieback; severe possum browse; understorey absent except for steepest slopes	Riparian protection; linked by forestry to Q08/220 and Q08/241	24.8 ha, 7 remnants
Smales Road Forest Remnants Q08/241		Flora: 1 reg.sig.	4 e.u.s	Diverse, healthy canopy; partly grazed; occasional emergent northern rata	Riparian protection; linked by forestry to Q08/220 and Q08/240	126.1 ha, 14 remnants widely scattered
Brooks Road Wetland Q08/244	Rep.site for 1 e.u.	Fauna not surveyed	2 e.u.s	Disturbed and grazed; weed infestation (gorse)	Riparian protection; near Q08/243	0.7 ha
Shoemaker Road Forest Remnant 2 Q08/247		Forest on alluvium; Flora: 1 reg.sig. Fauna not surveyed	1 e.u.	Diverse canopy, including kahikatea developing rounded-crowns; possibly grazed; weed infestation on edges (gorse)	Isolated	1.1 ha
Bream Tail Coastal Headland R08/001	Rep.site for 20 e.u.s	Flora: 6 threatened, 5 reg.sig. Fauna: 6 threatened, 4 reg.sig.	26 e.u.s	Extremely diverse but fragmented site; covers forest, shrubland, wetland, rockland and duneland habitats; variable condition, but apparently improving overall through fencing to exclude stock; non- ecosourced indigenous plants	Contiguous with Q08/225i and near Q08/225j; probable seabird nesting	260.7 ha, 18 remnants of varying sizes
Cove Road Shrubland and Forest R08/002	Rep.site for 2 e.u.s	Flora: 1 reg.sig.	2 e.u.s	Dense, healthy gumland shrubland with small area of forest	Near Q08/225g	20.2 ha, 2 remnants divided by road
Total Level 1 sites (57 sites)						13,675.6 ha

LEVEL 2 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Ngatoka Wetland Catchment Q07/115		Fauna: 1 threatened	5 e.u.s	Wetland areas grazed and weed-infested (willows) or fenced and planted in harakeke	Riparian protection	8.5 ha, 7 remnants
Pakauhokio Knoll Forest Q07/122		Pa sites	3 e.u.s	Highly disturbed and grazed; weed infested (pines); low diversity; constructed wetland	Riparian protection; contiguous with Q07/124	65.69 ha, 1 large and 5 smaller remnants
Waipu Caves Road Wetland Q07/123		Fauna: 3 threatened	1 e.u.	Small, grazed remnants of a formerly larger wetland	Near Q07/117; Riparian protection	0.4 ha, 2 remnants
Crutcher Road Forest Remnants Q07/133		Fauna not surveyed	1 e.u.	Small, unfenced forest remnants	Isolated, but probably contribute to habitat network for mobile species	7.2 ha, 2 remnants
Reid Road Forest Remnants Q07/134		Flora: 1 reg.sig.	1 e.u.	Small, unfenced forest remnants	Isolated, but probably contribute to habitat network for mobile species	11.3 ha, 2 remnants
Hewlett QEII Covenant Q07/136		Forest on alluvium	1 e.u.	Very small remnant, sparse understorey, but recently fenced		2.1 ha
Mangapai Caves Road Wetland Q07/140		Fauna not surveyed	3 e.u.s	Small, isolated; weed-infested; partially fenced	Riparian protection	3.6 ha, 4 remnants
Sandford Road Forest Remnants Q07/142		Forest on alluvium	2 e.u.s	Very small alluvial forest remnants, lacking understorey; trampled and grazed by stock; domesticated geese present	Isolated, but may provide ecological linkage between coast and larger forests further inland (e.g. Q07/121)	2.8 ha, 2 remnants
Hayward Road Forest Remnant Q07/146		Fauna not surveyed	1 e.u.	Low canopy diversity; possibly grazed	Isolated	1.9 ha
Moewhare Forest and Shrubland Q07/147			8 e.u.s	Grazed; sparse understorey; localised weed infestation	Riparian protection	33.6 ha, 13 remnants
Paparoa Road Dam Forest Remnants Q07/151		Fauna not surveyed	1 e.u.	Possibly grazed	Near Q07/147 and Q07/112	5.8 ha, 3 compact remnants
Ruarangi Road Forest Remnants 3 Q07/153			7 e.u.s	Grazed and disturbed; emergent pines; strong edge effects	Riparian protection	7.9 ha, 8 remnants, narrow
Ruarangi Road Wetland Q07/154		Fauna not surveyed	1 e.u.	Small, isolated; weed-infested (pampas, gorse); partially fenced	Riparian protection	0.5 ha, 2 remnants, small and narrow
Ruarangi Mangapai Forest Remnants Q07/155		Fauna: 1 threatened	2 e.u.s	Possibly grazed	Riparian protection; near Q07/112, Q07/114, and Q07/161; linked by crack willow to Q07/157	7.3 ha, 4 remnants, all linked by exotic/ indigenous vegetation
Ruarangi Road Forest Remnants 2 Q07/156		Fauna not surveyed; emergent podocarps	3 e.u.s	Some emergent podocarps; mostly grazed with sparse understorey; some dieback on edges	Contiguous with Q07/157	6.4 ha, 5 remnants

LEVEL 2 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Graham Road Riparian Forest Remnants Q07/157			2 e.u.s	Grazed and disturbed; weed infestation	Riparian protection; linked by crack willow to Q07/114 and Q07/155	16.3 ha, 6 remnants, long and narrow
Graham Road Forest Remnant Q07/159			1 e.u.	Grazed and disturbed; sparse understorey	Near Q07/157 and Q07/160	8.8 ha, 4 remnants
Graham Road Forest and Shrubland Q07/160		Fauna not surveyed	4 e.u.s	Probably grazed; emergent pines	Riparian protection; contiguous with pine plantation	19.7 ha, 4 remnants (1 large compact, 3 smaller)
Mangapai Riparian Forest Remnants Q07/161		Forest on alluvium	1 e.u.	Mostly grazed; weed infestation; strong edge effects	Riparian protection; linked by crack willow to remnants upstream (Q07/114, Q07/155)	7.7 ha, 4 remnants, long and narrow
Mill Brook Forest Remnants Q07/165		Forest on alluvium	1 e.u.	Grazed and disturbed; strong edge effects; under- storey sparse or absent; weed infestation	Riparian protection; near Q08/220 and Q08/224	27.1 ha, long and narrow
McLeod Road Forest Remnants Q07/166		Fauna not surveyed	3 e.u.s	Moderately sized area of secondary forest; reasonably fragmented with one larger central area; little information gathered (not surveyed)	Near Q07/121	34.6 ha, 1 main, 4 smaller remnants
Takahiwai Saltmarsh and Shrubland Q07/167			6 e.u.s	Small estuarine site with adjacent terrestrial shrubland; weed infestations; drains dug in mudflats	Contiguous with large areas of mangrove, saltmarsh, and mud- flats in Whangarei Harbour	4.3 ha
Northern Brynderwyn Hills Remnants Q08/227		Fauna not surveyed	3 e.u.s	Grazed and disturbed; sparse understorey	Between Q08/222, Q08/242 and Q08/225b	3.1 ha, 3 remnants
Braigh Forest Remnants Q08/229		Fauna not surveyed	1 e.u.	Possibly grazed	Near Q08/231	22.7 ha, 1 major , 1 minor remnant over river to east
Argyll Street Forest Remnant Q08/234		Forest on alluvium; Fauna not surveyed	1 e.u.	Possibly recently fenced; weed infestation (tree privet, Chinese privet)	Isolated	1.2 ha, 2 remnants
Finlayson's Brook Forest Remnants Q08/242		Forest on alluvium; Fauna not surveyed	1 e.u.	Disturbed and grazed; sparse understorey; weed infestation (crack willow, tradescantia, woolly nightshade)	Riparian protection; linked by treeland to Q08/220	6.0 ha, 5 small remnants spread along waterway
Brooks Road Forest Remnants Q08/243		Fauna not surveyed	1 e.u.	Probably grazed	Near Q08/242 and Q08/220	7.9 ha, 2 remnants
Millbrook Dam and Forest Remnants Q08/245			4 e.u.s	Large constructed dam with two contiguous forest remnants; probably grazed; little information	Isolated	26.6 ha, long narrow area

LEVEL 2 SITES Survey no.	REPRESENT- ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY AND PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE AND SHAPE
Shoemaker Road Forest Remnant 1 Q08/246		Forest on alluvium; Fauna: 1 threatened	1 e.u.	Understorey either mown lawns or exotic gardens; hydrology altered by drainage	Isolated	1.1 ha, 2 remnants divided by small track
Total Level 2 sites (29 sites)						369.2 ha

6. Acknowledgements

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- * Aerial orthophotography was provided courtesy of Northland Regional Council and Whangarei District Council. Copyright reserved.
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7. References

- Allan, H.H. 1982: Flora of New Zealand Volume 1: Indigenous Tracheophyta – Psilopsida, Lycopsidea, Filicopsida, Gymnospermae, Dicotyledons. Botany Division, Department of Scientific and Industrial Research. Government Printer, Wellington.
- Amokura (various dates): Newsletter of the Ornithological Society of New Zealand, Northland Region.
- Anonymous 2004. Recent sightings from the Northland Region. *Amokura* 93.
- Arand, J.; Basher, L.; Wardle, R.; Wardle, K. 1993: Inventory of New Zealand Soil Sites of international, national and regional importance. Part Two – North Island and northern offshore islands (1st edition). *New Zealand Society of Soil Science Occasional Publication 2*. Lincoln University, Canterbury.
- Atkinson, I. A. E. 1962: Semi-quantitative measurements of canopy composition as a basis for mapping. *Proceedings New Zealand Ecological Society* 9: 1–8.
- Atkinson, I. A. E. 1985: Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany* 23: 361–178.
- Beauchamp, A.J.; Parrish, G.R. 1999. Bird use of the sediment settlement ponds and roost areas at Port Whangarei. *Notornis* 46(4): 470–483.
- Beauchamp, A.J.; Parrish, G.R. 2007 *in press*. Wader and spoonbill roost use in Whangarei Harbour and Ruakaka estuary, Northland, 1973–2000. *Notornis*.
- Bell, B.D. 1959. Census of brown teal on Waipu River system. *Notornis* 8(2): 116–117.
- Bellingham, P; Fukami, T.; Wardle, D.; Mulder, C.; Towns, D. 2006. Above and below ground impacts of introduced predators on seabird dominated islands. Oral presentation at 'Ecology across the Tasman 2006'. Joint conference of the NZ Ecological Society and the Ecological Society of Australia. Wellington, New Zealand, 28 August – 1 September 2006.
- Boffa Miskell 2003: Bream Tail Farms – Assessment of Ecological Features and Conservation Values. Report prepared for Williams Holdings Nominees Ltd.
- Brook, F. 1996: Classification of the Ecological Districts of Northland. Unpublished report. Department of Conservation, Northland Conservancy.
- Brook, F. 2002: Uncommon and rare land snails in the Northland region of New Zealand, and an assessment of conservation management priorities. ISBN: 0–487–22343–9. New Zealand Department of Conservation, Northland Conservancy.
- Brownsey, P. J.; Smith-Dodsworth, J. C. 2000: New Zealand Ferns and Allied Plants. Revised edition. Bateman, Auckland.
- Bull, P.C.; Gaze, P.D.; Robertson, C.J.R. 1985: The Atlas of Bird Distribution in New Zealand. Ornithological Society of New Zealand Inc., Wellington.
- Cameron, E.K.; Taylor, G.A. 1997. Flora and fauna of Sentinel Rock, Mangawhai Heads, Northern New Zealand. *Tane* 36: 15–25.
- Campbell, D.J.; Atkinson, I.A.E. 2002: Depression of tree recruitment by the Pacific rat (*Rattus exulans* Peale) on New Zealand's northern offshore islands. *Biological Conservation* 107(1): 19–35.

- Crawley, M.J. 1997: The structure of plant communities. in Crawley, M.J. (ed.). Plant Ecology. Blackwell Science, Oxford, UK.
- Conning, L. 2001: Northland Protection Strategy – A Report to the Nature Heritage Fund Committee. Nature Heritage Fund, Wellington.
- Cowan, P.E. 2005: Brushtail possum. In King C.M. (ed.) The Handbook of New Zealand Mammals. 2nd Edition. Oxford University Press, Melbourne.
- de Lange, P.; Norton D.; Heenan P.; Courtney S.; Molloy B.; Ogle C.; Rance B. 2004: Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany* 42: 45–76.
- DOC 2006 (in prep.): List of regionally significant species in the Northland Region. Department of Conservation, Northland Conservancy.
- DOC 2007: Department of Conservation Herpetofauna Database (Bioweb). Accessed January 2007.
- Dodson, J.R.; Enright, N.J.; McLean, R.F. 1988: A late Quaternary vegetation history for far northern New Zealand. *Journal of Biogeography* 15: 647–656.
- Dowding, J.E.; Moore, S.J. 2006: Habitat networks of indigenous shorebirds in New Zealand. *Science for Conservation* 261. Science and Technical Publishing, Department of Conservation, Wellington.
- Edgar, E.; Connor, H. 2000: Flora of New Zealand Volume 5: Gramineae. Manaaki Whenua Press, Lincoln.
- Forester, L.; Pullman, N.; Holland, W. 2001: Bream Tail Vascular Plant List – Property of Duncan and Marie Dow. DOC Sites of Special Biological Interest Database R08/H008.
- Forester, L.; Townsend, A. 2004: Threatened Plants of Northland Conservancy. DOC Science Publishing, Science and Research Unit. Department of Conservation, Wellington.
- Forester, L. 2007: Coastal Cliff Native Plant Survey, La Bonte Property – Waipu. Unpublished report. Northland Regional Council.
- Gill, B.; Whitaker, T. 1996: New Zealand Frogs and Reptiles. David Bateman, Auckland.
- Gillies, C.; Fitzgerald, B.M. 2005: Feral cat. In King C.M. (ed.) The Handbook of New Zealand Mammals. 2nd Edition. Oxford University Press, Melbourne.
- Graeme, M.; Kendal, H. 2001: Saltwater paspalum (*Paspalum vaginatum*) – a weed review. Unpublished report prepared for Environment Waikato.
- Griffiths, J.W. 2000: The distribution and abundance of *Latrodectus atritus* on the west and east coasts of northern New Zealand. Unpublished report for the Department of Conservation, Northland Conservancy.
- Griffiths, J.W. 2001: Web site characteristics, dispersal and species status of New Zealand's katipo spiders, *Latrodectus katipo* and *L. atritus*. Unpublished PhD thesis, Lincoln University, Lincoln, New Zealand.
- Hansen, K. 2005. New Zealand fairy tern (*Sterna nereis davisae*) Recovery Plan 2005–15. Threatened Species Recovery Plan No. 57, Department of Conservation, Wellington.
- Hansen, K. 2005: Protection of shorebirds at three Northland breeding sites – Mangawhai, Waipu, and Ruakaka. *DOC Research and Development Series* 204. Department of Conservation, Wellington.
- Heath, R. A. 1975: Stability of some New Zealand coastal inlets. *New Zealand Journal of Marine & Freshwater Research* 9 (4): 449–57.
- Heather, B. D.; Robertson, H. A. 2000: The Field Guide to the Birds of New Zealand. Penguin Books (NZ) Ltd, Auckland.
- Hitchmough, R.; Bull L.; Cromarty, P. (comps.) 2007: New Zealand Threat Classification System lists – 2005. Department of Conservation, Wellington. 194 p.
- Innes, J.; Nugent, G.; Prime, K.; Spurr, E.B. 2004: Responses of kukupa (*Hemiphysalis novaeseelandiae*) and other birds to mammal pest control at Motatau, Northland. *New Zealand Journal of Ecology* 28(1): 73–81.
- Johnson, P.J.; Gerbeaux, P. 2004: Wetland Types in New Zealand. Department of Conservation, Wellington.

- Jones, C.; Sanders, M.D. 2005: European hedgehog. In King C.M. (ed.) *The Handbook of New Zealand Mammals*. 2nd edition. Oxford University Press, Melbourne.
- Jones, S. 1991: Field trip report: Brynderwyn Hills, Mangawhai. *Auckland Botanical Society Journal* 46: 078–103.
- Kendrick, J.; Young, M.E. 2006: Checklist of vascular indigenous plants, Harvey's Reserve (Bruce Matheson), Massey Road, Waipu. Department of Conservation Sites of Special Biological Interest Database (Q08/H052), Northland Conservancy, Whangarei.
- Kenny, J.A.; Hayward, B. W. 1996: Inventory and maps of important geological sites and landforms in the Northland Region (1st edition). *Geological Society of New Zealand Miscellaneous Publication* 83. Geological Society of New Zealand Inc., Lower Hutt.
- Kershaw, K. A.; Looney, J.H.H. 1985: Quantitative and Dynamic Ecology. Third edition. Edward Arnold, London.
- King, C. M. (ed.) 1990: *The Handbook of New Zealand Mammals*. Oxford University Press, Australia.
- King, C. M. (ed.) 2005: *The Handbook of New Zealand Mammals*. Oxford University Press, Australia.
- Leathwick, J.R.; Rogers, G.M. 1996: Modelling relationship between environment and canopy composition in secondary vegetation in central North Island, New Zealand. *New Zealand Journal of Ecology* 20: 147–162.
- Mabbett, H. 1981: The Great North Road, Auckland–Whangarei Section. N.S. Speedprint, Wellsford.
- Manning, D. 2001: Natural areas of Whangarei Ecological District. Reconnaissance Survey Report for the Protected Natural Areas Programme. Department of Conservation, Northland Conservancy.
- May, I. 1994: Annual Bird Race. *Amokura* 65.
- McDowall, R.M. 1990: *New Zealand Freshwater Fishes, a Natural History and Guide*. Heinemann Reed, Auckland.
- McGlone, M.S. 1983: Polynesian deforestation of New Zealand: a preliminary synthesis. *Archaeology in Oceania* 18: 11–25.
- McGlone, M.S.; Wilmshurst, J.M. 1999: Dating initial Maori environmental impact in New Zealand. *Quaternary International* 59: 5–16.
- McGuinness, C. 2001: Conservation requirements of New Zealand's nationally threatened invertebrates. *Threatened Species Occasional Publication* 20. Department of Conservation Biodiversity Recovery Unit, Wellington.
- McKenzie, H. 1971: The brown teal in the Auckland Province. *Notornis* 18: 280–86.
- McKenzie, N.R. 1942: *The Gael Fares Forth – The romantic story of Waipu and her sister settlements*. Second edition. Whitcombe & Tombs Ltd, Wellington.
- Miller P.J; Pierce R.J. 1995: Distribution and decline of North Island brown kiwi (*Apteryx australis mantelli*) in Northland. *Notornis* 42: 201–11.
- Moir, R.W.; Collen, B.; Thompson, C.S. 1986: The climate and weather of Northland. *New Zealand Meteorological Service Miscellaneous Publication* 115 (2). 2nd edition. Ministry of Transport, Wellington.
- Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.; Smith, N.; Stevens, T. 2002: Classifying species according to threat of extinction – A system for New Zealand. *Threatened Species Occasional Publication* 22. Department of Conservation, Wellington.
- Molloy, J. (comp.) 1995: Bat (peka peka) recovery plan (*Mystacina, Chalinolobus*). *Threatened species recovery plan* 15. Department of Conservation, Wellington.
- Mueller-Dombois, D.; Ellenberg, H. 1974: Aims and methods of vegetation ecology. John Wiley & Sons, New York.
- Moore, L.B; Edgar, E. 1970: *Flora of New Zealand Volume 2: Indigenous Tracheophyta – Monocotyledons except Gramineae*. Botany Division, Department of Scientific and Industrial Research. Government Printer, Wellington.

- Myers, S.; Park, G.; Overmars, F. 1987: A Guidebook for the Rapid Ecological Survey of Natural Areas. *New Zealand Biological Resources Centre. Publication No. 6*.
- NIWA 2007: New Zealand Freshwater Fish Database. National Institute of Water and Atmospheric Research. <http://fwdb.niwa.cri.nz>. Accessed January 2007.
- NZPCN 2007: New Zealand Plant Conservation Network website. <http://www.nzpcn.org.nz/>. Accessed January and February 2007.
- O'Connor, S.M.; Maloney, R.F.; Pierce, R.J. 2007: Pateke (*Anas chlorotis*) Recovery Plan, 2005–10. *Threatened Species Recovery Plan 59*. Department of Conservation, Wellington. 33 p.
- Ornithological Society of New Zealand (OSNZ) Northland/Far North Region. 1998: Northland Harbour High Tide Survey – Whangarei Harbour. *Amokura 69*: 5.
- Park, G.N.; Walls, G. Y. 1978: Inventory of Tall Forest Stands on Lowland Plains and Terraces in Nelson and Marlborough Land Districts, New Zealand. Botany Division, Department of Scientific and Industrial Research, Lower Hutt.
- Parrish, G.R. 1984. Whangarei Harbour wildlife survey. *New Zealand Wildlife Service Technical Report No. 8*. Department of Internal Affairs, Wellington, 71 p.
- Parrish, R. 1993a: Hochstetter's frog survey in the Waipu Gorge and Brynderwyn Hills area. Unpublished report. Department of Conservation, Northland Conservancy.
- Parrish, R. 1993b: Hochstetter's frog survey of the Mareretu Forest and Waipu Caves area. Unpublished report. Department of Conservation, Northland Conservancy.
- Parrish, G.R.; Lock, W.J. 1995: Classified Summarised Notes, North Island 1 July 1993 to 30 June 1994. *Notornis 42*(3): 145–173.
- Parrish, G.R.; Lock, W.J. 1996: Classified Summarised Notes, North Island 1 July 1994 to 30 June 1995. *Notornis 43*(3): 117–143.
- Parrish, R.; Honnor, L. 1997: New Zealand fairy tern (Tara-iti) *Sterna nereis davisiae* recovery plan: 1997–2002. Biodiversity Recovery Unit, Department of Conservation, Wellington.
- Parrish, G.R. 2000. Classified Summarised Notes, North Island 1 July 1998 to 30 June 1999. *Notornis 47*(4): 215–233.
- Parrish, R.; Williams, M. 2001: Decline of brown teal (*Anas chlorotis*) in Northland, New Zealand. *Notornis 48*(3): 131–136.
- Parrish, G.R. 2003: Classified Summarised Notes, North Island 1 July 2001 to 30 June 2002. *Notornis 50*(2): 103–112.
- Patrick, B. 2002: Conservation status of the New Zealand red katipo spider (*Latrodectus katipo* Powell, 1871). *Science for Conservation 194*. Department of Conservation, Wellington.
- Pierce, R.J. 1979: Foods and feeding of the wrybill (*Anarhynchus frontalis*) on its riverbed feeding grounds. *Notornis 26*: 1–21.
- Pierce, R.J. 1999: Regional patterns of migration in the banded dotterel *Charadrius bicinctus*. *Notornis 46*: 101–122.
- Pierce, R.J.; Sporle, W. 1998: Causes of kiwi mortality in Northland. *Conservation Advisory Science Notes 169*. Department of Conservation, Wellington.
- Shaw, W.B.; Allen, R.B. 2003: Ecological impacts of sea couch and saltwater paspalum in Bay of Plenty estuaries. *DOC Science Internal Series 113*. Department of Conservation, Wellington. 18 p.
- Standish, R.J. 2002: Experimenting with methods to control *Tradescantia fluminensis*, an invasive weed of native forest remnants in New Zealand. *New Zealand Journal of Ecology 26*: 161–170.
- Sullivan, J.J.; Timmins, S.M.; Williams, P.A. 2005: Movement of exotic plants into coastal native forests from gardens in northern New Zealand. *New Zealand Journal of Ecology 29* (1): 1–10.
- Sutton, M.E.; Christensen, B.R.; Hutcheson, J.A. 2006: Field identification of katipo. *DOC Research & Development Series 237*. Department of Conservation, Wellington.
- Taylor, G.T.; Parrish, G.R. 1991: Classified Summarised Notes, North Island 1 July 1989 to 30 June 1990. *Notornis 38* (4): 267–314.

- Taylor, G.T.; Parrish, G.R. 1992: Classified Summarised Notes, North Island 1 July 1990 to 30 June 1991. *Notornis* 39(3): 161–210.
- Taylor, G.T.; Parrish, G.R. 1994a: Classified Summarised Notes, North Island 1 July 1991 to 30 June 1992. *Notornis* 41(1): 1–49.
- Taylor, G.T.; Parrish, G.R. 1994b: Classified Summarised Notes, North Island 1 July 1992 to 30 June 1993. *Notorni* 41(4): 235–274.
- Taylor, G.A.; Taylor, R.H. 1989: Re-assessment of the status of southern elephant seals (*Mirounga leonina*) in New Zealand. *New Zealand Journal of Marine and Freshwater Research* 23: 201–213.
- Te Ara: the Encyclopedia of New Zealand 2007: Tribes of Whangarei. Accessed from <http://www.teara.govt.nz>, March 2007.
- Technical Advisory Group (Park, G.N.; Kelly, G.C.; Wardle, J.A.; Simpson, P.G.; Dingwall, P.R.; Ogle, C.C.; Mitchell, N.D.; Myers, S.C.) 1986: The New Zealand Protected Natural Areas Programme; A Scientific Focus. *Biological Resources Centre Publication No. 4*. NZ Department of Scientific and Industrial Research, Wellington.
- Tennyson, A.J.D.; Lock, W.J. 1998. Classified Summarised Notes, North Island 1 July 1996 to 30 June 1997. *Notornis* 45(4): 279–308.
- Tennyson, A.J.D.; Lock, W.J. 2000. Classified Summarised Notes, North Island 1 July 1997 to 30 June 1998. *Notornis* 47(4): 192–214.
- Walker, S.; Price, R.; Rutledge, D.; Theo Stephens, R.T.; Lee, W.G. 2006: Recent loss of indigenous cover in New Zealand. *New Zealand Journal of Ecology* 30(2): 169–177.
- Watt J.C. 1975: The terrestrial insects. Pp. 507–535 in Kuschel, G. (Ed.): Biogeography and Ecology in New Zealand. Dr W. Junk B.V. Publishers, The Hague.
- Wildland Consultants Ltd 2003: Ecological management and monitoring at Marunui Forest, Brynderwyn Hills. *Wildland Consultants Ltd Contract Report No. 708*. Prepared for Marunui Conservation Ltd. 12 p.
- Wildland Consultants Ltd 2004a: Marsden B Power Station repowering project – ecological assessment of the site and environs. *Wildland Consultants Ltd Contract Report No. 934*. Prepared for Mighty River Power Ltd. 34 p.
- Wildland Consultants Ltd 2004b: A survey of selected natural areas in Carter Holt Harvey Forests, Northern Region. *Wildland Consultants Ltd Contract Report No. 594*. Prepared for Carter Holt Harvey Forest Resources. 144 p. plus maps and Microsoft Access database.
- Wildland Consultants Ltd 2005: General patterns of bird use of Whangarei Harbour, March 2005. *Wildland Consultants Ltd Contract Report No. 1047*. Prepared for Northland Regional Council.
- Wildland Consultants Ltd 2006: Ecological assessment of the preferred alignment for the Marsden Point Rail Link corridor. *Wildland Consultants Ltd Contract Report No. 1279*. Prepared for Beca Infrastructure Ltd. 24 p.
- Wilcox, M. 2006 Field trip: Waipu Gorge, Waipu Estuary and Lang's Beach. 18/03/06. *Auckland Botanical Society Journal* 61(1): 51–55.
- Williams, R. 2006: Small is beautiful [article about NZ fairy tern]. *Forest and Bird*, May 2006: 22–23.
- Wright, A.E. 1978: Vascular plants of Hen Island (Taranga), north-eastern New Zealand. *Tane* 24: 11–102.

8. Appendices

8.1 FIELD SURVEY FORM

PROTECTED NATURAL AREAS PROGRAMME
WAIPU ECOLOGICAL DISTRICT



Department of Conservation
Te Papa Atawhai

NATURAL AREA NAME:		PNA NO.:
RECORDER:	SURVEY DATE:	
GRID REF.:	SSBI NO.:	
HABITAT TYPE(S):		
GEOMORPHOLOGICAL TYPE(S):		

ECOLOGICAL UNIT(S):

Habitat Class	Vegetation/ Habitat Structure	Landform	% of Total Area	% Percentage Canopy Cover			
				Abundant (50-100)	Common (20-50)	Frequent (5-20)	Occasional (0-5)

NATURAL AREA NAME:					PNA NO.:		
Habitat Class	Vegetation/ Habitat Structure	Landform	% of Total Area	% Percentage Canopy Cover			
				Abundant (50-100)	Common (20-50)	Frequent (5-20)	Occasional (0-5)

COMMENTS:



Department of Conservation
Te Papa Atawhai

25 August 2006

Dear Landowner

I would like to advise you that Wildland Consultants Ltd under contract with the Department of Conservation will soon be undertaking an updated survey of natural features such as forest, wetlands, gumlands and dunelands within the Takahiwai, Ruakaka and Waipu area of the Whangarei District. The natural features have been identified from recent aerial photography and are viewed from roadsides or (with the permission of landowners) from other viewpoints, recording information on their vegetation type and general condition. This survey is a continuation of work first undertaken by the Department in 1994.

In some cases, if these areas are not visible from the road, you may be contacted for permission to enter your land to enable a quick survey of the natural feature to gain information on the vegetation type and key plant species present.

Why are we doing this survey? Northland's natural features make a significant contribution to the character and quality of the region. Many of these areas are habitat for some of our increasingly rare plants and animals. The Department of Conservation and Kaipara District Council have existing information on many of the natural features in the District. However some of this information is now out of date, and therefore may no longer be accurate. This survey enables us to update our information and is an important reference point for assessing habitat changes over time and to assist landowners with management of their natural features.

The information gathered in this survey will be made available to anyone interested in natural features such as landowners, iwi, environmental groups, local bodies, and professionals.

The Kaipara District Council will be provided with the results of the survey upon completion.

With an increasing awareness in the value of natural features many residents and future residents to the District will have updated information describing the native plants and animals in the District. Information collected during this survey may be used to support cases made by private landowners to increase protection of forest or wetland on their land. These cases can be made to the Governments Biodiversity Condition and Advice Fund and the Northland Regional Council's Environment Fund. The Funds were set up to support landowners for the management and protection of natural areas, the information provided in this survey is an important tool in achieving these aims.

If you have any questions about the survey, please contact the Department of Conservation, (attention Peter Anderson or Wendy Holland) at Northland Conservancy Office in Whangarei, telephone (09) 430 2470; fax 09 430 2479 or email panderson@doc.govt.nz or wholland@doc.govt.nz.

Thank you for your assistance

A handwritten signature in black ink, appearing to read 'Chris Jenkins'.

Chris Jenkins
CONSERVATOR NORTHLAND
Department of Conservation

Waipu ecology goes under the microscope

THE WAIPU Ecological area is under scrutiny.

The Conservation Department has contracted Wildland Consultants to identify important natural features in the area, that include Takahiwai, Ruakaka, Waipu, Brynderwyns and Bream Tail.

Aerial photographs were used to identify the features, which will be viewed from roadsides and other viewpoints, with the permission of landowners.

Information about



NOTING NATURE: Tim Martin, Sarah Beadel and Jenny Lux from Wildland Consultants survey Langa Beach as part of a project to collect information on natural features in the Waipu Ecological area.

the vegetation type will be recorded.

and general condition The survey is a

Northland-wide project that aims to make information on the natural features, including forest, wetlands, gumlands and dunelands, in the region available to anyone interested.

The information will benefit landowners, iwi, environmental groups, local bodies and professionals.

It has been ongoing since 1994 and is nearing completion.

Wildland Consultants has started work in the Waipu area and expects to finish in early 2007.

DoC commissions a survey of Bream Bay's natural areas

The Department of Conservation has commissioned a report on important natural habitats within the *Waipu Ecological District*. The *Waipu Ecological District* includes the areas of Takahiwai, Ruakaka, Waipu, Brynderwyns and Bream Tail.

A team from Wildland Consultants have started working on this project, which is expected to be finished in early 2007.

The survey team will be using recent aerial photographs to identify natural features such as: forests, wetlands, dune lands and gumlands and will visit to take a closer look either from the roadside or, with the landowners permission, from a vantage point on private land, to identify the vegetation type and key plant species present.

The last such survey was undertaken in 1994 and is likely to be out of date.

Information obtained will be made available to anyone interested - such as landowners, iwi, environmental groups, local bodies and professionals.

(Bream Bay News, 23 November 2006)

8.3 CATEGORIES OF THREAT

In this report the categories of threat are taken from the New Zealand Threat Classification developed by Molloy et al. (2002). This new system replaces Molloy & Davis (1994), the prioritising system used previously for threatened species work by the Department of Conservation.

Below are Sections 3 and 7, which have been taken from Molloy et al. (2002) to explain the new species classification system.

3. Classification structure and categories

... This section describes each of the categories (shown in Fig. 1).

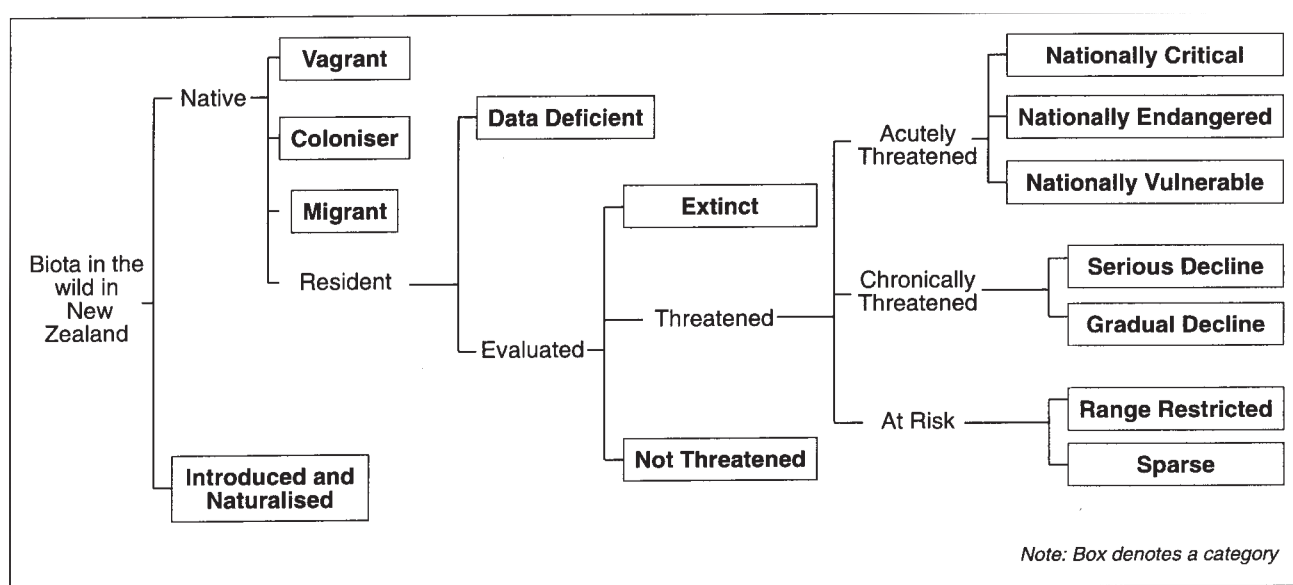


Figure 1. Structure of the New Zealand Threat Classification System.

INTRODUCED AND NATURALISED

Introduced and Naturalised taxa are those that have become naturalised in the wild after being deliberately or accidentally introduced to New Zealand by human agency.

If an Introduced and Naturalised taxon has an IUCN Red Listing in its country (or countries) of origin, the IUCN category and source of the listing are shown after the taxon's name in the New Zealand list. Current examples of this include the cress *Lepidium hyssopifolium* and the southern bell frog (*Litoria raniformis*), both of which are listed as Endangered in Australia; and the parma wallaby (*Macropus parma*), listed as Lower risk/Near threatened.

VAGRANT

For the purposes of this document, vagrants are taxa that are found unexpectedly and rarely in New Zealand, and whose presence in our region is naturally transitory. These are taxa that do not establish themselves beyond their point of arrival because of reproductive failure or for specific ecological reasons (see de Lange & Norton 1998).

Examples include the red-kneed dotterel (*Erythrogonys cinctus*) and the blue moon butterfly (*Hypolimnys bolina nerina*), both from Australia, and the spotted sawtail (*Prionurus maculatus*) from the tropical south-west Pacific Ocean.

If a taxon in the Vagrant category has been listed in an IUCN Red List in its country of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list.

COLONISER

Colonisers are taxa that have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild for less than 50 years. Three examples are the Nankeen night heron (*Nycticorax caledonicus*), the scoliid wasp *Radumeris tasmaniensis* and the orchid *Cryptostylis subulata*.

The IUCN Red List category and source of the listing is included where this exists.

MIGRANT

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle, but do not breed here are included in the category Migrant. Examples include the Arctic skua (*Stercorarius parasiticus*) and striped marlin (*Tetrapturus audax*).

In contrast, taxa that either breed here and migrate beyond New Zealand during their life cycle, e.g. Chatham Island albatross (*Thalassarche eremita*), or taxa that are resident in New Zealand for most of their lives, such as longfinned eels (*Anguilla dieffenbachii*), are not included in this category.

The IUCN Red List category and source of the listing is included where this exists.

DATA DEFICIENT

The amount of information available for assessing the threat of extinction is highly variable between taxa and groups of taxa. At one extreme there are taxa such as kakapo, *Gunnerya hamiltonii* and *Tecomanthus speciosa* where every wild individual is known, while at the other extreme there are taxa whose ecology and biology is virtually unknown (e.g. *Koeleria riguorum*, a recently described grass).

Certain criteria and/or definitions must be met for a taxon to be listed in a category. Where information is so lacking that an assessment is not possible, the taxon is assigned to the Data Deficient category. If a taxon is listed in a category other than Data Deficient but confidence in the listing is low due to poor quality data, then the listing can be qualified with the letters DP (Data Poor) to indicate this ...

EXTINCT

A taxon is listed as Extinct when there is no reasonable doubt, after repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon's historic range, that the last individual has died. Examples include huia (*Heteralocha acutirostris*) and Adams's mistletoe (*Trilepidea adamsii*). Only taxa that have become extinct since 1840 are included in the list. Taxa that are extinct in the wild but occur in captivity or cultivation are not listed in this category. These are listed as Critically Endangered and are qualified with the letters EW (Extinct in the Wild).

THREATENED

The threatened categories are grouped into three major divisions: 'Acutely Threatened', 'Chronically Threatened' and 'At Risk'.

Acutely Threatened

The categories in the 'Acutely Threatened' division—Nationally Critical, Nationally Endangered and Nationally Vulnerable—equate with the IUCN categories of Critically Endangered, Endangered and Vulnerable. Taxa in these three categories are facing a very high risk of extinction in the wild, as defined by criteria that quantify:

- Total population size
- Area of occupancy
- Fragmentation of populations
- Declines in total population
- Declines in habitat area
- Predicted declines due to existing threats

Although the criteria (described in Section 6) measure similar population features as those in the IUCN Red List criteria, numerical limits and timeframes are tailored to suit New Zealand circumstances. These were set through a process of testing and refinement by the project team and as a result of feedback from New Zealand species experts. Criteria that attempt to predict declines due to possible future threats are not included because of the highly speculative nature of this type of assessment.

Chronically Threatened

Taxa listed in either of the two categories in the 'Chronically Threatened' grouping (Serious Decline and Gradual Decline) also face extinction, but are buffered slightly by either a large total population, or a slow decline rate (see Section 6).

At Risk

Taxa that do not meet the criteria for Acutely Threatened or Chronically Threatened, but have either restricted ranges or small scattered sub-populations, are listed in one of two categories (Range Restricted and Sparse) that fall under the division 'At Risk'. Although these taxa are not currently in decline, their population characteristics mean a new threat could rapidly deplete their population(s). Range Restricted taxa either occur in a small geographic area (e.g. Three Kings Islands), are restricted to a particular habitat (e.g. geothermal areas), or require very specific substrates (e.g. ultramafic rock), and for colonial breeders, have fewer than 10 subpopulations. Taxa that have naturally restricted ranges and taxa that have become restricted as a result of human activities are both included in this category. This is because both would face the same risk of extinction in the face of a new threat. The two groups are differentiated by the use of a qualifier (see Section 4).

Sparse taxa have very small, widely scattered populations, e.g. New Zealand spinach (*Tetragonia tetragonoides*). As with the Range Restricted category, taxa that are either naturally sparse or have become sparse as a result of human activities are included in this category.

NOT THREATENED

Taxa that are assessed and do not fit any of the Threatened categories are listed in the Not Threatened category.

7. Criteria for the Acutely Threatened and Chronically Threatened categories

... a taxon must meet specific criteria to be listed in one of the Acutely Threatened or Chronically Threatened categories. The criteria for each category are set out below ...

NATIONALLY CRITICAL

Very small population *or* a very high predicted decline

A taxon is Nationally Critical when available scientific evidence indicates that it meets any of the following three criteria:

1. The total population size is ≤ 250 mature individuals.
2. Human influences have resulted in ≤ 2 sub-populations *and either*:
 - a. ≤ 200 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is ≤ 1 ha (0.01 km^2).
3. There is a predicted decline of $\geq 80\%$ in the total population in the next 10 years due to existing threats.

NATIONALLY ENDANGERED

A: Small population *and* moderate to high recent or predicted decline

A taxon is Nationally Endangered when available scientific evidence indicates that it fits at least one Status criterion *and* one Trend criterion as follows:

Status criteria

1. The total population size is 250–1000 mature individuals.
2. There are ≤ 5 sub-populations *and either*:
 - a. ≤ 300 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend criteria

1. There has been a decline of $\geq 30\%$ in the total population or habitat area in the last 100 years.
2. There is a predicted decline of $\geq 30\%$ in the total population in the next 10 years due to existing threats.

B: Small to moderate population *and* high recent or predicted decline

A taxon is Nationally Endangered when available scientific evidence indicates that it fits at least one Status criterion *and* one Trend criterion:

Status criteria

1. The total population size is 1000–5000 mature individuals.
2. There are ≤ 15 sub-populations *and either*:
 - a. 300–500 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is 10–100 ha ($0.1\text{--}1 \text{ km}^2$).

Trend criteria

1. There has been a decline of $\geq 60\%$ in the total population or habitat area in the last 100 years.

2. There is a predicted decline of $\geq 60\%$ in the total population in the next 10 years due to existing threats.

NATIONALLY VULNERABLE

Small to moderate population *and* moderate recent or predicted decline

A taxon is Nationally Vulnerable when scientific evidence indicates that it fits at least one Status criterion *and* one Trend criterion:

Status criteria

1. The total population size is 1000–5000 mature individuals.
2. There are ≤ 15 sub-populations *and either*:
 - a. 300–500 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is 10–100 ha (0.1–1 km²).

Trend criteria

1. There has been a decline of 30–60% in the total population or habitat area in the last 100 years and the total population or habitat area is still in decline.
2. There is a predicted decline of 30–60% in the total population in the next 10 years due to existing threats.

SERIOUS DECLINE

A. Moderate to large population *and* moderate to large predicted decline

A taxon is listed in Serious Decline when scientific evidence indicates that it fits at least one Status criterion *and* the Trend criterion:

Status criteria

1. The total population size is ≥ 5000 mature individuals.
2. There are ≥ 15 sub-populations *and either*:
 - a. ≥ 500 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is ≥ 100 ha (1 km²).

Trend criterion

1. There is a predicted decline of $\geq 30\%$ in the total population in the next 10 years due to existing threats.

B. Small to moderate population *and* small to moderate predicted decline

A taxon is listed in Serious Decline when available scientific evidence indicates that it fits at least one Status criterion *and* the Trend criterion:

Status criteria

1. The total population size is ≤ 5000 mature individuals.
2. There are ≤ 15 sub-populations *and either*:
 - a. ≤ 500 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is ≤ 100 ha (1 km²).

Trend criterion

1. There is a predicted decline of 5–30% in the total population in the next 10 years due to existing threats.

GRADUAL DECLINE

Moderate to large population *and* small to moderate decline

A taxon is listed in Gradual Decline when available scientific evidence indicates that it fits at least one Status criterion *and* the Trend criterion:

Status criteria

1. The total population size is > 5000 mature individuals.
2. There are > 15 sub-populations *and either*:
 - a. > 500 mature individuals in the largest sub-population, *or*
 - b. the total area of occupancy is > 100 ha (1 km²).

Trend criterion

1. There is a predicted decline of 5–30% in the total population in the next 10 years due to existing threats, and *the decline is predicted to continue beyond 10 years*.

8.4 CATEGORIES OF IMPORTANCE FOR GEOLOGICAL AND SOIL SITES

Geological sites

Ranking criteria for important geological sites and landforms in the Northland Region follow Kenny & Hayward (1996).

Sites are listed under three levels of importance:

- (a) International – site of international scientific importance.
- (b) National – site of national scientific, educational or aesthetic importance.
- (c) Regional – site of regional scientific, educational or aesthetic importance.

Soil sites

Ranking criteria for New Zealand soil sites of international, national, and regional significance, from Arand *et al.* (1993).

Soil sites are listed under three levels of importance:

(a) International

- Contains the best example of a soil (generally a soil group) or soil–vegetation or soil–landform association that is unique to New Zealand (or these latitudes)
- Contains a soil that is naturally uncommon or greatly reduced in extent in other parts of the world
- Contains a wide range of extensive soils with a relatively unmodified vegetation cover
- Has been studied in detail and is known internationally.

(b) National

- Contains the best or a ‘classic’ example of a soil (either a soil group or a mapping unit) or a soil–vegetation or a soil–landform association in New Zealand
- Contains a soil or soil–vegetation or a soil–landform association that is nationally uncommon or reduced in extent
- Contains a moderate range of extensive soils with a relatively unmodified vegetation cover
- Has been studied in detail and is known nationally.

(c) Regional

- Contains the best regional example of a soil (generally a mapping unit) or a soil or soil–vegetation or a soil–landform association
- Contains a limited range of soils under vegetation that is relatively unmodified.

8.5 CHECKLIST OF PLANT SPECIES IN WAIPU ECOLOGICAL DISTRICT

This species list was compiled by the authors during a reconnaissance survey in the late spring/early summer of 2006. It includes all vascular plant species known to be native to or wild and naturalised in Waipu Ecological District. Other records, including those from Department of Conservation Sites of Specific Biological Interest (SSBI) database and Auckland Museum Herbarium (AK), have been referenced following the Latin species name. AK herbarium records from the current study are also referenced.

1. INDIGENOUS SPECIES

Gymnosperms		<i>Corokia buddleioides</i> (Boffa Miskell 2003)	korokio
<i>Agathis australis</i>	kauri	<i>Coprosma acerosa</i>	
<i>Dacrycarpus dacrydioides</i>	kahikatea	<i>Coprosma arborea</i>	mamangi, tree coprosma
<i>Dacrydium cupressinum</i>	rimu	<i>Coprosma areolata</i>	
<i>Halocarpus kirkii</i> (AK 295324)	monoao	<i>Coprosma grandifolia</i>	kanono, raurekau
<i>Libocedrus plumosa</i>	kawaka	<i>Coprosma lucida</i>	shining karamu
<i>Phyllocladus trichomanoides</i>	tanekaha	<i>Coprosma macrocarpa</i>	
<i>Podocarpus hallii</i> (SSBI Q08/H021; Jones 1991)	Hall's totara	<i>Coprosma parviflora</i>	
<i>Podocarpus totara</i>	totara	<i>Coprosma propinqua</i> var. <i>propinqua</i>	
<i>Prumnopitys taxifolia</i>	matai	<i>Coprosma propinqua</i> var. <i>propinqua</i> × <i>C. robusta</i>	
<i>Prumnopitys ferruginea</i>	miro	<i>Coprosma repens</i>	taupata
Monocot. trees and shrubs		<i>Coprosma rhamnoides</i>	
<i>Cordyline australis</i>	ti kouka, cabbage tree	<i>Coprosma rigida</i> (AK 297990; AK 298333, current survey)	
<i>Cordyline banksii</i> cabbage tree	ti ngahere, forest	<i>Coprosma robusta</i>	karamu
<i>Pbormium cookianum</i> (Forester <i>et al.</i> 2001)	wharariki, mountain flax	<i>Coprosma spatbulata</i> subsp. <i>spatbulata</i>	
<i>Pbormium tenax</i>	harakeke, flax	<i>Coriaria arborea</i> var. <i>arborea</i>	tutu
<i>Rhopalostylis sapida</i>	nikau	<i>Corynocarpus laevigatus</i>	karaka
Dicot. trees and shrubs		<i>Dracophyllum latifolium</i> (incl. <i>D. matthewsii</i>)	neinei
<i>Ackama rosifolia</i>	makamaka	<i>Dracophyllum lessonianum</i>	
<i>Alectryon excelsus</i> subsp. <i>excelsus</i>	titoki	<i>Dysoxylum spectabile</i>	kohekohe
<i>Alseuosmia banksii</i> var. <i>banksii</i> (DOC internal files - Waipu Gorge; SSBI Q07/H047; Landcare)		<i>Elaeocarpus dentatus</i> (incl. <i>E. d.</i> var. <i>obovatus</i>)	hinau
<i>Alseuosmia banksii</i> var. <i>linariifolia</i> (Kendrick and Young 2006)		<i>Epacris pauciflora</i> var. <i>pauciflora</i> (AK 295325)	
<i>Alseuosmia macrophylla</i> (DOC internal files - Waipu Gorge; SSBI Q07/H047)	toropapa	<i>Fuchsia excorticata</i> (AK 298336, current survey)	kotukutuku, tree fuchsia
<i>Alseuosmia quercifolia</i> (DOC internal files - Waipu Gorge; Jones 1991; SSBI Q07/H047)		<i>Gaultheria antipoda</i>	tawiniwini
<i>Aristotelia serrata</i>	makomako, wineberry	<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>	hangehange
<i>Avicennia marina</i> subsp. <i>australasica</i>	manawa, mangrove	<i>Griselinia lucida</i>	puka
<i>Beilschmiedia tarairi</i>	taraire	<i>Hebe macrocarpa</i> var. <i>macrocarpa</i> (AK 298337; AK 298338, current survey)	kokomuka
<i>Beilschmiedia tawa</i>	tawa	<i>Hebe stricta</i> var. <i>stricta</i>	koromiko
<i>Brachyglottis kirkii</i> var. <i>angustior</i>	komingiroa	<i>Hedycarya arborea</i>	pigeonwood, porokaiwhiri
<i>Brachyglottis repanda</i>	rangiora	<i>Hoberia populnea</i>	houhere, lacebark
<i>Carmichaelia australis</i>	makaka, maukoro, NZ broom	<i>Knightsia excelsa</i>	rewarewa
<i>Carpodetus serratus</i>	putaputaweta	<i>Kunzea ericoides</i>	kanuka
		<i>Kunzea ericoides</i> var. <i>linearis</i>	
		<i>Laurelia novae-zelandiae</i>	pukatea
		<i>Leptospermum scoparium</i>	manuka

<i>Leptecophylla juniperina</i> (Boffa Miskell 2003)	prickly mingimingi	<i>Streblus heterophyllus</i> × <i>S. ?banksii</i> (AK 298332, current survey)	small-/large-leaved milktree hybrid
<i>Leucopogon fasciculatus</i>	mingimingi	<i>Syzygium maire</i> (SSBI Q07/H047)	maire tawake, swamp maire
<i>Leucopogon fraseri</i>	patotara		
<i>Litsea calicaris</i> (Forester <i>et al.</i> 2001)	mangeao	<i>Toronia toru</i>	toru
<i>Lophomyrtus bullata</i> (Jones 1991)	ramarama	<i>Vitex lucens</i>	puriri
<i>Macropiper excelsum</i> subsp. <i>excelsum</i>	kawakawa	<i>Weinmannia silvicola</i>	towa
<i>Melicope simplex</i> (Kendrick and Young 2006)			
<i>Melicope ternata</i>	wharangi	Monocot. lianes	
<i>Melicytus macrophyllus</i>	large-leaved mahoe	<i>Freycinetia banksii</i>	kiekie
<i>Melicytus micranthus</i>		<i>Ripogonum scandens</i>	supplejack, kareao
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>	mahoe		
<i>Metrosideros excelsa</i>	pohutukawa	Dicot. lianes	
<i>Metrosideros robusta</i>	northern rata	<i>Calystegia sepium</i> (Jones 1991; SSBI Q07/H047)	pohue
<i>Mida salicifolia</i> (incl. <i>M. s.</i> var. <i>myrtifolia</i>)	mida, sandalwood	<i>Calystegia soldanella</i>	shore bindweed, panahi
<i>Myoporum laetum</i>	ngaio	<i>Clematis cunninghamii</i>	ngakau-kiore
<i>Myrsine australis</i>	mapou	<i>Clematis paniculata</i>	puawananga
<i>Myrsine salicina</i>	toro	<i>Metrosideros carminea</i> (AK 297995, current survey)	carmine rata, akakura
<i>Nestegis apetala</i> (Forester <i>et al.</i> 2001)	coastal maire	<i>Metrosideros diffusa</i>	rata
<i>Nestegis cunninghamii</i>	black maire	<i>Metrosideros fulgens</i>	rata
<i>Nestegis lanceolata</i>	white maire	<i>Metrosideros perforata</i>	aka
<i>Nestegis montana</i> (DOC internal files - Waipu Gorge)	oro-oro	<i>Muehlenbeckia australis</i>	
<i>Notofagus truncata</i> (Forester <i>et al.</i> 2001)	hard beech, tawhai raunui	<i>Muehlenbeckia complexa</i>	pohuehue
<i>Olearia furfuracea</i>	akepiro	<i>Parsonsia capsularis</i>	akakiore
<i>Olearia rani</i>	heketara	<i>Parsonsia heterophylla</i> (Jones 1991)	NZ jasmine, akakaikiore
<i>Ozothamnus leptophyllus</i>	tauhinu	<i>Passiflora tetrandra</i>	kohia
<i>Pennantia corymbosa</i>	kaikomako	<i>Rubus australis</i>	bush lawyer, tataramoa
<i>Pimelea prostrata</i>	pinatoro	<i>Rubus cissoides</i>	bush lawyer, tataramoa
<i>Pisonia brunoniana</i> (DOC Bioweb database)	parapara	<i>Rubus schmidelioides</i>	bush lawyer, akatataramoa
<i>Pittosporum cornifolium</i>	tawhirikao	<i>Tetragonia implexicoma</i>	
<i>Pittosporum crassifolium</i>	karo	<i>Tetragonia tetragonioides</i>	kokihi
<i>Pittosporum eugenioides</i>	tarata, lemonwood		
<i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>	kohuhu		
<i>Plagiantbus divaricatus</i>	saltmarsh ribbon- wood, makaka	Lycopods and psilopsids	
<i>Plagiantbus regius</i> (AK 298005, current survey)	manatu, ribbonwood	<i>Huperzia varia</i>	Whiri-o-Raukatauri
<i>Pomaderris kumerabo</i>	kumarahou	<i>Lycopodiella cernua</i>	maatukutuku
<i>Pomaderris</i> aff. <i>phylicifolia</i>		<i>Lycopodium deuterodensum</i>	puakarimu
<i>Pouteria costata</i> (Forester <i>et al.</i> 2001)	tawapou	<i>Lycopodium volubile</i>	waewaekoukou
<i>Pseudopanax arboreus</i>	five finger, whauwhaupaku	<i>Tmesipteris elongata</i> (Jones 1991)	
<i>Pseudopanax crassifolius</i>	lancewood, horoeka	<i>Tmesipteris lanceolata</i> (Jones 1991)	
<i>Pseudopanax crassifolius</i> × <i>P. lessonii</i>		<i>Tmesipteris sigmatifolia</i> (Jones 1991)	
<i>Pseudopanax lessonii</i>	houpara	<i>Tmesipteris tannensis</i> (Jones 1991)	
<i>Quintinia serrata</i>	tawheowheo		
<i>Raukawa anomalus</i>		Ferns	
<i>Rhabdotbamnus solandri</i>	taurepo	<i>Adiantum cunninghamii</i>	huruhuru tapairu, common maidenhair fern
<i>Schefflera digitata</i>	pate	<i>Adiantum diaphanum</i> (Jones 1991; Forester <i>et al.</i> 2001)	huruhuru tapairu
<i>Solanum aviculare</i> f. <i>aviculare</i> (Jones 1991)	poroporo	<i>Adiantum fulvum</i>	huruhuru tapairu
<i>Sophora chatbamica</i>	kowhai	<i>Adiantum bispidulum</i>	rosy maidenhair fern
<i>Streblus heterophyllus</i>	small-leaved milktree		

<i>Adiantum viridescens</i> (SSBI Q07/H059; Forester <i>et al.</i> 2001)	huruhuru tapairu	<i>Lastreopsis velutina</i> (Forester <i>et al.</i> 2001)	
<i>Artbropteris tenella</i>		<i>Lastreopsis microsora</i> subsp. <i>pentangularis</i>	
<i>Asplenium bulbiferum</i>	hen and chicken fern, mouku	<i>Leptopteris hymenophylloides</i>	heruheru
<i>Asplenium flaccidum</i>	hanging spleenwort, makawe	<i>Lindsaea trichomanoides</i> (Jones 1991; SSBI Q08/H021)	
<i>Asplenium lamprophyllum</i> (Boffa Miskell 2003)		<i>Loxogramme dictyopteris</i> (Jones 1991; SSBI Q07/H047)	
<i>Asplenium oblongifolium</i>	shining spleenwort, huruhuruwhenua	<i>Loxsoma cunninghamii</i> (AK 176354)	
<i>Asplenium polyodon</i>	sickle spleenwort, petako	<i>Lygodium articulatum</i>	mangemange (Jones 1991; SSBI Q07/H059; SSBI Q07/H054)
<i>Asplenium baurakiense</i>		<i>Microsorium pustulatum</i>	kowaowao, hound's tongue fern
<i>Azolla filiculoides</i>	retoretore	<i>Microsorium scandens</i>	fragrant fern, mokimoki
<i>Blechnum cbambersii</i>	rereti	<i>Paesia scaberula</i>	matata
<i>Blechnum discolor</i>	petipeti, crown fern	<i>Pellaea rotundifolia</i>	tarawera, button fern
<i>Blechnum filiforme</i>	panako, thread fern	<i>Pneumatopteris pennigera</i>	pakau, gully fern
<i>Blechnum fluviatile</i> agg. (Jones 1991)	kiwikiwi	<i>Polystichum</i> sp. (recorded as <i>P. richardii</i> in Forester <i>et al.</i> 2001)	
<i>Blechnum fraseri</i> (Jones 1991)		<i>Pteridium esculentum</i>	bracken, rarahu
<i>Blechnum membranaceum</i>		<i>Pteris comans</i>	coastal brake
<i>Blechnum novae-zelandiae</i>	kiokio	<i>Pteris macilentia</i> (Jones 1991)	
<i>Blechnum minus</i>	swamp kiokio	<i>Pteris saxatilis</i> (Forester <i>et al.</i> 2001)	
<i>Blechnum minus</i> × <i>B. novae-zelandiae</i>		<i>Pteris tremula</i>	turawera, shaking brake
<i>Cyathea cunninghamii</i> (SSBI Q08/H021)	gully tree fern, punui	<i>Pyrrosia eleagnifolia</i>	leather-leaf fern
<i>Cyathea dealbata</i>	ponga, silver tree fern	<i>Rumobra adiantiformis</i> (DOC internal files – Waipu Gorge; SSBI Q07/H059)	
<i>Cyathea medullaris</i>	mamaku	<i>Schizaea dichotoma</i> (SSBI Q07/H047)	
<i>Cyathea smithii</i> (SSBI Q08/H021)	katote, soft tree fern	<i>Trichomanes elongatum</i> (Kendrick & Young 2006; SSBI Q07/H059)	
<i>Deparia petersenii</i> subsp. <i>congrua</i>		<i>Trichomanes endlicherianum</i> (Jones 1991; SSBI Q07/H047; SSBI Q07/H047)	
<i>Dicksonia squarrosa</i>	wheki	<i>Trichomanes reniforme</i> (Landcare; Jones 1991)	
<i>Diplazium australe</i>		<i>Trichomanes venosum</i> (SSBI Q08/H021; SSBI Q07/H047; SSBI Q07/H059)	
<i>Doodia australis</i>	rasp fern, pukupuku		
<i>Doodia mollis</i> (AK 298335, current survey)			
<i>Doodia squarrosa</i> (SSBI Q07/H059)			
<i>Gleichenia dicarpa</i> (SSBI Q08/H021)	tangle fern		
<i>Gleichenia microphylla</i>	waewaekaka		
<i>Grammitis ciliata</i> (Kendrick & Young 2006)			
<i>Histiopteris incisa</i>	matata		
<i>Hymenophyllum demissum</i>	irirangi		
<i>Hymenophyllum dilatatum</i> (Jones 1991)	matua mauku		
<i>Hymenophyllum ferrugineum</i> (SSBI Q08/H021)	mauku		
<i>Hymenophyllum flabellatum</i>	mauku		
<i>Hymenophyllum flexuosum</i> (SSBI Q07/H059)	mauku		
<i>Hymenophyllum multifidum</i>	mauku		
<i>Hymenophyllum rarum</i> (Kendrick & Young 2006; SSBI Q07/H059)	mauku		
<i>Hymenophyllum revolutum</i> (Kendrick & Young 2006)	mauku		
<i>Hymenophyllum sanguinolentum</i> (Kendrick & Young 2006)	piripiri		
<i>Hymenophyllum scabrum</i> (SSBI Q07/H059)	mauku		
<i>Hypolepis ambigua</i>			
<i>Hypolepis distans</i>			
<i>Lastreopsis glabella</i>			
<i>Lastreopsis bispida</i>			

Orchids

<i>Aciantbus sinclairii</i>	
<i>Anzybas rotundifolius</i> (Jones 1991)	
<i>Corybas cheesemanii</i> (Jones 1991)	spider orchid
<i>Cyrtostylis oblonga</i> (Kendrick & Young 2006; SSBI Q07/H047)	
<i>Diplodinium alobulum</i> (Jones 1991)	
<i>Diplodinium brumalum</i> (DOC internal files – Waipu Gorge; SSBI Q07/H059)	
<i>Diplodinium trullifolium</i> (Kendrick & Young 2006; SSBI Q07/H059)	
<i>Drymoanthus adversus</i> (Kendrick & Young 2006)	
<i>Earina autumnalis</i> (Jones 1991)	Easter orchid
<i>Earina mucronata</i>	bamboo orchid
<i>Icthyostomum pygmaeum</i> (Kendrick & Young 2006)	
<i>Microtis unifolia</i> agg.	onion orchid
<i>Nematoceras rivulare</i> (SSBI Q07/H059)	
<i>Nematoceras triloba</i> (Jones 1991; SSBI Q07/H059)	
<i>Oriboceras novae-zeelandiae</i>	
<i>Petalocbilus chlorostylus</i> (SSBI Q07/H059)	
<i>Prasopphyllum colensoi</i> (SSBI Q07/H059)	
<i>Pterostylis agathicola</i> (Kendrick & Young 2006)	

<i>Pterostylis banksii</i>	green hood orchid
<i>Pterostylis graminea</i> agg. (SSBI Q07/H047)	
<i>Simpliglottis cornuta</i> (SSBI Q07/H059)	
<i>Stegostylis</i> sp.	
<i>Thelymitra longifolia</i> agg.	
<i>Thelymitra pauciflora</i> agg.	
<i>Winika cunninghamii</i>	winika
(DOC internal files – Waipu Gorge; SSBI Q08/H001)	

Grasses

<i>Austrofestuca littoralis</i>	
<i>Austrostipa stipoides</i>	
<i>Cbionobloa bromoides</i>	
<i>Cortaderia splendens</i>	toetoe
<i>Dichelachne crinita</i>	patiti
<i>Isachne globosa</i>	swamp millet
<i>Lacnagrostis billardierei</i>	sand wind grass
<i>Lacnagrostis filiformis</i>	wind grass
(AK 297993, current survey)	
<i>Microlaena avenacea</i> (SSBI Q07/H047)	bush rice grass
<i>Microlaena stipoides</i>	patiti
<i>Oplismenus birtellus</i> subsp. <i>imbecillis</i>	
<i>Rytidosperma biannulare</i> (Forester <i>et al.</i> 2001)	
<i>Rytidosperma gracile</i>	
<i>Spinifex sericeus</i>	spinifex, kowhangatara

Sedges

<i>Baumea arthropophylla</i>	
<i>Baumea articulata</i>	
<i>Baumea juncea</i>	
<i>Baumea rubiginosa</i>	
<i>Baumea teretifolia</i>	
<i>Bolboschoenus fluviatilis</i>	marsh clubrush, ririwaka
<i>Carex dissita</i>	
<i>Carex flagellifera</i>	manaia
<i>Carex geminata</i> (AK 297985, current survey)	
<i>Carex lambertiana</i>	
<i>Carex lessoniana</i>	
<i>Carex maorica</i>	
<i>Carex ocbrosaccus</i>	
<i>Carex pumila</i>	
<i>Carex secta</i>	purei
<i>Carex solandri</i>	
<i>Carex testacea</i>	
<i>Carex virgata</i>	purei
<i>Cyperus ustulatus</i>	toetoe upokotangata, giant umbrella sedge
<i>Desmoschoenus spiralis</i>	pingao
<i>Eleocharis acuta</i>	sharp spike sedge
<i>Eleocharis gracilis</i>	slender spike sedge
<i>Eleocharis sphacelata</i>	kuta, tall spike sedge
<i>Ficinia nodosa</i>	wiwi, knobby clubrush
<i>Gabnia lacera</i>	tarangarara

<i>Gabnia pauciflora</i> (Kendrick and Young 2006; SSBI Q07/H047; SSBI Q07/H051)	takahikahi
<i>Gabnia setifolia</i>	mapere
<i>Gabnia xanthocarpa</i>	tupari-maunga
<i>Isolepis cernua</i>	
<i>Isolepis inundata</i> (Jones 1991)	
<i>Isolepis reticularis</i> (SSBI Q08/H021)	
<i>Lepidosperma australe</i>	
<i>Lepidosperma laterale</i>	
<i>Morelotia affinis</i>	
<i>Schoenoplectus tabernaemontani</i>	lake clubrush, kapungawha
<i>Schoenus maschalinus</i>	
<i>Schoenus apogon</i>	
<i>Schoenus tendo</i>	wiwi
<i>Uncinia banksii</i>	matau, hook sedge
<i>Uncinia uncinata</i>	kamu, matau a Maui, hook sedge
<i>Uncinia zotovii</i>	matau, hook sedge

Rushes

<i>Juncus edgariae</i>	wi
<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush, wi
<i>Juncus pallidus</i>	wi
<i>Juncus planifolius</i>	
<i>Juncus sarophorus</i>	wi
<i>Luzula picta</i> var. <i>picta</i>	

Monocot. herbs (other than orchids, grasses, sedges and rushes)

<i>Apodasmia similis</i>	oioi
<i>Arthropodium cirratum</i>	rengarenga
<i>Astelia banksii</i>	kakaha
<i>Astelia solandri</i>	kowharawhara, perching lily
<i>Astelia trinervia</i> (Kendrick & Young 2006)	kauri grass, mauri
<i>Collospermum bastatum</i>	kahakaha, perching lily
<i>Cordylone pumilio</i> (Kendrick & Young 2006; Wilcox 2006)	ti rauriki
<i>Dianella nigra</i>	turutu
<i>Lemna minor</i>	karearea
<i>Sparganium subglobosum</i> (AK 297989, current survey)	maru, burr reed
<i>Triglochin striata</i> (AK 298334, current survey)	arrow grass
<i>Typha orientalis</i>	raupo
<i>Zostera</i> sp.	sea grass

Composite herbs

<i>Cotula coronopifolia</i>	bachelor's button
<i>Euciton audax</i>	
<i>Euciton collinus</i>	
<i>Euciton spbaericus</i> (Forester <i>et al.</i> 2001)	
<i>Lagenifera pumila</i>	papataniwhaniwha
<i>Pseudognaphalium luteoalbum</i>	pukatea
<i>Senecio bispidulus</i> (Jones 1991; Forester <i>et al.</i> 2001)	

Senecio minimus (Jones 1991)
Senecio glomeratus (SSBI Q08/H021)
Senecio lautus

Dicot. herbs (other than composites)

<i>Acaena anserinifolia</i>	piripiri
<i>Apium prostratum</i>	native celery
<i>Callitriche muelleri</i>	
<i>Centella uniflora</i>	
<i>Dichondra repens</i>	Mercury Bay weed
<i>Disphyma australe</i>	horokaka
<i>Drosera auriculata</i>	
<i>Elatostema rugosum</i>	parataniwha
<i>Epilobium nerteroides</i>	
<i>Epilobium nummulariifolium</i>	
<i>Epilobium pedunculare</i> (SSBI Q07/H047)	
<i>Epilobium rotundifolium</i> (AK 297986, current survey)	
<i>Galium propinquum</i>	mawe
<i>Geranium solanderi</i>	
<i>Geranium bomeanum</i> (Jones 1991)	
<i>Gonocarpus aggregatus</i>	
<i>Gonocarpus incanus</i>	piripiri
<i>Haloragis erecta</i> subsp. <i>erecta</i>	toatoa
<i>Hydrocotyle elongata</i> (SSBI Q08/H021)	
<i>Hydrocotyle heteromeria</i>	
<i>Hydrocotyle microphylla</i>	
<i>Hydrocotyle moschata</i>	
<i>Hydrocotyle novae-zeelandiae</i> (Jones 1991)	
<i>Hydrocotyle tripartita</i>	
<i>Leptostigma setulosa</i>	
<i>Lobelia anceps</i>	punakuru
<i>Myriophyllum propinquum</i>	
<i>Nertera depressa</i>	
<i>Nertera dichondrifolia</i>	
<i>Oxalis exilis</i>	
<i>Oxalis magellanica</i> (AK 297992, current survey)	
<i>Oxalis rubens</i>	
<i>Parietaria debilis</i>	
<i>Pelargonium inodorum</i> (DOC Bioweb 2007)	kopata
<i>Peperomia urvilleana</i>	
<i>Persicaria decipiens</i>	
<i>Pratia angulata</i>	panakenake
<i>Ranunculus reflexus</i>	maruru
<i>Samolus repens</i>	sea primrose
<i>Sarcocornia quinqueflora</i>	glasswort
<i>Selliera radicans</i>	remuremu
<i>Solanum americanum</i> (Landcare; SSBI Q08/H021)	small-leaved nightshade
<i>Spergularia media</i>	
<i>Suaeda novae-zelandiae</i> (AK 297982, current survey)	
<i>Wahlenbergia gracilis</i> (SSBI Q07/H059)	

Doubtful records

Myrsine divaricata (SSBI Q08/H052)

2. ADVENTIVE SPECIES

Gymnosperms

<i>Pinus pinaster</i>	maritime pine
<i>Pinus radiata</i>	radiata pine

Dicot. trees and shrubs

<i>Acacia longifolia</i>	Sydney golden wattle
<i>Acacia mearnsii</i>	black wattle
<i>Acacia melanoxylon</i>	Tasmanian blackwood
<i>Acacia paradoxa</i> (AK 297987)	
<i>Acacia sophorae</i>	
<i>Acacia verticillata</i>	prickly Moses
<i>Banksia integrifolia</i> (AK 297994)	coastal banksia
<i>Brugmansia candida</i>	angel's trumpet
<i>Cotoneaster glaucophyllus</i>	cotoneaster
<i>Crataegus monogyna</i>	hawthorn
<i>Elaeagnus × reflexa</i>	elaeanus
<i>Eriobotrya japonica</i>	loquat
<i>Erythrina × sykesii</i>	coral tree
<i>Euonymus japonicus</i>	Japanese spindle tree
<i>Hakea salicifolia</i>	willow-leaved hakea
<i>Hakea sericea</i>	prickly hakea
<i>Hydrangea macrophylla</i>	hydrangea
<i>Hypericum androsaemum</i>	tutsan
<i>Impatiens sodenii</i>	shrub balsam
<i>Juglans</i> sp.	walnut
<i>Leycesteria formosa</i>	Himalayan honeysuckle
<i>Ligustrum lucidum</i>	tree privet
<i>Ligustrum sinense</i>	Chinese privet
<i>Lupinus arboreus</i>	lupin
<i>Paraserianthes lophantha</i>	brush wattle
<i>Polygala myrtifolia</i> (SSBI Q07/H051)	sweet pea shrub
<i>Prunus persica</i>	peach tree, nectarine
<i>Psoralea pinnata</i>	dally pine
<i>Rbaphiolepis umbellata</i> (AK 297984)	Sexton's bride
<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)	blackberry
<i>Salix fragilis</i>	crack willow
<i>Senecio angulatus</i>	Cape ivy
<i>Senecio petasitis</i>	velvet groundsel
<i>Solanum mauritianum</i>	woolly nightshade
<i>Solanum pseudocapsicum</i>	Jerusalem cherry
<i>Syzygium smithii</i>	lillypilly, monkey apple
<i>Ulex europaeus</i>	gorse

Dicot. lianes

<i>Anredera cordifolia</i>	madeira vine
<i>Araujia sericifera</i>	moth plant
<i>Calystegia silvatica</i>	
<i>Hedera helix</i>	ivy
<i>Jasminum polyanthum</i>	jasmine
<i>Jasminum</i> sp.	jasmine
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Passiflora edulis</i>	black passionfruit

<i>Passiflora mollissima</i> var. <i>tripartita</i>	banana passionfruit
<i>Rosa</i> sp.	rose vine
<i>Rumex sagittatus</i>	climbing dock
<i>Senecio angulatus</i>	cape ivy
<i>Senecio mikanioides</i>	German ivy
<i>Vinca major</i>	periwinkle
<i>Vitis vinifera</i>	grape
<i>Wisteria sinensis</i>	wisteria

Ferns

<i>Azolla pinnata</i> (AK 297991)	
<i>Neprolepis cordifolia</i>	tuber ladder fern

Monocot trees and shrubs

<i>Phoenix canariensis</i>	Phoenix palm

Grasses

<i>Agrostis capillaris</i>	browntop
<i>Agrostis stolonifera</i>	creeping bent
<i>Aira caryophylla</i>	silvery hairy grass
<i>Ammophila arenaria</i>	marram
<i>Anemantele lessoniana</i> *	gossamer grass
<i>Antioxanthum odoratum</i>	sweet vernal
<i>Arundo donax</i>	giant reed
<i>Avena barbata</i>	slender oat
<i>Axonopus fissifolius</i> (SSBI Q08/H021)	narrow-leaved carpet grass
<i>Briza maxima</i>	large quaking grass
<i>Briza minor</i>	shivery grass
<i>Bromus diandrus</i>	ripgut brome
<i>Bromus bordeaceus</i> (AK 297983, current survey)	soft brome
<i>Bromus willdenowii</i>	prairie brome
<i>Cortaderia selloana</i>	pampas
<i>Dactylis glomerata</i>	cocksfoot
<i>Digitaria sanguinalis</i>	summer grass
<i>Ehrharta erecta</i>	veld grass
<i>Elytrigia repens</i>	couch
<i>Glyceria maxima</i>	reed sweetgrass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Lagurus ovatus</i>	haretail
<i>Lolium perenne</i>	rye grass
<i>Parapholis incurva</i>	sickle grass
<i>Paspalum dilatatum</i>	paspalum
<i>Paspalum distichum</i>	Mercer grass
<i>Paspalum urvillei</i>	
<i>Paspalum vaginatum</i>	saltwater paspalum
<i>Pennisetum clandestinum</i>	kikuyu grass
<i>Pbleum pratense</i>	timothy
<i>Poa annua</i>	annual poa
<i>Poa trivialis</i> (SSBI Q07/H059)	rough stalked meadow grass
<i>Schedonorus phoenix</i>	tall fescue
<i>Setaria palmifolia</i>	palm grass

* Indigenous grass species naturalised from plantings in the Ruakaka Dunelands site (Q07/128).

<i>Sporobolus africanus</i>	ratstail
<i>Stenotaphrum secundatum</i>	buffalo grass
<i>Vulpia myuros</i>	vulpia hair grass
<i>Zizania latifolia</i> (SSBI Q07/H056)	Manchurian wild rice
Unidentified bamboo species	running bamboo

Sedges

<i>Carex divulsa</i>	
<i>Carex ovalis</i>	
<i>Cyperus eragrostis</i>	
<i>Cyperus tenellus</i>	
<i>Isolepis sepulcralis</i>	

Rushes

<i>Juncus acuminatus</i>	sharp-fruited rush
<i>Juncus articulatus</i>	
<i>Juncus bulbosus</i>	
<i>Juncus effusus</i>	soft rush
<i>Juncus tenuis</i>	track rush

Monocot. herbs (other than orchids, grasses, sedges and rushes)

<i>Agapanthus praecox</i>	agapanthus
<i>Agave</i> sp.	
<i>Aloe</i> sp.	aloe
<i>Allium triquetrum</i>	three-cornered garlic
<i>Asparagus asparagoides</i>	smilax
<i>Asparagus scandens</i>	climbing asparagus
<i>Canna indica</i>	canna lily
<i>Crocasmia</i> × <i>crocasmiflora</i>	montbretia
<i>Hedycium flavescens</i>	ginger
<i>Hedycium gardnerianum</i>	kahili ginger
<i>Kniphofia uvaria</i>	red hot poker
<i>Spirodella punctata</i>	purple-backed duckweed
<i>Tradescantia fluminensis</i>	tradescantia
<i>Watsonia bulbifera</i>	watsonia
<i>Yucca</i> sp.	yucca
<i>Zantedeschia aethiopica</i>	arum lily

Composite herbs

<i>Arctotis</i> sp.	arctotis
<i>Aster subulatus</i> (SSBI Q07/H051)	sea aster
<i>Bellis perennis</i>	daisy
<i>Bidens frondosa</i>	beggars' ticks
<i>Cirsium arvense</i>	California thistle
<i>Cirsium vulgare</i>	Scotch thistle
<i>Conyza albida</i>	fleabane
<i>Conyza bilbaoana</i> (SSBI Q07/H051)	fleabane
<i>Crepis capillaris</i>	hawksbeard
<i>Erigeron karvinskianus</i>	Mexican daisy
<i>Gamochaeta purpurea</i> (SSBI Q08/H021; SSBI Q07/H047)	purple cudweed
<i>Gamochaeta simplicicaulis</i> (SSBI Q08/H021; SSBI Q07/H047)	cudweed
<i>Gamochaeta spicata</i>	cudweed
<i>Gazania linearis</i>	gazania

<i>Gazania rigens</i> (SSBI Q07/H051)		<i>Linum bienne</i> (SSBI Q07/H047)	
<i>Hypochoeris radicata</i>	catsear	<i>Linum trigynum</i>	
<i>Lapsana communis</i>	nipplewort	<i>Linum catharticum</i>	
<i>Leontodon taraxacoides</i>	hawkbit	<i>Lotus pedunculatus</i>	lotus
<i>Leucanthemum vulgare</i>	oxeye daisy	<i>Lotus suaveolens</i>	hairy birdsfoot trefoil
<i>Osteospermum fruticosum</i>	rain daisy/ dimorphotheca	<i>Ludwigia palustris</i>	water purslane
<i>Picris echioides</i>	ox tongue	<i>Ludwigia peploides</i>	primrose willow
<i>Senecio bipinnatisectus</i>	Australian fireweed	<i>Malva</i> sp.	mallow
<i>Senecio elegans</i>	purple groundsel	<i>Medicago nigra</i>	bur medick
<i>Senecio sylvaticus</i>	wood groundsel	<i>Melilotus indicus</i>	King Island melilot
<i>Senecio vulgaris</i>	groundsel	<i>Mentha</i> × <i>piperita</i>	peppermint
<i>Sonchus oleraceus</i>	puha	<i>Modiola caroliniana</i>	creeping mallow
<i>Taraxacum officinale</i>	dandelion	<i>Myosotis laxa</i> var. <i>caespitosa</i>	forget-me-not
Dicot. herbs (other than composites)		<i>Myosotis</i> sp.	forget-me-not
<i>Acanthus mollis</i>	acanthus	<i>Nasturtium officinale</i>	watercress
<i>Acetosa acetosella</i>	sheep's sorrel	<i>Oenanthe pimpinellioides</i>	parsley dropwort
<i>Ageratina adenophora</i>	Mexican devil	<i>Orobancha minor</i>	broomrape
<i>Ageratina riparia</i>	mist flower	<i>Parentucellia viscosa</i>	tarweed
<i>Alisma plantago-aquatica</i>	water plantain	<i>Physalis peruviana</i>	cape gooseberry
<i>Alternanthera philoxeroides</i>	alligator weed	<i>Plantago australis</i> (SSBI Q07/H047)	swamp plantain
<i>Alternanthera</i> aff. <i>sessilis</i>		<i>Plantago coronopus</i> (SSBI Q07/H051)	buck's-horn plantain
<i>Anagallis arvensis</i>	scarlet pimpernel	<i>Plantago lanceolata</i>	narrow-leaved plantain
<i>Blackstonia perfoliata</i> (Forester et al. 2001)		<i>Plantago major</i> (SSBI Q08/H021)	broad-leaved plantain
<i>Cakile edentula</i>	sea rocket	<i>Polycarpon tetraphyllum</i>	allseed
<i>Cakile maritima</i>	sea rocket	<i>Polygonum hydropiper</i>	water pepper
<i>Callitriche stagnalis</i>	starwort	<i>Polygonum persicaria</i>	native willow weed
<i>Cardamine</i> sp.		<i>Polygonum strigosum</i>	
<i>Carpobrotus edulis</i>	South African ice plant	<i>Prunella vulgaris</i>	selfheal
<i>Cerastium fontanum</i>	mouse-ear chickweed	<i>Ranunculus repens</i>	creeping buttercup
<i>Cbenopodium album</i>	fathen	<i>Rumex obtusifolius</i>	dock
<i>Cbenopodium ambrosioides</i> (SSBI Q07/H051)	Mexican tea	<i>Sagina procumbens</i>	pearlwort
<i>Conium maculatum</i>	hemlock	<i>Sigesbeckia orientalis</i>	
<i>Coronopus didymus</i>	twin cress	<i>Silene gallica</i>	catchfly
<i>Crassula multicaeva</i>	fairy crassula	<i>Solanum chenopodioides</i>	velvety nightshade
<i>Datura stramonium</i>	thorn apple	<i>Solanum linnaeanum</i>	apple of Sodom
<i>Daucus carota</i>	wild carrot	<i>Solanum nigrum</i>	black nightshade
<i>Digitalis purpurea</i>	foxglove	<i>Solanum pseudocapsicum</i>	Jerusalem cherry
<i>Duchesnea indica</i>	Indian strawberry	<i>Spergularia rubra</i>	sand spurrey
<i>Euphorbia peplus</i>	milkweed	<i>Stachys sylvatica</i> (AK 297988)	hedge woundwort
<i>Fragaria vesca</i>	wild strawberry	<i>Trifolium pratense</i>	red clover
<i>Foeniculum vulgare</i>	fennel	<i>Trifolium repens</i>	white clover
<i>Fumaria capreolata</i>	fumitory	<i>Tropaeolum majus</i>	garden nasturtium
<i>Fumaria muralis</i>	scrambling fumitory	<i>Urtica urens</i> (SSBI Q07/H059)	nettle
<i>Galium aparine</i>	cleavers	<i>Verbena bonariensis</i>	purple-top
<i>Galium divaricatum</i>		<i>Veronica anagallis-aquatica</i>	water speedwell
<i>Geranium robertianum</i>	herb Robert	<i>Veronica arvensis</i>	field speedwell
<i>Geranium</i> sp.	geranium	<i>Veronica plebeia</i> (SSBI Q08/H021; SSBI Q07/H059)	
<i>Hypericum perforatum</i>	St John's wort	<i>Veronica serpyllifolia</i>	turf speedwell
<i>Impatiens walleriana</i>	busy lizzie	<i>Vicia sativa</i>	vetch
		<i>Vicia tetrasperma</i>	
		<i>Vinca major</i>	periwinkle

8.6 COMMON PLANT NAMES USED IN TEXT

Introduced/exotic species are indicated by an asterisk.

* agapanthus	<i>Agapanthus praecox</i>	* haretail	<i>Lagurus ovatus</i>
akepiro	<i>Olearia furfuracea</i>	* hawkbit	<i>Leontodon taraxacoides</i>
* alligator weed	<i>Alternanthera philoxeroides</i>	* hawthorn	<i>Crataegus monogyna</i>
* allseed	<i>Polycarpon tetraphyllum</i>	heketara	<i>Olearia rani</i>
* annual poa	<i>Poa annua</i>	* hemlock	<i>Conium maculatum</i>
* arctotis	<i>Arctotis</i> sp.	heruheru	<i>Leptopteris blymenophylloides</i>
* aristeia	<i>Aristea ecklonii</i>	hen and chicken fern	<i>Asplenium bulbiferum</i>
arrow grass	<i>Triglochin striata</i>	hinau	<i>Elaeocarpus dentatus</i>
* arum lily	<i>Zantedeschia aethiopica</i>	houhere	<i>Hobertia populnea</i>
bachelor's button	<i>Cotula coronopifolia</i>	hound's tongue fern	<i>Microsorium pustulatum</i>
* banana passionfruit	<i>Passiflora mollissima</i> var. <i>tripartita</i>	houpara	<i>Pseudopanax lessonii</i>
* black wattle	<i>Acacia mearnsii</i>	* hydrangea	<i>Hydrangea macrophylla</i>
bracken	<i>Pteridium esculentum</i>	* Japanese honeysuckle	<i>Lonicera japonica</i>
* Brazilian plume	<i>Justicia carnea</i>	* Japanese spindle tree	<i>Euonymus japonicus</i>
* broomrape	<i>Orobanche minor</i>	* jasmine	<i>Jasminum polyanthum</i>
* brush wattle	<i>Paraserianthes lophantha</i>	* Jerusalem cherry	<i>Solanum pseudocapsicum</i>
* buffalo grass	<i>Stenotaphrum secundatum</i>	kahakaha	<i>Collospermum bastatum</i>
* bur medick	<i>Medicago nigra</i>	kahikatea	<i>Dacrydium dacrydioides</i>
carmine rata	<i>Metrosideros carminea</i>	kaikomako	<i>Pennantia corymbosa</i>
* catchfly	<i>Silene gallica</i>	kanono	<i>Coprosma grandifolia</i>
* catsear	<i>Hypochaeris radicata</i>	kanuka	<i>Kunzea ericoides</i>
* Chinese privet	<i>Ligustrum sinense</i>	karaka	<i>Corynocarpus laevigatus</i>
* cleavers	<i>Galium aparine</i>	karamu	<i>Coprosma robusta</i>
* climbing asparagus	<i>Asparagus scandens</i>	karo	<i>Pittosporum crassifolium</i>
* clivia	<i>Clivia miniata</i>	kauri	<i>Agathis australis</i>
coastal banksia	<i>Banksia integrifolia</i>	kawaka	<i>Libocedrus plumosa</i>
coastal maire	<i>Nestegis apetala</i>	kawakawa	<i>Macropiper excelsum</i> subsp. <i>excelsum</i> f. <i>excelsum</i>
* coral tree	<i>Erythrina xyskiesii</i>	kiekie	<i>Freycinetia banksii</i>
* cotoneaster	<i>Cotoneaster glaucophyllus</i>	* kikuyu grass	<i>Pennisetum clandestinum</i>
* crack willow	<i>Salix fragilis</i>	king fern	<i>Marattia salicina</i>
* creeping buttercup	<i>Ranunculus repens</i>	* King Island melilot	<i>Melilotus indicus</i>
* dally pine	<i>Psoralea pinnata</i>	kiokio	<i>Blechnum novae-zelandiae</i>
* dimorphotheca	<i>Osteospermum fruticosum</i>	* knobby clubbrush	<i>Ficinia nodosa</i>
* dock	<i>Rumex</i> sp.	kohekohe	<i>Dysoxylum spectabile</i>
duckweed	<i>Lemna minor</i>	kohuhu	<i>Pittosporum tenuifolium</i>
* elaeagnus	<i>Elaeagnus x reflexa</i>	koromiko	<i>Hebe stricta</i> var. <i>stricta</i>
* eucalyptus	<i>Eucalyptus</i> sp.	kowhai	<i>Sophora chatbamica</i> or <i>S. microphylla</i>
* fairy crassula	<i>Crassula multica</i>	kumarahou	<i>Pomaderris kumerabo</i>
* fathen	<i>Chenopodium album</i>	lake clubbrush	<i>Schoenoplectus tabernaemontani</i>
* fishtail palm	<i>Caryota aequatorialis</i>	lancewood	<i>Pseudopanax crassifolius</i>
five finger	<i>Pseudopanax arboreus</i>	* large quaking grass	<i>Briza maxima</i>
* foxglove	<i>Digitalis purpurea</i>	large-leaved mahoe	<i>Melicytus macrophyllus</i>
fragrant fern	<i>Microsorium scandens</i>	large-leaved milk tree	<i>Streblus banksii</i>
* garden nasturtium	<i>Tropaeolum majus</i>	leather-leaf fern	<i>Pyrrosia eleagnifolia</i>
* gazania	<i>Gazania linearis</i>	* lotus	<i>Lotus pedunculatus</i>
* ginger	<i>Hedychium gardnerianum</i> or <i>H. flavescens</i>	* macrocarpa	<i>Cupressus macrocarpa</i>
glasswort	<i>Sarcocornia quinqueflora</i>	* madeira vine	<i>Anredera cordifolia</i>
* gorse	<i>Ulex europaeus</i>	mahoe	<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>
gully fern	<i>Pneumatopteris pennigera</i>	maire tawake	<i>Syzygium maire</i>
gully tree fern	<i>Cyathea cunninghamii</i>	mamaku	<i>Cyathea medullaris</i>
* hairy birdsfoot trefoil	<i>Lotus suaveolens</i>	mamangi	<i>Coprosma arborea</i>
Hall's totara	<i>Podocarpus hallii</i>	manatu	<i>Plagianthus regius</i>
hangehange	<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>	* Manchurian wild rice	<i>Zizania latifolia</i>
hanging spleenwort	<i>Asplenium flaccidum</i>	mangrove	<i>Avicennia marina</i> subsp. <i>australasica</i>
harakeke	<i>Phormium tenax</i>	manuka	<i>Leptospermum scoparium</i>
hard beech	<i>Notofagus truncata</i>	mapou	<i>Myrsine australis</i>
		* maritime pine	<i>Pinus pinaster</i>

* marram	<i>Ammophila arenaria</i>	sea primrose	<i>Samolus repens</i>
marsh clubrush	<i>Bolboschoenus fluviatilis</i>	* sea rocket	<i>Cakile edentula</i> or <i>C. maritima</i>
matai	<i>Prumnopitys taxifolia</i>	sea rush	<i>Juncus kraussii</i> subsp. <i>australiensis</i>
* Mexican daisy	<i>Erigeron karvinskianus</i>	shining karamu	<i>Coprosma lucida</i>
* Mexican devil	<i>Ageratina adenophora</i>	* shivery grass	<i>Briza minor</i>
mida	<i>Mida salicifolia</i>	shore bindweed	<i>Calystegia soldanella</i>
* milkweed	<i>Euphorbia peplus</i>	shore spurge	<i>Euphorbia glauca</i>
mingimingi	<i>Leucopogon fasciculatus</i>	* sickle grass	<i>Parapholis incurva</i>
miro	<i>Prumnopitys ferruginea</i>	* soft rush	<i>Juncus effusus</i>
* mist flower	<i>Ageratina riparia</i>	* South African iceplant	<i>Carpobrotus edulis</i>
* montbretia	<i>Crocsmia x crocosmiiflora</i>	spinifex	<i>Spinifex sericeus</i>
native celery	<i>Apium prostratum</i>	* starwort	<i>Callitriche stagnalis</i>
native iceplant	<i>Disphyma australe</i>	supplejack	<i>Ripogonum scandens</i>
ngaio	<i>Myoporum laetum</i>	* sweet vernal	<i>Anthoxanthum odoratum</i>
nikau	<i>Rhopalostylis sapida</i>	* tall fescue	<i>Schedonorus phoenix</i>
northern rata	<i>Metrosideros robusta</i>	tanekaha	<i>Phyllocladus trichomanoides</i> var. <i>trichomanoides</i>
oioi	<i>Apodasmia similis</i>	tangle fern	<i>Gleichenia dicarpa</i>
* palm grass	<i>Setaria palmifolia</i>	taraire	<i>Beilschmiedia tarairi</i>
* pampas	<i>Cortaderia selloana</i>	tarata	<i>Pittosporum eugenioides</i>
parapara	<i>Pisonia brunoniana</i>	* tarweed	<i>Parentucellia viscosa</i>
* paspalum	<i>Paspalum dilatatum</i>	taupata	<i>Coprosma repens</i>
pate	<i>Schefflera digitata</i>	taurepo	<i>Rhabdotbamnus solandri</i>
patotara	<i>Leucopogon fraseri</i>	tawa	<i>Beilschmiedia tawa</i>
* periwinkle	<i>Vinca major</i>	tawapou	<i>Pouteria costata</i>
pigeonwood	<i>Hedycarya arborea</i>	tawheowheo	<i>Quintinia serrata</i>
pingao	<i>Desmoschoenus spiralis</i>	thread fern	<i>Blechnum filiforme</i>
pink bindweed	<i>Calystegia sepium</i>	ti kouka	<i>Cordyline australis</i>
pohuehue	<i>Muehlenbeckia complexa</i>	ti ngahere	<i>Cordyline banksii</i>
pohutukawa	<i>Metrosideros excelsa</i>	titoki	<i>Alectryon excelsus</i> var. <i>excelsus</i>
ponga	<i>Cyathea dealbata</i>	toro	<i>Myrsine salicina</i>
Poor Knights lily	<i>Xeronema callistemon</i>	totara	<i>Podocarpus totara</i> or <i>P. ballii</i>
* poplar	<i>Populus</i> sp.	towai	<i>Weinmannia silvicola</i>
* prairie brome	<i>Bromus willdenowii</i>	* track rush	<i>Juncus tenuis</i>
* prickly hakea	<i>Hakea sericea</i>	* tradescantia	<i>Tradescantia fluminensis</i>
* puha	<i>Sonchus oleraceus</i>	tree fuchsia	<i>Fuchsia excorticata</i>
puka	<i>Griselinia lucida</i>	* tree privet	<i>Ligustrum lucidum</i>
pukatea	<i>Laurelia novae-zelandiae</i>	* tuber ladder fern	<i>Nephrolepis cordifolia</i>
puriri	<i>Vitex lucens</i>	turepo	<i>Streblus heterophyllus</i>
* purple groundsel	<i>Senecio elegans</i>	turutu	<i>Dianella nigra</i>
* purple-top	<i>Verbena bonariensis</i>	tutu	<i>Coriaria arborea</i> var. <i>arborea</i>
putaputaweta	<i>Carpodetus serratus</i>	* veld grass	<i>Ebrharta erecta</i>
* radiata pine	<i>Pinus radiata</i>	* velvet groundsel	<i>Senecio petasitis</i>
rangiora	<i>Brachyglottis repanda</i>	* vulpia hair grass	<i>Vulpia myuros</i>
rasp fern	<i>Doodia australis</i>	* walnut	<i>Juglans</i> sp.
* ratstail	<i>Sporobolus africanus</i>	* watsonia	<i>Watsonia bulbifera</i>
raupo	<i>Typha orientalis</i>	wharariki	<i>Pbormium cookianum</i>
* reed sweetgrass	<i>Glyceria maxima</i>	wheki	<i>Dicksonia squarrosa</i>
remuremu	<i>Selliera radicans</i>	* white clover	<i>Trifolium repens</i>
rengarenga	<i>Artropodium cirratum</i>	white maire	<i>Nestegis lanceolata</i>
rewarewa	<i>Knightsia excelsa</i>	* wild carrot	<i>Daucus carota</i>
rimu	<i>Dacrydium cupressinum</i>	* willow-leaved hakea	<i>Hakea salicifolia</i>
* ripgut brome	<i>Bromus diandrus</i>	* willow weed	<i>Polygonum</i> sp.
* rye grass	<i>Lolium perenne</i>	* windmill palm	<i>Trachycarpus fortunei</i>
saltmarsh ribbonwood	<i>Plagianthus divaricatus</i>	* woolly nightshade	<i>Solanum mauritianum</i>
* saltwater paspalum	<i>Paspalum vaginatum</i>	* Yorkshire fog	<i>Holcus lanatus</i>
sea grass	<i>Zostera</i> sp.		

8.7 CHECKLIST OF FAUNA SPECIES IN WAIPU ECOLOGICAL DISTRICT

Compiled by authors, Ray Pierce and Richard Parrish. Nomenclature follows Hitchmough *et al.* (2007) for indigenous species. Nomenclature for exotic species is as follows: Heather & Robertson (1996) for birds, Gill and Whitaker (1996) for amphibians, McDowall (2000) for fish, and King (2005) for mammals.

PL = present in large numbers (>100 present in study area at one time in last 15 years).

P = present in small numbers (<100 present in study area at one time in last 15 years).

R = recorded (<10 present in study area at one time in last 15 years).

E = not recorded in last 15 years, though previous records exist; presumed locally extinct.

U = unconfirmed record.

MAMMALS

Indigenous

<i>Cbalinolobus tuberculata</i>	long-tailed bat; pekapeka	U
<i>Hydrurga leptonyx</i>	leopard seal	R
<i>Mirounga leonina</i>	southern elephant seal	R

Introduced (feral)

<i>Bos taurus</i>	feral cattle	R
<i>Capra bircus</i>	feral goat	P
<i>Erinaceus europaeus</i>	European hedgehog	PL
<i>Felis catus</i>	cat	PL
<i>Lepus europaeus</i>	brown hare	PL
<i>Mus musculus</i>	house mouse; kiore-iti	PL
<i>Mustela erminea</i>	stoat	PL
<i>Mustela furo</i>	ferret	P
<i>Mustela nivalis</i>	weasel	P
<i>Oryctolagus cuniculus</i>	European rabbit	PL
<i>Rattus norvegicus</i>	Norway rat; pouhawaiki	PL
<i>Rattus rattus</i>	ship rat	PL
<i>Sus scrofa</i>	feral pig	PL
<i>Trichosurus vulpecula</i>	brush-tail possum	PL

BIRDS

Indigenous

<i>Anarhynchus frontalis</i>	wrybill; ngutuparore	P
<i>Anas chlorotis</i> "North Island"	pateke, brown teal	E
<i>Anas gracilis</i>	tete; grey teal	P
<i>Anas rhynchotis</i>	Australasian shoveler; kuruwhengi	R
<i>Anas superciliosa superciliosa</i>	grey duck; parera	R
<i>Antibornis melanura melanura</i>	bellbird; korimako; makomako	R
<i>Antbus novaeseelandiae novaeseelandiae</i>	New Zealand pipit; pihoihoi	P
<i>Apteryx mantelli</i> *	North Island brown kiwi	E?
<i>Ardea novaebollandiae</i>	white-faced heron	P

* Not confirmed present since 1970s.

<i>Arenaria interpres</i>	turnstone	P
<i>Botaurus poiciloptilus</i>	Australasian bittern; matuku	R
<i>Bowdleria punctata vealeae</i>	North Island fernbird; matata	P
<i>Bubulcus ibis</i>	cattle egret	R
<i>Calidris acuminata</i>	sharp-tailed sandpiper	R
<i>Calidris alba</i>	sanderling	R
<i>Calidris canutus</i>	huahou, lesser knot	P
<i>Calidris ferruginea</i>	curlew sandpiper	R
<i>Calidris mauri</i>	western sandpiper	R
<i>Calidris melanotos</i>	pectoral sandpiper	R
<i>Calidris ruficollis</i>	red-necked stint	R
<i>Catbaracta antarctica lonnbergi</i>	brown skua; hakoakoa	R
<i>Charadrius bicinctus bicinctus</i>	banded dotterel; tuturiwhatu	P
<i>Charadrius obscurus aquilonius</i>	northern New Zealand dotterel; tuturiwhatu	P
<i>Chlidonias leucopterus</i>	white-winged black tern	R
<i>Chrysococcyx lucidus lucidus</i>	shining cuckoo; pipiwharau	PL
<i>Circus approximans</i>	Australasian harrier; kahu	PL
<i>Cyanorbambus novaezealandiae novaezealandiae</i>	red-crowned kakariki; kakariki	R
<i>Egretta alba modesta</i>	white heron; kotuku	R
<i>Egretta sacra sacra</i>	reef heron; matuku-moana	P
<i>Eudynamis taitensis</i>	long-tailed cuckoo; koekoea	R
<i>Eudyptula minor iredalei</i>	northern little blue penguin; korora	R
<i>Falco novaeseelandiae</i> "bush"	bush falcon	U
<i>Gallirallus australis greyi</i> *	weka	E
<i>Gallirallus philippensis assimilis</i>	banded rail; moho-pereru	P
<i>Gerygone igata</i>	grey warbler; riroriro	PL
<i>Haematopus finschi</i>	New Zealand pied oystercatcher; torea	P
<i>Haematopus unicolor</i>	variable oystercatcher; torea, torepango	PL
<i>Hemiphaea novaeseelandiae</i>	kukupa; kereru; New Zealand pigeon	PL
<i>Himantopus himantopus leucocephalus</i>	poaka; pied stilt	P
<i>Hirundo tabitica neoxena</i>	welcome swallow	PL
<i>Larus dominicanus dominicanus</i>	southern black-backed gull; karoro	PL
<i>Larus novaehollandiae scopulinus</i>	red-billed gull; tarapunga	PL
<i>Limosa baemastica</i>	Hudsonian godwit	R
<i>Limosa lapponica</i>	bar-tailed godwit	P
<i>Morus serrator</i>	Australasian gannet; takapu	P
<i>Nestor meridionalis septentrionalis</i>	North Island kaka	R
<i>Ninox novaeseelandiae novaeseelandiae</i>	morepork; ruru	PL
<i>Numenius madagascariensis</i>	eastern curlew	R
<i>Numenius phaeopus</i>	whimbrel	R
<i>Petroica macrocephala toitoi</i>	tomtit; miromiro; pied tit	P
<i>Pbaetbon lepterus</i>	white-tailed tropicbird	R
<i>Pbaetbon rubricauda</i>	red-tailed tropicbird; amokura	R
<i>Pbalacrocoryx carbo novaehollandiae</i>	black shag; kawau	P
<i>Pbalacrocoryx melanoleucos brevirostris</i>	little shag; kawaupaka	P
<i>Pbalacrocoryx sulcirostris</i>	little black shag	P
<i>Pbalacrocoryx varius varius</i>	pied shag; karuhiruhi	P
<i>Platalea regia</i>	royal spoonbill; kotuku-ngutupapa	R
<i>Pluvialis fulva</i>	Pacific golden plover	R
<i>Polioccephalus rufopectus</i>	New Zealand dabchick; weweia	R
<i>Porphyrio melanotus</i>	pukeko	PL
<i>Porzana pusilla affinis</i> †	marsh crane; koitareke	E?

* Last unconfirmed report in 1986.

† Not confirmed present since 1970s.

<i>Porzana tabuensis plumbea</i>	spotless crane; puweto	P
<i>Prosthemader a novaeseelandiae</i> <i>novaeseelandiae</i>	tui	PL
<i>Pterodroma macroptera gouldi</i>	grey-faced petrel; oi	U
<i>Rhipidura fuliginosa placabilis</i>	North Island fantail; piwakawaka	PL
<i>Stercorarius parasiticus</i>	Arctic skua	R
<i>Stercorarius pomarinus</i>	pomarine skua	R
<i>Sterna albifrons</i>	little tern	R
<i>Sterna caspia</i>	Caspian tern; taranui	P
<i>Sterna nereis davisae</i>	New Zealand fairy tern	R
<i>Sterna striata striata</i>	white-fronted tern; tara	P
<i>Tachybaptus novaehollandiae</i>	Australian little grebe	R
<i>Tadorna variegata</i>	paradise shelduck; putangitangi; pari	PL
<i>Tbinornis novaeseelandiae</i>	New Zealand shore plover; tuturuatu	R
<i>Todiramphus sanctus</i>	New Zealand kingfisher; kotare	PL
<i>Tringa hypoleucos</i>	common sandpiper	R
<i>Tringa nebularia</i>	greenshank	R
<i>Tringa terek</i>	terek sandpiper	R
<i>Vanellus miles</i>	spur-winged plover	PL
<i>Zosterops lateralis</i>	silveryeye; tauhou	PL

Introduced

<i>Acridotheres tristis</i>	myna	PL
<i>Alauda arvensis</i>	skylark	PL
<i>Anas platyrhynchos</i>	mallard	PL
<i>Callipepla californica</i>	California quail	PL
<i>Carduelis carduelis</i>	goldfinch	PL
<i>Carduelis chloris</i>	greenfinch	PL
<i>Carduelis flammea</i>	redpoll	P
<i>Cygnus atratus</i>	black swan	P
<i>Emberiza citrinella</i>	yellowhammer	PL
<i>Fringilla coelebs</i>	chaffinch	PL
<i>Gymnorhina tibicen hypoleuca</i>	Australian magpie (white-backed subspecies)	PL
<i>Gymnorhina tibicen tibicen</i>	Australian magpie (black-backed subspecies)	P
<i>Meleagris gallopavo</i>	wild turkey	P
<i>Passer domesticus</i>	house sparrow	PL
<i>Pavo cristatus</i>	peafowl	P
<i>Phasianus colchicus</i>	pheasant	PL
<i>Platycercus eximius</i>	eastern rosella	PL
<i>Prunella modularis</i>	dunnock; hedge sparrow	P
<i>Streptopelia roseogrisea</i>	barbary dove	R
<i>Sturnus vulgaris</i>	starling	PL
<i>Synois ypsilopborus</i>	brown quail	PL
<i>Turdus merula</i>	blackbird	PL
<i>Turdus philomelos</i>	song thrush	PL

REPTILES

Indigenous*

<i>Caretta caretta</i>	loggerhead turtle	R
<i>Chelonia mydas</i>	green turtle	R
<i>Cyclodina aenea</i>	copper skink	P
<i>Eretmochelys imbricata</i>	hawksbill turtle	R

* Including vagrant marine turtles and sea snakes.

<i>Hoplodactylus granulatus</i>	forest gecko	R
<i>Naultinus elegans elegans</i>	Auckland green gecko	R
<i>Oligosoma smitbii</i>	shore skink	R
<i>Pelamis platurus</i>	yellow-bellied sea snake	R

Introduced

<i>Lampropholis delicata</i> *	rainbow skink	P

FISH

Indigenous

<i>Aldrichetta forsterii</i>	yelloweyed mullet	PL
<i>Anguilla dieffenbachii</i>	longfin eel	PL
<i>Anguilla australis</i>	shortfin eel	PL
<i>Arripis trutta</i>	kahawai	PL
<i>Cheimarrichthys fosteri</i>	torrentfish	P
<i>Galaxias fasciatus</i>	banded kokopu	PL
<i>Galaxias maculatus</i>	inanga	PL
<i>Galaxias postvectis</i>	shortjaw kokopu	R
<i>Gobiomorphus basalis</i>	Cran's bully	PL
<i>Gobiomorphus cotidianus</i>	common bully	PL
<i>Gobiomorphus gobioides</i>	giant bully	P
<i>Gobiomorphus buttoni</i>	redfin bully	PL
<i>Mugil cephalus</i>	grey mullet	PL
<i>Retropinna retropinna</i>	common smelt	PL

Introduced

<i>Cyprinus carpio</i>	European (koi) carp	R
<i>Gambusia affinis</i>	mosquitofish	PL
<i>Oncorhynchus mykiss</i>	rainbow trout	PL
<i>Salmo trutta</i>	brown trout	PL

FROGS

Indigenous

<i>Leiopelma hochstetteri</i>	Hochstetter's frog	PL

Introduced

<i>Litoria aurea</i>	green and golden bell frog	PL

INDIGENOUS LAND SNAILS†

<i>Amborhytida dunni</i>		R
<i>Cytora cytora</i>		R
<i>Cytora torquilla</i>		R
<i>Dosinea subrosea</i>		R
<i>Liarea turriculata</i>		R
<i>Paryphanta busbyi busbyi</i>	kauri snail	PL

• Recently discovered at Lang's Beach (6 March 2007) (David Chapple, Victoria University, pers. comm.).

† These lists probably only represent a small proportion of the total number of species present. Systematic surveys of the ED would increase the diversity of these lists.

<i>Phenacobelix giveni</i>	R
<i>Punctidae</i> sp. 64	R
<i>Punctidae</i> sp. 164	R
<i>Schizoglossa worthyae</i>	R
<i>Tberasiella</i> sp. (<i>celinde</i> or <i>tamora</i>)	R

OTHER MOLLUSCS*

Indigenous

<i>Amphibola crenata</i>	mudsnail	PL
<i>Austrovenus stutchburyi</i>	cockle	PL
<i>Cellana</i> sp.	limpet	PL
<i>Cominella glandiformis</i>	mud whelks	PL
<i>Cyclomactra ovata</i>		PL
<i>Macomona liliana</i>		PL
<i>Nucula bartvigiana</i>	nutshell	PL
<i>Paphies australe</i>	pipi	PL
<i>Paphies subtriangulata</i>	tuatua	PL
<i>Potamopyrgus antipodarum</i>		PL
<i>Saccostrea cucullata</i>	New Zealand rock oyster	PL
<i>Turbo smaragdus</i>	catseye	PL
<i>Zeacumantus lutulentus</i>		PL
<i>Zediloma subrostrata</i>	mudflat topshell	PL

Introduced

<i>Crassostrea gigas</i>	Pacific oyster	PL
<i>Cantareus aspersa</i>	garden snail	PL
<i>Oxybilus alliarius</i>	garlic glass snail	PL
<i>Oxybilus cellarius</i>	cellar glass snail	PL

INDIGENOUS CRUSTACEANS*

<i>Elminius modestus</i>	common barnacle	PL
<i>Helice crassa</i>	mud crab	PL
<i>Hemigrapsus crenulatus</i>		PL
<i>Parenepbrops planifrons</i>	koura; freshwater crayfish; kawai	PL
<i>Talorchestia</i> sp.	sandhopper	PL
	shrimp species	PL
	polychaete worm species	PL

OTHER INVERTEBRATES*

Indigenous

<i>Cambridgea</i> sp.	spider	R
<i>Danaus plexippus</i>	Monarch butterfly	P
<i>Peripatus</i> sp.		R
<i>Olinga feredayi</i>	caddisfly	R
<i>Uloma tenebrioides</i>		R
<i>Zizina otis</i>	common blue butterfly	R

* These lists probably only represent a small proportion of the total number of species present. Systematic surveys of the ED would increase the diversity of these lists.

Introduced

<i>Apis mellifera</i>	bee	PL
<i>Bombus</i> spp.	bumble bee	PL
<i>Vespula germanica</i>	German wasp	PL
<i>Pieris rapae</i>	white cabbage butterfly	P

8.8 GLOSSARY OF TERMS

Biodiversity

The variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Buffer

A zone surrounding a natural area which reduces the effects of external influences on the natural area. For example, shrubland or exotic plantations surrounding an indigenous remnant provide physical protection to it by reducing changes in wind and light, reducing the chance of weed infestation and providing a corridor for the movement of wildlife into and out of it, so that it is less isolated. Vegetation is often considered a buffer to waterways—riparian vegetation and wetlands protect both water quality and habitat from influences arising on the surrounding land.

Community

An association of populations of plants and animals which occur naturally together in a common environment.

Diversity and Pattern

Diversity is the variety and range of species of biological communities, ecosystems and landforms. Pattern refers to changes in species composition, communities and ecosystems along environmental gradients.

Ecological District

A local part of New Zealand where geological, topographical, climatic and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities.

Ecological Region

A group of adjacent Ecological Districts which have diverse but closely related characteristics, or in some cases a single very distinctive Ecological District.

Ecological unit

Vegetation type occurring on a particular landform or soil or rock type.

Ecosystem

Any inter-related and functioning assemblage of plants, animals and substrates (including air, water and soil) on any scale including the processes of energy flow and productivity (Myers *et al.* 1987).

Endemic

Occurring naturally in, and restricted to, a particular country, region or locality.

Exotic

Introduced to New Zealand; not indigenous.

Forest

Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which tree cover exceeds that of shrubs. Trees are woody plants > 10 cm diameter at breast height (dbh) and shrubs are woody plants < 10 cm dbh. Tree ferns > 10 cm dbh are treated as trees (Atkinson 1985).

Habitat

The part of the environment where a plant or animal lives. It includes both the living and non-living features of the area.

Indigenous

Native to New Zealand. This includes species which occur naturally in New Zealand *and* other places (e.g. migratory bar-tailed godwits which return to New Zealand from Siberia every summer). Species which only occur in New Zealand are 'endemic'.

Landform

Descriptor of the distinctive naturally formed physical characteristics of the land, e.g. hillslope, gully, ridge top, etc.

Linkages/Corridors

An area of habitat which links two or more other areas of habitat. Depending on the habitat type, the linkage or corridor can comprise indigenous vegetation (e.g. forest, shrubland), exotic vegetation (e.g. pine forest), aquatic habitat (e.g. a farm pond) or any other feature which assists the movement of indigenous species between habitat patches. Where a linkage exists between habitats the opportunities for genetic exchange within a species are greater, which enhances the viability of that population. For many species, in particular mobile fauna such as birds, a corridor does not have to be continuous to be effective. Small remnants can act as stepping stones between two larger habitats.

Natural area

A tract of land which supports natural landforms and predominantly native vegetation or provides habitat for indigenous species; identified as a unit for evaluation of ecological quality and representativeness and has potential to be ecologically significant.

Naturalness

The degree to which a habitat is modified and disturbed by human activity or introduced plants and animals and what natural values are retained despite these factors.

Rarity

This is a measure of commonness and may apply to entire ecosystems through to single species. It may refer to the conservation status of a species (see Appendix 8.3) or habitat type in any one of the following ways: formerly common but now rare; confined to a limited geographic area; at the limit of its range; or with a contracting or fragmented range.

For example, old growth alluvial swamp forests are an extremely rare ecosystem type in Northland, and indeed nationally, even though they contain no species which are regarded as rare in themselves.

Reedland

Reedlands comprise 20–100% cover of reeds, which are tall erect herbs emergent from shallow water, having branched leaves or stems that are either hollow or have very spongy pith, e.g. raupo, *Baumea articulata* and lake clubrush (Johnson & Gerbeaux 2004, adapted from Atkinson 1985).

Regionally significant

Assessed by the Department of Conservation (Northland Conservancy) to be either rare or threatened within the Northland Region.

Representativeness

The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area. This implies consideration of the full range of natural ecosystems and landscapes that were originally found in the reference area and how well they are represented in the environment today. The reference period for 'original' land cover used for this study was the immediate pre-human era (late Holocene). The identification and evaluation of the key representative natural areas in all Ecological Districts is the principal objective of the PNA Programme (Myers *et al.* 1987). In this survey the concept of representativeness was applied at the level of ecological units.

Riparian protection

Riparian vegetation performs important protective functions to streams such as shading, sediment control, primary production and provision of habitat linkages/corridors. Without riparian protection water temperature can rise depleting the available oxygen and leading to the death of aquatic life. Leaf litter and woody debris enters into the nutrient cycle of the stream providing food for the first consumer in the food web e.g. mayflies, caddisflies and stonefly. Riparian vegetation acts as a filter for non-point source water discharges.

Rockland

Land in which the area of residual bare rock exceeds the area covered by any one class of plant growth-form. Cliff vegetation often includes rocklands.

Rushland

Rushlands comprise 20–100% cover of rushes, which are *Juncus* spp., that have stiff, erect stems or similarly non-flattened leaves (Johnson and Gerbeaux 2004, adapted from Atkinson 1985).

Scrub*

Refers to early successional communities dominated by or with a > 50% component of exotic species such as gorse, woolly nightshade, hakea, wilding pine etc. This definition differs from Atkinson (1985), in which scrub is structurally defined rather than compositionally defined. In this study, scrub refers to vegetation dominated by exotic species. Low woody vegetation in which the indigenous component is > 50% is termed 'shrubland'.

Secondary vegetation

Indigenous vegetation established after destruction or disturbance of the previous vegetation and which is essentially different from the original vegetation.

Shrubland*

Indigenous vegetation in which the cover of shrubs and trees in the canopy is > 80% and in which shrub cover exceeds that of trees. Trees are woody plants > 10 cm diameter at breast height (dbh) and shrubs are woody plants < 10 cm dbh. Tree ferns > 10 cm dbh are treated as trees. This definition combines both indigenous 'scrub' and 'shrubland' cf. Atkinson (1985). These two classes had to be amalgamated as 'scrub' adopts another meaning in this study.

* This term was adopted by earlier PNAP surveys in Northland to refer to vegetation types, as defined below. This definition has been retained for this study to provide consistency in interpretation of the Northland Region DOC PNAP reports.

Site

An area of habitat or habitats identified during the field survey phase of the PNAP. Some small habitats occurring in close geographical proximity, with similar characteristics and functions, have been grouped and addressed as one site e.g. forest remnants and wetlands within the same catchment.

Succession

Succession is the dynamic process whereby one plant community changes into another, involving the immigration and local extinction of species, coupled with changes in the relative abundance of different plant species (Crawley 1997). Change may be due to natural or human-induced factors, or both. Primary succession refers to the colonisation of a bare surface by vegetation (e.g. the greening of new volcano after it erupts out of the sea). Secondary succession refers to the process of colonisation and change after original vegetation has been destroyed, e.g. by fire, human-induced land clearance, etc.

Survey no.

A sequential number given to each site (e.g. Q08/220). The first letter and two figures refer to the NZMS 260 topographical map sheet on which the site is shown.

Sustainability

The long-term ecological viability of a natural area. This is related to the size and shape of the area as well as to threats from introduced pests.

Treeland

Vegetation in which the cover of trees in the canopy is 20–80%, with tree cover exceeding that of any other growth form, and in which the trees form a discontinuous upper canopy above either a lower canopy of predominantly non-woody vegetation or bare ground (Atkinson 1985), e.g. ‘totara treeland’ refers to a common type in Waipu Ecological District in which sparse totara trees are emergent over an understorey of mainly exotic grasses and herbs. Treeland is mainly induced by grazing.

Vegetation type

The most detailed vegetation descriptive name employed in this study, defined by the composition of dominant canopy species, in order of abundance (e.g. taraire–puriri–kahikatea) and the structure of the vegetation, e.g. forest, treeland, shrubland, reedland, etc.

Viability

The ability of natural communities in the site to maintain themselves in the long-term in the absence of particular management efforts to achieve this. Regeneration and vigour of species within these communities and stability of communities and processes contribute to viability.

Wetland

An area of land that is permanently or intermittently waterlogged and supports flora and fauna adapted to wet conditions. Wetland is used as a broad definition for several types of aquatic systems, e.g. ponds, lakes, swamps, bogs, ephemeral wetlands, saltmarshes, mangroves, etc.

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