Natural areas of Manaia Ecological District

Reconnaissance survey report for the Protected Natural Areas Programme

2010

Department of Conservation
Te Papa Atawhai

Natural areas of Manaia Ecological District (Northland Conservancy)

Reconnaissance Survey Report for the Protected Natural Areas Programme

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2010

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Foreword

The Manaia 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 Manaia Ecological District (ED). Natural areas within the ED were surveyed by the Department of Conservation from 1997 to 1999, and subsequently by Wildland Consultants in September 2009. There has been no previous comprehensive survey and review of ecological information of this geographical area.

Manaia is the smallest ecological district in the Northland Region, although its size is very much disproportionate to its rich biodiversity and number of habitat types. The Ecological District contains several relatively large and semi-contiguous natural areas, including Manaia Ridge Scenic Reserve and Surrounds and Bream Head Scenic Reserve and Surrounds, the latter of which is considered to be the finest example of coastal forest remaining in Northland. Approximately 52% of the natural areas identified within this report are formally protected, which equates to around 21.8% of the total extent of the Ecological District.

Manaia Ecological District takes its name from the sacred maunga/mountain Manaia, the eponymous ancestor of many Northland iwi including Ngāti Wai and Ngāti Kahu. The maunga/mountain Manaia also forms the southeastern boundary of Te Whare Tapu o Ngāpuhi/The Sacred House of Ngāpuhi. Bream Head Scenic Reserve and Surrounds is of special significance to iwi, as local Māori regard the reserve's mountain Te Whara as an ancestor and consider the whole area, including the tracks passing through, as wahi tapu. The area from Home Point to Smugglers Bay contains much evidence of Māori occupation, including a defensive pā on Busby Head, many house terraces, food storage pits and numerous middens reflecting the wealth of food resources in Whangarei Harbour. Te Whara and Mt Manaia were once used as urupa or burial grounds.

Local residents take a tremendous amount of pride in the natural assets and biodiversity present in Manaia Ecological District. As such, there has been a groundswell in community-based conservation, such as the many landcare groups coordinated by the Whangarei Heads Landcare Forum (WHLF) and the formation of the Bream Head Conservation Trust (BHCT). Both organisations work closely with the Department of Conservation. Feral pigs and goats have been removed from large natural areas of the Ecological District, while possums, feral cats and mustelids are kept at low densities over large areas. There is now a concerted effort to reduce rat numbers in high value areas. These initiatives, including work carried out as part of the Whangarei Kiwi Sanctuary and Operation Nest Egg, have seen North Island brown kiwi numbers in Manaia ED rise to approximately 300 individuals. In addition, much work has also been undertaken to control invasive weeds that threaten the natural areas of Northland.

Success breeds success. Each milestone reached makes the people involved in local conservation more eager to achieve larger, far-reaching goals. For example, there are plans to transform Bream Head Scenic Reserve into a pest-free mainland island with the construction of a pest exclusion fence. If this became a reality, we would see species such as red-crowned kakariki, NI kaka and NI bellbird successfully breeding within the reserve, and the way would be paved for re-introductions of other threatened birds, lizards and invertebrates.

Manaia Ecological District will continue to be a focus for restoration in the Northland Region. This mandate is being actioned by the Department of Conservation, local authorities, and community groups, each of whom are committed to the vision that has thus far allowed Manaia's indigenous biodiversity to flourish in a way that is rarely seen on the mainland.

Chris Jenkins

Conservator Northland

Abstract

Manaia Ecological District (ED) covers c.6,444 ha, comprising most of the area known as the Whangarei Heads. It adjoins Whangarei ED to the west and Whangaruru ED to the north. In 1996 it was recognised as a distinct ecological district (Brook 1996). It is characterised by the spectacular formations of Bream Head and Mt. Manaia, which support some of the finest examples of coastal forest remaining in the North Island. Bream Head Scenic Reserve and Surrounds (Q07/074) and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) are the most significant ecological features of Manaia ED. Proportionately, Manaia ED has the greatest length of coastline of any ecological district in Northland, with its sheltered, rocky bays to the west contrasting with the extensive dunelands and sandfields of Ocean Beach Recreation Reserve (Q07/075) in the east.

Twenty-seven natural areas of ecological significance covering c.2,736 ha (42.5% of the ED) were identified from a field reconnaissance survey undertaken from 1997-1999, and in September 2009, together with information from existing databases and reports. These natural areas comprise forest (c.1,834.8 ha; 67%), shrubland (c.531.1 ha; 19%), duneland/ sandfield (c.251.6 ha; 9%), freshwater wetland (c.42.2 ha; 1.5%), rockland (c.32.3 ha; 1.2%), and estuarine habitat (c.9.8 ha; < 0.1%).

Manaia ED contains a high diversity of indigenous flora and fauna, including one locally endemic plant species. There are high numbers of rare or threatened species in the ED, as well as rare ecosystem types. At present, 'Threatened' species include six plants, ten birds, three land snail taxa, one spider, three lizards, and one fish. 'At Risk' species include 27 plants, 17 birds, three land snail taxa (including one endemic species), three lizards, and three other terrestrial invertebrates, There are also a further 83 regionally significant species, which are considered rare or threatened in Northland (72 plant, five bird, five reptile, and one fish species).

Manaia ED is a stronghold for North Island brown kiwi, with key areas of forest and shrubland forming part of the Whangarei Kiwi Sanctuary. Intensive predator trapping, translocations and advocacy by the Whangarei Heads Landcare Forum and Department of Conservation have seen the local kiwi population reach approximately 300 birds. The survival rate of wild-fledged kiwi chicks has increased, which together with call-count monitoring suggests that sustained predator control is working.

Coastal forests and shrublands are the dominant vegetation types in Manaia ED, but natural communities on gumland soils and coastal dunes, which are nationally rare ecosystem types, are also an important feature. Freshwater wetlands are poorly represented in the ED, and most have become degraded following the invasion of weeds such as Mexican devil. Wetlands, however, provide habitat for several threatened bird species and form an important part of a greater habitat network outside the ED, particularly around the Taiharuru River system to the north.

Virtually all natural areas in Manaia ED are of significant conservation and ecological value. Due to the presence of endemic[1] species, threatened species, rare ecosystem types, and outstanding examples of coastal forest, several natural areas of Manaia ED are of national ecological significance. Approximately 52% of the extent of natural areas identified are formally protected. Priorities for protection in Manaia ED include: the formal protection of (i) Taurikura Ridge Bush (Q07/073); (ii) coastal shrubland in the north-west of the ED (which includes The Nook); (iii) an excellent example of gumland located within McDonald Coastal Shrubland (Q07/068); (iv) important wetlands such as Kerr Road Swamp (Q07/076) and Harambee Road Swamp Q07/172); and (v) the protection of critical buffers and linkages.

1 Endemic to Manaia ED.

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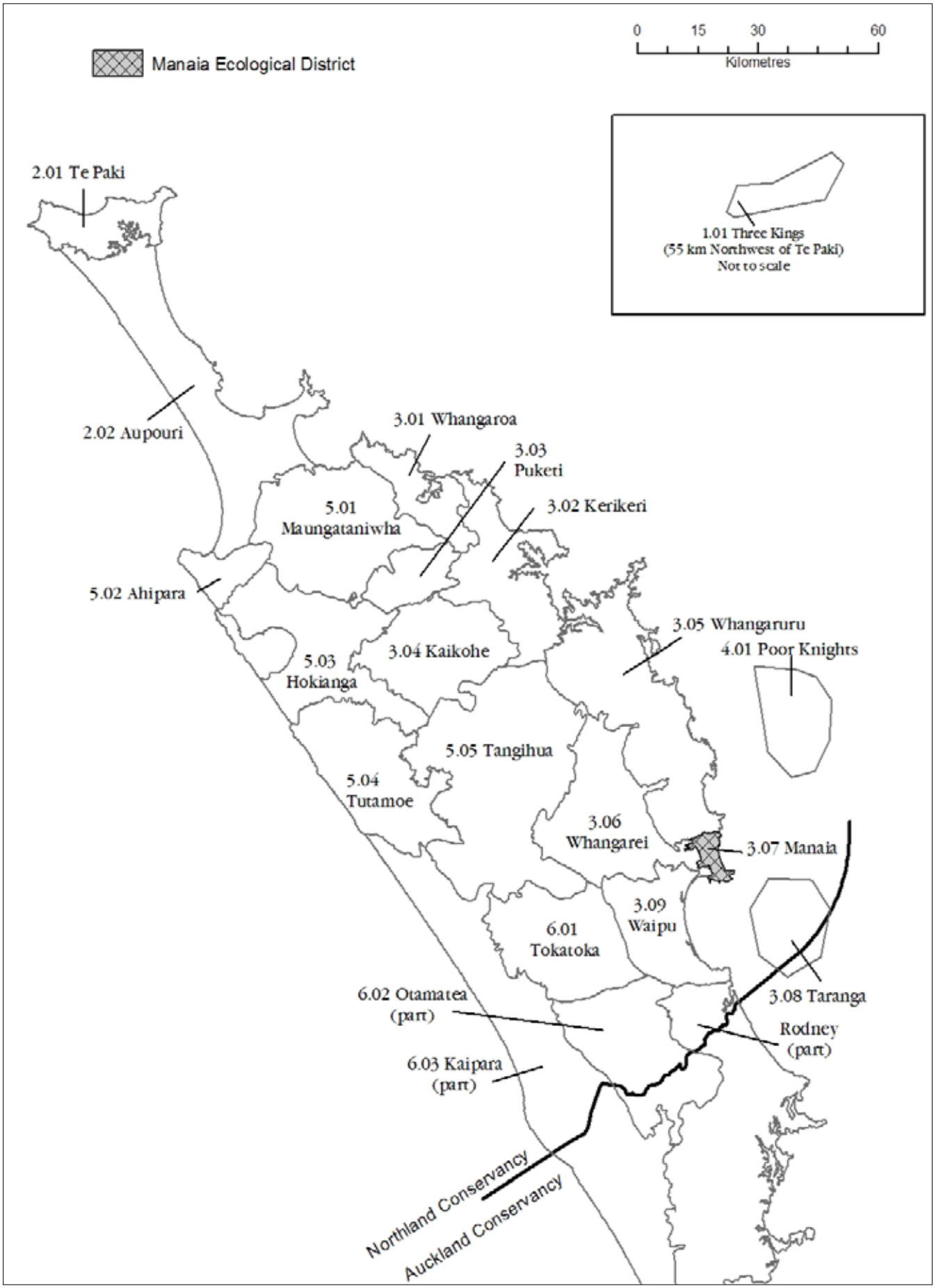
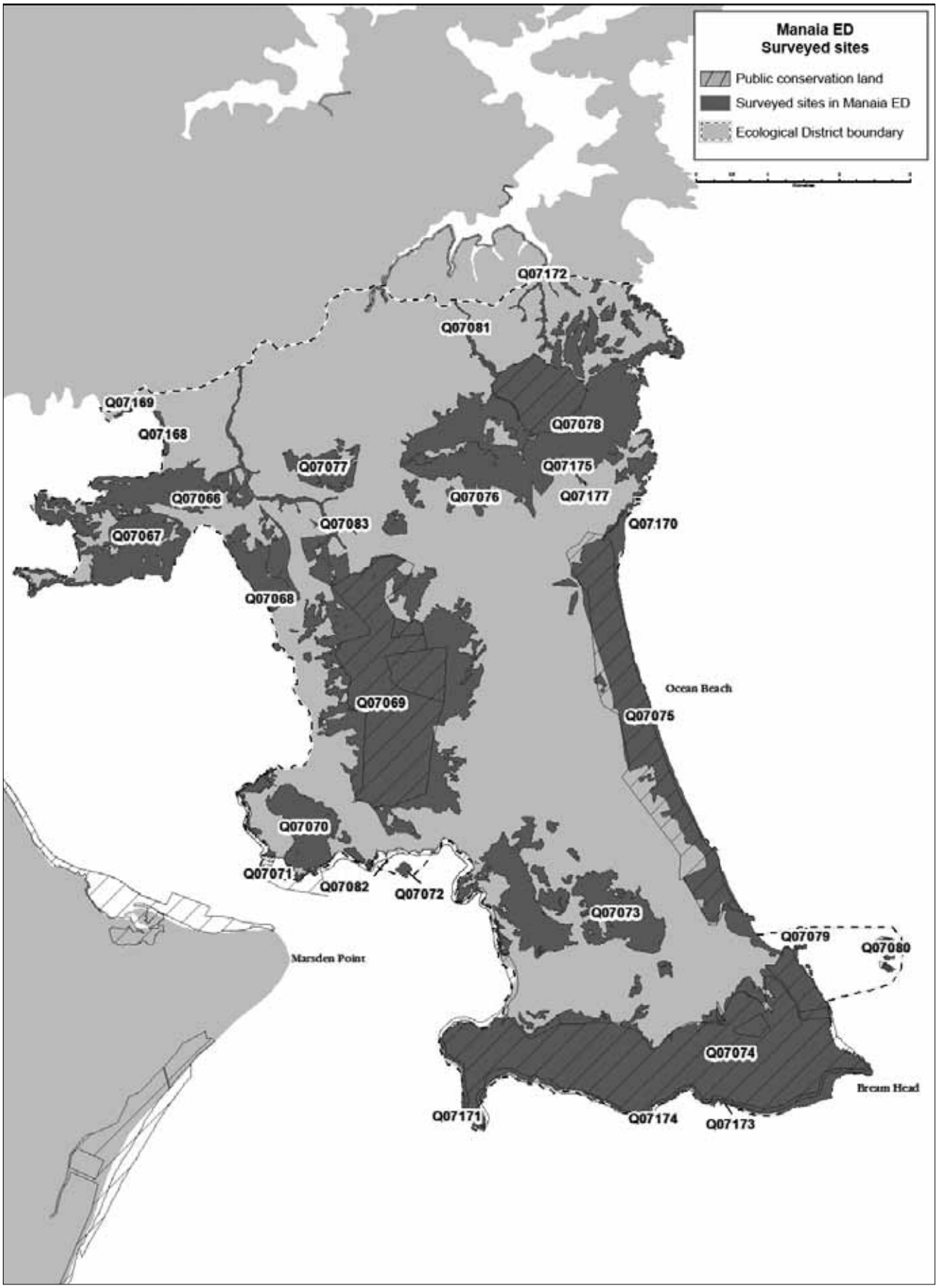


Figure 2. Map of surveyed sites, Manaia Ecological District



1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) was established in 1982 to implement s3 (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 are considered for protection, as well as those features which are special or unique.

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

This report is based on reconnaissance surveys undertaken between 1997 and 1999, and in 2009, and existing published and unpublished data, and includes descriptions of most natural areas within Manaia Ecological District.

The natural areas described have been evaluated according to two levels of significance based on specified criteria (see Section 2).

This approach was adopted so that the survey report 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 New Zealand Biodiversity Strategy (2000).

The Purpose and Principles of the RMA are set out in Part II of the act and include:

- safeguarding the life-supporting capacity of air, water, soil and ecosystems,
- the preservation of the 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,
- the protection of intrinsic values of ecosystems, and
- maintenance and enhancement of the quality of the environment.

Of particular relevance is Section 6(c) of the RMA, 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 diversity of indigenous plant and animal communities. In recognition of the biogeographic differences between various parts of New Zealand, a map and classification of ecological regions and districts was developed (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 ecological districts in 1982. Ecological regions and districts in northern New Zealand were redefined in 1996 to more accurately classify ecological variation within the Northland and Auckland areas (Brook 1996).

The PNAP uses the division of ecological districts as a national framework 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 Manaia Ecological District. It includes maps and brief descriptions of most of the indigenous natural areas within Manaia Ecological District, together with an analysis of the main vegetation types and information on threatened species and other taxa of scientific interest.

Natural areas within Manaia ED were originally surveyed by DOC between 1997 and 1999, and subsequently in 2009 by Wildland Consultants Ltd.

The natural areas described have been assessed according to ecological criteria outlined in Section 2.5. Sites meeting any of these criteria have been defined as Level 1 and Level 2 sites.

Aerial photography from 2008 was used to prepare the site maps using the original survey maps and maps from the current study. In a few cases, the site boundaries have changed from the site boundaries identified in the original survey, and hence the vegetation description presented in the report may not match the current extent of the site. Generally site boundaries changed very little or not at all whilst the site boundary of some sites was improved upon with the benefit of an aerial view compared to the topographical interpretation used for the original survey. Where the site boundary changed significantly, this is indicated at the beginning of the site report in the 'Area' section.

Soil descriptions are given only for sites listed as being of international, national or regional significance in Arand *et al*. (1993). Significant geological sites and landforms of international, national or regional importance have been derived from Kenny and Hayward (1996) (See Appendix 4).

2. Methodology

2.1 GENERAL APPROACH

Information on the composition, extent and ecological values of indigenous natural areas within 13[2] ecological districts in Northland was gathered during rapid reconnaissance surveys using semi-quantitative methods between 1994 and 1997. Since 1997 survey work on a further five[3] ecological districts was started.

The survey of Manaia Ecological District was part of this larger study. Field work was carried out mainly by Diana Manning and Andrea Booth from the Department of Conservation and co-ordinated in the Whangarei Office of the Northland Conservancy between 1997 and 1999.

Natural areas were identified from topographic maps, existing databases, published and unpublished reports, aerial photographs and field and aerial observations. Areas were identified without regard for tenure. Consequently, many natural areas which are administered by the Department of Conservation, as well as other protected areas, were also surveyed using the same methodology. This provided a consistent approach to determine representativeness of unprotected natural areas.

Each site was mapped and described. Having evaluated the sites (see assessment criteria in Section 2.5 below) they were grouped according to one of two levels of ecological significance (see Section 4). Scientific names of species for which common names have been used are given in Appendix 6 (Flora) and Appendix 7 (Fauna).

In the writing of this report, extensive use was made of information from existing biological databases such as the Northland Conservancy Sites of Special Biological Interest (SSBI) Information System, DOC Bioweb Threatened Plants Database, Bioweb Herpetofauna Database, NIWA New Zealand Freshwater Fish Database, published information, and Department of Conservation internal reports.

In order to compile up-to-date plant records for Manaia ED, herbarium records were consulted from the Auckland Institute and Museum (AK) and Te Papa Museum (WELT). Information on invertebrate collections was received from Auckland Museum. Geographical and geological information was gained from existing published and unpublished maps. Landform/ geological descriptions for each site were compiled by Dr. Fred Brook.

Although several sites were not surveyed in detail during 1997-1999, large amounts of data were collected, considerably expanding the information

2 Northland contains 19 mainland EDs: Te Paki, Aupouri, Maungataniwha, Ahipara, Whangaroa, Hokianga, Puketi, Kerikeri, Kaikohe, Tutamoe, Tangihua, Whangaruru, Whangarei, Otamatea (part), Rodney (part; Rodney ED was one of the original PNAP surveys to be conducted in the country with work carried out in 1983/84), Waipu, Kaipara (part), Tokatoka, and Manaia. The first 13 were surveyed/or survey was started by Northland Conservancy between 1994-1997. To date 17 reports have been published.

3 The EDs are Manaia, Tokatoka, Otamatea (part), Waipu, and Kaipara (part). It is also expected that Rodney ED (part) will be re-surveyed using the methodology outlined in this report.

base for Manaia Ecological District. It is important to note that, because of time and budgetary constraints, some important features within 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 way of a leaflet delivered by mail (Appendix 2) informing them of the programme and the reasons for it. The leaflet was signed by the then Regional Conservator of the Department of Conservation, Northland Conservancy, and provided contacts for further information. The Conservancy's then Protection Manager undertook iwi consultation throughout Tai Tokerau advising of the pending PNAP surveys.

In many instances permission for access was sought from landowners either by telephone or direct visit, and was generally given. In very few cases was access refused.

2.3 DATA ACQUISITION AND ANALYSIS

2.3.1 Vegetation and flora

A rapid reconnaissance field survey was carried out to record and map the ecological and geomorphological characteristics, habitat types and canopy vegetation of each identified natural area. Most of this work was carried out from roads, foreshores or high points using telescopes and binoculars.

Some sites were not sighted or surveyed in full, due to failure to obtain landowner permission for access. In these instances, sites were identified and described from aerial photographs. Information on some of these sites, therefore, remains limited, and it is likely that some ecological units have not been recorded.

Natural areas were mapped using six broad categories of habitat class: forest, shrubland, wetland, estuarine, duneland/sandfield, and rockland (see Appendix 8 for a glossary of terms). The original 1997-99 surveys did not differentiate between manuka and kanuka in many sites, possibly because the sites were observed from too great a distance. In such cases, 'kanuka/manuka' has been used to describe the ecological unit.

At each site, the composition and relative abundance of canopy plant species was recorded on the field survey sheet (Appendix 1) in the following four categories: greater than 50% cover was defined 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 a valuable approach for description of forest stands.

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

This semi-quantitative method was favoured because of the time constraints for the field survey, the extensive areas to be covered and because it could be applied to all vegetation types. 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 did not provide a great deal of information on the distribution of uncommon and threatened species or understorey species.

Landform and geology was described by Dr. Fred Brook using information from published and unpublished maps, reports and topographical maps. This information was combined with vegetation types to determine ecological units defined by particular vegetation-geomorphological characteristics, e.g. kanuka forest on hillslope, spinifex grassland on dunes. Most sites contain a range of ecological units.

Other relevant information such as fauna observations, threats and landowner information was collected incidentally and 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, e.g. SSBI and threatened species information, was added to the report forms.

Completed survey forms are held by the Department of Conservation, Northland Conservancy Office, Whangarei.

2.3.2 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 Bioweb Herpetofauna database (DOC 2009).
- 'Uncommon and rare land snails in the Northland Region of New Zealand, and an assessment of conservation management priorities' (Brook 2002).
- The New Zealand Freshwater Fish Database (NIWA 2009).
- Incidental field observations during this PNAP survey by the Department of Conservation (1997-1999) and Wildland Consultants Ltd in 2009.
- Biodiversity report prepared for the Whangarei Heads Landcare Forum (Pierce *et al.* 2002).
- Te Whara (Bream Head) Restoration Plan for 2001-02 (Pierce *et al.* 2001).
- New Zealand Bird Atlas (Robertson *et al.* 2007).

2.4 NATIONALLY THREATENED AND AT RISK AND REGIONALLY SIGNIFICANT SPECIES CLASSIFICATIONS

The most recent national threat classifications are Miskelly *et al.* (2008) for birds, de Lange *et al.* (2009) for vascular plants, and Hitchmough *et al.* (2007) for remaining biota. The classification system used in this report for birds and vascular plants is based on Townsend *et al.* (2008) (see Appendix 3). The classification system for remaining biota (i.e. aquatic fauna, reptiles and terrestrial invertebrates) is based on the older system of Molloy et al. (2002) (see Appendix 3), which uses different threat categories and selection criteria and is currently in the process of being updated. Therefore, lists of threatened species in Manaia ED will include a mixture of threat categories from both systems. For example, North Island fernbird ('At Risk-Declining' in Miskelly *et al.* 2008) uses the most recent threat classification system, while koura ('Chronically Threatened – Gradual Decline') is classed under the now outdated system. It should be noted that threat categories from the two systems with similar names may appear to be similar, but may not be due to changes in their defining criteria.

Townsend *et al.* (2008) considers species classified as Nationally Critical, Nationally Endangered, or Nationally Vulnerable to be 'Threatened' and Declining, Recovering, Relict and Naturally Uncommon species to be 'At Risk' (currently only applied to vascular plants and birds). Molloy *et al.* (2002) also considers Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, Gradual Decline, At Risk, Range Restricted, and Sparse categories all to be 'Threatened' (currently applied to aquatic fauna, reptiles and terrestrial invertebrates). This report therefore uses the appropriate terminology to describe species as being either 'Threatened' or 'At Risk'.

Species classified as 'regionally significant' by DOC Northland Conservancy (DOC, in prep.; W. Holland pers. comm.) are those which are not nationally threatened or uncommon, but which are currently considered to be uncommon or threatened within the Northland Region.

Nomenclature follows Miskelly *et al.* (2008) for threatened indigenous bird species and Hitchmough *et al.* (2007) for all other threatened indigenous fauna. Status of bird species or subspecies (i.e. endemic - found only in New Zealand; indigenous - also breeds outside New Zealand) is taken from Heather & Robertson (1996). The individual site descriptions detail known significant fauna only. Most of the common bird species of Northland, both indigenous and introduced, are to be found in Manaia Ecological District.

2.5 CRITERIA FOR ASSESSING ECOLOGICAL SIGNIFICANCE

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

- They are predominantly indigenous in character, by virtue of plant species composition and abundance.
- 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 and/or much reduced from its former extent.

The conservation value of these areas was then assessed using a two-level classification of ecological significance based on the PNAP criteria of representativeness, rarity and special features, diversity and pattern, habitat structure and characteristics important for the maintenance of ecosystems (buffer, linkage or corridor, size, and shape).

The highest value areas (Level 1) are those which contain significant vegetation and/or significant habitats of indigenous fauna in terms of the RMA and are defined by the presence of one or more of the following ecological characteristics:

1. Contain or is regularly used by nationally threatened or uncommon taxa, including subspecies and indeterminate taxa.
2. Contain or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in Manaia Ecological District (i.e. 'regionally significant' species).
3. Contain the best representative examples in Manaia Ecological District of a particular ecological unit or combination of ecological units.
4. Have high diversity of taxa or habitat types for Manaia Ecological District.
5. Form ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.
6. Contain habitat types that are rare or threatened in Manaia Ecological District or regionally or nationally.
7. Support good populations of taxa which are endemic to Northland or Northland-Auckland.
8. Are important for indigenous or endemic migratory taxa.
9. Cover a large geographic area relative to other similar habitat types within Manaia Ecological District.

Level 2 sites are natural areas supporting populations of indigenous flora and fauna not identified as meeting the criteria for Level 1. They are sites which:

1. Contain common indigenous species.
2. May be small and isolated from other habitats.
3. May contain a high proportion of pest species.

4. May be structurally modified e.g. forest understorey grazed.
5. Have not been surveyed sufficiently to determine whether they meet the criteria for Level 1 sites.

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

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness[4]	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 (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 Patterns	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 Viabilit	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.

4 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).

2.6 CHANGE OVER TIME

Natural ecosystems and habitats are dynamic, both physically and biologically. Some areas change over short time scales, e.g. dunes, whilst others change more gradually, e.g. climax forest. Changes may include the status and composition of species present, which could alter the significance of some habitats.

Human activities, both within or adjoining significant natural areas, can rapidly speed up the processes of change. Fire, followed by weeds, can dramatically modify shrublands. Drainage of adjoining land can alter the water tables of wetlands, thus lowering the quality of the habitat and facilitating the establishment of weeds. Ongoing piecemeal destruction, modification, and sustained grazing of indigenous habitats will mean that some will be lost in the long term.

The natural areas identified in this survey will require regular monitoring in order to observe changes in both species and habitat composition and condition.

2.7 LAND ENVIRONMENTS OF NEW ZEALAND

Land Environments of New Zealand (LENZ) is an environmental classification system that uses modelling techniques to classify New Zealand into broadly similar environments based on climatic, landform and soil factors, and the distribution of species. The Threatened Environment Classification is a combination of three national databases: Land Environments of New Zealand (LENZ), the Land Cover Database 2 (LCDB2), and Protected Areas of New Zealand (PANZ). Threatened land environments are assigned one of six threat categories on the basis of past habitat loss (percentage indigenous cover remaining) and current legal protection (Walker *et al.* 2007). Threatened Environment status is included in each site description in Section 4 (also see 5.1.3 and Table 5).

3. Ecological character

3.1 LOCATION AND SETTING

Manaia Ecological District covers approximately 6,444 ha and is the smallest and one of the most distinct ecological districts in Northland (Brook 1996). The Ecological District is dominated by the spectacular landscape features of Mt Manaia and Bream Head, which define the skyline with their jagged ridges and volcanic rocky outcrops. Manaia ED comprises most of the Whangarei Heads area, bordering Whangarei Harbour and Whangarei ED to the west and Whangaruru ED to the North. The northern boundary of the ED spans from Kirikiri Point in the west across to a small headland south of Awahoa Bay in the east. A significant part of this boundary follows the road, just south of Taiharuru River.

Mt Manaia stands alongside Bream Head as one of Northland's most significant coastal forests. These sites are complemented by smaller but biologically important natural areas such as Kauri Mountain, Taurikura Ridge, and Mt Aubrey. Bream Head contains a full zonation of communities from sandy and rocky shores to high forest slopes and rocky outcrops, and has been identified by the Department of Conservation as having outstanding conservation value.

Key habitat types in Manaia ED include coastal forests and shrubland, dunelands, freshwater wetlands, saltmarsh, rocklands, cliffs and rocky headlands, and coastal islands. In addition, Manaia ED is strategically placed for recolonisation to the mainland of threatened bird species from the nearby Hen and Chicken Islands (Conning 2001).

The first European settlement of the Whangarei Heads area began in the 1830s. The Manaia Block, which stretched from Munro Bay to Taurikura and across to Ocean Beach, was purchased by the Crown for £200 in 1855. The area was soon settled by Scots from Nova Scotia, followers of the non-conformist Rev. Norman McLeod. Local historic notables, including the MacGregors, McKenzies, Urquharts and Harrisons, all owned parts of Taurikura Ridge at different times. The area was soon part of a thriving Whangarei Harbour/Head community of settlers with a school and regular church services by the late 1850s (DOC internal report.). Manaia ED was an important link in coastal communications during the development of Northland. Many residents gained their living from the sea; lime was extracted close to the water's edge, and a freezing works plant was built to take advantage of the deep-water anchorage (McManaway 1983).

There was little Maori settlement in the area when the Scots arrived, however, the very large number of archaeological sites is indicative of intensive occupation since the time of early Polynesian settlement, at least 700 years ago (Ritchie 2008).

Despite the impacts of human activities, the biodiversity values of Manaia ED are very high and distinctive. This is partly a result of the diverse physical nature of the area, with topography, geology, soil and climate

interacting to shape the extent and composition of the distinct ecosystems that are present.

3.2 TOPOGRAPHY/GEOLOGY

Topography

Manaia ED contains a series of prominent, steep-sided, and commonly bluffed hills, separated by low, rolling country. The Manaia and Bream Head (Te Whara) - Mt Lion (Matariki) ridges dominate the skyline, rising to highpoints at 420 m and 476 m respectively, with distinctive eroded rock spires and pinnacles present on the narrow ridge crests. Other hills in this ED range between 100 m and 250 m in altitude.

The eastern coast of the ED between Kauri Mountain and Busby Head faces the open sea, whereas the western coast lies within the lower reaches of Whangarei Harbour. Ocean Beach and Proctors Beach[5] on the eastern coast is a 7 km-long sandy beach backed by dunes and wetlands, and Smugglers Bay on the eastern side of Busby Head is a sandy pocket beach backed by dunes. Most of the rest of the eastern coast of the ED is backed by cliffs or steep rocky slopes. On the sheltered western coast there are a series of gravely and sandy pocket beaches separated by rocky headlands.

Several small, rocky islands are scattered around the coastline, including the Bream Islands (Guano, Mauitaha, Tarakanahi and Moturaki Islands) at the southern end of Ocean Beach, Frenchman Island off Busby Head, and High, Calliope, and Motukararo Islands within Whangarei Harbour.

Geology

The Manaia ED contains a diverse range of rock types (Thompson 1961; Isaac *et al*. 1994; Hayward *et al.* 2001). The oldest rocks represented are Waipapa Terrane greywacke and chert of Mesozoic age, which were accreted to the New Zealand Gondwana margin during the Middle Triassic to Late Jurassic. In Manaia ED the Waipapa Terrane forms a fault-bounded wedge extending between Parua Bay and the northern end of Ocean Beach. It is locally overlain by thin sequences of Te Kuiti Group glauconitic and calcareous sandstones, which were deposited in a shallow marine environment during the Late Eocene.

These sedimentary rocks are in turn structurally overlain by Northland Allochthon mélange, comprising a chaotically-jumbled mix of sedimentary rocks (including mudstone, sandstone and fine-grained limestone) ranging in age from Late Cretaceous to Oligocene. The various rock units incorporated in the Northland Allochthon were originally deposited in shallow to deep marine settings of the northeast coast of Northland, and were tectonically-emplaced southwestwards over Northland at the beginning of Miocene time. The Northland Allochthon in the Whangarei Heads area was subsequently uplifted and eroded, forming a low-lying

5 Proctors is the name locally given to the beach north of Ocean Beach settlement.

landmass, upon which volcanic eruptions built a series of andesitic and dacitic volcanoes (Taurikura Subgroup) during the Early Miocene. In the present day landscape, the eroded remnants of these volcanoes and associated subvolcanic intrusions form most of the prominent hills of the Manaia ED, and the Northland Allochthon rocks form the intervening lowlands.

Manaia Ridge, Mt Aubrey, Castle Rock, the hill above Home Point, and much of the Matariki (Mt Lion)-Te Whara (Bream Head) ridge consist of intercalated volcaniclastic breccia and lava flows cut by dikes. These rock sequences originally formed parts of the flanks of large andesitic stratovolcanoes that have since been mostly eroded away. Andesitic dikes and laccoliths at Kauri Mountain, Reserve Point, Darch Point, Motukaroro, High Island, Home Point, Peach Cove, and the south end of Ocean Beach, and microdiorite laccloliths at Bream Islands and east of Smugglers Bay, are subvolcanic intrusions that formed within and at the bases of these volcanoes. The eroded remnants of smaller dacitic volcanoes form hills on the eastern side of Munro Bay, north of Timperley Road, between McKenzie Bay and Ocean Beach, at Busby Head, and on the spur west of Mt Lion. Many of the volcanic hills in Manaia ED are prone to slope failures. The lower flanks of Mt Aubrey, Manaia Ridge, and the Matariki (Mt Lion)-Te Whara (Bream Head) ridge in particular are fringed by landslide and rock fall deposits.

An extensive dunefield and associated wetland behind Proctors Beach, and a small dunefield behind Smugglers Bay, formed in mid-late Holocene time, following the post-glacial sea level rise.[6]

Soils

The soils of Manaia ED reflect the diversity of topography and rock type. They range from clay loams in the steeplands, through a range of loamy soils and clays in the rolling hill country, to sandy loams and sands in the lowlands. Steepland clay loams occur on the southern slopes of Bream Head, much of Manaia Ridge and the coastal flanks of Kauri Mountain, the latter of which includes stony clay loam. Clay soils dominate at Busby Head and Kauri Mountain. Lowland soils include extensive clays and peaty soils behind the sands of Ocean Beach.

3.3 CLIMATE

The Manaia Ecological District experiences a warm temperate climate with mild winters and warm summers, with summer temperatures often reaching 30°C. The altitude ranges from sea level to the highest point of Te Whara at 476 m asl. The closest weather station is located at Whangarei Airport (Onerahi) in Whangarei ED.

The Northland Region has the highest mean annual temperature in New Zealand. In eastern areas of Northland mean annual temperatures vary from about 15.5° to 16.0°C, and the mean annual temperature range for the region is small, averaging 8.5°C. At Whangarei Airport the mean

6 Geological information provided by Dr. Fred Brook.

monthly temperature reaches 20°C in January and February, and drops to a minimum of 12°C in July. Relative humidity is high in all seasons due to the influence of the surrounding sea and the lack of any large mountain masses (Whangarei City has a mean annual humidity of 82%).

Mean annual rainfall at Whangarei Airport is 1,555 mm, with the winter months normally have significantly higher rainfall than summer months. In Manaia ED, rainfall is generally higher in La Nina years when cyclonic conditions bring frequent easterly and northerly rainfall. In El Nino years, cooler south-westerly conditions prevail, which in summer can bring desiccating conditions to the area (from Pierce *et al.* 2002).

Daily air temperature variations are small, with low extremes of temperatures and few frosts.

The ED has approximately 2,000 hours of bright sunshine per year.

(Source: Moir *et al.* 1986).

3.4 VEGETATION AND FLORA

A preliminary plant species checklist for Manaia Ecological District is presented in Appendix 5. Herbarium records largely concentrate on the threatened, uncommon or unusual plants present in Manaia ED, and therefore it is likely that some common species have been omitted from this preliminary list. Common names used in the text are listed with their species names in Appendix 6.

3.4.1 Historic vegetation

Before humans arrived in the ED, the original vegetation would have largely comprised coastal forest with wetland complexes in low-lying land behind coastal dunes and ridges (Conning 2001). According to historical logging records, kauri forest would have once been abundant on the slopes of Mt Manaia.

European settlement in the middle of the 19th century saw a dramatic change in the landscape, with much of the forest being developed for agricultural purposes. Kauri and other mature forest trees were removed from both sides of Mt Manaia and elsewhere in the early years of the 20th century, with kauri logs being hauled into McLeod Bay and then rafted to Auckland for sale. More than three million feet of timber was removed from the ED. Kauri gum also sustained a local industry, with 192 acres of land between Mt Manaia and Ocean Beach being established as a kauri gum reserve for gumdigging (McManaway 1983).

From the 1850s to the 1950s the combination of repeated burning, logging and grazing, which was necessary for the early farmers to earn a living from their farmlands, had significant adverse impacts on the ecology of the surviving forests and other ecosystems in the area (Pierce *et al.* 2002). During this period extensive wetland and dune lake systems, which would have once occupied the land behind the dunes of Ocean Beach, were drained and converted to pasture.

3.4.2 Present day vegetation

Manaia ED has a relatively large proportion of indigenous forest and shrubland remaining compared with what remains in other ecological districts in Northland. This can partly be attributed to its precipitous topography, which discouraged clearance and protected some vegetation from fire.

Coastal forest near the shoreline, including forest and treeland on cliffs and scarps, is dominated by pohutukawa. Coastal forest on hillslopes contains many different forest types; common canopy species include pohutukawa, puriri, taraire, kowhai, karaka, kanuka, and mamaku.

Secondary forest in Manaia ED is dominated by kanuka/manuka.

Mixed stands of manuka and kanuka dominate shrubland areas. Areas of manuka-dominant shrubland are rare in Manaia ED.

Gumland vegetation typically occurs on more impoverished soils. Low-growing manuka is abundant in association with species such as *Gleichenia microphylla*, *Dracophyllum* spp., *Baumea teretifolia*, *Schoenus tendo*, *Epacris pauciflora*, *Drosera auriculata*, and a range of orchid species.

Foredunes support a variety of indigenous species including pingao, spinifex, tauhinu, *Zoysia pauciflora*, and the rare sand daphne *Pimelea villosa* subsp. *villosa*. Harakeke, pohuehue, coastal toetoe, knobby clubrush, and isolated stands of *Kunzea ericoides* var. *linearis* shrubland occur behind the foredunes on consolidated dunes.

Although wetlands are very under-represented in Manaia ED, there's a range of wetland types present. These include fertile swamps which support raupo reedland, harakeke flaxland, and a range of sedges; saltmarshes; and one area of gumland (see above). Seeps are common but most are too small or degraded to record as PNAP sites (L. Forester, NRC, pers. comm.).

3.4.3 Main vegetation types

FORESTS

Coastal forest is the most abundant indigenous habitat type in Manaia ED, with four relatively large tracts of forest remaining (Q07/069, Q07/073, Q07/074, and Q07/078).

Most of the forest that occurs in Manaia ED can be classed as coastal forest because of its close proximity to the sea.

Broadleaved forest

Coastal forest

Dominant and co-dominant forest types include kowhai, taraire, puriri, mamaku, and pohutukawa.

Kowhai forest is present on steep hills at Bream Head Scenic Reserve and Surrounds (Q07/074) with ti kouka, karaka, rewarewa, kohekohe, nikau, and mapou. Kowhai is co-dominant with pohutukawa, puriri, and taraire

at the same site, while at Taurikura Ridge Bush (Q07/073), kowhai is co-dominant with puriri, taraire, and rewarewa.

Taraire forest occurs on the south-facing slopes of Bream Head Scenic Reserve and Surrounds (Q07/074), immediately above the coastal margin and in gullies. Puriri, rewarewa, kowhai, ti kouka, tawa (including tawaroa), nikau, and mamaku are associated species. Taraire is co-dominant with puriri at Taurikura Ridge Bush (Q07/073), occurring with rewarewa, ti kouka, karaka, and mamaku.

Puriri is another common canopy species in coastal forest associations, occurring in steep gullies at Taurikura Ridge Bush (Q07/073) and Bream Head Scenic Reserve and Surrounds (Q07/074), and on steep hillslopes at Manaia Ridge Scenic Reserve and Surrounds (Q07/069). Puriri is co-dominant with kanuka, taraire, and totara.

Mamaku forest is common at Manaia Ridge Scenic Reserve and Surrounds (Q07/069), where it occupies recently disturbed areas. It is co-dominant with kauri, nikau, pohutukawa, totara, and rewarewa. At Kauri Mountain Conservation Area and Surrounds (Q07/078), mamaku occurs with tanekaha.

Pohutukawa is a feature of the coastal cliffs along The Nook peninsula, the southern shoreline of Bream Head Scenic Reserve and Surrounds (Q07/074), and cliffs and scarps at the northern end of Ocean Beach Recreation Reserve and Surrounds (Q07/075). On cliff faces and scarps, the canopy is usually fragmented with pohutukawa occurring over harakeke, *Astelia banksii*, taupata, knobby clubrush, houpara, rengarenga lily, coastal toetoe, pohuehue, grasses, and herbaceous plants such remuremu, makaokao, *Lobelia anceps*, and glasswort.

In areas of forested hillslope, pohutukawa is co-dominant with a range of species, including puriri, taraire, totara, puriri, and tawa.

Other broadleaved forest types

Forest types that are likely to be beyond the immediate influence of coastal conditions are restricted to Kauri Mountain Conservation Area and Surrounds (Q07/078) and Timperly Road Bush (Q07/077). Kanuka/manuka is co-dominant with kauri, kohuhu, puriri, totara, tanekaha, and towai at Q07/078, while mamaku treefernland (included as a forest type) predominates at Q07/077. Totara, towai, kanuka, manuka, kahikatea, ti kouka, gorse, and pampas are associated species.

Kauri forest

Kauri forest has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069), Bream Head Scenic Reserve and Surrounds (Q07/074), and Kauri Mountain Conservation Area and Surrounds (Q07/078), although it also occurs in other parts of Manaia ED which have not been fully surveyed. Kauri forest occupies ridges, steep slopes, and the tops of bluffs, where it commonly occurs with species such as totara, tanekaha, rewarewa, kanuka, and mamangi.

SHRUBLANDS

Manuka and kanuka shrublands comprise the second largest indigenous vegetation type (after coastal forest) in Manaia ED. These shrublands provide important linkages between other habitats and buffering for large tracts of indigenous forest. Shrublands often contain high biodiversity values and provide important habitat for threatened and uncommon fauna and flora. For the purposes of this report, areas of kikuyu grassland present in Bream Head Scenic Reserve and Surrounds (Q07/074) have been categorised as shrubland. At the western end of the reserve, some areas of kikuyu grassland are being revegetated by the Bream Head Conservation Trust with predominantly manuka, which will then allow natural regeneration to take over (W. Holland, DOC, pers. comm.). In the eastern end, areas of kikuyu have been invaded by gorse, which over time may encourage the natural regeneration of indigenous plants.

Kanuka or manuka shrubland

Much of this shrubland type has formed on areas formerly covered in mixed forest, which were cleared by early human settlers. Kanuka/ manuka shrubland occurs in all of the larger mainland sites in Manaia ED. Commonly associated species include pohutukawa, puriri, kauri, totara, rewarewa, kowhai, ti kouka, mamaku, mingimingi, gorse, and woolly nightshade.

Taupata shrubland

On Mauitaha Island (part of Q07/080), taupata shrubland occurs with harakeke, coastal mahoe, and emergent pohutukawa. Taupata is co-dominant with kikuyu on Tarakanahi Island (part of Q07/079).

Harakeke flaxland

On Guano Island (part of Q07/080), harakeke flaxland occurs with taupata, *Cyperus ustulatus*, native iceplant, *Crassula sieberiana*, and shore groundsel. On Moturaka Island (part of Q07/089), harakeke is present with *Cyperus ustulatus*, taupata, pohuehue, *Baumea juncea*, knobby clubrush, *Asplenium haurakiense*, and *A. northlandicum*.

ESTUARINE WETLANDS

Areas of saltmarsh are very uncommon in Manaia ED and are summarised as below:

- Mangroves occur in Kiteone Road Saltmarsh (Q07/168), south-east of Parua Bay. Mangroves grade into sea rush and oioi salt meadow.
- Two discrete areas of saltmarsh dominated by sea rush occur near the creek at the northern end of Ocean Beach Recreation Reserve and Surrounds (Q07/075).

FRESHWATER WETLANDS

Fertile wetlands

Fertile wetlands (or swamps) are fed by nutrient-rich ground and surface water, as well as rainwater. Their water levels vary seasonally and they are often flooded by water loaded with silt and nutrient when river or lake levels are high. In Manaia ED, raupo reedland and associations of *Baumea* sp., harakeke, and *Bolboschoenus fluviatilis* are the most common ecological units within fertile wetlands. The only example of a freshwater wetland grading into saltmarsh occurs at Kiteone Road Saltmarsh (Q07/168). A representative example of harakeke flaxland in swamp is present in Whangarei Heads Road Wetland (Q07/083). This habitat type is particularly rare in Northland.

Gumland

Gumland is a very uncommon wetland type in Manaia ED and throughout Northland; there is only one known site in the ED. Gumlands are typically dominated by manuka occurring on strongly leached, podzolised, infertile soils where drainage is impeded. Seasonally these areas become waterlogged in winter and are very dry in summer (Lux *et al.* 2009). Pure manuka stands on gumland are found at one site in Manaia ED: McDonald Coastal Shrubland (Q07/068). Associated species include *Gleichenia microphylla*, *Sticherus flabellatus*, *Dracophyllum lessonianum*, *Drosera auriculata*, *Baumea teretifolia*, *Schoenus tendo*, *S. brevifolius*, *Lepidospermum laterale*, *L. australe*, *Lycopodiella cernua*, *Microtis unifolia* agg., *Orthoceras novae-zeelandiae*, *Pterostylis graminea*, *Singularybas oblongus*, *Thelymitra carnea*, *Thelymitra longifolia*, and prickly hakea.

ROCKLANDS

Rockland occurs mainly on the exposed coastal margins of Bream Head Scenic Reserve and Surrounds (Q07/074), Kauri Mountain Conservation Area and Surrounds (Q07/078), and islands and rock stacks. Exposed rocky outcrops and rock stacks are present at Manaia Ridge Scenic Reserve and Surrounds (Q07/069), Mt Aubrey Coastal Forest and Shrubland (Q07/070), and Bream Head Scenic Reserve and Surrounds (Q07/074). Rockland vegetation is dominated by salt-resistant herbs such as native iceplant, glasswort, makaokao, remuremu, NZ celery, NZ spinach, Mercury Bay weed, shore groundsel, and *Pseudognaphalium luteoalbum*. Woody species such as pohutukawa, karo, and taupata occur on Peach Rock Stack A and B (Q07/173 and Q07/174).

DUNELANDS

Dunelands in Manaia ED are restricted to Smugglers Bay in Bream Head Scenic Reserve and Surrounds (Q07/074) and Ocean Beach Recreation Reserve and Surrounds (Q07/075), the latter of which is approximately 6.5 km in length and comprises most of the eastern boundary of the Ecological District. The dunelands are relatively small and narrow, but support a distinctive plant and animal community and provide habitat for many threatened species. The dunes are typical in being shaped and reshaped by erosion and deposition of sand brought about by wind and sometimes water movement (Pierce *et al.* 2002).

- Dunes which are largely unvegetated may have sparse or frequent spinifex, while pingao, tauhinu, shore bindweed, *Zoysia pauciflora*, knobby clubrush, and *Pimelea villosa* subsp. *villosa*, lupin, catsear, and purple groundsel are scattered throughout.
- Where foredunes are vegetated, spinifex is generally dominant, with occasional tauhinu, pingao, *Pimelea villosa* subsp. *villosa*, knobby clubrush, shore bindweed, pohuehue, lupin, purple groundsel, and marram grass.
- On back dunes, clumps of knobby clubrush are frequent. An interesting feature of this habitat type is the presence of the threatened Northland kanuka (*Kunzea ericoides* var. *linearis*), which occurs in discrete patches in the mid to northern part of the site. Flax and coastal toetoe are locally frequent, while *Coprosma macrocarpa* and karo are scattered throughout. Pampas, smilax, moth plant, and gorse are invading this part of the site.
- On consolidated dunes situated between the back dunes and farmland, pohuehue and kikuyu grow in dense swards. Large patches of gorse are frequent, while lupin and apple of Sodom, and clumps of harakeke and knobby clubrush, are scattered throughout. The regionally significant fireweed *Senecio biserratus* occurs rarely. Where dunes have been heavily modified by stock, kikuyu, lotus, and buffalo grass are locally dominant.
- Saltwater paspalum is locally common along the shallow estuarine margins of the creek at the northern end of Ocean Beach Recreation Reserve and Surrounds. It also occurs in occasional clumps in dune hollows.

3.4.4 Nationally Threatened and At Risk plants

Manaia ED has a high number of nationally threatened and uncommon plant species for its size (6,444 ha). Six 'Threatened' and 27 'At Risk' plant taxa (de Lange *et al*. 2009) have been recorded. Three are classed as Nationally Critical, one Nationally Endangered, two Nationally Vulnerable, five Declining, 19 Naturally Uncommon, and three Relict (Table 2).

There is one plant species endemic to Manaia ED: *Pseudowintera insperata* (Nationally Critical) recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) and Bream Head Scenic Reserve and Surrounds (Q07/074).

TABLE 2: NATIONALLY THREATENED AND AT RISK PLANT TAXA (AS PER CLASSIFICATIONS IN DE LANGE *ET AL*. 2009) RECORDED IN MANAIA ECOLOGICAL DISTRICT.

*=not recorded for sometime – see section 3.4.6

TAXON	COMMON NAME	PLANT GROUP	THREAT CATEGORY	QUALIFIER
**Juncus holoschoenus* var. *holoschoenus*		Rush	Nationally Critical	CD, DP, EF, SO
Pseudowintera insperata	Northland horopito	Dicot tree	Nationally Critical	DP
Senecio scaberulus		Composite herb	Nationally Critical	EF
Lepidium oleraceum		Grass	Nationally Endangered	CD, EF, RR, Sp
Dactylanthus taylorii		Dicot herb	Nationally Vulnerable	CD, PD, RF, Sp
Pimelea tomentosa		Dicot shrub	Nationally Vulnerable	PD
Brachyglottis kirkii var. *kirkii*		Dicot shrub	Declining	DP
Coprosma acerosa	sand coprosma	Dicot shrub	Declining	DP
Kunzea ericoides var. *linearis*	Northland kanuka	Dicot tree	Declining	HI
Pimelea villosa subsp. *villosa*	sand daphne	Dicot tree/shrub	Declining	PD, RF
Scandia rosifolia	kohepiro	Dicot shrub	Declining	DP
Calystegia marginata		Vine	Naturally Uncommon	SO, Sp
Celmisia adamsii var. *rugulosa*		Dicot herb	Naturally Uncommon	Sp
Chionochloa bromoides	Coastal tussock	Grass	Naturally Uncommon	RR, Sp
Coprosma neglecta		Dicot tree/shrub	Naturally Uncommon	RR
Doodia mollis		Fern	Naturally Uncommon	Sp
Doodia squarrosa		Fern	Naturally Uncommon	Sp
Fucshia procumbens		Dicot liane	Naturally Uncommon	Sp
Hymenophyllyum atrovirens	mauku, filmy fern	Fern	Naturally Uncommon	DP, RR, Sp
Libocedrus plumosa	kawaka	Gymnosperm	Naturally Uncommon	Sp
Microlaena carsei		Grass	Naturally Uncommon	DP
Myosotis spathulata		Dicot herb	Naturally Uncommon	DP, EF, Sp
Olearia angulata		Dicot tree	Naturally Uncommon	Sp
Peperomia tetraphylla		Dicot herb	Naturally Uncommon	SO, Sp
Pimelea acra		Dicot shrub	Naturally Uncommon	RR
Pittosporum ellipticum		Dicot tree	Naturally Uncommon	Sp
Pittosporum virgatum		Dicot tree	Naturally Uncommon	Sp
Pomaderris paniculosa subsp. *novae-zelandiae*		Dicot shrub	Naturally Uncommon	RR, Sp
Sophora fulvida	kowhai	Dicot shrub	Naturally Uncommon	RR
Tetragonia tetragonioides	kokihi	Dicot herb	Naturally Uncommon	EF, SO
Ficinia spiralis	pingao	Sedge	Relict	CD, Inc, Sp
Pisonia brunoniana	parapara	Dicot tree	Relict	TO
Streblus banksii	turepo	Dicot tree	Relict	Sp

THREATENED

Pseudowintera insperata Northland horopito (Nationally Critical $_{DP}$)

Pseudowintera insperata is a shrub or small tree up to 7 m tall which occupies lowland forest and exposed ridge tops within low windshorn shrubland. Its former range included all the northern Whangarei Harbour high points from Maungatapere to Bream Head[7], but the species is now only known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2003, CHR 569931A) and Bream Head Scenic Reserve and Surrounds (Q07/074) (2004, CHR 573382).

Senecio scaberulus (Nationally Critical $_{EF}$)

Senecio scaberulus is a grey-green, hairy-leaved fireweed found in open coastal and offshore island habitats from Auckland northwards. Formerly widespread, it is now rare in the wild with few recent records (E.K. Cameron pers. comm.). It is also known to hybridise with *S. hispidulus*. Although known from the neighbouring Whangaruru ED at Matapouri, it has only been recorded once in Manaia ED, from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993). It may have been overlooked in the field so additional survey of suitable habitats would be worthwhile (L. Forester, NRC, pers. comm. 2009).

Lepidium oleraceum Cook's scurvy grass (Nationally Vulnerable $_{CD, EF, RR, Sp}$)

Cook's scurvy grass is a sprawling, upright, fleshy-leaved herb in the Brassiceae family, which was once common on the coast and islands throughout New Zealand. It is now largely restricted to offshore islands. In Manaia ED, it has only been recorded on Mauitaha Island (part of Q07/080) (1990-1991, SSBI Q07/R07/H079). It was reconfirmed at this site in May 2010, with a very healthy population recorded (W. Holland, DOC, pers. comm.).

Pimelea tomentosa (Nationally Vulnerable $_{PD}$)

A slender, finely hairy shrub endemic to open shrubland from Three Kings Islands to Nelson/Marlborough (Poole & Adams 1990). Although there are very few records from Northland, this species has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1995, SSBI Q07/R07/H042; reconfirmed in 2007) and Bream Head Scenic Reserve and Surrounds (Q07/074) (G. Coulston, DOC, pers. comm.).

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7 A manuscript currently in submission with the journal *Phytochemistry* (October 2009; P.J. de Lange & N.B. Perry pers. comm.) has shown that the Logues Bush *Pseudowintera* are not *P. insperata* but closest to *P. axillaris*. Their sesquiterpene dialdehyde chemistry indicates that they are *P. axillaris* × *P. colorata* - though functionally stable and so to all intensive purposes *P. axillaris* type plants. That work confirms the belief expressed by Heenan & de Lange (2006) that *P. insperata* is a local endemic of the Whangarei Basin, extant today at only two sites, Mt Manaia and Bream Head, and that chemically *P. insperata* is distinct from all other *Pseudowintera* possessing alone the sesquiterpene dialdehyde coumarate-10 (P.J. de Lange & N.B. Perry pers. comm.).

AT RISK

Coprosma acerosa sand coprosma (Declining $_{DP}$)

This endemic shrub occurs on coastal sands throughout New Zealand (Allan 1961), but is rapidly becoming scarce in large parts of its range as a result of dune reclamation and competition by marram grass (NZPCN 2009). In Manaia ED, there are two records of *Coprosma acerosa* from Ocean Beach Recreation Reserve and Surrounds (Q07/075): 1956 (WELT SP9021) and 1997 (recorded during this PNAP survey).

Kunzea ericoides var. *linearis* Northland kanuka (Declining)

Kunzea ericoides var. *linearis* is a variety of kanuka endemic to the northern North Island where it is most abundant from Kaitaia northwards on sandy coastal soils. In the west it extends south to the Pouto Peninsula but it is disjunct and generally scarce. In the east it extends almost to Pakiri, then occurs locally around the Waitemata Harbour with spot occurrences on Great Barrier Island, near Miranda and on the Hapuakohe Range. There is some evidence to suggest that these southerly occurrences are not natural (NZPCN 2009). As it is not especially distinct from kanuka (*Kunzea ericoides* var. *ericoides*), past surveys may have simply recorded it as *Kunzea ericoides*. Its main threat is loss of habitat through coastal development (NZPCN 2009). In Manaia ED, it is only known from the dunelands of Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1956, WELT 14118, reconfirmed by Wildland Consultants during this survey, 2009).

Pimelea villosa subsp. *villosa* sand daphne (Declining $_{PD, RF}$)

This is a low, spreading, silky-haired shrub that grows on coastal sand dunes. It is endemic to the North Island and two distinct forms have recently been recognised (Burrows 2009) of which one is further restricted to Northland (*P. villosa* subsp. *villosa*). 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 & Townsend 2004). It is also be adversely affected by browsing and grazing mammals, seed destruction by rodents, and competition from marram grass (NZPCN 2009). In Manaia ED, it only occurs at Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1999, AK 248037) and was reconfirmed during the 2009 survey by Wildland Consultants. This species was formerly known as the northern form of *Pimelea arenaria*.

Scandia rosifolia kohepiro (Declining $_{DP}$)

This sprawling, woody, and aromatic shrub is endemic to the North Island and is found in coastal to subalpine areas (0-1400 m asl), usually on cliff faces, clay banks or amongst boulders. It also occurs along cliffs lining river gorges and more rarely in scrub (NZPCN 2009). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1970, AK 126104; reconfirmed in 2008, SSBI Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Young 2007).

Calystegia marginata (Naturally Uncommon $_{SO, SP}$)

This slender climber, which has narrow, arrow-shaped leaves, is found on the margins of open, low shrubland (Wilson & Given 1987) and forest throughout Northland and in eastern Australia, and is often associated with disturbed land. *Calystegia marginata* occurs in Manaia ED in Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland, DOC, pers. comm.) and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993) and was recorded at Bream Head Scenic Reserve and Surrounds (Q07/074) in February 2010 (W. Holland, DOC, pers. comm.).

Celmisia adamsii var. *rugulosa* (Naturally Uncommon $_{SP}$)

This endemic tufted daisy is restricted to Manaia ED and nearby Pataua, where it is usually found on the steep, sparsely vegetated, rock outcrops, cliff faces and rock tors along the ridgelines of Mt Manaia, Mt Aubrey, and Bream Head. It has also been recorded from rough pasture, reverting shrubland, and pine plantations. In Manaia ED, this species is known from four localities: Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1999, AK 300271), Mt Aubrey Coastal Forest and Shrubland (Q07/070) (Young 2007), Bream Head Scenic Reserve and Surrounds (Q07/074) (2004, AK 286208), and Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, AK 252592).

Chionochloa bromoides coastal tussock (Naturally Uncommon $_{RR, SP}$)

An endemic grass found in the North Island where virtually confined to northern offshore islands and easterly headlands from the Bay of Islands south to the Poor Knights, Chickens and Mokohinau Islands. There is one westerly outlier occurs at Maunganui Bluff. In Manaia ED, coastal tussock has been recorded from Smugglers Bay in Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046).

Coprosma neglecta (Naturally Uncommon $_{RR}$)

A shrub restricted to Northland, found in scattered populations at Three Kings Islands, North Cape, Whangaroa, Maunganui Bluff (Tutamoe ED) and in Manaia ED, Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1999, AK 292693, reconfirmed in 2008, Q07/R07/H042).

Doodia mollis (Naturally Uncommon $_{SP}$)

This small tufted fern is usually found in North Island coastal to lowland forest, often along river margins or in alluvial forest, especially in damp sites or in deep highly fertile forest soils (NZPCN 2009). It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Young 2007, SSBI Q07/R07/H042) and Taurikura Ridge Bush (Q07/073) (Forester & Tyson 2008, in SSBI Q07/R07/H044).

Doodia squarrosa (Naturally Uncommon $_{SP}$)

In Northland, this fern is very local in lowland areas, usually in rocky forest and scrub (Brownsey & Smith-Dodsworth 2000). It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1995, SSBI Q07/R07/H042).

Fuchsia procumbens (Naturally Uncommon $_{Sp}$)

This prostrate, sprawling fuchsia is endemic to open coastal habitats on the mainland from North Cape to Maunganui Bluff on the west coast and Coromandel and Great Barrier Island on the east coast (Godley & Berry 1995). In Manaia ED, it is known from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993, reconfirmed in 2010, W. Holland, DOC, pers. comm.) and Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, AK 282046).

Hymenophyllum atrovirens (Naturally Uncommon $_{DP, RR, Sp}$)

An endemic species of filmy fern that is usually a rheophytic species typically found throughout New Zealand in dark overhangs and holds along the flood zone of steep sided rivers, river gorges and along the banks of narrow streams in dense forest. It is rarely (if ever) found away from water, and is often found near or under water falls (NZPCN 2009). In Manaia ED, *Hymenophyllyum atrovirens* has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993, reconfirmed 2008, SSBI Q07/R07/H042).

Libocedrus plumosa kawaka (Naturally Uncommon $_{Sp}$)

This endemic cypress has a disjunct distribution, being restricted to Northland and northwest Nelson, where it is found locally within coastal to lowland forest. In Northland, it often occurs in association with kauri, often on ridge lines, spurs, or areas of major wind throw damage (NZPCN 2009). Within Manaia ED, it is only known from forest remnants in the Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993, reconfirmed 2008, SSBI Q07/R07/H042), Kauri Mountain Conservation Area and Surrounds (Q07/078) (2000, SSBI Q07/R07/H038), and Bream Head Scenic Reserve and Surrounds (W. Holland, DOC, pers. comm. 2010).

Microlaena carsei (Naturally Uncommon $_{DP}$)

This diminuitive, creeping perennial grass is seemingly endemic to kauri dominated forest where it usually found in damp, shaded hollows amongst tree roots and in shaded sites on the margins of fast flowing streams and/or river banks. In Manaia ED, *Microlaena carsei* has been recorded from Taurikura Ridge Bush (Q07/073) (Forester & Tyson 2008, in SSBI Q07/R07/H044).

Myosotis spathulata (Naturally Uncommon $_{DP, EF, Sp}$)

An endemic, widely spreading, perennial herb that is usually found throughout New Zealand on or near rock outcrops, under rock overhangs, on ledges or amongst rubble in forest or shrubland (NZPCN 2009). Within Manaia ED, it is known from forest remnants in the Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1980, AK 269600).

Olearia angulata (Naturally Uncommon $_{Sp}$)

This small, endemic tree is often represented at any one site by only a handful of trees. It occurs on rocky headlands, cliff faces, ultramafic shrublands, and dune forests in coastal areas. There is only one record

of *Olearia angulata* from Manaia ED: Manaia Ridge Scenic Reserve and Surrounds (1997, SSBI Q07/R07/H042).

Peperomia tetraphylla (Naturally Uncommon $_{SO, Sp}$)

In New Zealand, this indigenous succulent herb has been recorded from Northland, the Bay of Plenty and East Cape areas. It occurs in coastal to lowland areas where it is usually epiphytic on tree trunks, but also found amongst tree roots, shaded cliff faces and ledges and on boulders within forest (NZPCN 2009). In Manaia ED, there is one record from Taurikura Ridge Bush (Q07/073) (1996, SSBI Q07/R07/H043).

Pimelea acra (Naturally Uncommon $_{RR}$)

Pimelea acra was until recently, known as *Pimelea* (b) (AK 165780; Mt Manaia) (Burrows 2009). It is a small shrub akin to *P. eremitica* but differing by having coarse hairs on the leaf margins. It inhabits south- to east-facing bluffs, occurring on the open face or in shallow gullies amongst other shrubland vegetation and bare clay and moss (A. Townsend, DOC, pers. comm.) and only occurs in the Manaia ED (Whangarei Heads) and Little Barrier. It has been recorded from Mt Aubrey Coastal Forest and Shrubland (Q07/070) (Young 2007), Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2003, AK 284501), and Bream Head Scenic Reserve and Surrounds (Q07/074) (1997, CHR 469709, reconfirmed in 2009 during this survey).

Pittosporum ellipticum (Naturally Uncommon $_{Sp}$)

This endemic tree occurs from Te Paki to Mt Pirongia in the west and the Karangahake and Waioeka gorges in the east (NZPCN 2009). Within this range it is very uncommon, most often being found associated with kauri forest, and always in relatively open vegetation (*ibid*). In Manaia ED, it is known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1980, AK 269603; reconfirmed in 2008, SSBI Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Pittosporum virgatum (Naturally Uncommon $_{Sp}$)

A slender tree which is usually associated with kauri forest, often on ridge lines, slips scars or in secondary regrowth within cut-over kauri forest. It prefers relatively open vegetation, where it typically forms apparently evenly-aged cohorts (NZPCN 2009). It has been recorded once in Manaia ED at Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Pomaderris paniculosa subsp. *novae-zelandiae* (Naturally Uncommon $_{RR, Sp}$)

This subspecies is endemic to Northland and known from only two localities: North Cape (Te Paki Ecological District) and Mt Manaia. In Manaia ED, it has been recorded from the summit of Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1977, AK 269401; reconfirmed in 2008, SSBI Q07/R07/H042).

Sophora fulvida kowhai (Naturally Uncommon $_{RR}$)

This small, endemic species of kowhai grows to 10 m tall and has hairy, small, crowded, yellow-green or grey leaflets. It occurs in open or disturbed sites, on base-rich volcanic rock, rubble and outcrops, and amongst mixed podocarp-broadleaved forest in Northland, Auckland and the Waikato (NZPCN 2009). *Sophora fulvida* is a common forest component at Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (SSBI Q07/R07/H042) (1997, CHR 513392) and Bream Head Scenic Reserve and Surrounds (Q07/074) (1997, CHR 513396), and also occurs at Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland, DOC, pers. comm. 2010).

Tetragonia tetragonioides kokihi (Naturally Uncommon $_{EF, SO}$)

Commonly known as NZ spinach, this species occurs in the coastal strand zone, often growing along beaches amongst driftwood and sea weed but also in sand dunes, on boulder and cobble beaches, on cliff faces, and rock ledges (NZPCN 2009). In Manaia ED, it is present at Ocean Beach Recreation Reserve and Surrounds (Q07/075) (recorded by Wildland Consultants during this survey, 2009) and Mauitaha Island (part of Q07/080) (recorded in May 2010, W. Holland, DOC, pers. comm.).

Ficinia spiralis pingao (Relict $_{CD, Inc, Sp}$)

Pingao is an endemic sand-binding sedge which has declined in abundance throughout New Zealands's coastal dunes as a result of weed competition (especially with marram grass), dune stabilisation and compaction, harvesting, trampling, vehicle traffic, and browsing animals (NZPCN 2009). In Manaia ED, pingao is restricted to Ocean Beach Recreation Reserve and Surrounds (Q07/075), where it was recorded during this survey in 1997 and 2009.

Pisonia brunoniana parapara (AK 294655) (Relict $_{TO}$)

Parapara is a small coastal broadleaved tree that is now uncommon on the Northland mainland due to browsing impacts. It currently occurs on Raoul Island, Three Kings Islands, and other offshore islands off the North Island, but is also known from scattered mainland locations from Te Paki to Mangawhai. It formerly occurred in Coromandel and on the East Cape. It is now virtually extinct on the mainland, usually only represented by one or a few trees. A significant population of parapara is present (200+ plants of which about 30% are mature) at Bream Head Scenic Reserve and Surrounds (Q07/074) (1994, AK 294655, reconfirmed in 2009, W. Holland, DOC, pers. comm.) and is the largest known mainland population extant today (W. Holland, DOC, pers. comm.).

Streblus banksii turepo (Relict $_{Sp}$)

This endemic tree is found in coastal and lowland forests (0-200 m asl), preferring deep and fertile soils. Large trees are often found on alluvial terraces. On offshore islands it seems more able to tolerate drier conditions and skeletal soils and may at times be found on steep cliff faces, rock ledges, or as stunted shrubs on cobble/boulder beaches (NZPCN 2009). In Manaia ED, turepo has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (2006, AK 297658) and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2010, SSBI Q07/R07/H042).

NON-RESIDENT INDIGENOUS

Drosera peltata (Coloniser $_{DP, EF, SO}$)

This species of sundew occurs in the North Island from Te Paki to about Auckland. It is found on consolidated sand dunes, on clay pans, and sometimes on peat, but usually occupies low gumland scrub and adjacent shrublands (NZPCN 2009). It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie, 1993) and Bream Head Scenic Reserve and Surrounds (Q07/074) (L. Forester, 1993, SSBI Q07/R07/H046).

Unconfirmed Records

Myosotis matthewsii (Nationally Endangered $_{DP, EF, RR}$)

Myosotis matthewsii is a mostly sprawling annual to short-lived perennial herb which is endemic to the northern North Island (western areas from near Kaitaia to Warawara Forest). It is found in coastal to lowland areas near seepages and on damp colluvium at the base of cliffs, on damp ground around water fall plunge pools and on the margins of slow-flowing streams. It has also been recorded from poorly drained ground on the margins of walking tracks (NZPCN 2009). Clunie (1993) recorded it from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) but it has not been vouchered and has not been seen before or since in the ED.

Hebe bollonsii (Naturally Uncommon $_{sp}$)

This endemic hebe occurs in petrel scrub, low wind shorn shrubland and open coastal forest and rock stacks on the Poor Knights and Hen and Chicken Islands and is local on rock stacks and headlands from Tutukaka to Mimiwhangata (NZPCN 2009). Clunie (1993) recorded *Hebe bollonsii* from Bream Head Scenic Reserve and Surrounds (Q07/074), however, it was not vouchered and has not been seen before or since in the ED. It is likely that this specimen may have been confused with a similar species in the *Hebe* genus.

3.4.5 Regionally significant plants

Manaia ED has 72 regionally significant plants (DOC 2009 in prep.; Table 3). Each of these species and its occurrence in Manaia ED is treated briefly in the following section.

TABLE 3: REGIONALLY SIGNIFICANT PLANT TAXA (CLASSIFICATION FROM DOC 2009 IN PREP.) RECORDED IN MANAIA ECOLOGICAL DISTRICT.

* = taxa not recorded recently (i.e. pre-1980s).

TAXON	COMMON NAME	PLANT GROUP
Adiantum aethiopicum	maidenhair fern	Fern
Ascarina lucida var. *lucida*	hutu	Dicot tree
Asplenium flabellifolium	necklace fern	Fern
Asplenium gracillum		Fern
Asplenium hookerianum		Fern
Asplenium northlandicum		Fern
Blechnum triangularifolium		Fern

TAXON	COMMON NAME	PLANT GROUP
Beilschmiedia tawa (f. *B. tawaroa* sensu Wright)	tawaroa	Dicot tree
Brachyglottis kirkii var. *angustior*	Kirk's tree daisy	Dicot tree
Carex forsteri		Sedge
Carex ochrosaccus		Sedge
Cheilanthes distans		Fern
Cheilanthes sieberi		Fern
Chinochloa conspicua subsp. *cunninghamii*		Grass
Clematis foetida		Dicot vine
Collospermum microspermum		Monocot herb
Coprosma neglecta		Dicot shrub
Coprosma rigida		Dicot shrub
Coprosma rotundifolia		Dicot shrub
Coprosma tenuicaulis	swamp coprosma	Dicot shrub
Corokia buddleioides	korokio	Dicot shrub
Corokia cotoneaster	korokio	Dicot shrub
Cyathea cunninghamii	punui, gully tree fern	Fern
Dracophyllum sinclairii		Dicot shrub
Einadia triandra	pigweed	Dicot herb
Epacris pauciflora		Dicot tree
Epilobium pallidiflorum		Dicot herb
Euchiton involucratus		Dicot herb
Fuchsia excorticata	kotukutuku	Dicot tree
Geranium solanderi		Dicot herb
Grammitis billardierei		Fern
Grammitis ciliata		Fern
Hebe ligustrifolia (includes *H.* "Whangarei")		Dicot shrub
Hebe macrocarpa var. *latisepela*		Dicot shrub
Hebe macrocarpa var. *macrocarpa*		Dicot shrub
Hebe parviflora		Dicot shrub
Helichrysum lanceolatum		Dicot shrub
Hydrocotyle microphylla		Dicot herb
Hymenophyllum lyalli		Fern
Hymenophyllum multifidum		Fern
Leionema nudum	mairehau	Dicot shrub
Leptostigma setulosa		Dicot herb
Libertia grandiflora	mikoikoi	Monocot herb
Linum monogynum	rauhuia	Dicot herb
Lophomyrtus obcordata	rohutu	Dicot tree
Loxsoma cunninghamii		Fern
Luzula banksiana var. *banksiana*		Rush
Melicytus novae-zelandiae	coastal mahoe	Dicot shrub
Metrosideros carminea	akakura, carmine rata	Dicot vine
Metrosideros robusta	northern rata	Dicot tree
Myoporum laetum	ngaio	Dicot tree
Nestegis apetala	coastal maire	Dicot tree
Nestegis cunninghamii	black maire	Dicot tree
Nestegis montana		Dicot tree
Olearia albida		Dicot tree
Ophioglossum coriaceum		Fern
Passiflora tetrandra		Dicot vine
Pennantia corybosa	kaikomako	Dicot tree
Phormium cookianum subsp. *hookeri*	whaririki	Monocot shrub
Phyllocladus toatoa	mountain toatoa	Dicot tree
Pouteria costata	tawapou	Dicot tree
Pseudowintera axillaris	horopito	Dicot tree

TAXON	COMMON NAME	PLANT GROUP
Rubus schmidelioides var. *schmidelioides*	bush lawyer	Dicot vine
Rubus squarrosus	bush lawyer	Dicot vine
Senecio biserratus		Dicot herb
Senecio quadridentatus		Dicot herb
Sticherus cunninghamii		Fern
Suaeda novae-zelandiae		Dicot herb
Tetraria capillaris		Sedge
Triglochin striata	arrow grass	Monocot herb
Toronia toru	toru	Dicot tree
Urtica ferox	ongaonga, tree nettle	Dicot shrub
Zoysia minima		Grass

Adiantum aethiopicum maidenhair fern

This indigenous maidenhair fern is fairly common in the northern North Island, but becomes uncommon south of Waikato (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has been collected from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Ascarina lucida var. *lucida* hutu

An attractive shrub or small tree that is common in the western South Island, but only has scattered populations in the North Island. It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1984, SSBI Q07/R07/H042).

Asplenium flabellifolium necklace fern

This small fern is widely distributed throughout New Zealand, although it is usually confined to the east coast of both major islands, where it grows on dry, rocky ground (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has only been recorded along track margins in Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded by Wildland Consultants during this survey, 2009); however, it is probably more common than collections suggest.

Asplenium gracillimum

This fern, which has also been known as *Asplenium bulbiferum* subsp. *gracillimum*, is known from Manaia ED (Wright 1980). *A. gracillum* (var. *laxum*) has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2007, SSBI Q07/R07/H042).

Asplenium hookerianum

A fern that occurs throughout New Zealand, although it is scarce north of Waikato. It is usually found on shaded clay banks or rocky outcrops in scrub and open forest, or on the ground in disturbed forest remnants (NZPCN 2009). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993, reconfirmed in Young 2007).

Asplenium northlandicum

This fern is confined to coastal cliffs and rocks in the northern North Island (Brownsey & Smith Dodsworth 2000). It has been recorded from Motukaroro Island (Q07/071) (1992, SSBI Q07/R07/H128), Mauitahi Island (part of Q07/080) (1990-1991, SSBI Q07/R07/H079), Moturaka Island (part of Q07/079) (reconfirmed in May 2010, W. Holland, DOC, pers. comm), and there is an historical record from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1956, WELT P2110).

Beilschmiedia tawa (*f. B. tawaroa* sensu Wright) tawaroa

Some authorities do not recognise *Beilschmiedia tawaroa* as separate from tawa (*B. tawa*) (NZPCN 2009). In Northland, tawaroa merges into tawa on the mainland closest to the Poor Knights Islands (E. Cameron pers. comm.). For the purposes of this report, tawaroa has been referred to as '*Beilschmiedia tawa* (including *B. tawaroa*)'. This entity has been recorded from several sites within Manaia ED: Taurikura Ridge Bush (Q07/073) (Forester & Tyson 2008, in SSBI Q07/R07/H044), Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993, reconfirmed in 2008, SSBI Q07/R07/H042), and Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993, reconfirmed in 2007, SSBI Q07/R07/H046).

Blechnum triangularifolium

This endemic fern species is found in drier, coastal to montane areas throughout the North Island, and in coastal districts of the South Island from Cape Farewell to north Canterbury; on slopes, banks, cliffs and road cuttings under light scrub or coastal forest, and sometimes in the open (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (Young 2007).

Brachyglottis kirkii var. *angustior* Kirk's tree daisy

An endemic tree daisy that is restricted to the north of the North Island, typically found from Te Puke and Ngaruawahia northwards (NZPCN 2009). In Manaia ED, it has only been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2007, in SSBI Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046), however, this species is probably more common than records suggest.

Carex forsteri

A sedge that is found throughout the North Island and South Island where it usually inhabits dense forest within high rainfall areas, favouring wet seepages, depressions and along stream banks (NZPCN 2009). *Carex forsteri* has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

Carex ochrosaccus

This sedge is endemic to the North Island, where it mostly occurs from Whangarei and Dargaville South to the Bay of Plenty and Mokau River. Further southwards, it becomes sparsely distributed, ranging about as far south as the Manawatu Gorge. It occupies coastal to lowland habitats, usually in damp situations within alluvial forest, but also along

stream banks and within coastal seepages. It sometimes forms extensive sedgelands within willow carr (NPCN 2010). *Carex ochrosaccus* has only been recorded from Manaia Ridge Scenic Reserve (Q07/069) (A. Townsend, DOC, pers. comm.) in Manaia ED.

Cheilanthes distans

Commonly known as woolly cloak fern, *Cheilanthes distans* occurs in the eastern parts of the North Island and South Island, from coastal to montane areas in dry, rocky places, usually in full sun (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993) and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042).

Cheilanthes sieberi

The taxonomic identity of this small, non-endemic fern has been the subject of some debate, and it is also recognised as *Cheilanthes sieberi* subsp. *sieberi.* It is found in dry coastal to montane areas of the North Island and South Island, usually along the east coasts (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has been recorded from Mt Aubrey Coastal Forest and Shrubland (Q07/070) (2001, SSBI Q07/R07/H043).

Chionochloa conspicua subsp. *cunninghamii*

This endemic tussock is found in the North Island only, occurring from sea level to 1500m in forest, scrub, cliff faces and rocky clearings (Edgar & Connor 2000). In Manaia ED, this species has only been recorded Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046).

Clematis foetida

This large woody climber is found on forest margins throughout New Zealand. In Manaia ED, it was recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) by Clunie (1993).

Collospermum microspermum

This ephiphyte is only found in North Island montane forests above 300m (Moore & Edgar 1970). In Manaia ED, it has only been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Young 2007).

Coprosma propinqua

Coprosma propinqua is a divaricating shrub found in swamp, scrub, and forest throughout New Zealand (Poole & Adams 1994). It was recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) by Clunie (1993).

Coprosma rigida

Coprosma rigida is a divaricating shrub with small leaves and reddish bark (Poole & Adams 1994). It is relatively uncommon in Northland, and in Manaia ED it is only known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993; reconfirmed in 2008, SSBI Q07/R07/H042) and Taurikura Ridge Bush (Q07/073) (2006, DOC internal report).

Coprosma rotundifolia

Coprosma rotundifolia is a shrub with roundish, softly hairy leaves that occupies forests and shrublands on hill slopes and alluvial flats. It is uncommon in Northland due to habitat loss. In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) by Clunie (1993).

Coprosma tenuicaulis swamp coprosma

This endemic shrub occurs in the North Island and South Island, occupying lowland swamps and boggy ground, poorly drained shrubland and riparian forest (NZPCN 2009) and is becoming local in Northland due to habitat loss. It has been recorded from Taurikura Ridge Bush (Q07/073) (Forester & Tyson 2008, in SSBI Q07/R07/H044) and Kauri Mountain Road Seep (Q07/177) (recorded by Wildland Consultants during this survey, 2009)

Corokia buddleioides korokio

Corokia buddleioides is a much branched shrub up to 4m tall. It occurs in lowland to montane forest and forest margins from North Cape to East Cape and Rotorua (Poole & Adams 1990). In Manaia ED, it is known from Mt Lion in Bream Head Scenic Reserve and Surounds (Q07/074) (1999, AK 300278).

Corokia cotoneaster korokio

This divaricating shrub is found throughout New Zealand and on the Three Kings Islands. It occurs in lowland and montane shrubland and scrub, especially in drier rocky places (Wilson & Galloway 1993). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1999, AK 292396) and Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046).

Cyathea cunninghamii puniu, gully tree fern

This indigenous tree fern is of local distribution in the North and South Islands, occurring usually in damp gullies or near river banks (Brownsey & Smith-Dodsworth 2000). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

Dracophyllum sinclairii

This species is endemic to the North Island where it occurs from Te Paki south to Kawhia Harbour in the west and East Cape in the east (NZPCN 2009). In Manaia ED, this species has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (SSBI Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074), (2007, SSBI Q07/R07/H046).

Einadia triandra pigweed

This endemic herb is found on the New Zealand mainland, the Three Kings Islands, Stewart Island, and the Chatham Islands (NZPCN 2009). It has been recorded from three localities in Manaia ED: Ocean Beach

Recreation Reserve and Surrounds (Q07/075) (1997, AK 233425), Mauitahi Island (Q07/080) (1990-1991, SSBI Q07/R07/H079), Guano Island (Q07/080) (1990, SSBI Q07/R07/H080), and Peach Cove Stack A (Q07/173) (1992, SSBI Q07/R07/H126).

Epacris pauciflora

An endemic, flowering shrub found in the North Island and South Island from Te Paki to Charleston (NZPCN 2009). This species was recorded from McDonald Coastal Shrubland (Q07/068) (recorded in 2009 by Wildland Consultants during this survey).

Euchiton involucratus

An annual to biennial herb that is distributed throughout forests in New Zealand. It is occasionally found in open ground (Allan 1961). In Manaia ED, this species has only been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

Fuchsia excorticata kotukutuku

The largest member of the *Fuchsia* genus, kotukutuku is common throughout much of New Zealand as far south as the Auckland Islands, but is uncommon in Northland. It grows from sea level up to about 1000 m asl, particularly alongside creeks and rivers. The species is highly palatable to browsing mammals. In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Geranium solanderi

This indigenous perennial herb occurs in the North Island, South Island, Chatham Islands, and many northern offshore islands. It is found in coastal to montane areas, and was formerly widespread in short tussock grasslands, on lava fields, clay pans and on rocky coastal headlands (NZPCN 2009). In Manaia ED, *Geranium solanderi* has been recorded from Motukaroro Island (Q07/071) (1991, SSBI Q07/R07/H070).

Grammitis billardierei

A widespread, indigenous fern with erect to short-creeping rhizomes. It commonly occurs as a low epiphyte, on rocks or occasionally on the ground, in lowland forest to alpine scrub (Brownsey & Smith-Dodsworth 2000). *Grammitis billardeirei* has been recorded in Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042).

Grammitis ciliata

An endemic fern with erect to short-creeping rhizomes and hairy stipes. It is usually found on clay banks, damp earth or rock in lowland to montane forest (Brownsey & Smith-Dodsworth 2000). *Grammitis ciliata* has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042).

Hebe ligustrifolia (includes *H.* "Whangarei")

Hebe ligustrifolia is endemic to Northland and *Hebe* "Whangarei" represents the southern part of this variable species. *Hebe* "Whangarei" occupies open scrub and forest margins from about the Bay of Islands to Manaia ED where it is common in Munro Bay Coastal Bush (Q07/067) (A. Townsend, DOC, pers. comm. 2010), Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042), Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046), and Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland pers. comm.)

Hebe macrocarpa var. *latisepala*

An endemic shrub that occurs on Mt Manaia and Bream Head in Northland, Great Barrier Island, Little Barrier Island, Coromandel Pensinsula (Te Moehau to Kauaeranga Valley), and Kohukohunui (Hunua Ranges). It inhabits coastal forest and shrubland (Eagle 2008).

Hebe macrocarpa var. *macrocarpa*

This subspecies is endemic to the northern North Island, but is not common in Northland. In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, Q07/R07/H042) where it is an uncommon component of shrublands and the forest understorey on higher ridges, and Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, Q07/R07/H046).

Hebe parviflora

Commonly known as tree hebe, *Hebe parviflora* grows in lowland to mountain sites from near Russell in Northland to Marlborough in the South Island. It is a tall shrub to small tree up to 7.5m tall, usually with several trunks (Dawson & Lucas 2000). In Northland, *H. parviflora* is known from Bream Head Scenic Reserve and Surrounds (Q07/074) (2008, SSBI Q07/R07/H046) and there is a record from near Russell[8] (in the Whangaruru ED).

Helichrysum lanceolatum

This endemic shrub is typically found in coastal and lowland shrublands throughout the North Island and South Island (Allan 1961). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Hydrocotyle microphylla

This species of creeping herb is locally distributed throughout the North, South, and Stewart Islands. It occurs in coastal to lowland open places on damp ground (Allan 1961). In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

8 Bayley & Kellow (2006).

Hymenophyllum lyalli

This small species of filmy fern is usually epiphytic on tree fern trunks or at the base of other trunks, more rarely on rock or mossy banks (Brownsey & Smith-Dodsworth 2000). It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042).

Hymenophyllum multifidum

An endemic fern that is common throughout New Zealand in lowland forest to alpine shrubland. It occurs on the ground, on rock or as an epiphyte, favouring damp areas (Brownsey & Smith-Dodsworth 2000). In Manaia ED, this species is only known from Manaia Ridge Scenic Reserve (Q07/069) (A. Townsend, DOC, pers. comm.).

Leionema nudum **mairehau**

This small, endemic shrub is confined to the North Island where it is locally distributed from Te Paki south to Kawhia and the northern Kaimai Range (NZPCN 2009). In Manaia ED, it is a frequent component of shrublands and the forest understorey on higher ridges at Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993, reconfirmed in 2009 by Wildland Consultants during this survey) and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2007, SSBI Q07/R07/H042).

Leptostigma setulosa

This creeping herb is endemic to the New Zealand mainland and Stewart Island, but is often absent from large areas. It can be locally common (NZPCN 2009). In Manaia ED, this species has only been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Libertia grandiflora **mikoikoi**

Endemic to North Island, occurring in coastal to montane areas where it favours open, lowland forest remnants, forest margins, steep slopes, ridgelines, bluffs, cliffs, stream banks, and river terraces (NZPCN 2009). *Libertia grandiflora* has been recorded from bluffs near Summit Lookout and along the ridge towards Peach Cove Saddle in Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046) and previously from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1994, AK 240211).

Linum monogynum **rauhuia**

A perennial herb or sub-shrub that occurs on rocky places and duneland in coastal to inland areas (Allan 1961). In Manaia ED, rauhuia has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993).

Lophomyrtus obcordata **rohutu**

This endemic shrub occurs in coastal to lowland forests throughout New Zealand from Kaitaia (35° S) southwards, but is very local in Northland. In Manaia ED, there is an historical record from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1957, WELT SP64915) and a more

recent record from Bream Head Scenic Reserve and Surrounds (Q07/074) (1980, AK 157361).

Loxsoma cunninghamii

This uncommon fern is found only in lowland forests from Kaitaia to Thames. The record from McDonald's Coastal Shrubland (Q07/068) (recorded by Wildland Consultants during this survey, 2009) is the first since the 1930s in the Whangarei Heads area.

Luzula banksiana var. *banksiana*

This endemic rush is found throughout much of mainland New Zealand. It reaches its northern limit at Bream Head Scenic Reserve and Surrounds (Q07/074) (2004, AK 286203; reconfirmed in 2007, SSBI Q07/R07/H046).

Melicytus novae-zelandiae coastal mahoe

A stout, endemic shrub that is found mainly on coastal islands in the north of the North Island (Allan 1961). In Manaia ED, coastal mahoe was recorded from Mauitaha Island in the Bream Islands Nature Reserve (Q07/080) (1990-1991, SSBI Q07/R07/H079) (recconfirmed in May 2010, W. Holland, DOC, pers. comm.) and Guano Island (part of Q07/080) (recorded in May 2010, W. Holland, DOC, pers. comm.).

Metrosideros carminea akakura, carmine rata

This endemic climbing rata with carmine-coloured flowers is distributed from Te Paki south to Taranaki in the west and Mahia Peninsula in the east (NZPCN 2009). It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded by Wildland Consultants during this survey, 2009).

Metrosideros robusta northern rata

This distinctive tall tree, which can begin life as an epiphyte or as a terrestrial plant, was once widespread from Te Paki south to Wellington, but it is now uncommon over large parts of this area mainly due to defoliation by possums, which causes tree mortality. In Manaia ED, it has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (recorded during this survey), Taurikura Ridge Bush (Q07/073) (recorded during this PNAP survey), and Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, SSBI Q07/R07/H038).

Myoporum laetum ngaio

This coastal tree is found throughout New Zealand as far south as Dunedin (Allan 1961) but is uncommon in Northland. In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, AK 298397) and Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1997, SSBI Q07/R07/H041).

Nestegis apetala coastal maire

Coastal maire is a shrub or small tree up to 6 m tall with spreading

or sometimes twisted branches, which is found on cliffs and in coastal forest and shrubland. Its national distribution is limited to the Whangarei Heads, Cape Brett, and islands off the east coast of North Auckland and Coromandel Peninsula (Poole & Adams 1994). In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993) and reconfirmed in 2009 (W. Holland, DOC, pers. comm.).

Nestegis cunninghamii black maire

Black maire is scattered throughout lowland forests in the North Island and the northern South Island, but is very uncommon in Northland. Its dark green leaves are long and broadly lanceolate, and its bark is rough and fissured. Within Manaia ED, it is known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993), Bream Head Scenic Reserve and Surrounds (Q07/074) (AK 255812), and Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, SSBI Q07/R07/H038).

Nestegis montana

Nestegis montana occurs in forest throughout the North Island and has a local distribution in the South Island. In Manaia ED, it is known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

Olearia albida

This small coastal tree occurs locally from Te Paki ED to Tokomaru Bay, East Cape (Salmon 1980). It is generally larger and more common than *Olearia angulata* (Naturally Uncommon), which occurs in similar habitats. It has been recorded from Mauitaha Island (part of Q07/080) (1982, AK 159415), the coastal margin in Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, AK 282041), and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2007, SSBI Q07/R07/H042)

Ophioglossum coriaceum

This small fern is widely distributed on the New Zealand mainland, and is also present on the Chatham Islands, Kermadecs, and Stewart Island (Brownsey & Smith-Dodsworth 2000). It was recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Young 2007).

Oxalis magellanica

Oxalis magellanica is an indigenous herb found throughout New Zealand and also Australia and parts of South America. It occurs in coastal to montane habitats, where it is mostly found in indigenous forested and riparian areas. It prefers semi-shaded areas, but can be found in full-sun if permanently moist (NZPCN 2010). This species was recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) in September 2009 during this survey.

Passiflora tetrandra kohia

This endemic liane grows to *c.*10 m tall and climbs by means of tendrils (modified branches rising from leaf axils). It occurs in lowland forest in the North Island and South Island. In Manaia ED, it has only been recorded

from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993) and Taurikura Ridge Bush (Q07/073) (2001, SSBI Q07/R07/H049).

Pennantia corymbosa kaikomako

Kaikomako is widespread throughout lowland New Zealand, but is uncommon in Northland due to habitat loss. This small, slender tree has a divaricating juvenile stage and grows up to 10 m tall. The only record of kaikomako in Manaia ED is from from Taurikura Ridge Bush (Q07/073) (W. Holland, DOC, pers. comm.).

Phormium cookianum subsp. *hookeri* whaririki

Whaririki is smaller than harakeke (*Phormium tenax*) and is characterised by its drooping and twisted capsules. Found throughout the South Island and locally in the North Island, it is uncommon in Northland, occurring at higher altitudes. In Manaia ED, it is known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2008, SSBI Q07/R07/H042), Bream Head Scenic Reserve and Surrounds (Q07/074) (2007, SSBI Q07/R07/H046) and Mt Aubrey Coastal Forest and Shrubland (Q07/070) (2001, SSBI Q07/R07/H043).

Pouteria costata tawapou

Tawapou is a coastal, shiny-leaved tree (up to 20 m tall) restricted to the north of the North Island and adjacent islets (Allan 1961). As a result of seed and seedling predation by rats and other herbivores, these trees are becoming increasingly uncommon on the Northland mainland. In Manaia ED, it is present at Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland, DOC, pers. comm. 2010) and Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded during this survey, 2009), particularly around Peach Cove.

Pseuodowintera axillaris horopito

This erect shrub or tree (up to 8 m) occurs in the North and South Islands in lowland and lower montane forests (Allan 1961), but is uncommon in Northland. In Manaia ED, it was recorded from Bream Head Scenic Reserve and Surrounds (Q07/074), near the summit of Mt Lion (Matariki) (2007, AK 301842).

Rubus schmidelioides var. *schmidelioides* bush lawyer

A liane with stout stems to 10m or more, sometimes forming a dense intertwining bush. It occurs in the North and South Islands in lowland and montane forest and shrublands (Eagle 2008). This species has been recorded from Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, SSBI Q07/R07/H038) but was possibly mis-identified (W. Holland, DOC, pers. comm.).

Rubus squarrosus bush lawyer

Relatively common south of the Manawatu (NZPCN 2009), *Rubus squarrosus* is a yellow-prickled, leafless, scrambling climber with a scattered distribution in Northland. In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) in 1980 (AK 157364) and in recent years (W. Holland, DOC, pers. comm.), and

Timperley Road Bush (Q07/073) (Pierce 2006, in SSBI Q07/R07/H090), where it is relatively common in localised areas on the lower northern face (W. Holland, DOC, pers. comm.).

Senecio biserratus

An annual to short-lived perennial herb up to 1 m tall that is often associated with dune systems, where it usually grows amongst *Muehlenbeckia complexa* (NZPCN 2010). In Manaia ED, *Senecio biserratus* was recorded during this survey in 2009 from the back dunes of Ocean Beach Recreation Reserve and Surrounds (Q07/075).

Senecio quadridentatus

Senecio quadridentatus is a short-lived, perennial herb found throughout New Zealand in coastal to subalpine habitats, where it always occupies recently disturbed ground (NZPCN 2009). In Manaia ED, there is a record of this species from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993).

Sticherus cunninghamii waekura

An endemic fern that is found throughout New Zealand but is uncommon in the east and south of the South Island. It occurs in lowland to montane areas but generally at higher altitudes in the North Island, growing on roadside banks or on the floor of open, dry forest (Brownsey & Smith-Dodsworth 2000). In Manaia ED, *Sticherus cunninghammi* is known from Manaia Ridge Scenic Reserve (Q07/069) (A. Townsend, DOC, pers. comm.).

Suaeda novae-zelandiae

A fleshy, much-branched sub-shrub that occupies salt marshes and rocky and gravelly coasts within range of high tide (Allan 1961). *Suaeda novae-zelandiae* was recorded from Kiteone Road Saltmarsh (Q07/168) (recorded by Wildland Consultants during this survey, 2009).

Tetraria capillaris

Tetraria capillaris occurs in North Island from Te Paki south to about Taranaki and Hawkes Bay, and in the South Island recorded from the Nelson area and Westland. This species usually occurs in seral vegetation within swamps, peat bogs, pakihi, gumland scrub, on sand podzols, in dune slacks or in open ground within regenerating kauri forest (NZPCN 2009). In Manaia ED, it was collected from McDonald Coastal Shrubland (Q07/068) (recorded by Wildland Consultants during this survey, 2009).

Toronia toru toru

Toru is a small tree reaching 10 m tall which is found in lowland to mountain forest and shrubland from North Cape south to East Cape and west of Taupo (Poole & Adams 1994). The genus has only this species, which is restricted to New Zealand. In Manaia ED, there are records of toru from Bream Head Scenic Reserve and Surrounds (Q07/074) (Clunie 1993) and Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, SSBI Q07/R07/H038).

Triglochin striata arrow grass

This is a small grass-like (although it is not a grass) monocotyledon, which grows on mudflats in sparse swards, often mixed with other salt meadow herbs such as makaokao and remuremu. Its main threat is competition from invasive weeds, for example saltwater paspalum. In Manaia ED, it has been recorded from Kiteone Road Saltmarsh (Q07/168) (recorded by Wildland Consultants during this survey, 2009).

Urtica ferox ongaonga

Ongaonga is a shrub reaching 3 m tall that is armed with long stinging hairs. It is found on shrubland and forest margins in the North Island and South Island (Poole & Adams 1994), however, there are very few records from Northland (W. Holland, DOC, pers. comm.). In Manaia ED, it has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (2006, AK 297659).

Zoysia minima

An endemic grass that is locally distributed throughout the North Island and South Island, but is uncommon in Northland. It occurs on sand dunes, sandy ground, and gravel from sea level to 600 asl (NZPCN 2009). In Manaia ED, it has been recorded in the foredunes at Ocean Beach Recreation Reserve and Surrounds (Q07/075) (recorded by Wildland Consultants during this survey, 2009).

Unconfirmed records

Griselinia littoralis kapuka

This shrub or tree occurs in forest throughout New Zealand where it is usually found at higher altitudes, although it is uncommon in Northland. It is highly palatable to browsing mammals. There is a record of *Griselinia littoralis* from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Clunie 1993), but it has not been vouchered and has not been recorded before or since in the ED.

3.4.6 Threatened and regionally significant plant species not recorded recently in Manaia Ecological District

Juncus holoschoenus var. *holoschoenus* (Nationally Critical $_{CD, DP, EF, SO}$)

There is one historic record of the rush *Juncus holoschoenus* from Manaia ED (from Kerr Point by Dumbleton in 1967, CHR 174857). This species is also indigenous to Australia, however, it is considered to be a species complex, with taxonomy not fully resolved. It is not clear whether this specimen (CHR 174857) is the threatened variety. Currently, *Juncus holoschoenus* var. *holoschoenus* is only known with certainty from relatively weed free sub-alpine mires and frost flats in inland Bay of Plenty, so it is unlikely that this specimen is the Nationally Critical species.

Dactylanthus taylorii **pua o te reinga, wood rose**
(Nationally Vulnerable $_{CD, PD, RF, Sp}$)

This endemic root parasite is distributed from Northland to Wairarapa, and occurs on the roots of about 30 species of indigenous broadleaved trees. The plant prefers damp but well-drained places and is often found at the head of small streams. *Dactylanthus taylorii* is threatened by habitat destruction, trampling by cattle, collectors of wood roses, and browsing animal such as possums, rats and pigs (NZPCN 2009). There is one record of this plant from Manaia ED: Mt Aubrey Coastal Forest and Shrubland (Q07/070) (1985, AK 306983), however, it is unknown if this plant still occurs at this site. Currently, there is only one extant population of *Dactylanthus taylorii* known in Northland from the Puketi/ Omahuta Forest in Puketi ED.

Epilobium pallidiflorum **swamp willowherb**
(regionally significant)

This indigenous herb inhabits swamps, marshes and river banks (Allan 1961). It is found throughout the South Island and North Island, the Chatham Islands, and Australia (NZPCN 2009). In Manaia ED, it was recorded from Urquharts Bay in 1967 (AK 128959).

3.4.7 Plant species reaching their distributional limits in Manaia ED

Luzula banksiana var. *banksiana* and *Hebe macrocarpa* var. *latisepala* reach their northern limit in Manaia ED at Bream Head Scenic Reserve and Surrounds (Q07/074), and *Pomaderris paniculosa* subsp. *novae-zelandiae* reaches its southern limit in Manaia ED at Manaia Ridge Scenic Reserve and Surrounds (Q07/069).

3.5 FAUNA

Manaia ED has 24 nationally 'Threatened' and 25 'At Risk' fauna species, including one unconfirmed record of long-tailed bat (*Chalinolobus tuberculatus*). A checklist of fauna recorded in Manaia ED is included in Appendix 7.

3.5.1 Nationally Threatened and At Risk birds

Four key features of Manaia ED make it important for birds, including many threatened species:

- Close proximity of the Hen and Chicken Islands and the Poor Knights Islands.
- Coastal breeding and feeding sites for seabirds and wetland birds.
- Nearby presence of shellbanks in Whangarei Harbour, which are important feeding grounds for many shorebird species.
- Large, significant areas of semi-contiguous forest.

Manaia ED has records of ten nationally 'Threatened' bird species (one Nationally Critical, one Nationally Endangered, eight Nationally Vulnerable) and 17 'At Risk bird species (six Declining, five Naturally Uncommon, two

Recovering, and four Relict) in Miskelly *et al.* (2008). The distributions of these species in Manaia ED are described briefly below.

THREATENED

Grey duck *Anas superciliosa superciliosa*
(Nationally Critical) Endemic[9]

The preferred habitat of grey duck includes small lakes, slow-flowing rivers, and tidal water surrounded by forest (Heather & Robertson 1996), with recent records from wetlands and streams surrounding Kauri Mountain Conservation Area and Surrounds (Q07/078) (Pierce & Kerr 2007). There is also an historical record from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1979, SSBI Q07/R07/H041).

Australasian bittern *Botaurus poiciloptilus*
(Nationally Endangered $_{Sp, TO}$) Indigenous[10]

Bittern has been recorded from three sites within Manaia ED: Kauri Mountain Wetland (Q07/081), Harambee Road Wetland (Q07/172), and Kauri Mountain Road Pond and Raupo Swamp (Q07/175) (all records from Pierce & Kerr 2007). It is also known to visit many ephemeral wetlands and streams including the southern side of Kauri Mountain Conservation Area and Surrounds (Q07/078), Robinson Road, and the slopes of the Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

Bush falcon *Falco novaeseelandiae*
(Nationally Vulnerable $_{DP, St}$) Endemic

The only confirmed record of bush falcon in Manaia ED is a bird which was killed after flying into a window at Urquharts Bay in February 2006 (N. Miller, DOC, pers. comm.). In August 2008, a bush falcon was heard near Peach Cove, Bream Head Scenic Reserve and Surrounds (Q07/074) (A. Townsend, DOC, pers. comm.).

Caspian tern *Hydroprogne caspia*
(Nationally Vulnerable $_{SO}$) Indigenous[11]

A semi-cosmopolitan species that breeds in temperate Holarctic and some tropical regions, and Australasia. In New Zealand, Caspian terns usually breed on the coast of both main islands, with Northland being the stronghold (R. Pierce, pers. comm.). Recent national declines in bird numbers can be attributed to increased human activity and planting of pine trees and marram on favoured bare sandspits (Heather & Robertson 1996) and the ongoing impacts of carnivourous mammals. In Manaia ED, Caspian terns have been recorded roosting and fishing at Taurikura Bay and Urquharts Bay (Pierce 2005) and historically from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1979, SSBI Q07/R07/H041).

9 Different subspecies are present in the south western Pacific (Heather & Robertson 1996).

10 Breeds in Australia, New Caledonia and the Loyalty Islands (Heather & Robertson 1996). The NZ populations are the healthiest of the species (R. Pierce, pers. comm.).

11 Breeds locally in temperate parts of all continents except South America (Heather & Robertson 1996).

North Island brown kiwi ***Apteryx mantelli***
(Nationally Vulnerable $_{CD, PD RF}$) Endemic

North Island brown kiwi originally occurred throughout Northland, including the Aupouri Peninsula. In the 1970s, they were found throughout most forest and shrubland areas from the Brynderwyn Range to Awanui in the Far North (Bull *et al.* 1985). However, by the early 1990s, kiwi had all but disappeared from the Brynderwyn, Mareretu, and Tangihua Ranges and most other forest remnants south of a line between Whangarei and Dargaville (Pierce *et al.* 2006). There are currently about six main geographical groupings of kiwi in Northland, and within each there are several local concentrations or clusters, including Manaia ED (Pierce *et al.* 2006). Manaia ED supports four main sites for kiwi – Bream Head Scenic Reserve and Surrounds (Q07/074), Manaia Ridge Scenic Reserve and Surrounds (Q07/069), Kauri Mountain Conservation Area and Surrounds (Q07/078), and The Nook Peninsula (part of site Q07/067), plus some linkages comprising shrubland and forest, including Taurikura Ridge Bush (Q07/073) (R. Pierce, pers. comm. 2010).

The Manaia ED includes sites which are within the Whangarei Kiwi Sanctuary. The Whangarei Heads Landcare Forum (WHLF), in conjunction with DOC, has been managing kiwi across this area for many years undertaking predator control, advocacy, kiwi releases, and monitoring. There have been 62 kiwi released in Bream Head Scenic Reserve and Surrounds (Q07/074) since 2000; 24 on Mt Manaia since 2004 (within site Q07/069); and nine birds in Taurikura Ridge Bush (Q07/073) since 2005. Over the last six years, the WHLF has also released sub-adults in the Kauri Mountain Conservation Area and Surrounds (Q07/078) and The Nook. Fifteen of those birds released are being monitored by radio transmitter. Kiwi are also present at Mt Aubrey Coastal Forest and Shrublands (Q07/070), with one monitored pair recorded breeding in 2009 by WHLF (T. Hamilton, WHLF, pers. comm.).

After initially losing kiwi to dogs, advocacy by WHLF has lead to improved dog control by locals, resulting in no transmitter-carrying birds having been killed by dogs between November 2006 and December 2009. Between October 2008 and December 2009, there have been five known deaths of kiwi which were not carrying transmitters: three by vehicles and two by dogs. Most of the kiwi call counts are trending up, with the population now estimated to be in the order of 300 birds. Chick survival is no longer monitored because of costs (T. Hamilton, WHLF, pers. comm.). There are encouraging signs of kiwi recovery based on call count results and survival of released birds. The long-term survival of kiwi throughout Manaia ED is in the hands of the community, which to date has done a good job (R. Pierce pers. comm.).

North Island kaka ***Nestor septentrionali*****s**
(Nationally Vulnerable $_{CD, PD, RF}$) Endemic

North Island kaka still occur in some mainland forest tracts from Coromandel Peninsula to the Aorangi Range in the southern Wairarapa, but they are heavily impacted by stoats and possums (Greene *et al.* 2004). They are most numerous on the larger offshore islands, e.g. Hen

and Chickens, Great Barrier, Little Barrier, Mayor and Kapiti (Heather & Robertson 2006). In Manaia ED, kaka have been recorded visiting forest remnants in Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (SSBI Q07/R07/H042), Taurikura Ridge Bush (Q07/073) (recorded during this PNAP survey, 1998), and Bream Head Scenic Reserve and Surrounds (Q07/074) (1992, SSBI Q07/R07/H046). In recent years, kaka have been present year round at Manaia ED and flock sizes have increased, notably at Bream Head Scenic Reserve and Surrounds (Q07/074), where breeding has also been suspected. The predator control undertaken by DOC and the Whangarei Heads community will be benefiting this species locally (R. Pierce, pers. comm. 2010). Whangarei Heads residents regularly hear kaka flying overhead (W. Holland, DOC, pers. comm.).

Northern New Zealand dotterel *Charadrius obscurus aquilonius* (Nationally Vulnerable $_{CD}$) Endemic

This species breeds on sandspits, at stream mouths, on beaches, shellbanks and sandbanks and among low dunes. Dotterel populations are threatened by coastal development, pine plantations and plantings of marram grass to stabilise foredunes and sandspits (Heather & Robertson 1996). In Manaia ED, this species is mostly seen at Ocean Beach Recreation Reserve and Surrounds (Q07/075) where they also breed. Two pairs were observed in September 2009 at the northern end of Proctors Beach during this survey by Wildland Consultants, although they were not seen to be nesting. Northern New Zealand dotterel is also known to visit Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al*. 2001).

Pied shag *Phalacrocorax varius varius* (Nationally Vulnerable) Indigenous

In New Zealand, pied shags have a patchy breeding distribution, mainly in warmer areas on sheltered coasts, harbours and offshore islands. Colonies are commonly in pines, pohutukawa or northern rata growing on cliffs and overhanging the sea (Heather & Robertson 1996). In Manaia ED, pied shags have been recorded from High Island (Q07/072) (1992, SSBI Q07/R07/H123), Bream Head Scenic Reserve and Surrounds (Q07/074) (1979, SSBI Q07/R07/H046), on Moturaka Island within the Bream Islands Scenic Reserve (Q07/079) (1992-94, SSBI Q07/R07/H128), on Mauitahi and Guano Islands within the Bream Islands Nature Reserve (Q07/080) (1990-1991, SSBI Q07/R07/H079), on Awaroa Island (Q07/170) (1991, Q07/R07/H078), and there is a roost site on the harbour's edge at Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland, DOC, pers. comm.). They breed at nearby Taiharuru Estuary and elsewhere in Whangarei Harbour (R. Pierce pers. comm.).

Red-billed gull *Larus novaehollandiae scopulinus* (Nationally Vulnerable) Endemic[12]

A highly gregarious species that is widespread and locally common in New Zealand, frequenting estuaries, harbours and open coastlines, parks

12 Different subspecies are present in South Africa, Australia, and the south western Pacific (Heather & Robertson 1996).

of coastal cities, and occasionally wet paddocks and sportsfields. A reduction in winter food supplies (offal and sewage discharged into the sea) is likely to have adversely affected red-billed gull numbers (Heather & Robertson 1996). Red-billed gulls have been recorded from High Island (Q07/072) (1992, SSBI Q07/R07/H123), Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded by Wildland Consultants during this survey, 2009), Ocean Beach Recreation Reserve and Surrounds (Q07/075) (recorded by Wildland Consultants during this survey, 2009), on Moturaka and Tarakanahi islands within the Bream Islands Scenic Reserve (Q07/079) (1990 and 1999, SSBI Q07/R07/H128), on Mauitaha and Guano Islands within the Bream Islands Nature Reserve (Q07/080) (1990-1991, SSBI Q07/R07/H079), Frenchman Island (Q07/171) (breeding) (1991-1992, SSBI Q07/R07/H125), and on Awaroa Island (Q07/170) (recorded by Wildland Consultants during this survey, 2009). They probably breed elsewhere in the ED (R. Pierce pers. comm.).

Reef heron *Egretta sacra sacra*
(Nationally Vulnerable $_{so, st}$) Indigenous

Reef herons are usually solitary, nesting in caves, crevices, on rock shelves, in cliff-side vegetation under clumps of flax or *Astelia*, or among the roots of pohutukawa (Heather & Robertson 1996). Nationally the species is less widespread than it used to be, most probably because of increased human disturbance on the coast (Heather & Robertson 1996). However, many birds occur on Whangarei Harbour and nearby coastlines including in the Manaia ED, where they have been recorded from several locations, including McLeod Bay, Reotahi Bay, Taurikura Bay, Urquharts Bay, Busby Head (part of Bream Head Scenic Reserve and Surrounds, Q07/074), Frenchman Island (Pierce 2005), and Moturaka Island (Q07/089) (1991, SSBI Q07/R07/H070).

AT RISK

New Zealand pied oystercatcher *Haematopus finschi*
(Declining) Endemic[13]

Pied oystercatchers breed inland in the South island, mainly east of the Southern Alps, on braided riverbeds, farmland, fringes of lakes and in subalpine bogs. Over 1,000 birds use Whangarei Harbour as a wintering site (Heather & Robertson 1996). In Manaia ED, pied oystercatchers are known to roost and feed at several beaches including Mcleod Bay, Urquhart Bay, Ocean Beach Recreation Reserve and Surrounds (Q07/075), and Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

New Zealand pipit *Anthus novaeseelandiae* (Declining)

The species has a wide distribution with many subspecies, four of which are only in New Zealand, where they favour open habitats such as beaches, road verges and rough pasture. In Manaia ED, pipits have been

13 The 'Declining' status of this species is incongruous to the fact that bird numbers have increased dramatically since the late 1940s (R. Pierce, pers. comm.).

recorded from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (W. Holland, DOC, pers. comm.), Timperley Road Bush (Q07/077) (Pierce 2006, in SSBI Q07/R07/H090), Kauri Mountain Conservation Area and Surrounds (Q07/078) (2001, SSBI Q07/R07/H038), and Bream Head Scenic Reserve and Surrounds (Q07/074) near Smugglers Bay (W. Holland, DOC, pers. comm. 2009).

Northern little blue penguin *Eudyptula minor iredalei* (Declining $_{DP, EF}$) Endemic[14]

The northern little blue penguin is one of up to six subspecies of blue penguin which occurs around coastal New Zealand and southern Australia. Populations undergo severe crashes, and many dead birds are washed ashore in some years, probably as a result of food shortage or biotoxins (Heather & Robertson 1996). Islands off eastern Northland are one of the main breeding areas because they are relatively free of dogs, possums, mustelids, and cats. Nesting occurs at Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce 2005) and on Mauitahi Island within the Bream Islands Nature Reserve (Q07/080) (1990-1991, SSBI Q07/R07/H079). Birds have also been recorded ashore at Kauri Mountain Conservation Area and Surrounds (Q07/078), Ocean Beach Recreation Reserve and Surrounds (Q07/075), and The Nook (included in Q07/067). Predator and dog control may be benefitting this species locally (R. Pierce pers. comm.). One dead bird was recorded from Kiteone Saltmarsh (Q07/168) in September 2009 during this survey.

North Island fernbird *Bowdleria punctata vealeae* (Declining $_{RR, St}$) Endemic

Fernbird numbers have declined dramatically from historic levels with the loss of wetland and fernland through agricultural development, and the introduction of mammalian predators (Heather & Robertson 1996). North Island fernbird has been recorded from three locations in Manaia ED: McDonald Coastal Shrubland (Q07/068) (1994, SSBI Q07/R07/H091), Kerr Road Swamp (Q07/076) (L. Forester, NRC, pers. comm. 2009), and an historical record from Kauri Mountain Wetland (Q07/081) (1978, SSBI Q07/R07/H037).

Pied stilt *Himantopus himantopus leucocephalus* (Declining $_{SO}$) Indigenous

Pied stilts are probably a relatively recent colonist of New Zealand. They are coastal breeders in both main islands and birds breeding in the north are usually sedentary (Heather & Robertson 1996). In Manaia ED, this species is known to visit and breed at ephemeral wetlands and permanent throughout, e.g. northern Ocean Beach, Kiteone Road, Robinson Road and flooded pasture adjoining Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

14 Different subspecies are present in other parts of New Zealand, and in Australia (Heather & Robertson 1996).

White-fronted tern *Sterna striata striata*

(Declining $_{DP}$) Endemic

A common species in Whangarei Harbour and adjacent coastline. A survey in March 2005 recorded over 1,200 white-fronted terns throughout Whangarei Harbour, with 460 birds roosting on jetties and feeding at Parua Bay and 520 birds in the Marsden Point-Busby Head area. Smaller groups were observed roosting at other sites, including the beaches at McLeod Bay, Urquharts Bay, and near One Tree Point (Pierce 2005). Numbers of this species have been greatly reduced over the past 20 years (Pierce 2005). White-fronted tern frequently breeds on Frenchman Island (Q07/171) (R. Pierce, pers. comm.), and six individuals were recorded from Awaroa Island (Q07/170) in 1991 (SSBI Q07/R07/H078).

Banded rail *Rallus philippensis*

(Naturally Uncommon $_{DP}$) Indigenous [15]

In New Zealand, banded rail was formerly common throughout the main islands but declined by the 1930s due to habitat loss and the introduction of mammalian predators. They are now mainly found in mangrove forests, saltmarshes, and rushland in Northland (including the Three Kings, Poor Knights, and Great Barrier Islands), Coromandel Peninsula, and Bay of Plenty (Heather & Robertson 1996). The nearest stronghold to Maniaia ED is in the Taiharuru estuary (Pierce & Kerr 2007) in neighbouring Whangaruru ED, while in Manaia ED there have only been occasional reports from saltmarsh habitat at Ocean Beach Recreation Reserve and Surrounds (Q07/075) (R. Pierce pers. comm.).

Black shag *Phalacrocorax carbo novaehollandiae*

(Naturally Uncommon $_{SO, sp}$) Indigenous [16]

Black shags occur throughout the main islands and Chatham Islands, where they are found in sheltered coastal waters, estuaries, harbours, rivers, streams, dams, and lakes up to the subalpine zone. They are often caught in fishing nets and occasionally on hooked lines (Heather & Robertson 1996). In Manaia ED, this species is known to visit small streams and coastal waters, including Whangarei Harbour and off Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

Little shag *Phalacrocorax melanoleucos*

(Naturally Uncommon $_{Inc}$) Indigenous[17]

Little shags are found in sheltered coastal waters, estuaries, harbours, rivers, dams and lakes up to the subalpine zone (Heather & Robertson 1996). In Manaia ED, two little shags have been recorded from High Island (Q07/072) (1992, SSBI Q07/R07/H123) and they are also known to utilise the largest streams and ponds throughout the ED (R. Pierce pers. comm.).

15 Breeds in Indonesia, Phillipines, Melanesia, Australasia, Niue, and western Polynesia (Heather & Robertson 1996).

16 Subspecies also breeds in Australia and New Guinea (Heather & Robertson 1996).

17 Breeds in Australasia east of Borneo and Java, and in New Caledonia (Heather & Robertson 1996).

Little black shag *Phalacrocorax sulcirostris* (Naturally Uncommon $_{RR, SO}$) Indigenous[18]

Little black shags are a regular visitor to fresh and salt water habitats around the ED with the nearest known colony being a mixed (three) species shag colony at Taiharuru Estuary in Whangaruru ED (Pierce & Kerr 2007). In Manaia ED, 22 birds were recorded from High Island (Q07/072) in 1992 (SSBI Q07/R07/H123).

Long-tailed cuckoo *Eudynamys taitensis* (Naturally Uncommon DP) Migrant

Birds pass through Manaia ED on their migration north to the tropical Pacific. A few birds have been known to overwinter in the far north of New Zealand, but breeding does not occur here as the area is beyond the range of whitehead (*Mohoua albicilla*), its key host species in the North Island (Heather & Robertson 1996). Long-tailed cuckoo has only ever been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) in Manaia ED (R. Pierce pers. comm.), but the neighbouring Mt Tiger Ridge in Whangarei ED is part of a regular flyway during the northern migration in February-March. Therefore, Manaia Ridge Scenic Reserve and Surrounds (Q07/069) is also likely to be part of this flyway (R. Pierce, pers. comm.).

Pycroft's petrel *Pterodroma pycroftii* (Recovering) Endemic

This species breeds only in New Zealand, on islands off the northeastern coast of the North Island. Birds nest in small, localised colonies, interspersed with other burrowing petrels (Heather & Robertson 1996). Single dead birds have been recorded from Kauri Mountain Conservation Area and Surrounds (Q07/078) and Peach Cove within Bream Head Scenic Reserve and Surrounds (Q07/074) (R. Pierce pers. comm.).

Variable oystercatcher *Haematopus unicolor* (Recovering) Endemic

Variable oystercatchers inhabit the coasts of the North Island, South Island and offshore islands, but not the outlying islands. Northland is a stronghold for this species (Heather & Robertson 1996) and it has been recorded from five sites within Manaia ED: High Island (Q07/072) (1992, SSBI Q07/R07/H123), Moturaka Island within the Bream Islands Scenic Reserve (Q07/079) where they were recorded breeding with chicks present in January 2010 (W. Holland, DOC, pers. comm.), Mauitahi Island within the Bream Islands Nature Reserve (Q07/080) (SSBI Q07/R07/H079), and Bream Head Scenic Reserve and Surrounds (Q07/074), including nesting and roosting at Smugglers Bay and Peach Cove (Pierce *et al.* 2001). Two breeding pairs raised chicks at Smugglers Bay in the summer of 2009/10 (W. Holland, DOC, pers. comm.). Also roosts and feeds at McLeod Bay and Urquharts Bay (R. Pierce pers. comm.).

18 Breeds in Australasia east of Borneo and Java, and in New Caledonia (Heather & Robertson 1996).

Cook's petrel *Pterodroma cookii* (Relict $_{\text{Inc RR}}$) Endemic

This species breeds only in New Zealand, on Little Barrier, Great Barrier and Codfish Islands, and is the commonest small gadfly petrel beach-wrecked on the NZ coast. Cook's petrels nest in large colonies, often interspersed with black petrels in the north (Heather & Robertson 1996). A Cook's petrel skull was recorded from Peach Cove within Bream Head Scenic Reserve and Surrounds (Q07/074) (N.Miller, DOC, pers. comm. 2008).

Fluttering shearwater *Puffinus gavia* (Relict $_{\text{RR}}$) Endemic

This species breeds on islands and islets along the northeastern coast of the North Island from the Three Kings Islands to islands near Gisborne, and on islands in the Marlborough Sounds. Fluttering shearwaters are common only on islands free of cats and rats (Heather & Robertson 1996). In Manaia ED, breeding pairs have been recorded from Mauitaha Island (1990-1991, SSBI Q07/R07/H079) and Guano Island (Q07/080) (1990, SSBI Q07/R07/H080), and one predated bird was found on Moturaka Island (Q07/079) (1992, SSBI Q07/R07/H128).

Red-crowned kakariki *Cyanoramphus novaezelandiae novaezelandiae* (Relict) Endemic

In Northland, red-crowned kakariki are mainly restricted to pest-free offshore islands (Hen and Chickens, Poor Knights and Three Kings Islands), but they do also visit mainland forest along the eastern coast and inland. This species is particularly susceptible to predators such as stoats, cats and ship rats because they often feed on the ground and nest in holes close to the ground (Heather & Robertson 1996). The species is known from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (R. Pierce, pers. comm.), Bream Head Scenic Reserve and Surrounds (Q07/074) (W. Holland, DOC, pers. comm.), and Mauitaha Island within the Bream Islands Nature Reserve (Q07/080) (recorded in May 1977, SSBI Q07/R07/H079). A pair was recently recorded from forest remnants and gardens at Urquharts Bay (N. Miller, DOC, pers. comm.) on the boundary of Bream Head Scenic Reserve (Q07/074).

Spotless crake *Porzana tabuensis plumbea* (Relict $_{\text{SO}}$) Indigenous[19]

Spotless crake has a restricted distribution and, on the mainland, is largely confined to dense reed beds. It has recently been recorded from Harambee Road Swamp (Q07/172) (Pierce & Kerr 2007), Kauri Mountain Conservation Area and Surrounds (Q07/078) (L. Forester, NRC, pers. comm. 2009), and there is an historical record from Kauri Mountain Wetland (Q07/081) (1978, SSBI Q07/R07/H037). It has also been recorded at a stream fringing the Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

19 Also in Australia (Heather & Robertson 1996).

3.5.2 Regionally significant birds

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

Grey-faced petrel *Pterodroma macroptera gouldi* Endemic

In 1991, two individuals of grey-faced petrel were recorded in Manaia ED on Mauitahi Island, within the Bream Islands Nature Reserve (Q07/080) (SSBI Q07/R07/H079). Petrel burrows (probably grey-faced) were recorded at Bream Head Scenic Reserve and Surrounds (Q07/074) in summer 2007, near 'Cabbage Tree Flat'[20], although no birds were seen (N. Miller, DOC, pers. comm.). A grey-faced petrel was heard circling above Peach Cove in Autumn 2003 (A. Booth, DOC, pers. comm.).

Kukupa *Hemiphaga novaeseelandiae* Endemic

The survival and productivity of kukupa can be adversely affected by illegal hunting of birds, competition for fruit from possums, and the predation of eggs and chicks by introduced predators (Heather & Robertson 1996). In Manaia ED, kukupa are known from throughout the ED, with records from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1997, SSBI Q07/R07/H042), Mt Aubrey Coastal Forest and Shrubland (Q07/070) (W. Holland, DOC, pers. comm.), Taurikura Ridge Bush (Q07/073) (2006, SSBI Q07/R07/H044), Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded during this survey by Wildland Consultants, 2009), Timperley Road Bush (Q07/077) (Pierce 2006, in SSBI Q07/R07/H090), and Kauri Mountain Conservation Area and Surrounds (Q07/078) (recorded during this survey, 1998), together with many suburban backyards.

North Island bellbird *Anthornis melanura melanura* Endemic

Bellbirds inhabit forest and scrub areas on the North Island, South Island, Stewart Island, Auckland Islands, and many offshore islands. On the mainland north of the Waikato, they became extinct in 1860s (Heather & Robertson 1996) but a population has recently re-established in the predator-free Tawharanui Open Sanctuary (mid-2000s). In Manaia ED, NI bellbirds are regular visitors from the Hen and Chicken Islands and they have been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (W. Holland, pers. comm. 2010), Taurikura Ridge Bush (Q07/073) (1996, SSBI Q07/R07/H044), and Bream Head Scenic Reserve and Surrounds (Q07/074) (1992, SSBI Q07/R07/H046). They are also known to frequent many backyards in McLeod Bay, Urquharts Bay, and Ocean Beach settlement. NI bellbird is one species that is benefiting from pest control at Bream Head Scenic Reserve and Surrounds (Q07/074), where breeding has been recently confirmed (N. Miller, DOC, pers. comm.). A nest with three fledglings was also discovered on private property in the foot hills of Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (recorded in February 2010) and bellbirds are often seen in suburban gardens in spring (W. Holland, DOC, pers. comm.).

20 Not a formal place name.

North Island tomtit *Petroica macrocephala toitoi* Endemic

North Island tomtit numbers declined throughout the North Island after historic lowland forest clearance and the introduction of predatory mammals, but the subspecies was able to adapt in many areas and continued to persist in forest remnants (Heather & Robertson 2000). In Manaia ED, NI tomtit are now resident in Bream Head Scenic Reserve and Surrounds (Q07/074) (1994, SSBI Q07/R07/H046) where they are regularly seen (W. Holland, DOC, pers. comm.), Kauri Mountain Conservation Area and Surrounds (Q07/078), and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (R. Pierce pers. comm.).

Northern diving petrel *Pelecanoides urinatrix urinatrix* Indigenous[21]

Northern diving petrel is a circumpolar species, which has been recorded from Mauitahi Island within the Bream Islands Nature Reserve (Q07/080) (1990-1991, SSBI Q07/R07/H079) in Manaia ED. It is not known if the species currently breeds on Guano Island (included in Q07/080).

3.5.3 Nationally Threatened bat species

UNCONFIRMED RECORD

Long-tailed bat *Chalinolobus tuberculatus* (Nationally Vulnerable)

This bat species is found throughout the country and roosts in a diverse range of habitat such as mature pine stands and indigenous shrubland and wetlands (Moore 2001). There is an unconfirmed record of long-tailed bat from Peach Cove in the early 1990s at Bream Head Scenic Reserve and Surrounds (Q07/074) (SSBI Q07/R07/H046). Bats have also been sighted by a resident at Ocean Beach on two occasions during 2008 (I. Pritchard, pers. comm.). DOC will be undertaking follow-up surveys to determine bat species present at Bream Head (W. Holland, DOC, pers. comm.).

3.5.4 Nationally Threatened and At Risk land snail species

The distributions of land snail species in Manaia Ecological District are described by Brook (2002). A total of 12 indigenous species is known (Appendix 7), including the flax snail *Placostylus hongii*, which reaches its southern limit at Bream Head. The numbers preceeded by 'NMNZ M.' refer to voucher specimens in the Museum of New Zealand Te Papa Tongarewa.

Six indigenous land snail taxa present in Manaia Ecological District are considered to be nationally 'Threatened' or 'At Risk'. The majority of these species are only known from forest remnants, but one unnamed species (Punctidae sp. 223 NMNZ M.151458) is restricted to duneland and prostrate shrubland vegetation at just one site (Smugglers Bay) in Manaia ED (Brook 2002). Two species of land snail are endemic to Manaia ED.

The main existing threats to indigenous land snail species in Manaia Ecological District are predation, especially by rodents and hedgehogs,

21 Also breeds on islands off Tasmania and Bass Strait (Heather & Robertson 1996).

loss of habitat through fires and vegetation clearance, and modification of habitats as a result of browsing and trampling by introduced mammals (i.e. rabbits, cattle, horses, pigs, and possums). However, Argentine ants could have a very serious impact on populations of land snails if they were to get established at new sites (A. Booth, DOC, pers. comm.). Land snail populations in some coastal sites are also threatened by habitat modification resulting from smothering of indigenous shrubland vegetation by the introduced invasive kikuyu.

Threatened and uncommon indigenous land snail taxa in Manaia ED are listed below, based on information from Brook (2002) or as otherwise stated. The categories of threat follow the New Zealand classification system of Molloy *et al*. (2002).

ACUTELY THREATENED

Punctidae sp. 223 (NMNZ M.151458) (Nationally Critical)

This undescribed snail was formerly widely distributed on coastal dunefields in eastern Northland between Cape Reinga and Bream Tail. Its decline has presumably been caused by anthropic modification and clearance of indigenous vegetation on dunefields. It is presently known from two small extant populations only, including one in Manaia ED at Smugglers Bay within Bream Head Scenic Reserve and Surrounds (Q07/074) (Brook 2002), and the other occurring in Te Paki ED. *Phrixgnathus* "Smugglers" in McGuinness (2001) and Punctidae sp. 6 in Hitchmough *et al.* (2007) are synonyms.

CHRONICALLY THREATENED

Schizoglossa worthyae (Serious Decline)

In Manaia ED, the carnivorous semi-slug *Schizoglossa worthyae* has an allopatric distribution with respect to *Amborhytida dunniae*, being present in indigenous forest in the Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (Brook 2002, 2004) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Brook 2004).

Amborhytida dunniae (Gradual Decline)

In Manaia ED, *Amborhytida dunniae* is present in indigenous forest at Taurikura Ridge Bush (Q07/073) (two shells found in 2006, Q07/R07/H044) and on Kauri Mountain Conservation Area and Surrounds (Q07/078), but is apparently absent from other indigenous forest tracts between southeastern Parua Bay and Bream Head (F. Brook pers. comm.).

AT RISK

Therasiella "aff. *elevata*" (NMNZ M.96613) (Sparse)

This land snail species has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (NMNZ M.96613).

Liarea turriculata "Manaia" (Range Restricted)

This taxon is endemic to Manaia ED. It has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (1993, SSBI Q07/R07/H042), Munro Bay Coastal Bush (Q07/067), Mt Aubrey Coastal Forest and Shrubland (Q07/070), Taurikura Ridge Bush (Q07/073), and Bream Head Scenic Reserve and Surrounds (Q07/074) (F. Brook pers. comm.).

Placostylis hongii (Range Restricted)

A small extant population of this species is present in coastal broadleaved forest near Peach Cove, Bream Head Scenic Reserve and Surrounds (Q07/074) (Penniket 1981; Parrish *et al.* 1995; Brook and McArdle 1999). Powell (1938) reported the former existence of populations, now extinct, at Reotahi and Parua Bay. The population is being managed through rodent control and is now recovering (N. Miller, DOC, pers. comm.).

DATA DEFICIENT

Liarea egea "Bream Head" (NMNZ M.158257)

This undescribed snail species is known only from Bream Head Scenic Reserve and Surrounds (Q07/074).

3.5.5 Other Nationally Threatened and At Risk terrestrial invertebrates

This is not an exhaustive list of important invertebrates for Manaia ED, because a search of all national collections was not undertaken.

CHRONICALLY THREATENED

Black katipo spider *Latrodectus atritus* (Serious Decline)

Black katipo was recorded at Ocean Beach Recreation Reserve and Surrounds (Q07/075) in 2000 and 2008 (Griffiths 2000; A. Booth, DOC, pers. comm.).

AT RISK

Menimus oblongus (Sparse) (Broun 1880)

This species of darkling beetle has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/069), although it is not known if there are more recent records.

Peripatus sp. (Range Restricted)

Peripatus is a cryptic invertebrate which inhabits leaf litter and rotting logs. It has been recorded from Bream Head Scenic Reserve and Surrounds (Q07/074) (1992, SSBI Q07/R07/H046).

DATA DEFICIENT

The beetles *Menimus obscurus* and *M. thoracicus* (Broun 1880) are historically known from Manaia ED, while the weevil species *Unas piceus* has been recorded from Manaia Ridge Scenic Reserve and Surrounds (Q07/074) (Broun 1909).

3.5.6 Nationally Threatened and At Risk herpetofauna

CHRONICALLY THREATENED

Ornate skink *Cyclodina ornata* (Gradual Decline $_{DP}$) Endemic

This widespread species is endemic to the North Island and offshore islands. It has become increasingly uncommon on the mainland, although its decline there may be partly offset by increases on islands (DOC unpublished data 2007). There is an historical record of ornate skink from the northern end of Ocean Beach Recreation Reserve and Surrounds (Q07/075) (1979, SSBI Q07/R07/H041) and more recent records from Mauitaha Island (Q07/080) (recorded in 1993), Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded in 2001), and The Nook, which is included in Munro Bay Coastal Bush (Q07/067) (recorded in 2001) (DOC Bioweb 2009).

Pacific gecko *Hoplodactylus pacificus*
(Gradual Decline $_{HI}$) Endemic

Bioweb (2009) records come from Guano Island (recorded in 1968) (Q07/080) and Bream Head Scenic Reserve and Surrounds (Q07/074) (recorded in 2001). In 1991, many individuals were recorded on Mauitaha Island (Q07/080) (SSBI Q07/R07/H079).

Auckland green gecko *Naultinus elegans elegans*
(Gradual Decline $_{HI}$) Endemic

An arboreal species endemic to Auckland and Northland (north to approximately Hokianga). It inhabits forest and shrubland, including kanuka/manuka shrubland. There are two historical records (both 1980) of green gecko from kanuka/manuka shrubland in McLeod Bay, on the west coast of Manaia ED (DOC Bioweb 2009). The species has also been recorded from Mt Aubrey Coastal Forest and Shrubland (Q07/070) (recorded in 2004, W. Holland, DOC, pers. comm.), the northern end of Mt Manaia (within Q07/069) (recorded in 2005, W. Holland, DOC, pers. comm.), and Bream Head Scenic Reserve and Surrounds (Q07/074) (DOC Bioweb 2009).

AT RISK

Egg-laying skink *Oligosoma suteri* (Range Restricted $_{HI}$) Endemic

This species, also known as Suter's skink, is New Zealand's only indigenous egg-laying lizard. It is widespread on islands off the northeastern coast of the North Island and also occurs at a few mainland sites (Gill & Whitaker 1996). In Manaia ED, there is one historical record (1977) from Mauitaha Island (Q07/080) (DOC Bioweb 2009).

MacGregor's skink *Cyclodina macgregori* (Range Restricted $_{RC, HI}$) Endemic

This species is only found on mammal-free offshore islands. In Manaia ED, two skinks were recorded on Mauitaha Island (Q07/080) (1990, SSBI Q07/R07/H079).

Duvaucel's gecko *Hoplodactylus duvaucelii* (Sparse $_{HI}$) Endemic

Duvaucel's gecko occurs in the North Island from Bay of Plenty north, mostly on offshore islands with very few mainland localities (Gill & Whitaker 1996). In Manaia ED, it is known only from Mauitaha Island (Q07/080) (1991, SSBI Q07/R07/H079).

3.5.7 Regionally significant herpetofauna

Forest gecko *Hoplodactylus granulatus* Endemic

This species has been recorded at Manaia Ridge Scenic Reserve and Surrounds (Q07/069) (2007, SSBI Q07/R07/H042) and Bream Head Scenic Reserve and Surrounds (Q07/074) (Pierce *et al.* 2001).

Common gecko *Hoplodactylus maculatus* Endemic

Common gecko has been recorded from four locations in Manaia ED. In 1990, it was recorded from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (DOC Bioweb 2009). In 1991, many individuals were recorded from Mauitaha Island (SSBI Q07/R07/H079), while fewer numbers were recorded from Guano Island in 1990 (DOC Bioweb 2009). It is also known from Bream Head Scenic Reserve and Surrounds (Q07/074) (2002, SSBI Q07/R07/H046) and from the settlement of Ocean Beach (recorded in 2009, N. Miller, DOC, pers. comm.).

Green turtle *Chelonia mydas* (Migrant $_{TO}$) Migrant

The green turtle is likely to be an occasional visitor to Whangarei Harbour. It has been recorded at Taurikura Bay (2003) and Urquharts Bay (2003 and 2005) (DOC Bioweb 2009). There is a migratory non-breeding population in the Kermadecs (DOC unpublished data 2007).

Leatherback turtle *Dermochelys coriacea* (Migrant$_{TO}$) Migrant

The leatherback turtle has been recorded from Smugglers Bay, Bream Head Scenic Reserve and Surrounds (Q07/074) (1996, DOC Bioweb 2009), and at various locations in Northland outside Manaia ED (Gill 1997).

OTHER

Yellow-bellied sea snake *Pelamis platurus* (Vagrant$_{DP}$)

The yellow-bellied sea snake is found in the Indian and Pacific Oceans and is a relatively regular visitor to northern New Zealand (Gill & Whitaker 1996). A dead specimen has been recorded from Ocean Beach Recreation Reserve and Surrounds (Q07/075) (2002, DOC Bioweb 2009).

3.5.8 Threatened fish species

CHRONICALLY THREATENED

Longfin eel *Anguilla dieffenbachii*
(Gradual Decline$_{HI}$) Endemic

Longfin eels are found throughout New Zealand, but are threatened by over-harvesting (especially of large females) and habitat modification. Within Manaia ED, this species has only been recorded from an unnamed stream draining from the north of Bream Head Scenic Reserve and Surrounds (Q07/074) with its outlet at Ocean Beach (NIWA 2009).

3.5.9 Regionally significant fish species

Banded kokopu *Galaxias fasciatus* Endemic

This primarily coastal species occurs in shaded streams throughout New Zealand. It has been recorded from unnamed streams within Bream Head Scenic Reserve and Surrounds (Q07/074) (2005, SSBI Q07/R07/H046) and at Urquharts Bay and McLeod Bay. It has also been recorded from Taurikura Ridge Bush (Q07/073) (1992, SSBI Q07/R07/H044), Kauri Mountain Wetland (Q07/081), and Harambee Road Wetland (Q07/172) (Pierce & Kerr 2007). Although this species is currently not threatened, it is listed as 'locally in decline' (DOC unpublished data 2007), which can be attributed to habitat modification and loss.

3.5.10 Nationally Threatened fauna not recorded recently in Manaia Ecological District

***Succinea archeyi* (Serious Decline)**

This species is presumed to be extinct in Manaia ED. Subfossil shells indicate it was formerly present on the Ocean Beach and Smugglers Bay dunefields (Brook 2000).

3.6 THREATS

Manaia Ecological District contains many plant and animal species that are threatened by competition from introduced pest plants, predation from pest animals, and habitat loss/modification. Pests also have dramatic impacts on the integrity of indigenous habitats.

There are 13 species of pest mammals present in Manaia ED: dogs, cats, three rodent species, two mustelid species, hedgehogs, rabbits, hares, possums, goats, and pigs. These are all known to have varying adverse impacts on susceptable indigenous species. Mustelids are predators of indigenous birds, their eggs and chicks, and of invertebrates and lizards. Feral cats are predators of lizards, birds and many insects. Rats feed on indigenous fruit and seeds, insects, birds, snails and lizards while house mice and hedgehogs predate upon seeds, insects, land snails and lizards, and along with rats can compete with indigenous birds. Rabbits damage indigenous orchids and modify indigenous sand-binding vegetation in fragile coastal environments through soil disturbance and direct browsing (Department of Conservation 1999). Possums can adversely impact nesting kiwi, kukupa and kaka either through direct predation of eggs and nestlings or competition for resources such as food and habitat. The marked decline of kukupa in Northland during the 1980s (Pierce *et al.* 1993) was likely caused by a combination of poaching and increasing levels of possum predation exacerbated by background predation of nests by rats and stoats and competition from possums for food (R. Pierce pers. comm.).

Dogs are a major threat to kiwi of all ages. In Northland, between 1990 and June 1995, dogs accounted for 135 (70%) of all reported kiwi deaths, with the greatest numbers attributed to feral or wandering/stray dogs (38 deaths) and pet dogs that are running loose during the day (29 deaths) (Pierce & Sporle 1997). In 2006, dogs were responsible for killing two of four kiwi that were carrying transmitters in Kauri Mountain Conservation Area and Surrounds (Q07/078), and kiwi sign dropped significantly in the same area during 2006/07 (T. Hamilton, WHLF, pers. comm.). Other predators, particularly stoats, have a chronic impact on kiwi chick survival rates and also hole nesting species such as kaka and kakariki.

Manaia ED has several islands scattered around its coastline, which support threatened seabirds, lizards, and plants. The close proximity of these islands to the mainland, however, makes them vulnerable to mustelids and rat invasion and depletion of birds and other fauna. Mainland nesting fauna e.g. northern NZ dotterel, variable oystercatcher, and other shore-nesting bird species and lizards are threatened by combinations of cats, mustelids, rats, hedgehogs, black-backed gulls, horses, wandering dogs, people, vehicles (e.g. quad bikes), habitat degradation, and lack of habitat protection.

Land snails and other invertebrates are particularly heavily preyed upon by introduced mammals and birds (e.g. rat, mouse, possum, hedgehog, pig, and song thrush). Fortunately, the eradication of pigs from Bream Head Scenic Reserve and Surrounds (Q07/074) has eliminated one hazard faced by the giant land snail, *Placostylus hongii,* which is restricted to

forest near Peach Cove. Coastal invertebrates such as black katipo and the land snail Punctidae sp. 223 may also be threatened by the degradation or loss of vegetation cover through wind erosion, dune encroachment, invasion by exotic plant species (e.g. marram grass and kikuyu), and possibly rabbit browse (Brook 1999b). Controlling rodents can have significant benefits for land snail populations. For example, in one area at Bream Head where rodents have been controlled to low levels over a six year period, adult flax snail numbers have approximately doubled and juvenile numbers have increased tenfold (N. Miller, DOC, pers. comm.).

In terms of browsing mammals, the threat to natural areas within Manaia ED has been significantly reduced through targeted operations to decrease goat and pig numbers. Livestock have been excluded from Bream Head[22] and access is also decreasing at other reserves (Pierce *et al.* 2002).

The possum is the most destructive browser in Manaia ED's forested areas, where it primarily affects adult trees, with foliage, flowers and sometimes fruit of a large number of species being eaten (Cowan 2001). Many tree species in Manaia ED (e.g. kohekohe, pohutukawa, northern rata, towai, and five-finger) are very susceptible to possum browsing. Currently, it is thought that these species require possum indices to be below about 5% residual trap catch[23] in order to maintain growth and/or reproduction levels adequate to sustain populations (P. Whaley, DOC, pers.comm). Loss of foliage also contributes to a lower volume of litter on the forest floor with consequential reductions in nutrient cycling (Cowan 2001). Manaia ED retains a relatively high proportion of natural areas (*c.*42% of total land cover), but there is the risk of further loss and fragmentation of forest and shrubland habitat particularly through accidental fires and subdivision development. Fragmentation can leave natural areas vulnerable to 'edge effects' such as increased light and wind, greater temperature extremes, and lower humidity. Smaller habitats are also vulnerable to pollution from human activities, e.g. septic tank overflows and possibly air pollution. Habitat loss for less mobile species such as NI fernbird, lizards and land snails can result in local extinctions, while a reduction on habitat size will inevitably lower the carrying capacity of an area by diminishing the habitat and food resources available. The desirability of the Whangarei Heads area as a place to live or visit has resulted in increased subdivision pressures, particularly on the west coast (e.g. McLeod Bay). Development has the potential to bring new pets (especially dogs and cats) into the area which would seriously threaten the recovery of kiwi and shorebirds locally, unless appropriate controls on pets are taken. Residential developments can also be sources of weed invasions through 'garden escapees'. Land development such as plantation forestry and residential subdivision is also a threat to some snail populations (Brook 1999b).

22 Cattle are effectively excluded from all of Bream Head Scenic Reserve and Surrounds as of 2009; however, there is one exception to this. About 20 ha in the central north face is under a seasonal grazing "arrangement" whereby the former landowner is permitted to graze cattle in an electrically fenced and fairly modified area for a few months over winter for a period of for 20 years. There are approximately 10 years left before the arrangement expires (N. Miller, DOC, pers. comm.).

23 Indices at Bream Head Scenic Reserve and Surrounds have been below 7% since 1995 due to annual possum (and rat) control operations (N. Miller, DOC, pers. comm.).

The risks of smaller predators, such as Argentine ants, getting further established in the area, are also likely to increase with expanding subdivision. Argentine ants can adversely affect ecological processes such as seed germination and pollination, and eat some insect species to extinction. Unless controlled, many endemic invertebrate species could be adversely affected by Argentine ants and local exctinctions are likely, placing species with restricted distribution at risk. Particularly at risk from Argentine ants are those species that occur in coastal shrubland, for example, flax snails (Harris 2007).

Pest plants are a major threat to the indigenous biodiversity of Manaia ED. Northland has more environmental weeds than any other region in New Zealand due largely to the very climatic conditions that encourage good growth of indigenous vegetation (Pierce *et al.* 2002). Exposed margins of shrubland and forest areas are particularly vulnerable to weed invasion by species such as pampas, Mexican daisy, woolly nightshade, elaeagnus, Japanese honeysuckle, contorta pine, radiata pine, tree privet, and Chinese privet. Shrublands are more readily invaded by weeds due to relatively higher light levels reaching the ground, although dense, intact areas of forest are also vulnerable to invasion by shade-tolerant plants such as ginger and moth plant. Taiwan cherry also needs to be recognised as a threat to mature forest; roadsides constitute a major risk corridor for this species and others (D. McKenzie, NRC, pers. comm.). A Phoenix palm was removed from Peach Cove in the mid 1990s, presumably seeded from Phoenix palm plantings near Ocean Beach. Other wilding Phoenix palms are present along Ocean Beach Road and the eastern coastal end of Bream Head Scenic Reserve and Surrounds (Q07/074) (W. Holland, DOC, pers. comm.). Dunefields are host to a range of invasive weeds, including smilax, moth plant, pampas, purple groundsel, kikuyu, apple of Sodom, and gorse. Marram grass is present on the foredunes of Ocean Beach Recreation Reserve and Surrounds (Q07/075), and it now threatens indigenous sand binders such as spinifex and pingao. Wherever pest plants become dominant, the natural processes of germination and growth of indigenous plants are impaired.

Prickly hakea, willow-leaved hakea, and contorta pine are frequent in gumland areas. The presence of fire-resistant hakea species intensifies the potential degradation as a result of fire, as these species are able to out-compete the regeneration of manuka, kanuka, and other indigenous shrubland species, whose growth rate is extremely slow on infertile soils (Lux *et al.* 2009). A new pest plant, *Hakea drupacea*, was recorded in recent years from the northern end of Mt Manaia. This species poses the same threats to indigenous biodiversity as other *Hakea* species (T. McCluggage, DOC, pers. comm.)[24].

Wetlands comprise only a small proportion of the natural habitats present in Manaia ED, and most of these have been degraded to varying degrees by drainage and/or invasive weeds. Lack of buffering facilitates weed establishment. Mexican devil is probably the most prolific pest plant within freshwater wetlands, although the presence of hornwort (*Ceratophyllum*

24 Adult plants have been removed and follow-up for seedlings is ongoing (T. McCluggage, pers. comm.).

demersum) in Kauri Mountain Wetland (Q07/081) (G. Townsend, NRC, pers. comm. 2010) poses a significant threat to this and other freshwater waterbodies in the area. Species such as gorse, pampas, and crack willow are frequent on wetland margins. Most wetlands are fenced to exclude stock.

Recent extensive weed surveys throughout Manaia ED show that it is comparatively weed-free. However, there are still serious environmental pest plant species present and it is important to note that there are new and emerging weeds like Queensland poplar, selaginella and buddleja, which need active management (D. McKenzie, NRC, pers. comm.).

3.7 RESTORATION WORK UNDERTAKEN BY THE COMMUNITY

The ecological significance of Manaia ED is highly regarded by the local community and as such a number of landcare groups have been established to address the key issues in 'their back yard'. In 2001 the Whangarei Heads Landcare Forum (WHLF) was formed to facilitate better coordination, information sharing and integration of effort within the area, and to enhance the effectiveness of each individual group's efforts. A report prepared for the WHLF by Pierce *et al.* (2002) highlights the following issues that Landcare groups are currently addressing on both privately owned and reserve land:

- Weed control.
- Possum, rat and mustelid control.
- Control of feral cats, and education of domestic cat and dog owners.
- Fencing of indigenous vegetation.
- Replanting indigenous corridors.
- Kiwi protection activities, including radio-tagging and monitoring of kiwi, the release of sub-adult kiwi through Operation Nest Chick to supplement the local population, and predator control on private and reserve land.
- Enhancement of recreational resources of the area.
- Education and networking via meetings, newsletters etc.

Mustelid and feral cat control is undertaken in a management area which spans a *c.*6,000 ha mosaic of private and public forest, shrubland, wetland, duneland, and pasture. The WHLF works in and around the five main forest habitats in Manaia ED - Bream Head, Manaia Ridge, Taurikura Ridge Bush, The Nook, and Kauri Mountain. However, Bream Head and parts of Manaia Ridge are trapped for mustelids and cats mainly by the DOC Whangarei Area Office, although these areas are buffered to a considerable extent by the WHLF operations (http://issg.org). DOC also currently operates mustelid and cat traps in The Nook, Taurikura Ridge Bush, and Mt Aubrey on behalf of the WHLF. These traps are in addition to the DOC trapping program that the trappers carry out at Bream Head and in the buffer zone to the north of the Whangarei Heads peninsula, which extends from The Nook eastwards to the south of Pataua (P. Graham, DOC, pers. comm.). An expansion of more integrated ecological

restoration via intensive possum and rat control regimes (building on the current predator control) is currently being undertaken by several of the Landcare groups that are a part of the WHLF.

Of note is that fact that no ferrets have been caught in the WHLF area since 2005. It appears that all the resident ferrets have been trapped by the programme, and DOC's northern buffer zone has greatly reduced the chances of ferrets reinvading the WHLF project area. Progress has also been made in terms of reducing stoat numbers: 19 stoats were caught in the 07/08 season, the lowest number for the six years of trapping operation and well down from the peak of 55 in the first season (Hamilton 2008). The recovery of kiwi and other indigenous biota in Manaia ED is therefore appropriate and achievable provided predator control is maintained and pet-free covenants can be applied to new subdivisions in and adjacent to the Ecological District (Pierce 2006, in SSBI Q07/R07/H090).

The most recent landcare group to be formed in Manaia ED is the Taurikura Ant Care Group, which aims to coordinate control of Argentine ants in the Taurikura Bay area (Whangarei Heads Newsletter, October 2007). DOC and the local community are also in the process of developing an Argentine ant-free buffer zone adjoining Bream Head Scenic Reserve and Surrounds (Q07/074) in an effort to prevent their establishment within the reserve.

Considerable progress has been made over the past ten years or so to tackle the weed problem in Manaia ED, using a labour force made of Work for the Dole, Job Plus, Task Force Green, community workers, Global Plus, Polytech students and local residents. The controlled area includes private land, land administered by DOC and the Whangarei District Council (WDC), and land within Queen Elizabeth II Open Space Covenants. Weed control is largely funded by Northland Regional Council (NRC), the Lotteries Commission, and the Lion Foundation. The major weed species targeted include ginger, moth plant, elaeagnus, woolly nightshade, lantana, smilax, madeira vine, and palm grass (P. Harding, pers. comm.).

It should be noted that many individual property owners are also working to protect and enhance the biodiversity values of their land. This may be by controlling weeds and pest animals on their property, by ensuring that their dogs are kept under control to protect kiwi in the vicinity, or by restoring indigenous vegetation. The scale and intensity of restoration efforts is predicted to increase over time in Manaia ED (D. McKenzie, NRC, pers. comm.).

3.7.1 Bream Head Conservation Trust

In recognition of Bream Head's special significance as both a cultural and natural heritage site, the Bream Head Conservation Trust (BHCT) was formed in 2002 to facilitate the cooperative management of the area in partnership with DOC and other key agencies, including Whangarei District Council, Northland Regional Council, Royal Forest and Bird Protection Society, the local community and iwi (Ritchie 2008). The BHCT identified animal pest eradication as the most ecologically

sustainable and cost effective means of achieving its key outcomes for the reserve, which are to: restore the ecology of the reserve; preserve its historical and archaeological features; and enhance its recreational and educational potential in ways which are compatible with conservation values (breamheadtrust.org.nz).

In 2008, the Trust commissioned a report which describes a proposal to build a pest-proof fence at Bream Head Scenic Reserve and Surrounds (Q07/074), including an assessment of effects on the environment and an animal pest eradication programme at the reserve. The proposal is being investigated as part of a larger community initiative to restore and enhance an area that has been identified by DOC as being of outstanding conservation value (Ritchie 2008), and which is identified in this report as one of the most significant ecological features in the Manaia ED along with Mt Manaia. In February 2010 the Trust appointed a temporary ranger (with the aim for it to be permanent) to progress ecological gains at the reserve (W. Holland, DOC, pers. comm.).

4. Site descriptions

The 27 natural areas identified in the survey are described and mapped below. Level 1 sites (24 sites) are listed before Level 2 sites (3 sites). Criteria for inclusion in Level 1 and Level 2 site categories are provided in Section 2.4.

New Zealand Transverse Mercator Projection grid references are given for all sites. Records of threatened flora and fauna have been sourced from herbaria and other databases mentioned in Section 2.1, or were direct observations by Department of Conservation staff and Wildland Consultants during the course of this survey. The status of all records was checked prior to inclusion in this report. All records included were from the late 1970s or more recent, unless otherwise stated.

The fauna section in 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 (e.g. Gradual Decline) in capitals. 'No information' 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 site.

Aerial photography from 2008 was used to produce the site maps as a check against the original 1997-1999 survey. In a few cases, the site boundaries have changed from the site boundaries identified in the original survey, and hence the vegetation description presented in the report may not match the current extent of the site. Where the site boundary changed significantly, this is indicated at the beginning of the site report in the 'Area' section.

4.1 LEVEL 1 SITES

SITE	SURVEY NO.	GRID REF.
Tahunatapu Road Coastal Forest	Q07/066	1733300E 6039025N
Munro Bay Coastal Bush	Q07/067	1733502E 6038425N
McDonald Coastal Shrubland	Q07/068	1735100E 6038929N
Manaia Ridge Scenic Reserve and Surrounds	Q07/069	1737006E 6036534N
Mt Aubrey Coastal Forest and Shrubland	Q07/070	1735811E 6034632N
Motukaroro Island	Q07/071	1735263E 6033861N
High Island	Q07/072	1737112E 6033935N
Taurikura Ridge Bush	Q07/073	1739312E 6033541N
Bream Head Scenic Reserve and Surrounds	Q07/074	1740818E 6031045N
Ocean Beach Recreation Reserve and Surrounds	Q07/075	1740627E 6035743N
Kerr Road Swamp	Q07/076	1738199E 6039037N
Timperly Road Bush	Q07/077	1735898E 6039631N
Kauri Mountain Conservation Area and Surrounds	Q07/078	1739674E 6040347N
Bream Islands Scenic Reserve: Moturaka Island and Tarakanahi Island	Q07/079	1742713E 6032910N
Bream Islands Nature Reserve: Mauitaha Island and Guano Island	Q07/080	1743913E 6032653N
Kauri Mountain Wetland	Q07/081	1738800E 6038438N
Whangarei Heads Road Wetland	Q07/083	1735191E 6039100N
Kiteone Road Saltmarsh	Q07/168	1733798E 6040146N
Awaroa Island	Q07/170	1740699E 6038743N
Frenchman Island	Q07/171	1737920E 6030438N
Harambee Road Swamp	Q07/172	1739491E 6042039N
Peach Cove Stack A	Q07/173	1743029E 6030650N
Peach Cove Stack B	Q07/174	1742030E 6030469N
Kauri Mountain Pond and Raupo Swamp	Q07/175	1739463E 6039610N

TAHUNATAPU ROAD COASTAL FOREST

Survey no. Q07/066
Survey date 22 June 1997 and 27 January 1999
Grid reference 1733300E 6039025N (AX31)
Area 124.9 ha (106.9 ha forest, 17.9 ha shrubland, 0.1 ha wetland)
(This site has been adjusted to fit 2008 aerial photography. The main change is the addition of shrubland to the east).
Altitude 0-146 m asl

Ecological units

(a) Kanuka/manuka coastal forest on hillslope and in gully
(b) Puriri-totara coastal forest in gully
(c) Kauri-tanekaha coastal forest on hillslope
(d) Kanuka/manuka-woolly nightshade coastal shrubland on hillslope
(e) Kanuka/manuka-totara coastal forest in gully
(f) Gorse-woolly nightshade coastal shrubland on cliff face
(g) Kanuka/manuka-pohutukawa coastal forest on hillslope

(h) Kanuka/manuka-puriri coastal forest on hillslope

(i) Kanuka/manuka shrubland on hillslope

(j) Manuka-exotic grass-soft rush-*Baumea* sp. wetland on alluvium

Landform/geology

Steep coastal hills of Mesozoic chert and greywacke (Waipapa Group) with Lower Miocene gravelly limestone and calcareous sandstone (Waitemata Group); melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes) in the shore platform and coastal banks on the northern margin; and a small area of melange near the junction of Nook Road and Tahunatapu Road.

Vegetation

The site comprises an area of coastal forest and shrubland on a headland in eastern Parua Bay.

(a) South of Taihoa Road, kanuka/manuka coastal forest is dominant on hillslope on the eastern edge of the site. Totara is frequent with occasional tanekaha. Type (a) is also present in a gully, occurring with frequent puriri and occasional kauri, tanekaha, kahikatea, and pohutukawa.

(b) Puriri-totara forest is present in a gully with occasional pukatea, rewarewa, kauri, and ti kouka.

(c) Kauri-tanekaha coastal forest occupies upper slopes, with frequent rimu, kanuka and manuka, and occasional matai, rewarewa, totara, and pohutukawa.

(d) Kanuka/manuka-woolly nightshade shrubland occupies a steep slope below the highest point of the site. There is occasional totara and gorse.

(e) Kanuka/manuka-totara coastal forest is dominant in a gully, while puriri and rewarewa are frequent, and nikau, kohekohe, karaka, and kowhai are present in low numbers.

(f) Cliff face shrubland contains abundant gorse and common woolly nightshade.

(g) On the coastal cliffs and steep hillslopes south of Tahunatapu Road, kanuka/manuka forest is dominant with pohutukawa common. Kowhai, puriri, kohekohe, ti kouka, and some large kauri are frequent with occasional rewarewa, karaka, and rimu.

(h) North of Nook Road, kanuka/manuka is dominant with common puriri and occasional kauri, rewarewa, totara, and nikau.

(i) Kanuka/manuka shrubland is dominant in the eastern part of the site, occurring with occasional ti kouka and emergent totara. There is occasional hangehange, flax, gorse, pampas, and woolly nightshade on the shrubland margins. Narrow gullies within the shrubland contain small pockets of broadleaved forest.

(j) A narrow wetland is nestled between the north side of Nook Road and kanuka/manuka coastal shrubland. Manuka is abundant over a ground tier of exotic grass, *Baumea* sp., soft rush. Swamp millet is frequent, with occasional totara, ti kouka, mamaku, harakeke, water fern, and gorse. Woolly nightshade is scattered on the wetland margins.

Q07/066 Tahunatapu Road Coastal Forest

0 250 500 1,000
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

Significant flora

No information.

Fauna

NI brown kiwi (Nationally Vulnerable) are present; the WHLF currently monitors a sample of three transmitted adult kiwi breeding in this area. NI Kaka (Nationally Endangered), kukupa (regionally significant), and NI tomtit (regionally significant) are regularly seen in the site (T. Hamilton, WHLF, pers. comm.). Pukeko was recorded during this survey by Wildland Consultants in 2009.

Significance

The site contains a large proportion (*c*.86%) of coastal forest, which is an uncommon vegetation type in the Northland Region and throughout New Zealand. It is part of an important stepping stone that links sites such as Manaia Ridge Scenic Reserve and Surrounds (Q07/069) to natural areas in the north-west. Local kiwi benefit from the activities of the Papakarahi Landcare Group, which carries out predator control throughout the site (T. Hamilton, WHLF, pers. comm.). Forested areas supports at least two 'Threatened' bird species and two regionally significant bird species. Representative for type (b) puriri-totara coastal forest. Woolly nightshade and gorse are locally abundant, but are largely confined to the northern slopes of the site, opposite Kirikiri Point. Areas in the west of the site, including the headland, are at most risk of fragmentation from continued residential development, as well as the inevitable weed incursions which accompany new developments. Approximately 2.3 ha lie within a Queen Elizabeth II Open Space Covenant and 0.3 ha is protected within WDC-administered reserve. 43.4 ha of this site are within an 'At Risk' land environment (A6.1b), 77.5 ha are within 'Critically Underprotected' land environments (A6.1a, A6.1c), 0.02 ha lie within a 'Chronically Threatened' land environment (A6.1d), 0.2 ha is within an 'Underprotected' land environment (D1.2b), and 0.01 has is within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

MUNRO BAY COASTAL BUSH

Survey no.	Q07/067
Survey date	27 June 1997 and 21 September 2009
Grid reference	1733502E 6038425N (AX31)
Area	100.2 ha (99 ha forest, 1.2 ha shrubland)
Altitude	0-162 m asl

Ecological units

(a) Kanuka-pohutukawa coastal forest on hillslope

(b) Pohutukawa forest on steep hillslope

(c) Kanuka/manuka coastal shrubland on hillslope

(d) Kanuka forest on hillslope

Landform/geology

Coastal hills and a narrow peninsula comprising a diverse suite of rock types, including Mesozoic greywacke (Waipapa Group); Eocene conglomerate, gravelly limestone and glauconitic sandstone (Te Kuiti Group); melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes); and Lower Miocene andesitic dikes and larger subvolcanic intrusions (Coromandel Group).

Vegetation

(a) At the western end of the site (along The Nook peninsula) is an area of coastal forest dominated by kanuka with common pohutukawa. Kohekohe, puriri and kowhai occur frequently with occasional rewarewa, tanekaha, kauri, and coral tree.

(b) On the more exposed, southern side of The Nook peninsula the canopy is dominated by a long band of mature pohutukawa, most of which are host to numerous epiphytes (predominantly *Collospermum hastatum* and *Astelia solandri*). The understorey is characterised by common *Coprosma macrocarpa* and karamu, and frequent harakeke, with occasional ti kouka, *Gahnia lacera*, toatoa, *Cyperus ustulatus*, and ponga.

(c) Coastal shrubland dominated by kanuka/manuka is present in the east, with occasional emergent kauri, rimu, kahikatea, rewarewa, puriri, and kowhai.

Towards the top of the slope type (c) continues, with frequent species including tanekaha and totara. Remaining hillslope areas are characterised by type (d) tall kanuka with occasional tanekaha.

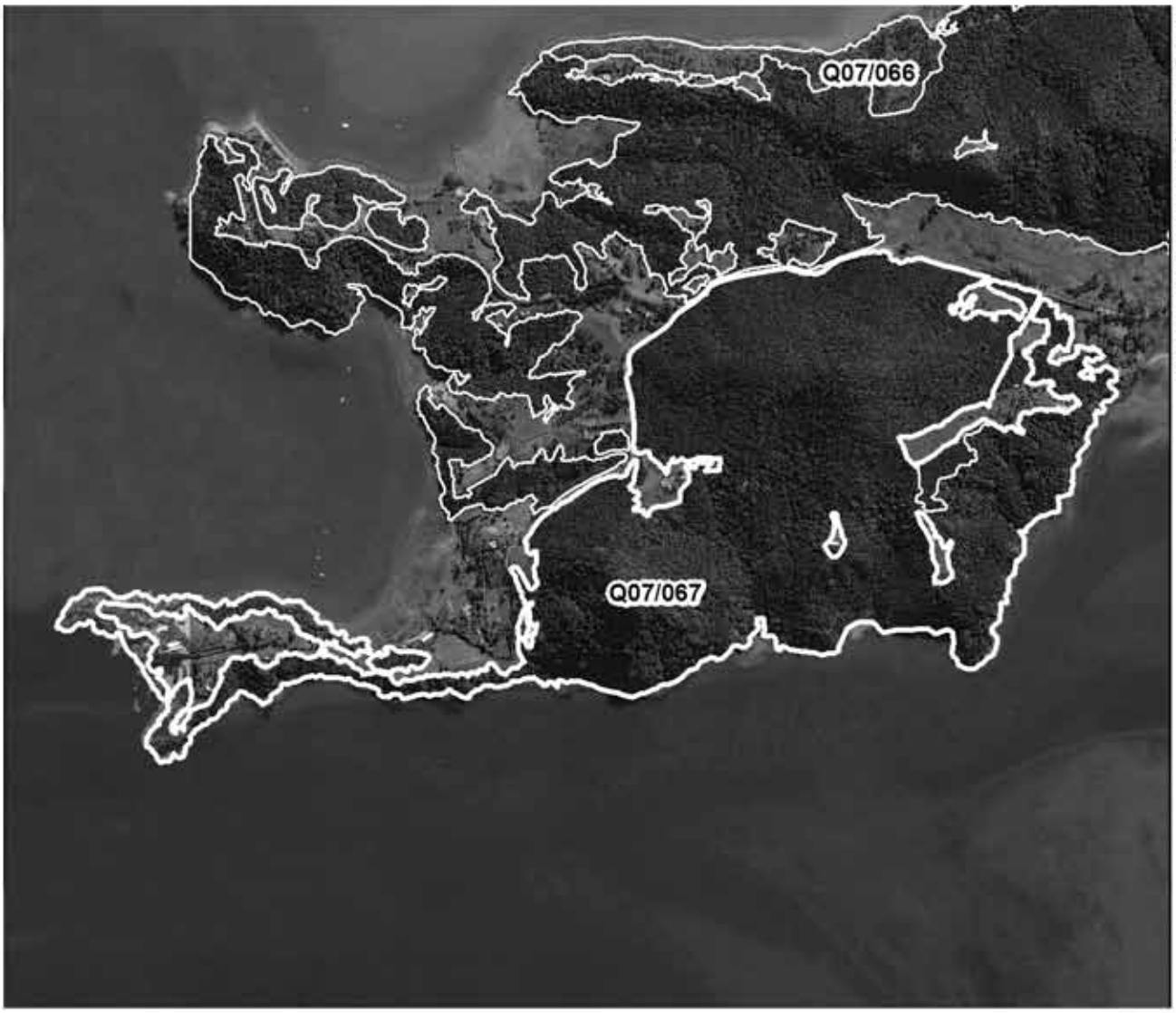
Significant flora

Hebe ligustrifolia (incl. *H.* 'Whangarei') (regionally significant) (A. Townsend, DOC, pers. comm. 2010).

Fauna

Birds

There are historical records (1978) of red-billed gull (Nationally Vulnerable), Caspian tern (Nationally Vulnerable), white-fronted tern (Declining), white-faced heron, black-backed gull, Australasian harrier, kingfisher, tui,



Q07/067 Munro Bay Coastal Bush

0 250 500 1,000
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

NI fantail, silvereye, and grey warbler. Up until 2007 five adult NI brown kiwi (Nationally Vulnerable) were radio monitored (T. Hamilton, WHLF, pers. comm.). Transmitters have now been removed, but kiwi are still at a high density at this site (T. Hamilton, WHLF, pers. comm.). NI Kaka (Nationally Endangered) are occasionally sited, while kukupa (regionally significant) and NI tomtit (regionally significant) are regularly observed (T. Hamilton, WHLF, pers. comm.). Tui, grey warbler, and silvereye were recorded during this 2009 survey by Wildland Consultants.

Lizards

Ornate skink (Gradual Decline) was recorded in 2001 (DOC Bioweb 2009).

Land snails

Liarea turriculata "Manaia" (Range Restricted) is present (F. Brook pers. comm.).

Significance

Munro Bay Coastal Bush contains some excellent examples of Northland coastal forest and shrubland, and is important as a remnant of coastal forest alongside the Whangarei Harbour, given that few forested areas remain. The south side of Reserve Point, in particular, contains some outstanding coastal pohutukawa forest, while the headland supports a small population of *Hebe ligustrifolia* (incl. *H.* 'Whangarei') amongst *Astelia banksii*, *Austrofestuca stipoides* and coastal shrubland species (A. Townsend, DOC, pers. comm. 2010). The site has old records for two 'Threatened' and one 'At Risk' bird species. Follow-up survey is required. Natural areas within the site also support one 'Threatened' species of skink and one 'At Risk' species of land snail. The site includes part of The Nook, which contains the biggest privately owned area of forest in Manaia ED and the highest density of the Nationally Vulnerable NI brown kiwi on private land (G. Coulston, DOC, pers. comm.). It also supports one other 'Threatened' bird species and two regionally significant bird species. Papakarahi Landcare Group carries out predator and possum control over approx 60% of The Nook peninsula as well as small areas of rat control (T. Hamilton, WHLF, pers. comm.). The forest and shrubland are relatively weed-free and efforts have been made to control gorse and pampas along the south side of Reserve Point (recorded by Wildland Consultants during this survey, 2009). This site contains representative examples of types (a) kanuka-pohutukawa coastal forest and (b) pohutukawa forest. Coral trees pose a risk to the coastal forest on the north side of Reserve Point, with several trees dominating parts of the canopy towards the end of the peninsula. 0.47 ha lies in DOC-administered scenic reserve and 0.8 ha is protected within WDC-administered reserve. 0.1 ha of the site is within a 'Chronically Threatened' land environment (A6.1d), 20.3 ha are within a 'Critically Underprotected' land environment (A6.1a), and 79.8 ha are within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

MCDONALD COASTAL SHRUBLAND

Survey no.	Q07/068
Survey date	27 June 1997 and 23 September 2009 (Wildland Consultants)
Grid reference	1735100E 6038929N (AX31)
Area	67.3 ha (32.3 ha forest, 35 ha shrubland)
Altitude	0-114 m asl

Ecological units

(a) Manuka coastal shrubland on gumland

(b) Kanuka forest on hillslope

(c) Puriri-kanuka forest in gully

(d) Kanuka-tanekaha forest in hillslope

Landform/geology

Coastal hills on an eroded, deeply weathered, Lower Miocene dacite dome (Coromandel Group).

Vegetation

The site is situated on a volcanic dome at the north end of McLeod Bay and comprises coastal gumland dominated by low-growing manuka shrubland with areas of kanuka and broadleaved forest.

(a) The north-eastern part of the site is cloaked in abundant, low-growing manuka shrubland (< 2m tall). South of the access track, the manuka is taller and more open. *Gleichenia microphylla* is abundant in the understorey, together with common *Schoenus tendo* and occasional *Dracophyllum lessonianum*, hangehange, and emergent radiata and contorta pine.

(b) Kanuka forest is local in the southern part of the site, occurring with occasional tanekaha and scattered emergent radiata and contorta pine.

(c) A gully is characterised by co-dominant puriri and kanuka, with occasional emergent pohutukawa, rimu, kauri, and Norfolk pine.

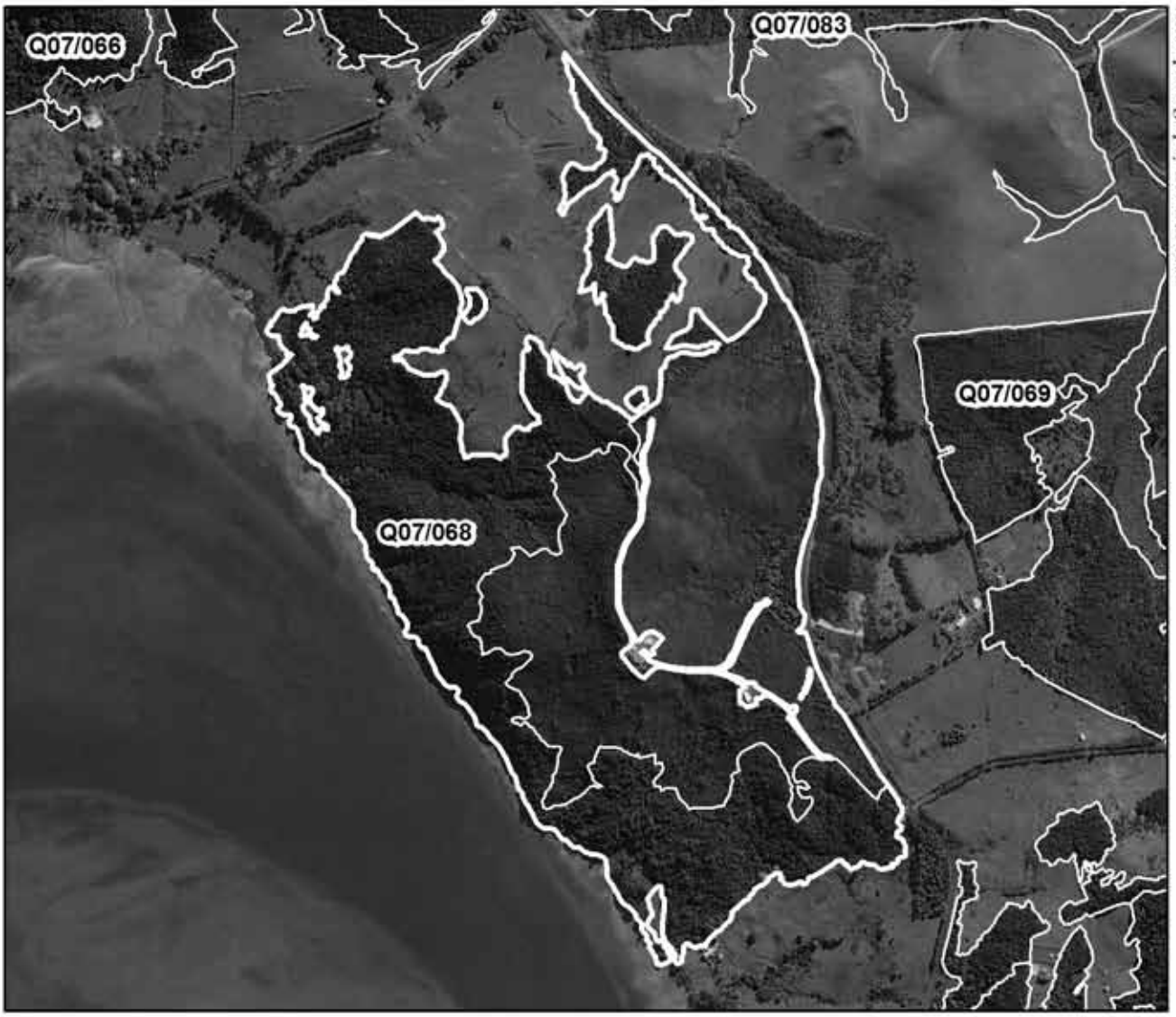
(d) Remaining areas in the south of the site comprise a canopy dominated by kanuka, with frequent tanekaha and occasional mamaku and emergent radiata pine.

Significant flora

Epacris pauciflora (regionally significant), *Loxsoma cunninghamii* (regionally significant), and *Tetraria capillaris* (regionally significant) were recorded at the site during this survey by Wildland Consultants, 2009. Several non-threatened species of orchid were also recorded.

Fauna

NI brown kiwi (Nationally Vulnerable) were radio monitored at this site until 2007. Seven Operation Nest Chick sub-adult kiwi have been released in the site, and it is thought there is still a local population present (T. Hamilton, WHLF, pers. comm; R. Pierce pers. comm.). NI fernbird



Q07/068 McDonald Coastal Shrubland

0 125 250 500
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

(Declining) was recorded in 1994 (SSBI Q07/R07/H091). Grey warbler and fantail were recorded during this survey by Wildland Consultants, 2009.

Significance

McDonald Coastal Shrubland contains the largest area of gumland in Manaia ED as well as extensive areas of shrubland. Gumland was once a relatively common habitat type in the Northland Region but is now threatened; this site contains the only gumland area identified in Manaia ED. The site supports three regionally significant plant species as well as a range of orchid species. This site contains representative examples of types (a), (c) and (d). It also supports at least one 'Threatened' and one 'At Risk' bird species. Parts of the site have been invaded by wilding pine (radiata and contorta pine) and prickly hakea. The weed species aristea and *Gladiolus undulatus* are locally common along the track margins, while elaeagnus, pampas, ginger, onion weed, hydrangea, and mistflower occur on the track margins leading into the area of broadleaved forest. Approximately 0.3 ha is protected within WDC-administered reserve. 4.2 ha of the site are within 'At Risk' land environments (A6.1b, A6.1d), 14.6 ha are within a 'Critically Underprotected' land environment (A6.1c), and 48.3 ha are within an 'Underprotected' land environment (D1.2b) (Walker *et al.* 2007).

MANAIA RIDGE SCENIC RESERVE AND SURROUNDS

Survey no. Q07/069
Survey date 13 February 1998
Grid reference 1737006E 6036534N (AX31)
Area 594.4 ha (498.3 ha forest, 96.1 ha shrubland)[25]
Altitude 20-420 m asl

Ecological units

(a) Kanuka/manuka forest on coastal hillslope
(b) Mamaku-pohutukawa-totara forest on steep coastal hillslope
(c) Kanuka/manuka-puriri forest on steep coastal hillslope and in coastal gully
(d) Puriri forest on steep coastal hillslope
(e) Kanuka/manuka-kowhai forest on moderate and steep coastal hillslope
(f) Kauri forest on steep coastal hillslope
(g) Mamaku treefernland in steep coastal gully
(h) Kauri-totara forest on steep coastal hillslope
(i) Kanuka/manuka-puriri-totara forest on steep coastal hillslope
(j) Manuka-pampas shrubland on coastal bluff
(k) Mamaku-kauri treefernland on steep coastal hillslope
(l) Mamaku-rewarewa treefernland on steep coastal hillslope
(m) Kanuka/manuka-rewarewa-totara coastal forest on steep coastal hillslope
(n) Kanuka/manuka coastal shrubland on coastal hillslope
(o) Pohutukawa-totara forest on steep coastal hillslope
(p) Pohutukawa-puriri-tawa forest on steep coastal hillslope
(q) Kanuka/manuka-kowhai-puriri forest on steep coastal hillslope
(r) Kanuka/manuka-totara forest on coastal hillslope
(s) Kanuka/manuka-kauri-totara forest on coastal hillslope
(t) Pohutukawa forest on rock coastal bluff
(u) Rewarewa forest on steep coastal hillslope
(v) Kanuka/manuka-kahikatea forest on moderate coastal hillslope
(w) Kanuka/manuka-kauri forest on coastal hillslope
(x) Nikau-puriri forest on steep coastal hillslope
(y) Mamaku-nikau treefernland on steep coastal hillslope
(z) Kanuka/manuka-tanekaha forest on coastal hillslope
(aa) Manuka shrubland on moderate coastal hillslope
(bb) Gorse-pampas shrubland on steep coastal hillslope
(cc) Kauri-tanekaha forest on steep coastal hillslope
(dd) Kanuka forest on hillslope

Landform/geology

Steep, bluffed hill country with prominent rocky pinnacles, comprising part of the deeply eroded flank of a Lower Miocene andesitic stratovolcano

25 Rockland has not been mapped or described.

(Coromandel Group), with much younger, unconsolidated, colluvial and landslide deposits present locally around the margins.

Vegetation

(a) On the lower slopes of Mt Manaia kanuka/manuka forest is dominant with frequent kowhai and ti kouka, and occasional puriri and emergent kauri and rimu. Mamangi is frequent in the subcanopy with occasional mahoe, mapou, putaputaweta, and kohukohu. In the understorey, species such as mamangi, *Coprosma rhamnoides* and hangehange are common with occasional scattered seedling podocarps and *Leptecophylla juniperina*. Further uphill, the canopy grades into type (b) mamaku-pohutukawa-totara forest (pohutukawa and totara are emergent) with frequent ti kouka and nikau, and occasional puriri, rewarewa, and northern rata. Epiphytic puka is also present.

(c) Kanuka/manuka-puriri coastal forest is also present on the lower slopes. Kowhai is frequent with occasional kahikatea, nikau, totara, rimu, mamaku, and epiphytic puka. Further up the slope, this grades into type (d) puriri coastal forest with occasional rewarewa, kanuka, manuka, kowhai, tawa, northern rata, ti kouka, nikau, mamaku, and puka. Continuing upwards, the forest grades into type (e) kanuka/manuka-kowhai forest with occasional kauri, totara and mamaku, while type (f) kauri forest occupies the top of a bluff and a wide basin on the lower slopes. Type (g) mamaku treefernland dominates a steep gully with occasional kanuka/manuka and emergent rewarewa.

(h) Above the bluffs and below the trig, kauri and totara dominate the open coastal forest canopy with frequent mamaku and rewarewa, and occasional ti kouka and kiekie.

Type (i) kanuka/manuka-puriri-totara coastal forest occurs on moderately steep slope, with frequent rewarewa, nikau and mamaku, and occasional matai and kauri. The open canopy has considerable dieback with dead trees visible. Further up the slope, on a rocky knoll, type (f) occurs with occasional nikau, mamaku, and one mature kauri.

(j) On rocky bluffs are characterised by low-growing (< 2 m tall) manuka shrubland and occasional pampas. Nearer to the ridge, the shrubland grades into type (k) secondary mamaku-kauri coastal forest in which the kauri is emergent in an open canopy. Totara, northern rata, tanekaha, rimu, and rewarewa are also present.

(l) Near the ridge top, mamaku and rewarewa dominate an open canopy with frequent nikau and occasional emergent puriri and totara.

(m) Below the ridgeline, kanuka/manuka-rewarewa-totara coastal forest is present with occasional mamaku, tanekaha, ti kouka and emergent puriri, kauri and rimu. The forest grades into type (n) kanuka/manuka shrubland (4-6 m tall) on the lower slopes with occasional ti kouka and shrubby pohutukawa.

On the lower moderate slopes southeast of the trig station, type (e) is present with occasional puriri, ti kouka, and mamaku. Further up the slope and below a bluff, type (o) pohutukawa-totara coastal forest is dominant with frequent kanuka, manuka and kauri, and occasional rewarewa, puriri, ti kouka, nikau, and mamaku.

(p) Pohutukawa-puriri-tawa coastal forest occupies a steep slope with occasional rewarewa, totara, kauri, mamaku, totara, rimu, and nikau. Further to the west, type (d) becomes dominant with frequent mamaku and occasional totara, kanuka, manuka, rewarewa, kowhai, pohutukawa, and ti kouka. Continuing westwards, the forest grades into type (q) kanuka/manuka-kowhai-puriri coastal forest mid-way up the steep slope. Other canopy species include occasional totara, kauri, matai, ti kouka, mamaku, and puka.

(r) Other areas on the lower slopes are characterised by kanuka/manuka-totara coastal forest with occasional rimu, kahikatea, rewarewa, ti kouka, and mamangi. Adjacent to this, type (s) kanuka/manuka-kauri-totara coastal forest occurs on a moderate slope with frequent mamangi occasional rimu, kowhai, and rewarewa. Nearer to the trig station, type (r) again becomes dominant, occurring with frequent rewarewa and occasional tawa, karaka, kauri, kahikatea, and mamaku, while on a rocky bluff below the trig, type (t) pohutukawa coastal forest dominates.

(u) Down from the trig on the western side of Mt Manaia, rewarewa coastal forest occurs on a steep slope with frequent kauri and occasional totara, tawa, rimu, mamaku, and nikau. Continuing downhill, the forest grades into type (c) with frequent rewarewa and kowhai, and occasional totara, mamaku, tawa, kauri, ti kouka, and epiphytic puka. Adjacent to this is an area characterised by type (v) kanuka/manuka-kahikatea forest with frequent totara and occasuional puriri, kauri, rimu, ti kouka, and nikau.

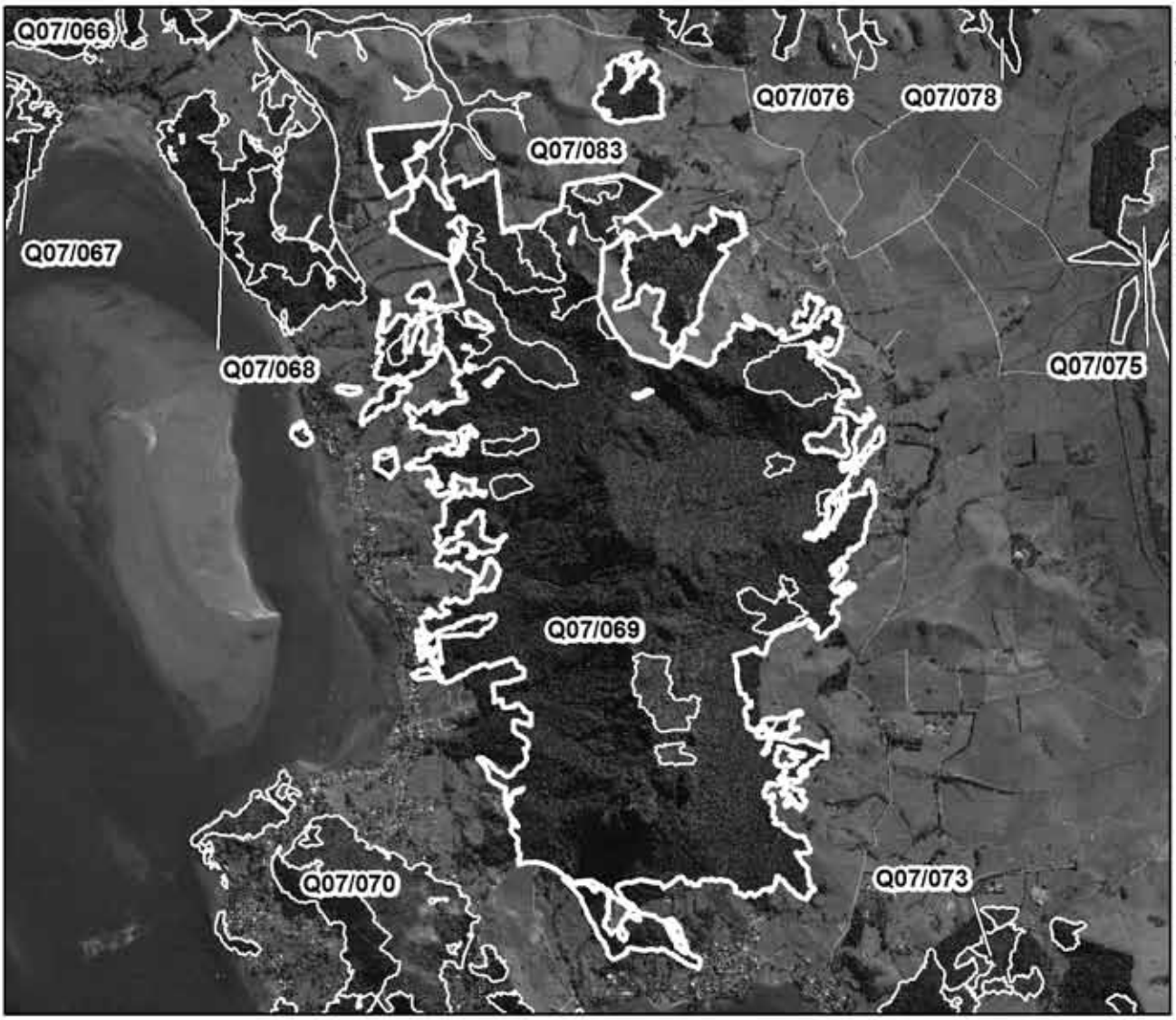
(w) Near the base of Mt Manaia, kanuka/manuka is present with commonly occurring emergent kauri. There is occasional rewarewa, puriri, nikau, pukatea, totara, kahikatea, and mamaku.

(x) Upper slopes are defined by nikau-puriri coastal forest with occasional kowhai, tawa, rewarewa, mamaku, pukatea, karaka, and emergent kauri. At the base of a rocky bluff type (d) occurs with frequent rewarewa, kanuka and manuka, and occasional northern rata, tawa, rimu, totara, kauri, kahikatea, mamaku, and nikau. Above this and near the top of the bluff, type (y) mamaku-nikau coastal forest is present on old slip pathways. Rewarewa is frequent with occasional ti kouka and emergent kauri and puriri.

Steep hillslope becomes characterised by type (z) kanuka/manuka-tanekaha coastal forest with occasional kauri and rewarewa.

(aa) At the northern end of the site, manuka shrubland is present on a moderate hillslope with frequent mamangi and occasional ti kouka. This is turn grades into type (n) further up the slope. Associated species include frequent emergent rewarewa and occasional mamangi, ti kouka, and mamaku. An adjacent area of type (bb) gorse-pampas shrubland occurs with frequent kanuka, manuka and hangehange, and occasional ti kouka. Type (aa) also occurs around rocky outcrops with occasional mamaku, pampas, gorse, and emergent rewarewa.

(cc) In the separate remnant, kauri-tanekaha coastal forest occurs on the steep northern slopes with occasional kanuka and manuka. On the southern side of the remnant, a steep hillslope with rocky bluffs is characterised by type (a) with frequent rewarewa, kauri and tanekaha, and occasional mamaku.



Q07/069 Manaia Ridge Scenic Reserve and Surrounds

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

(dd) In the north-west corner of the site, kanuka forest occurs with occasional tanekaha off the ridge sides. The understorey comprises gumland-type species such as *Leptecophylla juniperina*, *Morelottia affinis*, *Dianella nigra*, *Leucopogon fasciculatus*, bracken, and locally common *Celmisia adamsii* var. *rugulosa* (L. Forester, NRC, pers. comm.).

Significant flora

Threatened

Pseudowintera insperata (Nationally Critical) (2003, CHR 569931A) and *Pimelea tomentosa* (Nationally Vulnerable) (2007, SSBI Q07/R07/H042)

At Risk

Scandia rosifolia (Declining) (1970, AK 126104; reconfirmed by in 2008, SSBI Q07/R07/H042), *Calystegia marginata* (Naturally Uncommon), *Celmisia adamsii* var. *rugulosa* (Naturally Uncommon) (1999, AK 300271), *Coprosma neglecta* (Naturally Uncommon) (1999, AK 292693, reconfirmed 2008, SSBI Q07/R07/H042), *Doodia mollis* (Naturally Uncommon) (2007, SSBI Q07/R07/H042), *D. squarrosa* (Naturally Uncommon) (1995, SSBI Q07/R07/H042), *Myosotis spathulata* (Naturally Uncommon) (AK 269600), *Olearia angulata* (Naturally Uncommon) (SSBI Q07/R07/H042), *Pomaderris paniculosa* subsp. *novae-zelandiae* (Naturally Uncommon) (1977, AK 269401; reconfirmed in 2008, SSBI Q07/R07/H042), *Pimelia acra* (Naturally Uncommon) (2003, AK 284501), *Pittosporum ellipticum* (Naturally Uncommon) (1980, AK 269603; reconfirmed in 2008, SSBI Q07/R07/H042), *Sophora fulvida* (Naturally Uncommon) (1997, CHR 513392), kawaka (Naturally Uncommon) (2008, SSBI Q07/R07/H042), *Hymenophyllyum atrovirens* (Naturally Uncommon) (2008, SSBI Q07/R07/H042), and *Streblus banksii* (Relict) (2010, SSBI Q07/R07/H042), The non-threatened *Drosera peltata* (Coloniser) is also present. All non-referenced species are recorded in Clunie (1993). In 2009, a large population (>200) of *Celmisia adamsii* var. *rugulosa* was recorded in privately-owned kanuka forest at the north of the site, scattered along an open eroding face and down hill into forest (L. Forester, NRC, pers. comm.).

Regionally significant

Ascarina lucida var. *lucida* (1984, in SSBI Q07/R07/H042), *Asplenium gracillimum* (2007, SSBI Q07/R07/H042), *Asplenium hookerianum* (Young 2007), *Beilschmiedia tawa* (including *B. tawaroa*) (2008, SSBI Q07/R07/H042), *Brachyglottis kirkii* var. *angustior* (2007, SSBI Q07/R07/H042), *Carex forsteri*, *Carex ochrosaccus* (A. Townsend, DOC, pers. comm.), *Clielanthes distans* (2008, SSBI Q07/R07/H042), *Clematis foetida*, *Collospermum microspermum* (Young 2007), *Coprosma propinqua*, *C. rigida* (SSBI Q07/R07/H042), *C. rotundifolia, Corokia cotoneaster* (1999, AK 292396), *Cyathea cunninghamii*, *Dracophyllum sinclairii* (2008, SSBI Q07/R07/H042), *Euchiton involucratus*, *Grammitis billardierei* (2008, SSBI Q07/R07/H042), *G. ciliata* (2008, SSBI Q07/R07/H042), *Hebe macrocarpa* var. *latisepela* (A. Townsend, DOC, pers. comm.), *H. macrocarpa* var. *macrocarpa* (2008, SSBI Q07/R07/H042), *H. ligustrifolia*

(includes *H.* "Whangarei") (2008, SSBI Q07/R07/H042), *Helichrysum lanceolatum* (2008, SSBI Q07/R07/H042), *Hydrocotyle microphylla*, *Hymenophyllum lyalli* (2008, SSBI Q07/R07/H042), *H. multifidum* (A. Townsend, DOC, pers. comm.), kohia, kotukutuku, mairehau (2007, SSBI Q07/R07/H042), *Libertia grandiflora* (1994, AK 240211), *Metrosideros carminea* (2008, SSBI Q07/R07/H042), black maire, *Nestegis montana*, *Olearia albida* (2007, SSBI Q07/R07/H042), *Ophioglossum coriaceum* (Young 2007), northern rata (recorded during this survey), *Senecio quadridentatus*, *Sticherus cunninghamii* (A. Townsend, DOC, pers. comm.), and whararikí (2007, SSBI Q07/R07/H042). All non-referenced species are recorded in Clunie (1993). There is an historical record of *Lophymyrtus obcordata* (1957, WELT SP64915) from this site and a unconfirmed record of *Griselenia littoralis* (Clunie 1993).

Fauna

Birds

NI kaka (Nationally Vulnerable) (SSBI Q07/R07/H042), NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), NI tomtit (regionally significant) (R. Pierce pers. comm.), NI bellbird (regionally significant), Australasian harrier, morepork, tui, kingfisher, NI fantail, silvereye, grey warbler and welcome swallow (SSBI Q07/R07/H042). Red-crowned kakariki (Relict) is a frequent visitor (R. Pierce pers. comm.) An unidentified parakeet was heard during a survey in 1987, and a local parakeet aviary keeper reported flocks of up to nine unidentified parakeets visiting his caged birds (date unkown) (SSBI Q07/R07/H042). A bellbird nest with three fledglings was discovered on private property in the foot hills of Mt Manaia in February 2010 (W. Holland, pers. comm. 2010), which demonstrates that predator control is taking effect.

Lizards

Auckland green gecko (Gradual Decline) was recorded from the northern end of Mt Manaia in 2005 (W. Holland, DOC, pers. comm.). Forest gecko (regionally significant) was recorded in 2007 (SSBI Q07/R07/H042).

Terrestrial invertebrates

Schizoglossa worthyae (Serious Decline) (Brook 2002), *Menimus oblongus* (At Risk - Sparse) (Hitchmough *et al.* 2007), *Menimus oblongus* (Sparse) (Hitchmough *et al.* 2007), *Liarea turriculata* "Manaia" (Range Restricted) (1993, SSBI Q07/R07/H042), the weevil species *Unas piceus* (Data Deficient) (Hitchmough *et al.* 2007), and the stag beetle *Paralissotes planus* (F. Brook, pers obs.).

Significance

Manaia Ridge Scenic Reserve and Surrounds is one of Northland's most important coastal forested reserves and, along with Bream Head, rates as Manaia ED's most significant ecological feature. It is situated in an outstanding coastal ecosystem environs, with Bream Head Scenic Reserve and Surrounds (Q07/074) to the south and Kauri Mountain Conservation Area and Surrounds (Q07/078) to the north. It is an exceptional example

of coastal broadleaved-podocarp-kauri forest with supporting shrubland areas, containing an unusually rich diversity of species. An unusual feature is the 'sub-alpine' appearance of vegetation on the rocky summit of Mt Manaia, which is characterised by dense whahariki, rengarenga lily, *Celmisia adamsii* var. *rugulosa*, coprosma shrubs, various ferns and herbaceous plants (SSBI Q07/R07/H042). The Manaia stratovolcano breccia pinnacles, forming Mt Manaia and the ridge to the north are the most prominent exposures of Miocene volcanic breccia, and the best of two areas of ridge top tors in the Whangarei Heads area. They consist of weakly stratified andesite breccia, forming bluffs and spectacular pinnacles along Manaia ridge, and are classified as an extremely well-defined landform of scientific/educational and scenic value (Kenny and Hayward 1993).

The forests and shrublands of Manaia Ridge Scenic Reserve and Surrounds support two 'Threatened' and 15 'At Risk' plant species, 40 regionally significant plant species, and include a nationally significant population of the Nationally Critical endemic tree *Pseudowintera insperata*, which is only known from this site and Bream Head Scenic Reserve and Surrounds (Q07/074). Due to the size and quality of the reserve, all ecological units within the site are considered to be representative, except types (j) and (bb). Manaia Ridge Scenic Reserve and Surrounds provides critical mainland habitat for two 'Threatened' birds, one 'At Risk' bird, and three regionally significant birds, including species such as NI kaka, red-crowned kakariki, kukupa, and NI bellbirds which disperse from the Hen and Chicken Islands. The site supports one 'Chronically Threatened' and three 'At Risk' terrestrial invertebrate species, one 'Data Deficient' weevil, and one 'Chronically Threatened' and one regionally significant species of gecko. As part of the Whangarei Kiwi Sanctuary, Manaia Ridge Scenic Reserve and Surrounds is critical to the success of NI brown kiwi on the mainland. WHLF has released 41 kiwi into the reserve since 2004 (T. Hamilton, WHLF, pers. comm.).

Within the DOC-administered reserve, sustained ground-based possum control has reduced indices to below 10% Residual Tracking Index (RTI). The reserve is treated every 3-4 years in order to prevent significant population recovery. Pigs have been eradicated from the site and goats were not present until a recent incursion of animals near Timperley Road at the northern end of the site. Hunters were contracted to eliminate these goats (G. Coulston, DOC, pers. comm.). Approximately 330.7 ha of this site is within Manaia Ridge Scenic Reserve and Surrounds (DOC-administered), 19.1 ha are protected within WDC-administered reserve, 3.7 ha within a Conservation Covenant (WDC), and 6.9 ha lie within a Queen Elizabeth II Open Space Covenant. Approximately 0.3 of th site is within 'Acutely Threatened' land environments (A5.1a, A5.1c), 12.1 ha of the site are within 'Chronically Threatened' land environments (A6.1d, A7.1a), 25.8 ha within an 'At Risk' land environment (A6.1b), 2.4 ha within a 'Critically Underprotected' land environment (A6.1a), 51.3 ha are within an 'Underprotected' land environment (D1.2b), and 501.4 ha within 'No Threat Category' land environments (D1.1a, D1.1b, D1.1c, D1.1d) (Walker *et al.* 2007).

MT AUBREY COASTAL FOREST AND SHRUBLAND

Survey no.	Q07/070
Survey date	27 June 1997
Grid reference	1735811E 6034632N (AX31)
Area	86.4 ha (43.6 ha forest, 42.8 ha shrubland)
Altitude	5-216 m asl

Ecological units

(a) Kanuka/manuka coastal shrubland on steep hillslope

(b) Kanuka/manuka-puriri coastal forest on steep hillslope

(c) Pohutukawa coastal forest on steep hillslope

(d) Kanuka/manuka-pohutukawa coastal forest on steep hillslope and cliff

(e) Mixed fern rockland on rocky peaks

Landform/geology

Steep, bluffed hill country with prominent rocky pinnacles, comprising part of the deeply eroded flank of a Lower Miocene andesitic stratovolcano (Coromandel Group), with much younger, unconsolidated, colluvial and landslide deposits present locally around the margins. Darch Point (north-west of Mt Aubrey) comprises steep coastal hillside of Lower Miocene massive, blocky andesite (Coromandel Group) intruding melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes); overlain by hummocky landslide deposits at the eastern end.

Vegetation

(a) On the south side of Mt Aubrey, coastal kanuka/manuka shrubland up to 2 m in height occupies a steep hillslope. Frequent species include pohutukawa, puriri, and kowhai.

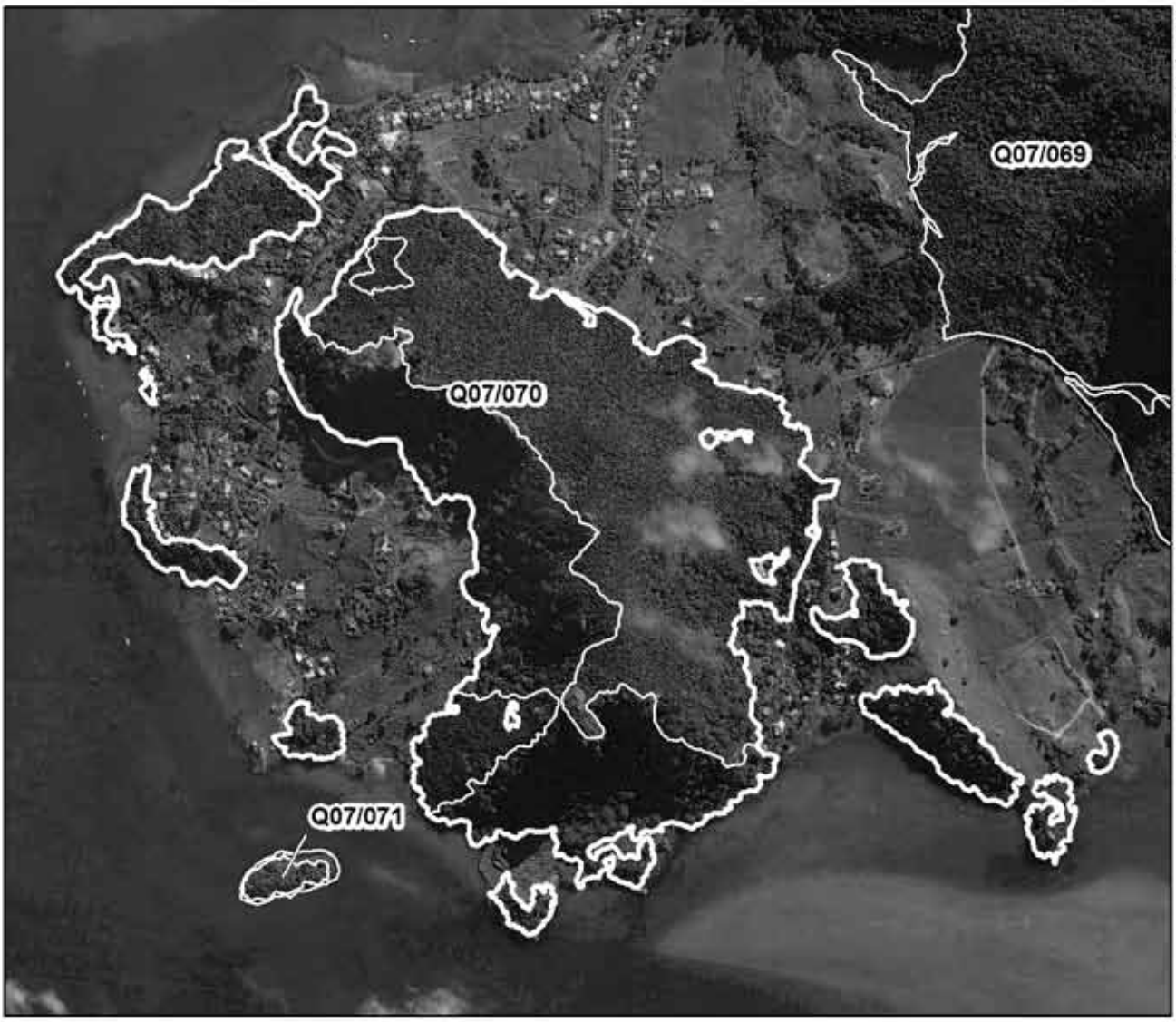
(b) On the peak above, there is kanuka/manuka-puriri coastal forest with frequent kowhai and kohekohe.

(c) To the east, near the lower edge of the site, pohutukawa coastal forest is dominant with frequent kohekohe, kowhai, puriri, kanuka, and manuka. To the north, the forest grades into a zone of shrubland (type a), which occurs with frequent emergent pohutukawa and puriri, and occasional emergent kauri, kahikatea, rewarewa, and rimu.

On the north side of Mt Aubrey, type (a) continues, with frequent totara, ti kouka, and occasional eucalyptus and puriri.

(d) In the small, separate coastal forest remnant at Darch Point, kanuka/manuka is dominant with common pohutukawa and frequent kowhai and kohekohe.

(e) Rocky peaks and outcrops occur throughout the site, and are characterised by a diverse mix of indigenous herbs, orchids and ferns. Typical species include *Peperomia urvilleana*, *Ctenopteris heterophylla*, *Wahlenbergia littoricola*, *Ichthyostomum pygmaeum*, *Winika cunninghamii*, *Crassula sieberiana*, *Cotula australis*, and *Thelymitra pauciflora*.



Aerial photography flown in 2008

Q07/070 Mt. Aubrey Coastal Forest and Shrubland

0 125 250 500
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

Significant flora

Dactylanthus taylorii (Nationally Vulnerable) (1985, AK 306983), *Calystegia marginata* (Naturally Uncommon) (W. Holland, DOC, pers. comm.), *Celmisia adamsii* var. *rugulosa* (Naturally Uncommon), *Pimelea acra* (Naturally Uncommon), *Sophora fulvida* (Naturally Uncommon) (W. Holland, DOC, pers. comm.), *Chielanthes sieberi* (regionally significant), tawapou (regionally significant), whararikí (regionally significant) (2001, SSBI Q07/R07/H043), and *Hebe ligustrifolia* (includes *H.* "Whangarei") (regionally significant) (W. Holland, DOC, pers. comm.).

Fauna

Birds

Red-billed gull (Nationally Vulnerable), pied shag (Nationally Vulnerable), northern little blue penguin (Declining), white-fronted tern (Declining), black shag (Naturally Uncommon), kukupa (regionally significant) black-backed gull, NZ kingfisher, tui, silvereye and grey warbler were recorded in 1979 (SSBI Q07/R07/H043). North Island brown kiwi (Nationally Vulnerable) are present, with one monitored pair recorded breeding in 2009 by WHLF (T. Hamilton, WHLF, pers. comm.). An unidentified petrel (*Pterodroma* sp.) was seen circling Mt Aubrey in December 2001 (A. Booth, DOC, pers. comm.). There is a pied shag roosting site on the harbour's edge (W. Holland, DOC, pers. comm.). Morepork was recorded during this survey in September 2009 by Wildland Consultants.

Lizards

Auckland green gecko (Gradual Decline) was recorded by a local resident in 2004 (W. Holland, DOC, pers. comm.).

Land snails

Liarea turriculata "Manaia" (Range Restricted) (F. Brook pers. comm.).

Significance

Mt Aubrey is an important area of coastal forest and shrubland complimenting the neighbouring forests of Manaia Ridge Scenic Reserve and Surrounds (Q06/069), Taurikura Ridge Bush (Q07/073), and Bream Head Scenic Reserve and Surrounds (Q07/074). The site used to be farmed, but now the indigenous vegetation is recovering. This site has supported one 'Threatened' plant[26], four 'At Risk' plants, four regionally significant plants, three 'Threatened' birds, three 'At Risk' birds, one regionally significant bird, one 'Chronically Threatened' gecko, and one 'At Risk' land snail. It also provides habitat for NI kaka (and possibly NI bellbird), which disperse from the Hen and Chicken Islands. The site supports a breeding pair of kiwi; a NI brown kiwi (male) can occasionally be heard on Mt Aubrey. However, predator control is not intensively managed and roaming dogs are a threat (W. Holland, DOC, pers. comm), although there have been no kiwi deaths at the site attributed to dogs

26 It is unknown if this site still supports *Dactylanthus taylorii.*

to date (P. Graham, DOC, pers. comm.). Representative site for types (c) and (e). Approximately 44.2 ha of the site are within WDC-administered scenic reserve, 2.4 ha are within a Conservation Covenant (WDC), 0.2 ha is within a Fencing Act Covenant (WDC), 4.5 ha are within Reotahi Scenic Reserve (DOC-administered), and 0.06 ha is protected within the Reoahi-Taurikura Seabed (DOC-administered). Approximately 1.5 ha of the site lie within an 'At Risk' land environment (A6.1b), 0.1 ha is within a 'Critically Underprotected' land environment (A6.1a), and 82.5 ha are within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

MOTUKARORO ISLAND

Survey no.	Q07/071
Survey date	27 June 1997
Grid reference	1735263E 6033861N (AX31)
Area	1.2 ha (0.8 ha forest, 0.4 ha rockland)
Altitude	0-30 m asl

Ecological units

(a) Pohutukawa coastal forest on island

(b) Exotic grass rockland on island

Landform/geology

Rocky islet comprising the eroded remnant of a Lower Miocene subvolcanic andesite intrusion.

Vegetation

(a) Situated off Reotahi Bay, this island is covered in abundant secondary pohutukawa coastal forest with frequent karaka and kohekohe. In the subcanopy, ti kouka, harakeke and kawakawa are frequent, with occasional mapou, karamu, *Coprosma macrocarpa, C. rhamnoides*, houpara, karo, kanuka, kowhai, wharangi, and leather-leaf fern. The undertstorey contains harakeke, *Astelia banksii*, knobby clubrush, pohuehue, bracken, *Adiantum hispidulum*, *Asplenium haurakiense*, *A. oblongifolium*, *Doodia australis*, *Microsorum pustulatum,* and a range of exotic grasses and herbs.

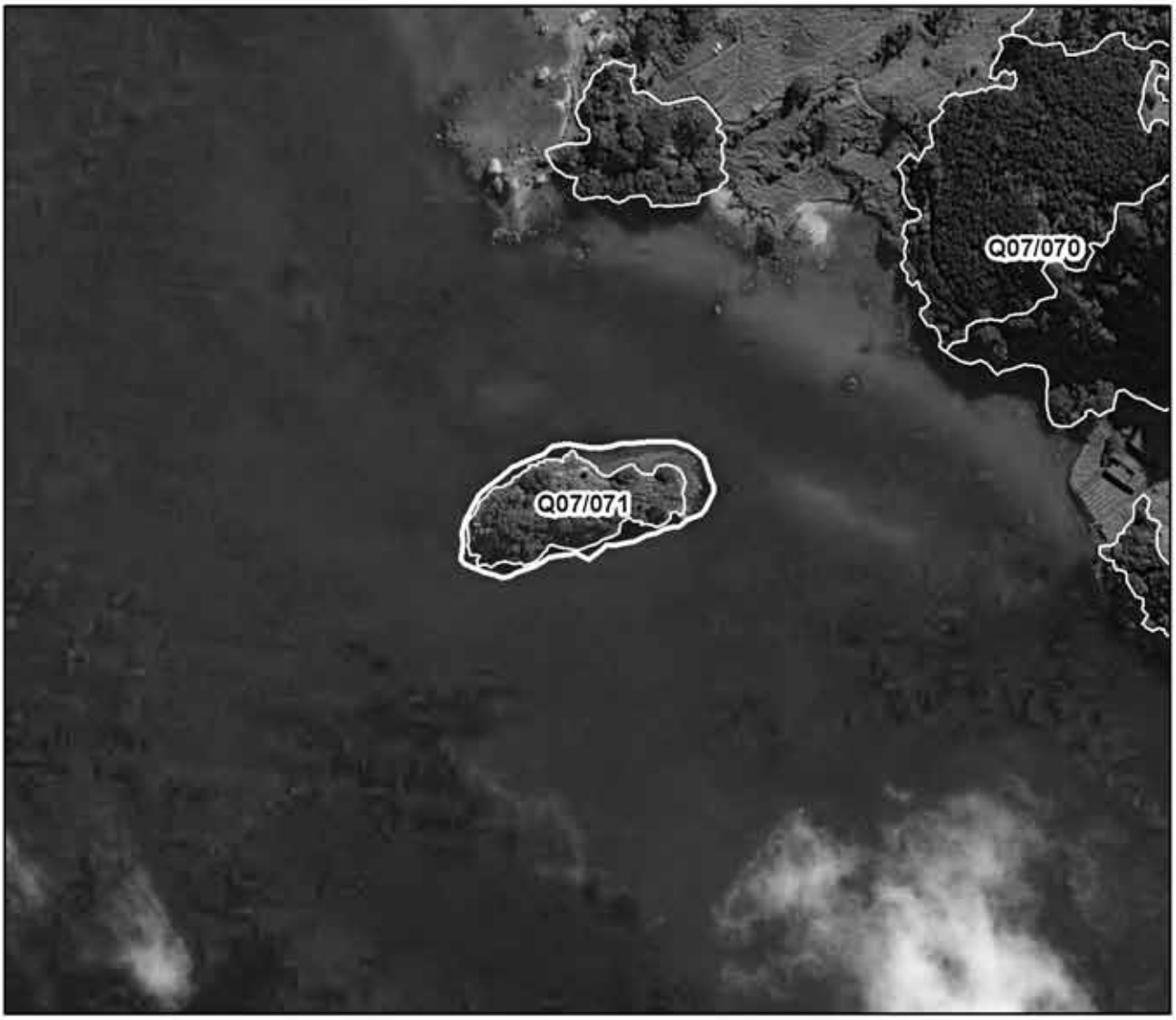
(b) The remainder of the island comprises bare rock with scattered exotic grass species, including ratstail, ripgut brome, paspalum, vulpia hair grass, and creeping bent.

Significant flora

Geranium solanderi (regionally significant) (1991, SSBI Q07/R07/H070).

Fauna

Two pied shags (Nationally Vulnerable) and three pairs of reef heron (Nationally Vulnerable) (reported breeding) were recorded in October 1991, together with silvereye and shining cuckoo (SSBI Q07/R07/H070). Red-billed gull (Nationally Vulnerable), northern little blue penguin (At

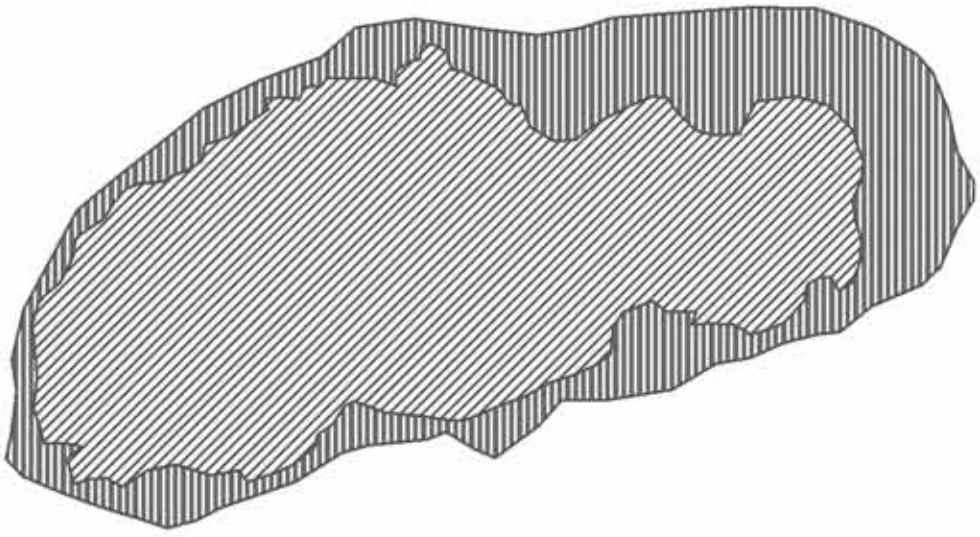


Q07/071 Motukaroro Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



Risk - Declining), gannet and black-backed gull were observed offshore (19991, SSBI Q07/R07/H070). More recently, reef heron have been recorded on the island (R. Pierce pers. comm.).

Significance

Islands covered with intact coastal forest are rare in Whangarei Harbour. Despite its size and proximity to the mainland, Motukaroro Island has remained in a relatively natural state. It supports one regionally significant plant species and at least three species of 'Threatened' seabirds and one 'At Risk' seabird. Representative site for type (a): pohutukawa coastal forest on island. The island is now part of Whangarei Harbour Marine Reserve. The site is host to several weed species, the most important being gorse, German ivy, and buffalo grass. It is not known if rodents inhabit the island, but it is within swimming distances for rats from the mainland. Motukararo Island is owned by the Northland Port Corporation. Approximately 1.0 ha of this site is within an 'Acutely Threatened' land environment (A7.2a) (Walker *et al.* 2007).

HIGH ISLAND

Survey no.	Q07/072
Survey date	27 June 1997
Grid reference	1737112E 6033935N (AX31)
Area	2.6 ha
Altitude	0-30 m asl

Ecological units

(a) Kanuka/manuka coastal forest on island

Landform/geology

Rocky islet comprising the eroded remnant of a Lower Miocene subvolcanic andesite intrusion.

Vegetation

(a) The island is covered in coastal forest, which is dominated by kanuka/manuka up to 4 m in height. Pohutukawa, kohekohe, and gorse are frequent with occasional puriri and *Prunus* sp. and emergent mamaku, ponga, and ti kouka. Pohutukawa is scattered around the fringe of the island. Understorey species include karamu, *Coprosma macrocarpa*, *C. rhamnoides*, mapou, hangehange, kawakawa, houpara, koromiko, toatoa, pigeonwood, and wheki. The ground tier is characterised by *Adiantum hispidulum*, *A. cunninghamii*, *Pteris tremula*, *Blechnum filiforme*, *Microsorum pustulatum*, *Asplenium haurakiense*, and *Carex flagellifera*. Exposed areas are occupied by *Lobelia anceps*, Mercury Bay weed, knobby clubrush, *Isolepis cernua*, sea rush, and *Lachnagrostis billardierei*.

Significant flora

No information.

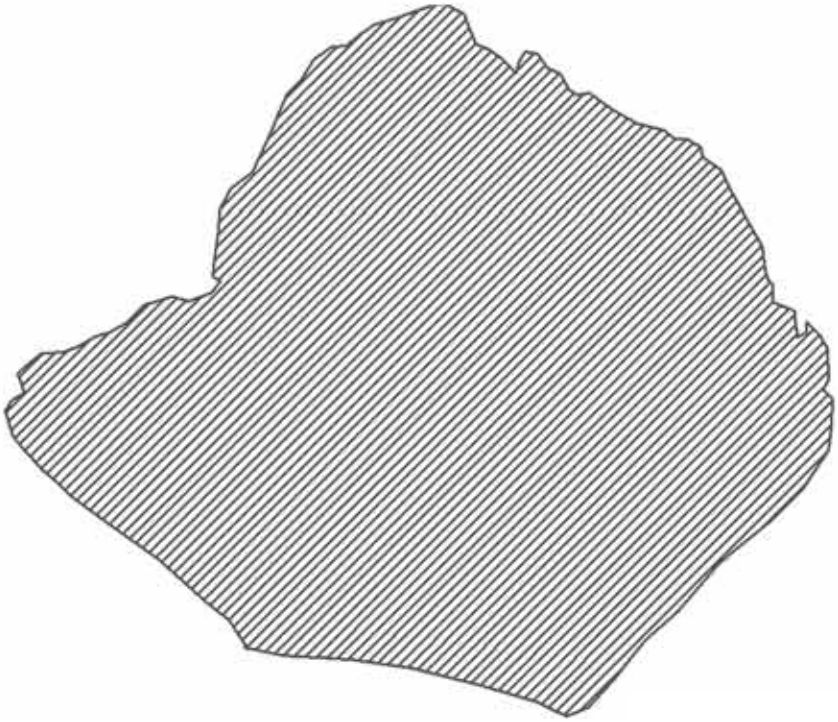
Aerial photography flown in 2008

Q07/072 High Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



Fauna

Birds

Red-billed gull (breeding, Nationally Vulnerable), pied shag (Nationally Vulnerable), little black shag (Naturally Uncommon), little shag (Naturally Uncommon), variable oystercatcher (breeding, Recovering) , NZ kingfisher, silvereye, and grey warbler have been recorded from the site (1992, SSBI Q07/R07/H123).

Land snails

The non-threatened *Delos coresia, Lamellidea novoseelandica, Liarea turriculata*, *Phenacohelix giveni*, *Punctid arewa*, *P. attenuispira*, *P. corella*, and *P. lampra* have been recorded from the site (1991-1994, SSBI Q07/R07/H123).

Significance

Forested islands are rare in Whangarei Harbour; High Island is known to support two 'Threatened' seabirds, three 'At Risk' seabirds, and a range of indigenous non-threatened land snails. Past disturbances have facilitated the establishment of invasive weeds such as ginger, smilax, gorse, cotoneaster, and pampas. It is not known if invasive mammals inhabit the island but the proximity to the mainland means that several species are likely to be present or at least gain access periodically. There are clear opportunities for restoration of this important island. The entire site (2.6 ha) lies within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

TAURIKURA RIDGE BUSH

Survey no.	Q07/073
Survey date	13 February 1998 and 20 March 1998
Grid reference	1739312E 6033541N (AX31)
Area	212.3 ha (166.6 ha forest, 45.1 ha shrubland, 0.6 wetland)
Altitude	0-245 m asl

Ecological units

(a) Kanuka/manuka coastal forest on hillslope

(b) Kanuka/manuka-kowhai coastal forest on steep hillslope

(c) Kowhai-rewarewa coastal forest on steep hillslope

(d) Karaka-kowhai coastal forest on steep hillslope

(e) Puriri-kanuka/manuka coastal forest on steep hillslope

(f) Kanuka/manuka-puriri coastal forest on steep hillslope

(g) Kowhai-puriri-taraire coastal forest on steep hillslope

(h) Pohutukawa-taraire coastal forest on moderate ridge

(i) Nikau-puriri-taraire coastal forest on steep hillslope

(j) Kanuka/manuka-mamangi coastal forest on moderate slope

(k) Kanuka/manuka coastal shrubland on moderate hillslope

(l) Kanuka/manuka-bracken coastal shrubland in gully

(m) Taraire-puriri coastal forest in steep gully

(n) Puriri coastal forest in steep gully

(o) Pohutukawa coastal treeland on hilltop

Landform/geology

Coastal hill country on eroded Lower Miocene dacite dome (Coromandel Group), with melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes) forming the headland between Taurikura Bay and McKenzie Bay.

Vegetation

(a) Kanuka/manuka coastal forest is dominant on steep hillslope. Kowhai, ti kouka, puka, and emergent rewarewa are present in low numbers, with occasional totara present at the edge of the forest. The subcanopy consists of occasional houhere, nikau, mamaku, mapou, mamangi, kohekohe, wheki, kawakawa, hangehange, mahoe, ponga, *Hebe* sp., *Coprosma rhamnoides*, harakeke, and kiekie. Ground cover species include occasional *Doodia australis*, *Adiantum* spp., hook grass, and mistflower. Type (a) also occupies a gully, where it occurs with frequent ti kouka and occasional puriri, kauri, towai, kohuhu, kahikatea, mamaku, nikau, and mingimingi.

(b) Abundant kanuka/manuka occurs on the same contour with common kowhai and occasional totara, pohutukawa, towai, puriri, karaka, ti kouka, and mamaku.

(c) Further up the slope, kowhai-rewarewa coastal forest is present with frequent taraire and occasional karaka, tawa, puriri, kanuka, manuka, and mamaku.

(d) A small area of karaka-kowhai coastal forest occurs near the top of the slope, with frequent puriri and ti kouka, and occasional taraire, kanuka, and manuka.

(e) Adjacent to type (d), puriri-kanuka/manuka forest becomes dominant, with occasional kowhai, karaka, totara, kohekohe, ti kouka, and nikau.

(f) Midway up the slope, type (a) grades into co-dominant kanuka/manuka and puriri with frequent taraire and kowhai, and occasional tawa, karaka, kohekohe, rewarewa, nikau, and epiphytic puka.

(g) Near the top of the ridge, kowhai-puriri-taraire coastal forest occurs on a steep hillslope with frequent kanuka, manuka and nikau, and occasional kahikatea, karaka, rewarewa, and ti kouka.

(h) Pohutukawa and taraire are co-dominant on a ridgeline, although the canopy is fragmented at the lower end. Rewarewa, kanuka, manuka, and mamaku are frequent with occasional karaka, puriri, nikau, and ti kouka.

(i) Nikau-puriri-taraire forest is present on a steep hillslope with frequent rewarewa and occasional northern rata, kohekohe, karaka, kahikatea, kanuka, manuka, mamaku, ti kouka, and puka. Two steep ridges on either side of of this hillslope are dominated by type (a) with occasional ti kouka and mamaku.

(j) Kanuka/manuka-mamangi coastal forest occurs on moderate slopes in the eastern part of the site, with occasional towai and ti kouka.

(k) Kanuka/manuka shrubland covers moderate hillslopes at the far eastern point of the site. Ti kouka, mamaku, and emergent kauri are also present.

(l) Kanuka/manuka and bracken dominate a gully, with frequent mingimingi and hangehange, and occasional mamaku, pampas, and gorse.

(m) Taraire and puriri dominate another gully, with frequent rewarewa and occasional ti kouka, karaka, tawa, and mamaku, and emergent pohutukawa and kahikatea. Kanuka and manuka are frequent on the edges. The subcanopy comprises frequent nikau and kohekohe, with occasional mamaku, ponga, houhere, and pate. Kiekie and nikau are dominant in the understorey, with occasional kawakawa, mahoe, supplejack, *Coprosma grandifolia*, pigeonwood, and turepo. Groundcover species include occasional *Pteris tremula*, *P. saxatilis*, *Blechnum filiforme*, pakau, *Microsorum scandens*, and *Adiantum viridescens.* Further north, type (a) is present on a ridge with occasional mamaku, mingimingi and ti kouka.

(n) In a steeper gully, puriri coastal forest occurs with frequent taraire. Nikau is frequent at the bottom of the gully, while mamaku is frequent in the gully head. Pukatea, rewarewa, kauri, kanuka, manuka, and kiekie are also present.

On the western side of the site, in a small coastal remnant in McKenzie Bay, type (b) occupies a moderate hillslope with frequent pohutukawa on the shoreline and mamaku frequent throughout. There is occasional puriri, kahikatea, mamangi, mahoe, rewarewa, and ti kouka. Pampas is scattered along the forest margins.

(o) Further south near the wharf, there is a separate coastal forest remnant on a small hilltop characterised by a canopy of pohutukawa over exotic grassland.

Significant flora

At Risk

Doodia mollis (Naturally Uncommon), *Microlaena carsei* (Naturally Uncommon) (both recorded by Forester & Tyson 2008, in SSBI Q07/R07/H044), and *Peperomia tetraphylla* (Naturally Uncommon) (1996, SSBI Q07/R07/H043).

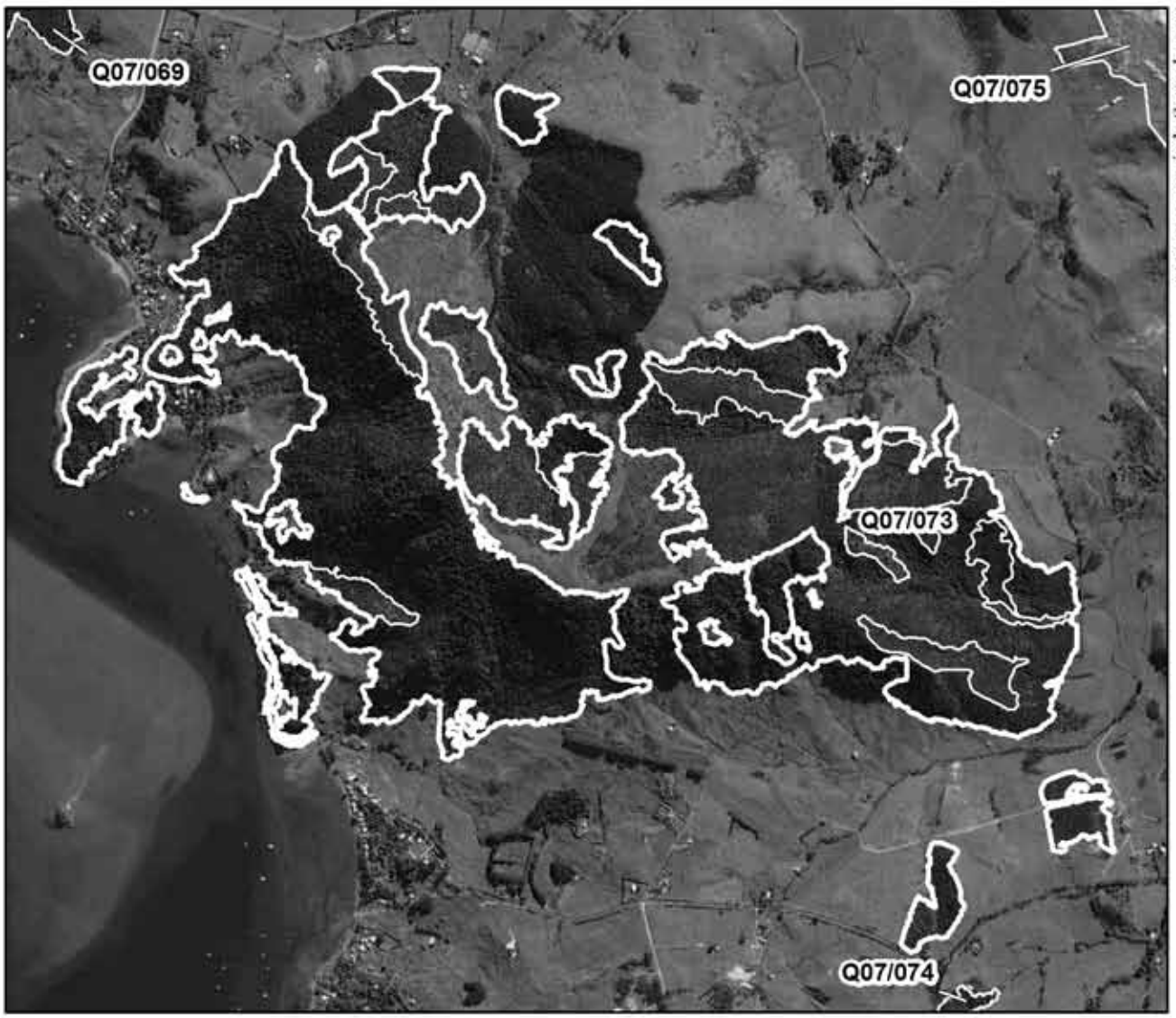
Regionally significant

Coprosma rigida, kaikomako (2006, DOC internal report), kohia, *Beilschmiedia tawa* (including *B. tawaroa*) (Forester & Tyson 2008, in SSBI Q07/R07/H044), and northern rata (recorded during the PNAP survey). All non-referenced records are included in SSBI Q07/R07/H043.

Fauna

Birds

NI kaka (Nationally Vulnerable), NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), NI tomtit (regionally significant) (T. Hamilton, WHLF, pers.comm. 2010), NI bellbird (regionally significant),



Q07/073 Taurikura Ridge Bush

0 250 500 1,000
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

shining cuckoo (Forester & Tyson 2008, in SSBI Q07/R07/H043), tui, grey warbler, NI fantail, kingfisher, morepork, Australasian harrier, pukeko, spur-winged plover, and white faced heron (recorded during the PNAP survey, 1998). WHLF has released nine kiwi at the site since 2005. Breeding of kiwi pairs was recorded in 2009. Australasian bittern (Nationally Endangered) are regularly sighted in small wetland in the north of the site (T. Hamilton, WHLF, pers.comm.).

Fish

Banded kokopu (regionally significant) (1992, SSBI Q07/R07/H044).

Land snails

Amborhytida dunniae (Gradual Decline) (two shells founds in 2006, SSBI Q07/R07/H044) and *Liarea turriculata* "Manaia" (Range Restricted) (F. Brook pers. comm.).

Other terrestrial invertebrates

Cave weta (2006, SSBI Q07/R07/H044), green chafer, giraffe weevil, two-spined weevil, and four-spined weevil (F. Brook, pers obs.).

Significance

Taurikura Ridge Bush contains a very prominent ridge system with the western and southern slopes providing a highly visible back-drop to the coastal settlements of Taurikura, McKenzie Bay, and Urquharts Bay. The ridge includes a contiguous area of approximately 160 ha of indigenous forest with a high content of puriri and kowhai, and is therefore of considerable value to frugivorous and nectivorous birds. Some puriri in particular 'are of immense size' (SSBI Q07/R07/H044). Another distinctive feature of the site is the large boulders and rocky outcrops, which is also typical of Manaia Ridge Scenic Reserve and Surrounds (Q07/069) and Bream Head Scenic Reserve and Surrounds (Q07/074). In an area of the southern slopes the substrate is very rocky (volcanic), which is indicative of the forest and substrate on the Hen and Chicken Islands (SSBI Q07/R07/H044). The site supports three 'At Risk' and five regionally significant plant species, and fauna that includes four 'Threatened', one 'At Risk', and three regionally significant species (including resident and transient kiwi). This site is representative for types (b), (c), (d), (e), (g), (h), (i), (j), (l), (m), and (n). The site's location between two of Northland's most significant coastal reserves (Mt Manaia and Bream Head) makes it an important corridor and supporting habitat, in particular for kiwi, kukupa and dispersing fauna from the Hen and Chicken Islands such as NI kaka, red-crowned kakariki and NI bellbird (W. Holland, DOC, pers. comm.).

The site is included in the Whangarei Kiwi Sanctuary, which is one of five sanctuaries in the country set up in 2000 as part of the NZ Biodiversity Strategy. Nine kiwi have been released on Taurikura Ridge since 2005 (T. Hamilton, WHLF, pers. comm.). Two listening stations have been established in the site, and in 2007-2008 there was an average of 4.4 calls per hour at Taurikura 1 station and 9.0 calls per hour at Taurikura 2 station (Pierce 2008). Pest control activities within the site

are thus predominantly undertaken by local landcare groups, with DOC targeting mustelids using a line of traps to protect resident kiwi. Before pest control commenced, ship rat and possum numbers were high. Evidence of this included severe browse on large pohutukawa, seeds predated by rats, and predated land snails (e.g. *Amborybida dunniae*). Predator trapping has been carried out in the site since 2002 as part of the wider WHLF kiwi project. In 2006, the Taurikura Ridge Project was established with the express aim of significantly reducing possum populations to low levels (T. Hamilton, WHLF, pers. comm.). It is being driven by a predator and pest control group that has been formed by local landowners and it operates as a sub-group of the WHLF. The project area covers approximately 350 ha (T. Hamilton, WHLF, pers. comm.). Building on the success of Stages 1 and 2 of the project, whereby possum numbers were dramatically reduced, it is the now taking pest control to the next level by incorporating intensive rat control alongside the possum and predator (mustelids and cats) control (Hunt & Moodie 2008). It is hoped that controlling rat numbers to low levels will eliminate the last pest threat from the project area and enable the successful breeding of 'Threatened' and 'At Risk' bird species (e.g. NI kaka, Australasian bittern, and NI fernbird), as well as protecting threatened plant species present. It is envisaged that this project will become a template to apply similar methodology to private land throughout the rest of Manaia ED. Taurikura Ridge landowners have all enthusiastically attended 'consultation' meetings at the draft stages of the proposal and will be further involved in bait preparation and trapline monitoring (Hunt & Moodie 2008).

Other threats are typical to natural areas in the ED. The proximity of the site to the coast makes it highly desirable as a residential area. Unless fully protected, parts of Taurikura Ridge Bush - and the flora and fauna present within it - will be under constant threat from development. Weeds are present, including Mexican devil, smilax, pampas, eleaegnus, soft rush, and inkweed. Some indigenous habitats have ginger infestations. Stock incursions into forested areas have been recorded on private property in the south-west of the site. A 7.4 ha block of broadleaved forest within the Taurikura Landcare Project area (at the southwest end of the ridge) is within a QEII Open Space Covenant and 0.1 ha is protected within WDC-administered reserve. Approximately 0.5 ha of the site is within an 'Acutely Threatened' land environment (A5.1a), 5.5 ha of the site are within a 'Chronically Threatened' land environment (A6.1d), 19.2 ha within an 'At Risk' land environment (A6.1b), 172.5 ha are within an 'Underprotected' land environment (D1.2b), and 14.8 ha are within a 'No Threat Category' land environment (D1.1b) (Walker et al. 2007).

BREAM HEAD SCENIC RESERVE AND SURROUNDS

Survey no.	Q07/074
Survey date	March – October 1998, September 2009
Grid reference	1740818E 6031045N (AX31)
Area	686.5 ha (540.6 ha forest, 118.4 ha shrubland, 5.5 ha duneland, 22.1 ha rockland)
Altitude	0-476 m asl

Ecological units

(a) Kauri forest on steep coastal ridge

(b) Karaka-puriri-nikau forest in steep coastal gully

(c) Kowhai forest on steep coastal hillslope

(d) Kanuka/manuka forest on coastal hillslope

(e) Kowhai-puriri forest in steep coastal gully

(f) Karaka-nikau-pohutukawa forest on coastal hillslope

(g) Pohutukawa forest on coastal hillslope and coastal margin

(h) Taraire-tawapou forest on steep coastal hillslope and gully

(i) Kohekohe-kowhai forest on steep coastal hillslope

(j) Puriri-taraire forest in coastal gully and on coastal hillslope

(k) Kowhai-puriri-taraire forest on steep coastal hillslope

(l) Pohutukawa-puriri forest on steep coastal hillslope

(m) Taraire forest on steep coastal hillslope

(n) Ti kouka shrubland on gentle coastal hillslope

(o) Kowhai-pohutukawa forest on steep coastal hillslope

(p) Pohutukawa-taraire forest on steep coastal hillslope

(q) Kanuka/manuka-rewarewa forest on steep coastal hillslope

(r) Kanuka/manuka-taraire forest on coastal hillslope

(s) Harakeke-houpara flaxland in steep coastal gully

(t) Harakeke-gorse flaxland on coastal cliff

(u) Gorse-smilax shrubland on steep coastal hillslope

(v) Gorse shrubland on moderate coastal hillslope

(w) Kanuka/manuka shrubland on coastal hillslope

(x) Nikau-puriri-taraire forest on steep coastal hillslope

(y) Kanuka/manuka-kowhai forest on steep coastal hillslope

(z) Puriri forest in steep coastal narrow gully

(aa) Kanuka/manuka-puriri forest in steep coastal gully and on steep hillslope

(bb) Kohekohe-taraire forest on steep coastal hillslope

(cc) Kanuka/manuka-pohutukawa forest on steep coastal hillslope and coastal ridge

(dd) Kanuka/manuka-mamangi shrubland on coastal hillslope

(ee) Kanuka/manuka-*Hebe* sp. shrubland on coastal hillslope

(ff) Pohutukawa-houpara forest on steep coastal hillslope

(gg) Kikuyu-harestail grassland on sand dune

(hh) Houpara-karaka forest on steep coastal hillslope

(ii) Karaka-kohekohe-puriri forest in coastal gully

(jj) Manuka shrubland on coastal hillslope

(kk) Kikuyu grassland on coastal hillslope

(ll) Bare rock rockland on outcrops and bluffs

Landform/geology

Steep, bluffed hill country with prominent rocky pinnacles, mostly comprising part of the deeply eroded flank of a Lower Miocene andesitic stratovolcano, but with the eroded remnant of a Lower Miocene dacite dome forming the spur west of Mt Lion (Matariki) (all Coromandel Group), and with much younger, unconsolidated, landslide deposits at Peach Cove and Cabbage Tree Flat. The area including Home Point comprises steep, bluffed coastal hills, mostly formed on an eroded Lower Miocene dacite dome, but with flank deposits of a Lower Miocene andesitic stratovolcano (all Coromandel Group) forming the northern hill. Smugglers Bay comprises eroded Holocene foredune at the back of pocket beach.

Vegetation

The site comprises a large area of predominantly broadleaved coastal forest and shrubland which spans the area between Busby Head in the west and Te Whara in the east.

Type (a) emergent kauri forest occupies a steep ridge east of Smugglers Bay, occurring with frequent rewarewa and mamangi and occasional kanuka, manuka, and mamangi.

Type (b) karaka-puriri-nikau coastal forest is present in a gully with frequent rewarewa and occasional kowhai, pukatea, and mamaku.

Near the top of the main ridge, type (c) kowhai forest occurs on a steep hillslope. Ti kouka is frequent with occasional karaka, rewarewa, kohekohe, nikau, mapou, and *Coprosma macrocarpa*. Type (d) kanuka/manuka forest is present on the same ridge, further to the east. Kowhai, houpara, ti kouka, mapou, and ti ngahere are present in low numbers.

Type (e) kowhai-puriri coastal forest is present in a steep gully midway up the slope. Frequent species include rewarewa, nikau and karaka with occasional kohekohe, mamangi, ti kouka, kanuka, manuka, and mamaku. At the bottom of the slope on the coastal margin, type (f) karaka-nikau-pohutukawa coastal forest is present with frequent kowhai and occasional kahikatea, matai, rewarewa, puriri, kanuka, manuka, and ti kouka.

(g) Pohutukawa forest dominates the coastal margin of the site with some very large old growth trees. Puriri and houpara are frequent and karaka, kowhai, puriri, kohekohe, tawapou, nikau, ti kouka, and whau are also present. Pohutukawa forest continues to dominate further up the slope while kowhai occurs frequently.

(h) In the same area, steep coastal hillslope and coastal gully are dominated by taraire and tawapou with occasional karaka, kohekohe, nikau, mahoe and puriri. In the subcanopy, parapara is dominant in patches as present

Q07/074 Bream Head Scenic Reserve and Surrounds

Q07/074 Bream Head Scenic Reserve and Surrounds

in 2009, occurring with occasional mahoe, *Streblus banksii* and karaka. Parapara is also common in the understorey, occurring with kawakawa, hangehange, nikau and turepo. The groundcover consists of common *Asplenium lamprophyllum*, occasional *Pteris comans* and prolific parapara seedlings.

(i) At the top of the steep slope above Peach Cove, kohekohe-kowhai forest is present with frequent kanuka and manuka, and occasional puriri, tawa, ti kouka, and mamaku. On the east side of Peach Cove Track, near the top of the main ridge, type (d) is dominant with frequent ti kouka and occasional puriri, rewarewa, karaka, kohekohe, kowhai, mamaku, and nikau.

(j) Downhill from the ridge, puriri and taraire dominate the steep hillslope forest. Frequent species include tawa, rewarewa, and kohekohe with occasional karaka, kowhai, nikau, kanuka, manuka, and mamaku.

At the bottom of the slope, the coastal margin is dominated by type (g) with frequent karaka and kohekohe, and occasional titoki, kowhai, kanuka, manuka, and ti kouka.

(k) On the steep upper slopes, kowhai, puriri and taraire are co-dominant. Associated species include rewarewa, nikau, ti kouka, tawa, mamaku, titoki, karaka, and kohekohe.

Towards the top of the main ridge, type (j) puriri-taraire forest occurs on a steep hillslope with frequent rewarewa and occasional tawa, kowhai, nikau, mamaku, and epiphytic puka.

Type (l) pohutukawa is abundant with common puriri at the bottom of the steep slope, with occasional taraire, kowhai, karaka, ti kouka, mahoe, and nikau. Continuing eastwards on the coastal margin, type (g) remains the dominant forest type. Houpara occurs frequently with occasional tawapou, kowhai, and ti kouka.

Type (m) taraire forest becomes the dominant canopy species on steep hillslope immediately above the coastal margin. Puriri is frequent with occasional rewarewa, kowhai, and ti kouka. Taraire continues to dominate further up the slope, with occasional tawa, nikau, and mamaku.

At Cabbage Tree Flat, type (n) ti kouka is abundant with frequent manuka and harakeke, and occasional mapou. Type (o) kowhai-pohutukawa forest dominates the steep slope above Cabbage Tree Flat, while mamaku, manuka, ti kouka, and nikau are present in low numbers. Type (p) pohutukawa-taraire forest is present on the northern edge of the shrubland. Ti kouka is frequent with occasional tawa, kohekohe, manuka, nikau, and mahoe. Type (g) occurs on steep hillslope with frequent karaka, tawapou, houpara and *Hebe parviflora*, and occasional kowhai, ti kouka, puriri, manuka, and nikau.

(q) Kanuka/manuka and rewarewa are co-dominant on the steep slope nearer the ridgeline. Nikau is frequent with occasional karaka, puriri, taraire, ti kouka, pigeonwood, mapou, and kiekie.

Type (r) kanuka/manuka-taraire forest is also present on a steep hillslope. Rewarewa is frequent and totara, with occasional puriri, ti kouka, nikau, mamaku, kowhai, lancewood, *Hebe parviflora*, puka, and kiekie.

(s) Flaxland dominated by abundant harakeke and common houpara occupies a steep coastal gully. Frequent species include gorse and emergent pohutukawa with occasional karaka and ti kouka.

An area of coastal cliffs is characterised by type (t) harakeke-gorse flaxland. Smilax occurs frequently under emergent pohutukawa.

Type (u) gorse-smilax shrubland dominates a steep slope below the lighthouse next to the beach. Pohuehue and harakeke are frequent with occasional *Calystegia* sp. and emergent karaka. Type (v) gorse shrubland is abundant on moderate slopes south of Ocean Beach Road. Also present are frequent emergent manuka and occasional emergent mamaku. Further up the slope, type (w) kanuka/manuka shrubland is present. Other species present include occasional ti kouka, mamaku, and gorse.

Type (x) nikau-puriri-taraire forest is present below rocky bluffs. Mamaku is frequent, with occasional totara, northern rata, miro, ti kouka, kanuka, manuka, rewarewa, kowhai, puka, and emergent rimu.

Forest to the west side of the Peach Cove track, near the ridgeline, is characterised by type (y) kanuka/manuka-kowhai forest on a steep slope. Puriri and rewarewa are frequent with occasional pohutukawa, ti kouka, nikau, and mamaku.

Other south-facing hillslope areas are defined by a uniform canopy of type (d) with occasional ti kouka; type (y) with occasional ti kouka, puka, and emergent puriri; type (bb) kohekohe-taraire forest with frequent rewarewa and occasional karaka, puriri, kowhai, nikau, kanuka, manuka, and puka; and type (cc) kanuka/manuka-pohutukawa forest with occasional, mamaku, kowhai, and kauri.

Steep narrow gullies are occupied by type (z) puriri forest with frequent kohekohe, and type (aa) kanuka/manuka-puriri forest with frequent kowhai. Other species present include rewarewa, pohutukawa, karaka, ti kouka, mamaku, nikau, and puka. This type of forest continues westwards onto a steep hillslope.

(dd) On Busby Head, there is a separate area of shrubland on a moderate east-facing slope. At the northern end, kanuka/manuka is dominant with common mamangi and occasional houpara, ti kouka, mamaku, *Clematis paniculata*, and emergent pohutukawa.

(ee) At the southern end of Busby Head, kanuka/manuka and *Hebe* sp. commonly occur with frequent hangehange and mapou, and occasional mamangi and rangiora.

(ff) The western side of the headland is characterised by abundant pohutukawa with common houpara and kanuka/manuka commonly occurring. On the lower coastal margin, harakeke is common with occasional pampas.

(gg) A small area of dunelands is situated behind the beach at Smugglers Bay. The dunelands are dominated by exotic grasses such as harestail and kikuyu, with frequent lupin and occasional pohuehue, ratstail, hawksbeard, knobby clubrush, and shore bindweed (F. Brook, unpub. data).

(hh) A small, discrete area of forest is present on on steep south facing slopes on Home Point. Houpara is dominant with common karaka and occasional puriri, whau, kowhai and wharangi.

(ii) A gully in the same area is dominated by karaka-kohekohe-puriri forest with frequent pohutukawa and kanuka/manuka on the ridgeline, and occasional whau.

(jj) Manuka shrubland (planted between 2003 and 2008) occurs on the northern coastal margin of Home Point, with occasional pohutukawa, ti kouka, harakeke, houpara, and karo (W. Holland, DOC, pers. comm.).

(kk) Kikuyu grassland covers large areas at Home Point and to the south of Ocean Beach. Gorse is scattered throughout.

(ll) Extensive areas of bare rock are prominent on the exposed east coast of the site. Rockland also flanks both sides of Busby Head.

Significant flora

Threatened

Pseudowintera insperata (Nationally Critical) (2004, CHR 573382) and *Senecio scaberulus* (Nationally Critical).

At Risk

Scandia rosifolia (Declining) (Young 2007); *Calystegia marginata* (2010, W. Holland, DOC, pers. comm.), *Fuchsia procumbens* (Naturally Uncommon) (2010, W. Holland, DOC, pers. comm.); kawaka (Naturally Uncommon) (W. Holland, DOC, pers. comm. 2010), *Pimelea acra* (Naturally Uncommon) (1997, CHR 469709, reconfirmed in 2009 during this survey); *Pittosporum ellipticum* (Naturally Uncommon), *Pittosporum virgatum* (Naturally Uncommon); *Celmisia adamsii* var. *rugulosa* (Naturally Uncommon) (2004, AK 286208); *Chionochloa bromoides* (Naturally Uncommon) (2007, SSBI Q07/R07/H046); *Sophora fulvida* (Naturally Uncommon) (1997, CHR 513396); parapara (Relict) (1994, AK 294655, reconfirmed 2009, W. Holland, DOC, pers. comm.) and *Streblus banksii* (Relict) (1996, AK 297658), which is sparsely distributed in the Reserve. *Dianella latissima* (Data Deficient) (1998, AK 300257) and *Drosera peltata* (Coloniser) are also present. All other non-referenced species are listed in Clunie (1993).

Regionally significant

Adiantum aethiopicum, *Blechnum triangularifolium*, *Brachyglottis kirkii* var. *angustior* (2007, SSBI Q07/R07/H046), *Cheilanthes distans*, *Chionochloa conspicua* subsp. *cunninghamii* (2007, SSBI Q07/R07/H046), *Corokia cotoneaster* (2007, SSBI Q07/R07/H046) *C. buddleioides* (1999, AK 300278), *Dracophyllum sinclairii* (2007, SSBI Q07/R07/H046), *Hebe ligustrifolia* (includes *H.* "Whangarei") (2008, SSBI Q07/R07/H046), *H. macrocarpa* var. *macrocarpa* (2007, SSBI Q07/R07/H046), *H. parviflora* (2007, SSBI Q07/R07/H046), *Helichrysum lanceolatum*, mairehau (recorded in 2009 by Wildland Consultants during this survey), kotukutuku, *Leptostigma setulosa*, *Libertia* aff. *grandiflora* (large capsules) (2007, SSBI Q07/R07/H046), *Linum monogynum*, *Lophomyrtus obcordata* (1980, AK 157361), *Luzula banksiana* var. *banksiana* (2004, AK 286203), *Metrosideros carminea* (recorded in 2009 by Wildland Consultants during this survey), ngaio (2007, AK 298397), black maire,

coastal maire (Young 2007), *Oxalis magellanica* (recorded during this survey by Wildland Consultants, 2009), *Pseudowintera axillaris* (2007, AK 301842), *Rubus squarrosus (*1980, AK 157364), tawapou*, Beilschmiedia tawa* (including *B. tawaroa*), toru, and ongaonga (2006, AK 297659). All other non-referenced species are listed in Clunie (1993).

Fauna

Threatened birds

NI brown kiwi (Nationally Vulnerable), NI kaka (visitor, Nationally Vulnerable), pied shag (Nationally Vulnerable), northern NZ dotterel (visitor, Nationally Vulnerable) (Pierce *et al.* 2001), reef heron (Nationally Vulnerable) (recorded from Busby Point in 1997), and red-billed gull (Nationally Vulnerable). Bush falcon (Nationally Vulnerable) was heard from a gully east of the Peach Cove carpark track in August 2008 (A. Townsend, DOC, pers. comm.) and a dead specimen was found nearby at Urquharts Bay in February 2006 (N. Miller, DOC, pers. comm.). Australasian bittern (Nationally Endangered) has been known to visit the reserve or its boundaries including an unnamed stream north of the site (Pierce *et al.* 2001).

At Risk birds

Northern little blue penguin (Declining) (Pierce 2005), pied oystercatcher (visitor, Declining), pied stilt (visitor, Declining) (Pierce *et al.* 2001), NZ pipit (Declining), red-crowned kakariki (visitor, Relict), long-tailed cuckoo (Naturally Uncommon), Pycroft's petrel (Recovering) (single dead bird recorded from Peach Cove, R. Pierce pers. comm.), variable oystercatcher (Recovering), and Cook's petrel (Relict) (skull recorded from Peach, N. Miller, DOC, pers. comm. 2008). In the summer of 2009/10, two breeding pairs of variable oystercatchers successfully raised chicks; one at Smugglers Bay and one at a small beach around from Smugglers Bays (W. Holland, DOC. pers. comm. 2010).

Regionally significant birds

Kukupa, NI tomtit, and NI bellbird (recorded breeding) (W. Holland, DOC, pers. comm.), A grey-faced petrel was heard circling above Peach Cove in Autumn 2003 (A. Booth, DOC, pers. comm.), and suspected grey-faced petrel burrows were recorded at Bream Head in summer 2007, near Cabbage Tree Flat, although no birds were seen (N. Miller, DOC, pers. comm.).

Non-threatened birds

Tui, grey warbler, NI fantail, silvereye, welcome swallow, paradise shelduck, morepork, shining cuckoo, Australasian harrier, Australasian gannet (visitor), black-backed gull and kingfisher (1979 and 1992, SSBI Q07/R07/H046). A breeding pair of variable oystercatchers with one chick were observed at the southern end of Ocean Beach, near Moturaka Island (W. Holland pers. comm.). White-faced heron was recorded during the PNAP survey.

Mammals

Unconfirmed early 1990s record of a bat species seen at Peach Cove, probably a long-tailed bat (Nationally Vulnerable) (SSBI Q07/R07/H046), and 2008 sightings of a bat on two occasions at Ocean Beach (I. Pritchard, pers. comm.).

Land snails

Punctidae sp. 223 (#P. sp. 6) (Nationally Critical) has been recorded from Smugglers Bay, where it lives amongst low herbaceous vegetation dominated by exotic grasses. The population occupies *c*.80 sq metres (Brook 2002)[27]. *Schizoglossa worthyae* (Serious Decline), *Therasiella "aff. elevata"* (NMNZ M.96613) (Sparse), flax snail (*Placostylis hongii*) (Range Restricted), which reaches its southern-most limit at Peach Cove (where it is being managed via rodent control), *Liarea turriculata* "Manaia" (Range Restricted) (F. Brook pers. comm.), and the non-threatened species *Liarea egea* Bream Head" (NMNZ M.158257) (Data Deficient), *Liarea hochstetteri*, *Phenacohelix giveni*, and *Delos coresia* (SSBI Q07/R07/H046).

Other invertebrates

Peripatus sp. (Range Restricted) and tree weta were recorded in 1992 (SSBI Q07/R07/H046). Also present are the carabid beetle (*Mecodema* cf. aff. *M. spiniferum*), green chafer, giraffe weevil, two-spined weevil, and four-spined weevil (F. Brook, pers obs.).

Lizards

Auckland green gecko (Gradual Decline) (DOC Bioweb 2009), Pacific gecko (Gradual Decline) (shed skin found on Peach Cove track in 2001, DOC Bioweb 2009), ornate skink (Gradual Decline) (2001, DOC Bioweb 2009), forest gecko (regionally significant) (Pierce *et al.* 2001), common gecko (regionally significant) (two individuals found crushed within a pile of fenceposts along the Northern boundary, 2002) (SSBI Q07/R07/H046), copper skink and shore skink (both recorded from Peach Cove, DOC Bioweb 2009). A skink described as being a gravid female shore skink was sighted near the main ridge track near the high point of Bream Head (Te Whara) (therefore within forest and well away from the coast) in 2010 by Cathy Mitchell, a local resident (Cathy Mitchell, pers. comm.).

Other reptiles

Leatherback turtle (regionally significant) was recorded in Smugglers Bay in 1996 (DOC Bioweb 2009).

Fish

Longfin eel (Gradual Decline), banded kokopu (regionally significant), shortfin eel, and common bully were recorded from an unnamed stream in the north of the site (NIWA 2009).

27 A cursory survey in November 2009 of the herbaceous vegetation along the seaward crest of the foredune did not yield any snails. Drought had caused the vegetation to brown off (F. Brook, pers. comm.).

Significance

Bream Head Scenic Reserve and Surrounds, along with Manaia Ridge Scenic Reserve and Surrounds (Q07/069), are the most significant ecological features of the Manaia Ecological District. Bream Head represents the largest and highest quality broadleaved coastal forest remaining in Northland and one of the best in the country. The reserve contains an outstanding coastal headland with a rugged shoreline backed by steep forest-clad slopes and rocky outcrops and peaks. Bream Head dominates the landscape both from the sea and from the land, and as such its imposing form is a natural gateway to Whangarei Harbour. In recognition of the special significance of the site as both a cultural and natural heritage site, the Bream Head Conservation Trust was formed in 2002 to facilitate the cooperative management of the area in partnership with DOC and other key agencies, including Whangarei District Council, Northland Regional Council, Royal Forest and Bird Protection Society, the local community and iwi (Ritchie 2008). The Trust is currently working on a project to erect a predator proof fence at the reserve and in February 2010 appointed a temporary ranger (with the aim for it to be permanent) to progress ecological gains at the reserve (W. Holland, DOC, pers. comm).

The reserve contains a complete sequence of vegetation types from the sandy and rocky seashore to high forest and rocky outcrops (Clunie 1993). Bream Head is the northernmost limit for the coastal woodrush *Luzula banksiana* var. *banksiana* (NZPCN 2009). In total, the site supports two 'Threatened', 11 'At Risk', and 30 regionally significant species of plants. This site is representative for all types, excluding those containing adventive species (types t, u, v, and gg). It contains the country's largest and most healthy population of the Nationally Critical tree *Pseudowintera insperata* (census completed in 2008 at 58 individuals) of which the only other population is found at Manaia Ridge Scenic Reserve and Surrounds (Q07/069); and also includes the largest population of parapara on the New Zealand mainland (200+ plants of which 30% are mature).

The largest parapara tree recorded was *c*.6 m tall (W. Holland, DOC, pers. comm.). The floral diversity of the reserve reflects the varied and often steep, exposed and rocky terrain, together with its rich volcanic soils.

The reserve supports a diverse range of fauna, which includes 15 'Threatened' species, 12 'At Risk' species, and eight regionally significant species. The site supports the Nationally Critical land snail (Punctidae sp. 223) which, in Manaia ED, is only found in Bream Head Scenic Reserve and Surrounds and one other location in Northland. The site also contains the southern-most colony of flax snail in New Zealand. A continuous poison operation targeting rodents has been underway since early 2003 to protect the one flax snail colony known in the reserve. The health of this population is regularly monitored, and recent observations demonstrate a doubling of adult numbers and a tenfold increase in juveniles (N. Miller, DOC, pers. comm.). Punctidae sp. 223, which inhabits dune habitat at Smugglers Bay, was formerly threatened by cattle browsing and trampling, but this area was fenced off in the 1990s. Loss of habitat due to rabbit browse is probably the main existing threat, while predation by the introduced snail *Oxychilus alliarius* is also a possible threat (Brook 2002). Bats, provisionally identified as long-tailed bats, were seen at Peach Cove

in the early 1990s; in 2008 a bat species was sighted twice outside a window at the Pritchard residence at Ocean Beach. NI kaka, NI bellbird and red-crowned kakariki are frequent visitors from the nearby Hen and Chicken Islands. In recent years NI bellbird has been recorded breeding at Bream Head, despite the relatively high numbers of ship rats. The activities of the WHLF complement the DOC-administered Whangarei Kiwi Sanctuary, which includes Bream Head Scenic Reserve and Surrounds. DOC have been releasing kiwi back into the reserve since 2000 (62 birds so far) (T. Hamilton, WHLF, pers. comm.).

The main focus of DOC resources in Manaia ED goes to the Bream Head Scenic Reserve and Surrounds, where increasing effort has been put in over the past 17 years. This has included the sustained control of possums and key invasive weeds (including pampas, prickly hakea, silver wattle, Tasmanian blackwood, apple of Sodom, and Mexican daisy), forest bird monitoring, and forest rehabilitation through planting programmes. Ground-based possum and rodent control is undertaken every year in the reserve. Possums are at almost undetectable levels in controlled areas; however, ship rats are proving more difficult to suppress. DOC has set a target of a 5% Residual Tracking Index (RTI) for ship rats, but most operations struggle to get rats below *c.*20% RTI, which is too high for species such as kakariki to breed and fledge chicks in the reserve. Possums are known to interfere with bait stations, therefore reducing bait availability to rats. In 2008, DOC carried out a ground-based pest operation using 1080 to eliminate trap-shy mustelids and possums, although this did not have a significant impact on rat numbers. DOC is now increasing the bait station density within the reserve in an attempt to reliably reduce rats to below 5% during the spring poison operations (N. Miller, DOC, pers. comm.). Feral cats are present within the site and are controlled by DOC and local landowners with a range of live and kill traps, e.g. SA Conibear traps. 'Threatened' and regionally significant birds, e.g. NI kaka, kukupa and NI bellbird, are likely to have benefited from the 1080 poisoning operations via the secondary kills of cats and mustelids. Traplines targeting stoats have also been set up along the ridgeline and roadside. In terms of invasive invertebrates, Argentine ants pose a major threat. DOC has established a buffer zone using the toxin Fiprinol to prevent the spread of Argentine ants from Urquhart's Bay and Ocean Beach into Bream Head. DOC is also monitoring the boundary of the site for new incursions, which will also be managed (A. Booth, DOC, pers. comm.). Pigs are not present in the site (G. Coulston, DOC, pers. comm.). Goats were common at the site until 1991, when an eradication programme began. The control effort was intensified in 1993 and the last goat was removed in 1994. Nearing the completion of the goat eradication operation, in December 1993, all 15 adjacent land-owners agreed to a ban on goat farming on all properties south of Ocean Beach Road between Urquharts Bay and Ocean Beach. In 1995, DOC successfully submitted that this goat farming ban be adopted into the NRC Regional Pest Management Strategy (Pierce *et al.* 2001). DOC staff and local residents occasionally shoot rabbits, given their potential to attract predators to the site and their adverse effect on seedling survival (N. Miller, DOC, pers. comm.). In addition, their grazing and burrowing can cause erosion and

impact on rare plants (Pierce *et al*. 2001), and destroy the habitat of threatened land snails (Brook 2002). Dogs are prohibited from entering the reserve unless permitted as part of a wildlife monitoring or pest control operation. Until recently, livestock have had adverse impacts upon sensitive habitats within the reserve, including forest, foreshore and duneland systems. Cattle are now effectively excluded from all of Bream Head Scenic Reserve as of 2009; however, there is one exception to this. Approximately 20 ha in the central north face is under a seasonal grazing "arrangement" whereby the former landowner is permitted to graze cattle in an electrically fenced and fairly modified area for a few months over winter for a period of 20 years. There are approximately ten years left before the arrangement expires (N. Miller, DOC, pers. comm.).

Bream Head Scenic Reserve and Surrounds has the outstanding biodiversity values to warrant its selection for a DOC-managed 'mainland island', although it was not selected as one of the six sites established by DOC in 1995-96 (Pierce *et al.* 2001). A recent study by Ritchie (2008) was requested by the Bream Head Conservation Trust to look at the feasibility of constructing a pest-proof fence along the northern boundary of the reserve. There is strong community support for this idea.

Since 1994, work has been undertaken to remove large radiata pines and ginger infestations, and moth plant and pampas on the coastal margins are treated annually. Control operations continue for Jerusalem cherry, pampas, Mexican devil, Mexican daisy, mist flower, wattles, and moth plant[28] around Smugglers Cove. This work is funded as part of the Island Weed Programme to create a buffer zone and reduce the seed source for the Poor Knights and Hen and Chicken Islands, and to maintain the ecological integrity of the reserve (Pierce *et al*. 2001). Weeds such as gorse and smilax are locally common in shrubland and on cliffs above the beach along the north-east coast of Bream Head. Weeds are absent or in low abundance where indigenous canopy cover is complete, although serious weeds such as ginger can still establish in densely forested areas (one small ginger plant was recorded during the current survey in 2009 along the ridgeline track heading east to Ocean Beach).[29]

Bream Head is classified as a geological site of regional significance: "Best exposed section through the cone facies and underlying subvolcanic intrusions in the Taurikura centre around Whangarei Heads" (Kenny and Hayward 1996). Approximately 518.4 ha of this site lie within Bream Head Scenic Reserve and Surrounds (DOC-administered), 4.8 ha within Bream Head Conservation Area (DOC-administered), 22.2 ha are protected within Bream Head Seabed (DOC-administered), and 9.7 ha are protected within WDC-administered reserve. Approximately 1.7 of th site are within an 'Acutely Threatened' land environment' (A5.1a), 54.9 ha within an 'At Risk' land environment (A6.1b), 0.9 ha within a 'Critically Underprotected' land environment (A6.1c), 4.7 ha are within an 'Underprotected' land environment (D1.2b), and 621 ha are within 'No Threat Category' land environments (D1.1a, D1.1b) (Walker *et al*. 2007).

28 A large moth plant was removed from Peach Cove in the mid to late 1990s, although seedlings continued to be found for several years (W. Holland, DOC, pers. comm.).

29 This ginger plant was pulled out by hand.

OCEAN BEACH RECREATION RESERVE AND SURROUNDS

Survey no.	Q07/075
Survey date	28 August 1997 and 22 September 2009
Grid reference	1740627E 6035743N (AX31)
Area	270 ha (1.7 ha forest, 258.6, ha duneland, 1.9 ha wetland, 7.1 ha estuarine, 0.7 rockland) (This site has been adjusted to fit 2008 aerial photography. Changes include the addition of small areas of estuarine and freshwater wetland habitat)
Altitude	0-30 m asl

Ecological units

(a) Buffalo grass-pohuehue-spinifex grassland on sand dune

(b) Buffalo grass-spinifex grassland on sand dune

(c) Spinifex grassland on sand dune

(d) Pampas-pohuehue tussockland on sand dune

(e) Harakeke-pohuehue flaxland on sand dune

(f) Gorse-kikuyu-pohuehue shrubland on sand dune

(g) Pohuehue-kikuyu-gorse vineland on sand dune

(h) *Kunzea ericoides* var. *linearis* shrubland on sand dune

(i) Sea rush rushland in marsh

(j) Saltwater paspalum grassland on stream bank

(k) Pohutukawa coastal forest on cliff

(l) Makaokao-remuremu-Mercury Bay weed herbfield on cliff

(m) Harakeke-*Astelia banksii* flaxland on cliff

(n) *Baumea articulata*-kuta-raupo sedgeland in swamp

Landform/geology

Holocene coastal dunefield of fixed and active transverse dunes and dune blowouts, with two headlands of Lower Miocene subvolcanic intrusions (Coromandel Group) cutting melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes) in the southern part of the site. Forested areas comprise coastal cliffs cut in Mesozoic greywacke and chert (Waipapa Group); melange of Cretaceous to Paleocene mudstone (Mangakahia Complex); and Lower Miocene andesitic dikes (Coromandel Group). Saltmarsh occupies valley floor wetland on Holocene alluvial deposits; remnant of formerly extensive Holocene swamp behind coastal dune belt. Freshwater wetlands occupy hollow on Holocene fixed sand dunes.

Vegetation

(a) At the southern end of Ocean Beach, there is a large, isolated sand dune covered with buffalo grass, pohuehue and spinifex. Tauhinu, shore bindweed, gorse, radiata pine, and kikuyu are frequent.

(b) Buffalo grass-spinifex grassland dominates a large, isolated sand

dune. Pohutukawa and harakeke are frequent with occasional houpara, kawakawa, coastal toetoe, pingao, *Astelia banksii*, knobby clubrush, and sea rocket.

(c) On foredunes, spinifex is the dominant species, occurring with frequent pingao, oioi, and pampas, and occasional tauhinu, marram, knobby clubrush, shore bindweed, *Zoysia pauciflora*, lupin, catsear, purple groundsel, smilax, and *Gladiolus undulatus*.

(d) Duneslacks are characterised by pampas and pohuehue. Oioi and buffalo grass are frequent with occasional shore bindweed, gorse, and smilax.

(e) There are localised associations of harakeke and pohuehue on sand dunes. Frequent species include knobby clubrush, pampas, and gorse with occasional ti kouka, pohutukawa, *Pimelea villosa* subsp. *villosa*, NZ spinach, *Coprosma* sp., Phoenix palm, and smilax.

The back dunes of the site are characterised two main vegetation types. Type (f) comprises is a coastal association of gorse, kikuyu and pohuehue with frequent shore bindweed and pampas, and occasional pohutukawa, karo, karamu, *Coprosma macrocarpa*, knobby clubrush, harakeke, and mapou. Type (g) comprises abundant pohuehue and kikuyu with locally common patches of gorse. Cleavers and lotus are frequent with occasional apple of Sodom and *Senecio biserratus*. In areas where the vegetation is more open, smilax and moth plant are frequent. (h) Several discrete patches of *Kunzea ericoides* var. *linearis* shrubland occur in the mid to northern part of the site (at Proctors Beach). Understorey vegetation is sparse under the canopy. Pampas and gorse are frequent on the shrubland margins.

(i) West of the dunelands, near the upper reaches of the stream which drains into the northern end of Proctors Beach, there are two discrete areas of saltmarsh characterised by abundant sea rush. Gorse is frequent on the margins.

(j) At the far northern end of the beach, along the sides of the stream, there is coastal saltwater paspalum grassland. Frequent species include tauhinu, pohuehue, sea rush, knobby clubrush and kikuyu, with occasional *Pimelea villosa* subsp. *villosa* and *Gladiolus undulatus.*

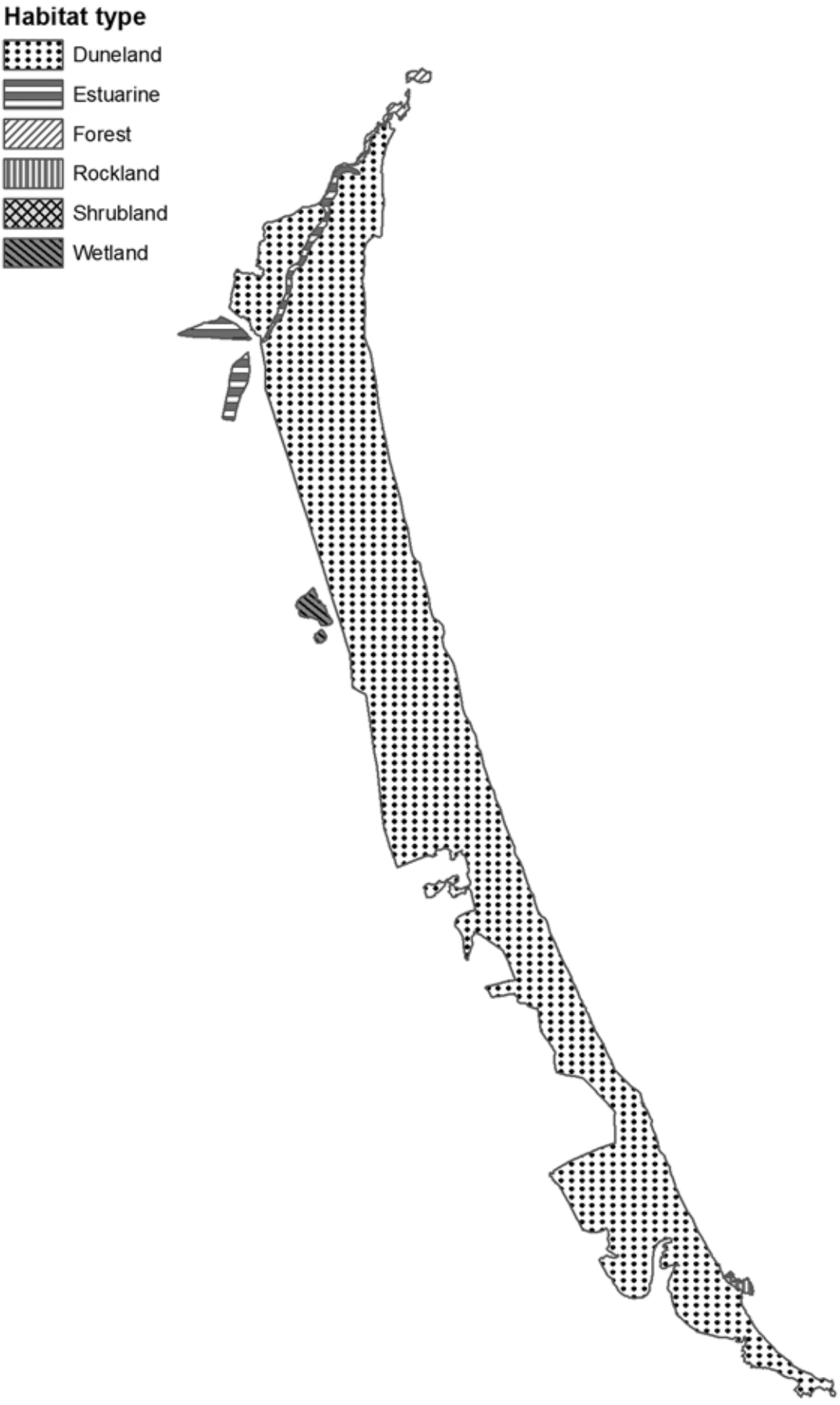
(k) A small patch of pohutukawa-dominant forest is present on coastal cliffs. Frequent species include harakeke, houpara, knobby clubrush, and *Astelia banksii*, with occasional karo, pampas, kawakawa, taupata, NZ spinach, NZ celery, native iceplant, glasswort, remuremu, and makaokao.

At the far northern end of the site, cliff faces are characterised by localised patches of type (l) makaokao-remuremu-Mercury Bay weed herbfield with occasional NZ spinach, *Isolepis cernua*, and glasswort; and scattered type (m) harakeke-*Astelia banksii* flaxland with occasional shore groundsel.

(n) Located in farmland near the western boundary of the site are two small freshwater wetlands. *Baumea articulata* is co-dominant with kuta while raupo is common. Gorse is frequent on the wetland margins and on raised islands within open water, with occasional ti kouka.

Q07/075 Ocean Beach Recreation Reserve and Surrounds

Q07/075 Ocean Beach Recreation Reserve and Surrounds



Significant flora

Coprosma acerosa (Declining) (1956, WELT SP9021; reconfirmed 1997 during this PNAP survey), *Kunzea ericoides* var. *linearis* (Declining) (1956, WELT 14118, reconfirmed 2009 during this PNAP survey), *Pimelea villosa* subsp. *villosa* (Declining) (1999, AK 248037), *Tetragonia tetragonioides* (Naturally Uncommon) (recorded by Wildland Consultants during this survey, 2009), pingao (Relict) (recorded during this survey in 1997 and 2009), *Einadia triandra* (regionally significant), ngaio (regionally significant) (1997, SSBI Q07/R07/H041), and *Senecio biserratus* (regionally significant) (recorded by Wildland Consultants during this survey, 2009). In September 2009, at least ten plants of *Pimelea villosa* subsp. *villosa* were recorded from the northern half of the site. There is an historical record of *Asplenium northlandicum* (regionally significant) from this site (1956, WELT P2110).

Fauna

Threatened birds

Grey duck (Nationally Critical) (historical record, 1979), Caspian tern (Nationally Vulnerable) (historical record, 1979), breeding northern NZ dotterel (Nationally Vulnerable), and red-billed gull (Nationally Vulnerable) (SSBI Q07/R07/H041). In September 2009 two pairs of northern NZ dotterels were recorded near the stream mouth at the northern end of Proctors Beach by Wildland Consultants.

At Risk birds

Northern little blue penguin (Declining), pied stilt (Declining) (R. Pierce pers. comm.), white-fronted tern (Declining) (historical record, 1979), black shag (Naturally Uncommon) (historical record, 1979), little shag (Naturally Uncommon) (historical record), NZ pipit (Declining), and variable oystercatcher (Recovering) (SSBI Q07/R07/H041). There have been occasional reports of banded rail (Naturally Uncommon) from saltmarsh habitat at the northern end of Proctors Beach (R. Pierce pers. comm.). Several oystercatchers were recorded near the stream mouth at the northern end of Proctors Beach in 2009 by Wildland Consultants.

Non-threatened birds

White-faced heron (historical record, 1979), black-backed gull, spur-winged plover, paradise shelduck, pukeko, kingfisher, and welcome swallow (SSBI Q07/R07/H041).

Lizards

Ornate skink (Gradual Decline) and shore skink (both recorded in 1979, SSBI Q07/R07/H041). Common gecko (regionally significant) was recorded in 1990 (DOC Bioweb 2009). Shore skink was most recently recorded from the site in August 2000 (SSBI Q07/R07/H041).

Other

Black katipo (Serious Decline) was recorded in 2000 and 2008 (Griffiths 2000; A. Booth, DOC, pers. comm.). A dead yellow-bellied seasnake (Vagrant, regionally significant) was found in 2002 (DOC Bioweb 2009).

Significance

Ocean Beach Recreation Reserve and Surrounds is the only site in Manaia ED containing an extensive duneland system. It is large and diverse, incorporating coastal forest, shrubland, vineland, herbfield, grassland, freshwater wetland, and saltmarsh habitat types. It contains representative examples of vegetation units (c), (e), (h), (i), (k), (l), and (m). The site supports five 'At Risk' plant species and four regionally significant species. It also supports numerous species of birds, including four 'Threatened' and eight 'At Risk' species of seabird, as well as one 'Threatened' and two regionally significant reptile species, and one 'Threatened' invertebrate species. Dogs, cats, stoats, weasels, rats, and hedgehogs threaten ground-nesting birds such as northern NZ dotterel. Predator control is currently being undertaken in an area of covenanted dunelands near the Ocean Beach settlement[30]. Signs have also been erected to educate dog owners about the risk their pets pose to local wildlife (dogs are not permitted on the beach). Such efforts have resulted in the slow recovery of the local dotterel population, with three chicks fledging last year. The farmland adjacent to the site currently supports large numbers of black-backed gulls, and it is likely they are adversely affecting nesting dotterels. DOC intends to talk to the local landowner soon about options for controlling black-backed gull numbers. Rabbits are common throughout the site and pose a threat to duneland vegetation, particularly pingao. Poisoning and shooting are periodically carried out to reduce their numbers (P. Cornille, DOC, pers. comm.).

Ocean Beach is a popular summer destination and has high recreational values. At Proctors Beach, there are risks associated with high beach usage such as disturbance of nesting birds and the trampling of nests and duneland vegetation by people and quad/trail bikes. Walkways have been established to lead people from the carpark to the beach in order to protect the dunes. However, it is evident that the dunes are frequently walked over, particularly between Proctors Beach in the north and Lighthouse Bay[31] in the south. At the northern end of Proctors Beach, near the estuary, a local farmer helps protect variable oystercatchers and dotterels from dogs and trail bikes. He has also fenced off some of the dunes on his property, and as a result much of the indigenous duneland vegetation has recovered (SSBI Q07/R07/H041). Weeds have established throughout much of the site and there is a risk that threatened duneland plants such as *Pimelea villosa* subsp. *villosa* will continue to be out-competed unless management is implemented. Weeds present in coastal dunelands include pampas, gorse, lupin, moth plant, and smilax, while in the northern part of the site, near the stream, saltwater paspalum is locally abundant with occasional radiata pine, kikuyu, lupin, freesia, *Gladiolus undulatus*, and buffalo grass. Moth plant has adapted well to the dunelands where it grows as a ground-cover and is protected from the elements by pohuehue (SSBI Q07/R07/H041). Phoenix palms are also establishing. Exotic iceplant and Norfolk pine were planted over a decade ago.

30 DOC does not currently carry out pest control at Ocean Beach Recreation Reserve and Surrounds.

31 Lighthouse Bay is a local name.

Despite being relatively species-poor compared with forested areas, dunelands are key habitats for retaining the natural biodiversity of Manaia ED. Dunelands also perform important roles in buffering shrubland, wetlands, and developed land from adverse maritime conditions (Pierce *et al.* 2002). Approximately 213.3 ha of this site are within Ocean Beach Recreation Reserve and Surrounds (DOC-administered), a reserve type which does not adequately provide for biodiversity protection. A further 0.6 ha is within Kauri Mountain Marginal Strip (DOC-administered), 12.7 ha are within a Queen Elizabeth II Open Space Covenant located between Ocean Beach and Proctors, and 4.4 ha are protected within WDC-administered reserve. In recent years, this area of covenanted land has been actively revegetated through successive public planting days (W. Holland, DOC, pers. comm. 2010). Approximately 5 ha of the site are within an 'Acutely Threatened' land environment' (A5.1a), 236.3 ha within 'At Risk' land environments (A6.1b, G1.1a), 15.6 ha within a 'Critically Underprotected' land environment (A6.1a), 0.2 ha is within an 'Underprotected' land environment (D1.2b), and 2.9 ha lie within a 'No Threat Category' land environment (D1.1a, D1.b) (Walker *et al.* 2007).

KERR ROAD SWAMP

Survey no.	Q07/076
Survey date	18 March 1997, 13 October 1998, 4 August 2009 and 24 September 2009
Grid reference	1738199E 6039037N (AX31)
Area	3.3 ha
Altitude	15-18 m asl

Ecological units

(a) Kahikatea-*Bolboschoenus fluviatilis* treeland in swamp

(b) *Baumea articulata-Bolboschoenus fluviatilis*-Mexican devil reedland in swamp

(c) *Bolboschoenus fluviatilis*-swamp millet-raupo-Mexican devil reedland in swamp

(d) Mexican devil-raupo-*Bolboschoenus fluviatilis* herbfield in swamp

(e) *Baumea articulata* reedland in swamp

(f) *Baumea* sp. sedgeland in swamp

(g) Raupo reedland in swamp

(h) Harakeke-manuka-*Baumea articulata* flaxland in swamp

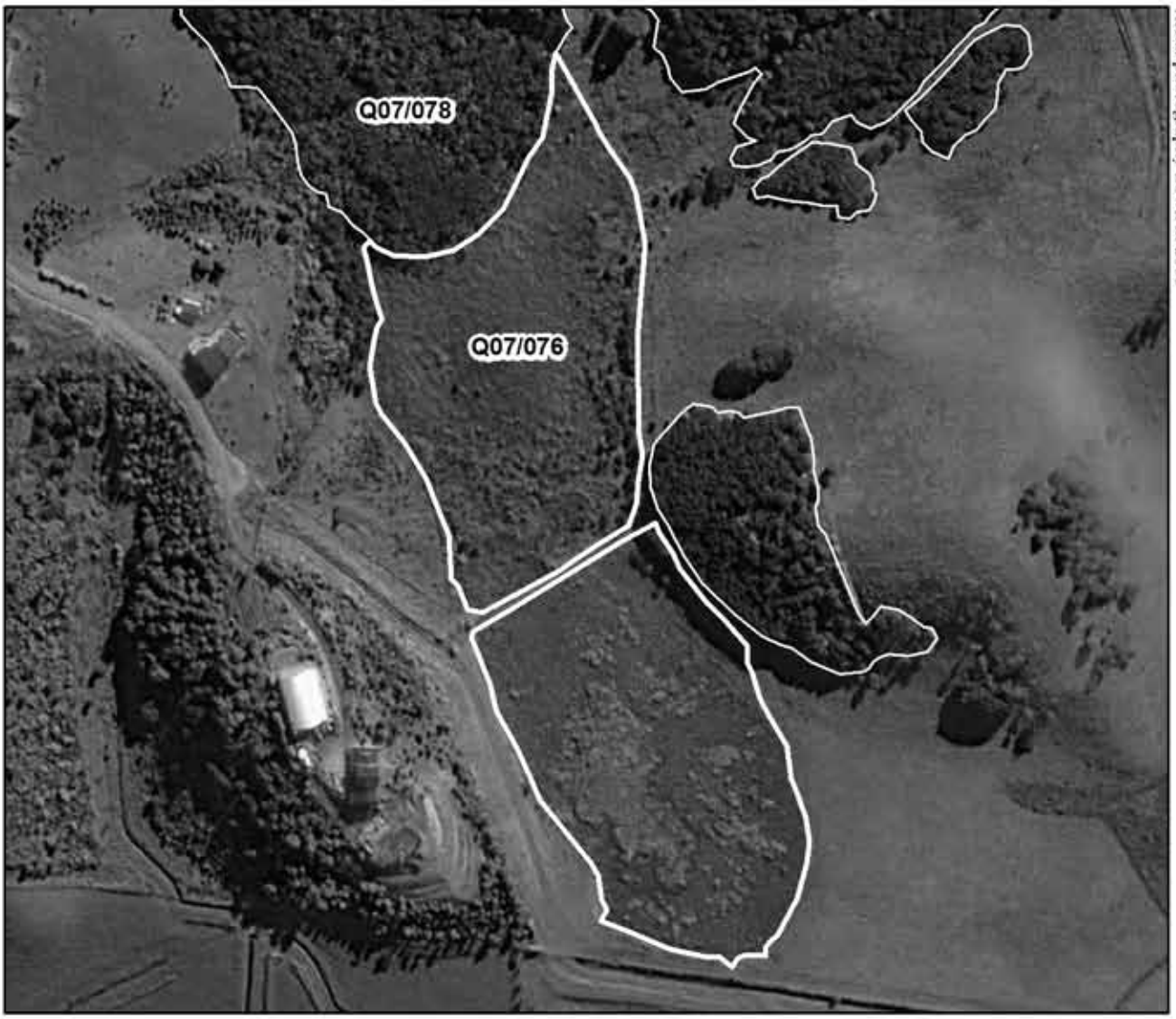
(i) *Cyperus ustulatus*-exotic grass spp. sedgeland in swamp

Landform/geology

Remnant of formerly extensive Holocene swamp behind dune belt.

Vegetation

(a) At the head of the wetland, where the site buffers the Kauri Mountain Conservation Area and Surrounds (Q07/078), kahikatea is emergent over



Q07/076 Kerr Road Swamp

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

common *Bolboschoenus fluviatilis* reedland with occasional ti kouka, kanuka, manuka, *Cyperus ustulatus*, and gorse.

The wetland area on the north side of the road is densely vegetated with a mosaic of types (b), (c), (d), (e), (f), (g) and (h). Throughout the northern part of the site there is occasional ti kouka, manuka, gorse, kapungawha, *Baumea teretifolia*, wheki, swamp kiokio, *Baumea rubiginosa*, oval sedge, *Cyperus ustulatus*, *Centella uniflora, Carex virgata*, and *Calystegia sepium*.

The lower half of the swamp has been drained and is now dominated by type (i) *Cyperus ustulatus*-exotic grass spp. sedgeland. Frequent soft rush occurs with occasional raupo, manuka, and ti kouka.

Significant flora

No information.

Fauna

NI fernbird (Declining), pukeko, NZ kingfisher, and Australasian harrier (L. Forester, NRC, pers. comm. 2009). Australasian bittern (Nationally Endangered) and spotless crake (Relict) have been recorded nearby and are likely to use this site (R. Pierce pers. comm.).

Significance

Freshwater wetlands are a very rare habitat type in Manaia ED, and Kerr Road Swamp is one of best remaining examples of a fertile swamp remaining in the ED. The site comprises a mosaic of reedland, sedgeland and herbfield vegetation types that is bisected by a farm track. Representative for types (a), (e), (g), and (h). The larger, northern part of the wetland is not grazed, is well-buffered by indigenous shrubland, and forms part of a rare freshwater wetland-terrestrial forest ecological sequence. The lower half of the site is degraded, grazed, and lacks any buffering, resulting in the absence of many indigenous wetland plant species and the profileration of exotic grasses and browse-tolerant soft rush. At least one species of threatened bird occurs at this site. Spotless crake (Relict) and Australasian bittern (Nationally Endangered) are also likely to utilise the wetland. As with other wetlands in Manaia ED, Mexican devil is the most abundant weed species in Kerr Road Swamp. Approximately 0.5 ha of this site is within a WDC-administered conservation covenant. 2.0 ha of this site are within an 'Acutely Threatened' land environment (A5.1a) and 1.3 ha are within an 'At Risk' land environment (A6.1b) (Walker *et al.* 2007).

TIMPERLY ROAD BUSH

Survey no.	Q07/077
Survey date	23 March 1998 and 7 October 2006
Grid reference	1735898E 6039631N (AX31)
Area	38.4 ha (17.7 ha forest, 20.7 ha shrubland)
Altitude	41-160 m asl

Ecological units

(a) Totara-mahoe-kanuka forest on steep hillslope

(b) Mamaku-totara treefernland on steep hillslope

(c) Mamaku treefernland on moderate hillslope

(d) Gorse shrubland on moderate hillslope

(e) Pampas-gorse tussockland on moderate hillslope

(f) Exotic grass-gorse grassland on steep hillslope

(g) Kanuka/manuka shrubland on moderate hillslope

(h) Puriri-taraire forest on moderate hillslope

(i) Kanuka/manuka-tanekaha-totara forest on moderate hillslope

(j) Puriri-taraire-totara forest on moderate hillslope

(k) Kahikatea-totara forest on moderate hillslope

(l) Mamaku-towai treefernland on moderate hillslope

Landform/geology

Steep, isolated hill comprising the eroded remnant of a Lower Miocene dacite dome (Coromandel Group).

Vegetation

(a) The entire southern and western slopes of the site comprise secondary forest dominated by totara-mahoe-kanuka forest, with occasional emergent species such as kauri, tanekaha, rimu, puriri, taraire, karaka, towai, and pohutukawa. Common understorey species include mapou, pate, ti kouka, pigeonwood, putaputaweta, bush lawyer, and *Metrosideros perforata*.

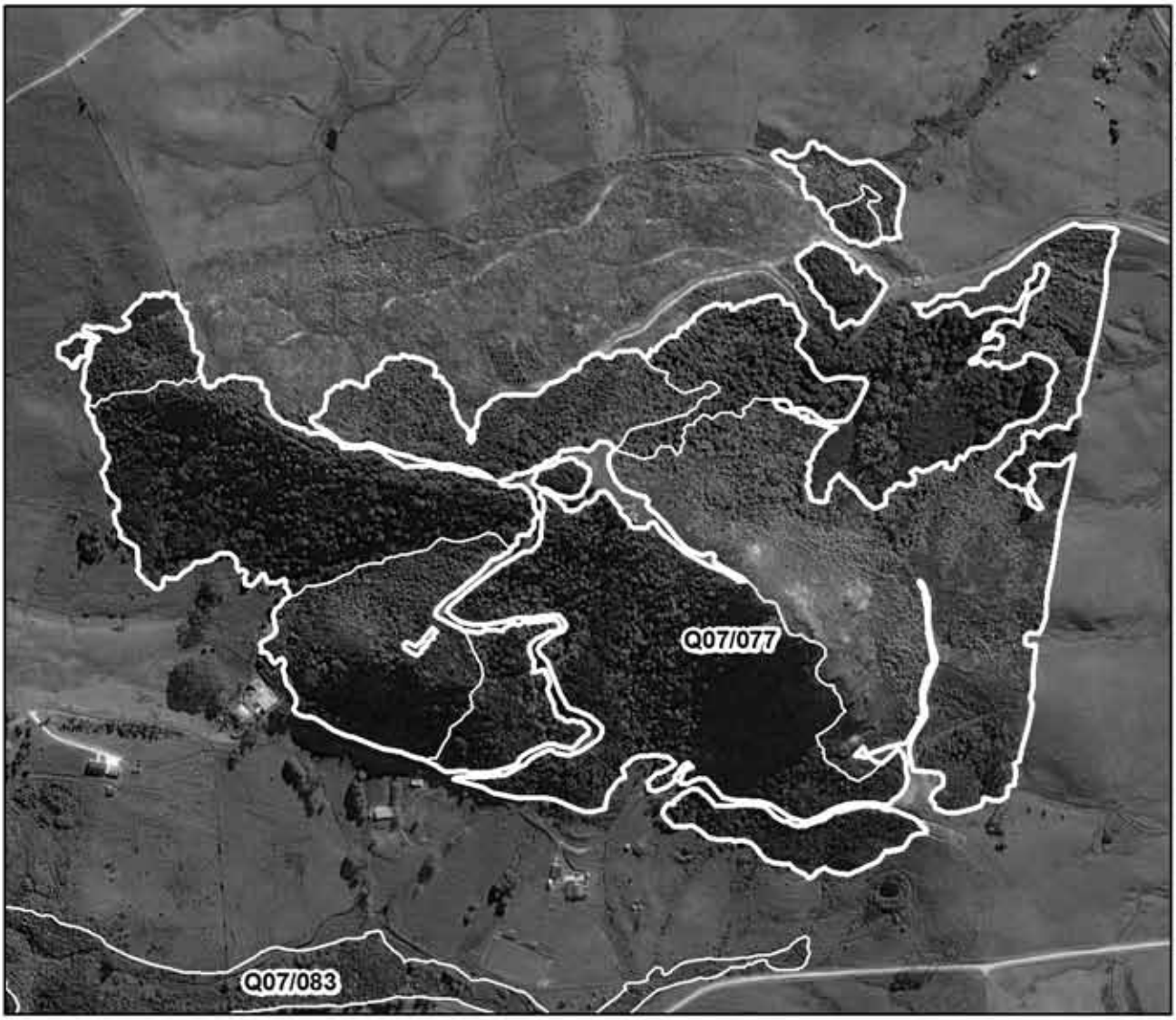
(b) A small pocket of mamaku-totara treefernland is present on the northern slopes of the site. Towai is frequent with occasional kahikatea, kanuka, manuka, pampas, and gorse. In the shrubland area, type (c) mamaku treefernland is abundant northwest of the highest point, with occasional ti kouka, kanuka and manuka.

(d) Gorse is the dominant shrubland species in the site, occurring with frequent pampas and occasional hangehange and ti kouka.

(e) Pampas-gorse tussockland is also present in disturbed areas, occurring with occasional totara, ti kouka, gorse, and mamaku.

(f) Exotic grass-gorse grassland is common on the eastern slopes of the rock knoll (the highest point of the site), while type (g) kanuka/manuka shrubland occupies a small area in the south-east corner of the site, occurring with occasional totara, ti kouka, mamaku, and gorse.

(h) A small remnant of puriri-taraire forest occurs with occasional karaka, pohutukawa, kahikatea, and mamaku.



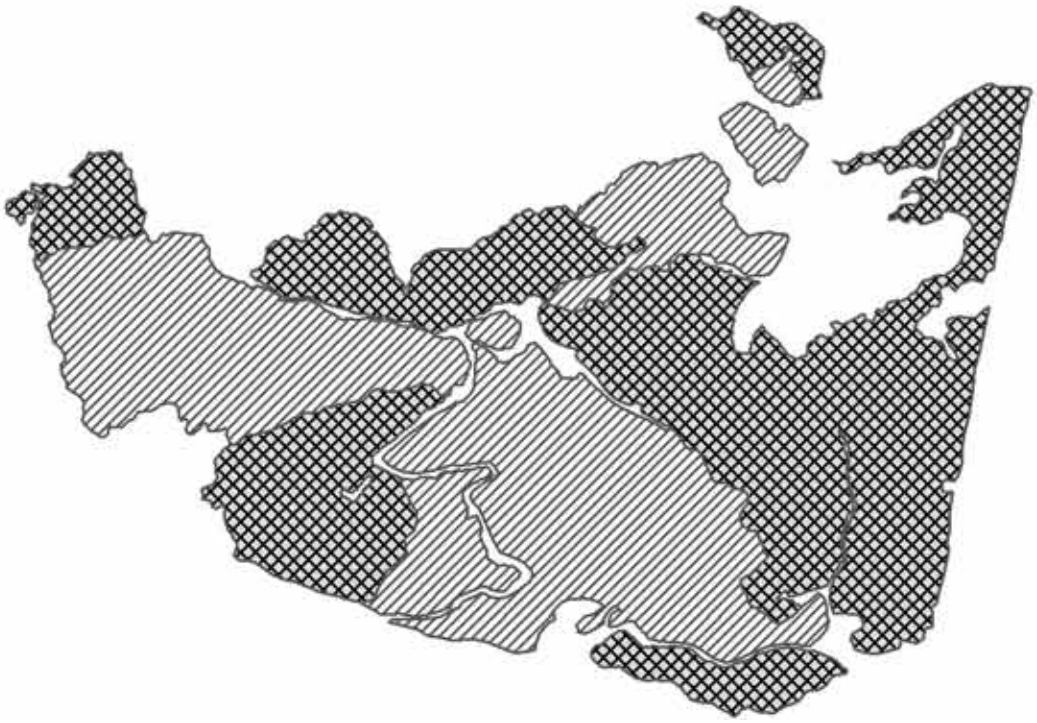
Aerial photography flown in 2008

Q07/077 Timperly Road Bush

0 75 150 300
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



(i) Kanuka/manuka-tanekaha-totara forest is present with occasional kauri, ti kouka and mamaku.

(j) Other areas of broadleaved forest on hillslope forest are characterised by puriri-taraire-totara forest with occasional karaka, kahikatea, mamaku, and ti kouka.

(k) A small remnant kahikatea-totara forest occurs with frequent kanuka and manuka and occasional puriri, kauri, and mamaku.

(l) In the far north-west of the site mamaku-towai treefernland occurs with occasional kanuka, manuka, kahikatea, ti kouka, and mahoe.

Significant flora

Rubus squarrosus (regionally significant) (2006, SSBI Q07/R07/H090).

Fauna

The WHLF monitored several transmitted NI brown kiwi (Nationally Vulnerable) in the site until 2006, when a large fire occurred. No kiwi have been monitored since 2006, but they are probably still present (H. Moodie, WHLF, pers. comm.). Kiwi sign in the form of droppings and probes were observed in the southern forest, and kukupa (regionally significant) have been recorded (2006, SSBI Q07/R07/H090). NZ pipit (Declining), Australasian harrier, welcome swallow, and spur-winged plover were recorded during the survey in March 1998.

Significance

Despite having been cleared for farmland until the mid 20th century, large areas of the site are in an advanced stage of forest regeneration, with a high diversity of indigenous plant species. Many parts of the forest support healthy seedling regeneration, including taraire, which indicates that seed dispersal by kukupa and other birds is taking place (SSBI Q07/R07/H090). Timperly Road Bush is known kiwi habitat and it is an important corridor for kiwi movement throughout Manaia ED. The site also supports one 'At Risk' bird and contains an important potential year-round food source for kukupa. It also provides an important linkage to surrounding habitat including Kauri Mountain (Q07/078) to the east, Tahunatapu Road Coastal Forest (Q07/066) and Munro Bay Coastal Bush (Q07/067) to the west, and Manaia Ridge Scenic Reserve and Surrounds (Q07/069) to the south. Representative site for types (a), (b), (c), (i), (j), (k), and (l). Houses have been built within the site (L. Forester, NRC, pers. comm. 2009). Gorse and pampas are the dominant weeds throughout the site. Approximately 13.2 ha of indigenous forest in the south-west of the site lie within a Queen Elizebeth II Open Space Covenant. Approximately 7.3 ha of this site are within an 'At Risk' land environment (A6.1b), 3.2 ha are within a 'Critically Underprotected' land environment (A6.1c), 0.2 ha is within an 'Underprotected' land environment (D1.2b), and 27.7 ha are within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007)

KAURI MOUNTAIN CONSERVATION AREA AND SURROUNDS

Survey no.	Q07/078
Survey date	2 September 1998
Grid reference	1739674E 6040347N (AX31)
Area	492.6 ha (327.2 ha forest, 152.4 ha shrubland, 0.1 ha wetland, 13 ha rockland) (This site has been adjusted to fit 2008 aerial photography. Main changes include the addition of forest and shrubland remnants to the north-east)
Altitude	0-245 m asl

Ecological units

(a) Kahikatea-puriri coastal forest on toeslope

(b) Kauri coastal forest on hillslope and ridge

(c) Kanuka/manuka-tanekaha coastal forest in gully and on hillslope

(d) Kanuka/manuka coastal forest on hillslope

(e) Kahikatea coastal forest on moderate hillslope

(f) Kanuka/manuka coastal shrubland on hillslope

(g) Kanuka/manuka-tanekaha coastal shrubland on moderate hillslope

(h) Kanuka/manuka-mamangi-mapou coastal shrubland on moderate hillslope

(i) Kanuka/manuka-mapou coastal shrubland on moderate hillslope

(j) Puriri-taraire forest on hillslope

(k) Kahikatea-kanuka/manuka-taraire coastal forest on moderate hillslope

(l) Kanuka/manuka-totara coastal forest on moderate hillslope

(m) Gorse-kanuka/manuka shrubland on moderate hillslope

(n) Kanuka/manuka-rimu forest in gully

(o) Kahikatea-kanuka/manuka-kauri forest on moderate hillslope

(p) Kanuka/manuka-totara coastal shrubland on moderate hillslope

(q) Kauri-tanekaha coastal forest on hillslope

(r) Kanuka/manuka-kohuhu forest on moderate hillslope

(s) Kanuka/manuka-kauri forest on hillslope

(t) Kanuka/manuka-towai forest on hillslope

(u) Kanuka/manuka-puriri-totara forest in moderate gully

(v) Kanuka/manuka-kauri-tanekaha forest on moderate hillslope

(w) Pohutukawa coastal forest on rock bluff

(x) Mamaku-tanekaha coastal treefernland on moderate hillslope

(y) *Bolboschoenus fluviatilis* reedland in swamp

Landform/geology

Steep coastal hills: northeastern part predominantly Mesozoic greywacke and chert (Waipapa Group), cut by Lower Miocene andesitic dikes and larger subvolcanic intrusions (Coromandel Group); southwestern part consists of a large Lower Miocene subvolcanic andesitic intrusion

(Coromandel Group), bounded by melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes).

Vegetation

(a) Kahikatea-puriri coastal forest is present at the bottom edge of the slope on the southern side of Kauri Mountain. Nikau is frequent with occasional rewarewa, matai, karaka, kanuka, manuka, and ti kouka. Above this, the hillslope vegetation grades into type (b) kauri forest with occasional pohutukawa, kahikatea, tanekaha, rimu, rewarewa, kanuka, and manuka. Continuing up the slope, type (c) kanuka/manuka-tanekaha forest is dominant with emergent tanekaha and occasional rewarewa, towai and kauri, while further up the slope type (d) kanuka/manuka coastal forest is present with frequent emergent kauri, and occasional rewarewa and ti kouka.

Type (d) is also dominant on moderate hillslopes west of Kauri Mountain Road, occurring with frequent mamangi and five-finger, and occasional matai, tawa, totara, kahikatea, mamaku, and ti kouka. Type (e) kahikatea coastal forest becomes dominant further down the slope with occasional totara, pukatea, rimu, tawa, ti kouka, and nikau.

(f) Kanuka/manuka dominates a zone of coastal shrubland. Tanekaha is frequent and ti kouka is present in low numbers. Further down the slope, type (f) grades into type (g) kanuka/manuka-tanekaha coastal shrubland, with occasional ti kouka.

Areas to the west are characterised by type (h) kanuka/manuka-mamangi-mapou shrubland and type (i) kanuka/manuka-mapou shrubland, with occasional ti kouka, tarata, mamaku, mamangi, harakeke, and emergent rimu.

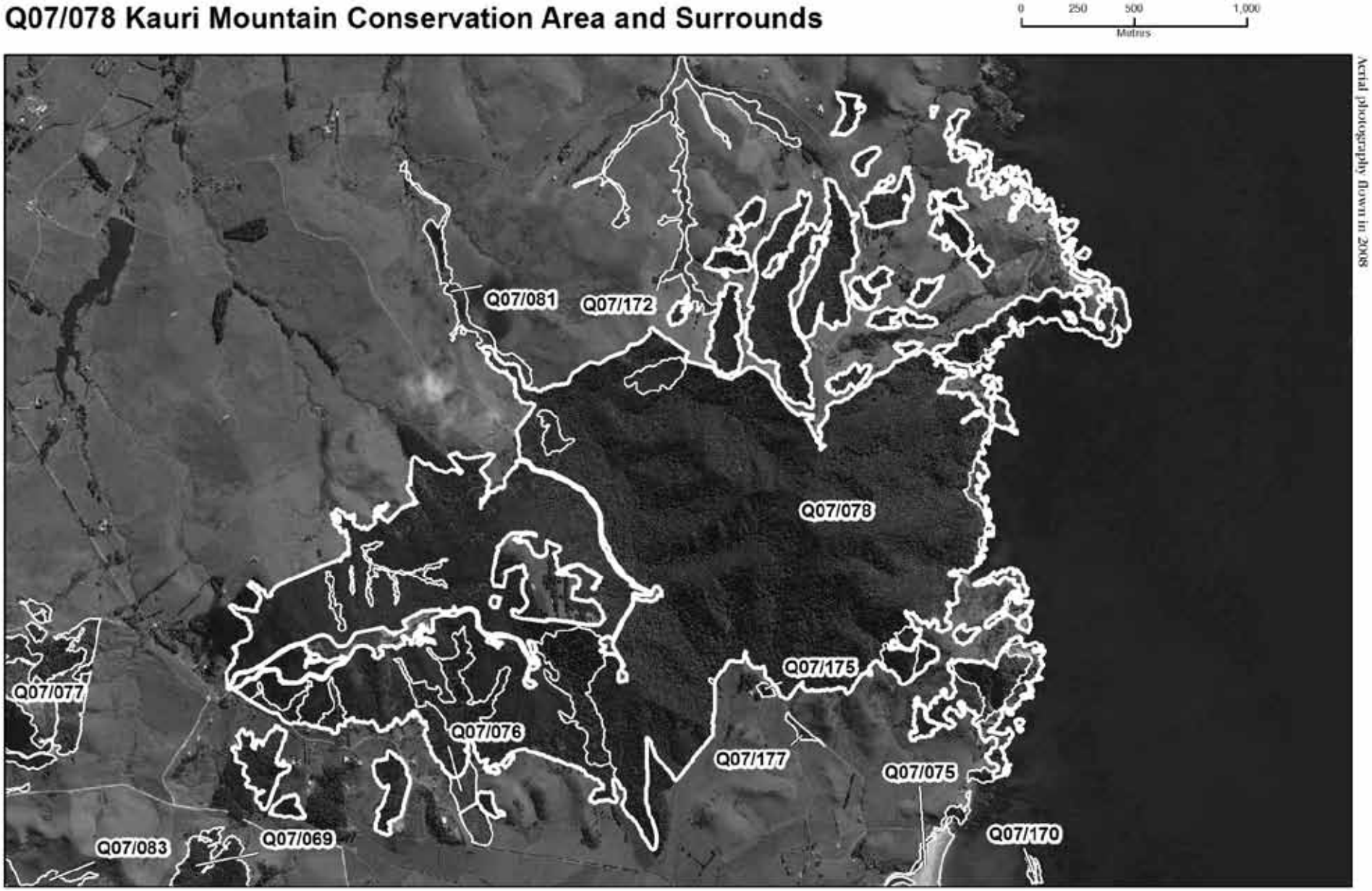
(j) Further west, shrubland gives way to hillslopes dominated by puriri-taraire forest with frequent rewarewa and occasional northern rata, kauri, totara, kahikatea, rimu, mamaku, kanuka, manuka, nikau, and epiphytic puka. To the west, the canopy changes to type (k) kahikatea-kanuka/manuka-taraire forest with frequent ti kouka and occasional rimu, rewarewa, totara, puriri, and nikau. Type (l) kanuka/manuka-totara coastal forest is also present on a moderate slope with frequent mapou, ti kouka, and rewarewa.

(m) Continuing west, coastal forest on hillslope is replaced by gorse-kanuka/manuka coastal shrubland with occasional pampas, while a gully is defined by type (f) with occasional totara, rimu, kohuhu, mamaku, and ti kouka.

Type (n) kanuka/manuka-rimu forest occupies a gully with frequent kahikatea and occasional kauri, rewarewa, towai, puriri, ti kouka, mamaku, and kiekie. Type (n) is fringed by type (o) kahikatea-kanuka/manuka-kauri forest on a moderate slope. Totara is frequent with occasional puriri, rimu, ti kouka, mamaku, and kiekie. Forest reverts to shrubland (types f and m) to the west, with frequent towai and ti kouka, and occasional puriri, taraire, totara, mapou, mamaku, and gorse. Type (p) kanuka/manuka-totara shrubland is also present with occasional emergent radiata pine.

Large areas of hillslope on the northern side of the site are dominated by type (f) with frequent mapou and ti kouka, and occasional totara, mamaku, pate, mamaku, gorse, and emergent kahikatea and radiata pine.

Q07/078 Kauri Mountain Conservation Area and Surrounds



Q07/078 Kauri Mountain Conservation Area and Surrounds

On the eastern side of Kauri Mountain Road, type (d) is dominant at the bottom of the stream gully, with occasional kahikatea, kauri, totara, and tanekaha. To the north and north-east, type (c) is present with occasional mamaku and kohuhu.

North of the trig, type (d) dominates a moderate slope with occasional totara and kauri. This in turn grades into type (q) kauri-tanekaha coastal forest further down the slope. Kanuka and manuka are frequent with occasional rewarewa, rimu, and emergent radiata pine.

(r) A small area of kanuka/manuka-kohuhu coastal forest occurs on a moderate slope between the two forks of the stream.

(s) Kanuka/manuka-kauri coastal forest dominates areas of moderate hillslope, occurring with occasional ti kouka and kohuhu.

(t) Kanuka/manuka-towai forest is also present on moderate hillslope, with frequent ti kouka and kohuhu, and occasional mamaku.

(u) In a separate remnant in the north of the site, kanuka/manuka-puriri-totara forest is present in a gully. Kahikatea is frequent with occasional kauri, pohutukawa, taraire, rewarewa, nikau, kohekohe, and epiphytic puka. Other vegetation types present in this remnant include type (v) kanuka/manuka-kauri-tanekaha forest with frequent totara and occasional rimu, and type (d) with occasional totara and tanekaha.

(w) In the separate, small coastal remnant in the southeast of the site, pohutukawa is dominant over an understorey of harakeke along the rocky bluffs. Other species include occasional puriri and mamaku.

(x) Mamaku-tanekaha coastal treefernland is present on a moderate hillslope. Nikau is frequent with occasional rimu, mapou, and ti kouka.

(y) A small wetland situated in a gully to the west of Kauri Mountain Road is dominated by *Bolboschoenus fluviatilis*. It is well-buffered by gorse and kanuka shrubland. Wheki, manuka, kapungawha, Mexican devil, and emergent ti kouka are scattered throughout.

Significant flora

At Risk

Celmisia adamsii var. *rugulosa* (Naturally Uncommon) (2001, AK 252592), *Fuchsia procumbens* (Naturally Uncommon) (2001, AK 282046), and kawaka (Naturally Uncommon) (2001, SSBI Q07/R07/H038).

Regionally significant

Black maire, *Hebe parviflora*, *Olearia albida*, northern rata, *Rubus schmidelioides* (possibly mis-identified), and toru (all recorded in 2001, SSBI Q07/R07/H038).

Fauna

Birds

North Island brown kiwi (Nationally Vulnerable) (WHLF have released 17 kiwi into the site up until 2009), NZ pipit (Declining), Pycroft's petrel (Recovering) (single dead bird found, R. Pierce pers. comm.), kukupa (regionally significant), NI tomtit (regionally significant) (R. Pierce pers. comm.), Australasian harrier, morepork, kingfisher, tui, shining cuckoo,

silvereye, and grey warbler (2001, SSBI Q07/R07/H038). Spotless crake (Relict) and pukeko are present in the wetland (L. Forester, NRC, pers. comm. 2009).

Reptiles

Shore skink (2001, SSBI Q07/R07/H038).

Land snails

The non-threatened species *Phrixgnathus douglasi* and *Liarea turriculata* are known from the site (F. Brook pers. comm.).

Fish

Banded kokopu (regionally significant) and shortfin eel (2001, SSBI Q07/R07/H038).

Significance

Kauri Mountain Conservation Area and Surrounds is the largest area of coastal forest between Bream Head and Russell, and is part of the Whangarei Kiwi Sanctuary, providing key habitat for NI brown kiwi. Major dog problems in 2006 resulted in the deaths of two kiwi that were carrying transmitters, and a dramatic decline in kiwi sign over the next year. However, since WHLF eradicated pigs from the site and dealt with the offending dogs' owner, kiwi counts are currently trending up. At the time of writing, there has been no dog sign since April 2008 (T. Hamilton, WHLF, pers. comm.). The site also supports two 'At Risk' species of threatened bird, at least two species of regionally significant bird, and one species of regionally significant freshwater fish. The vegetation is diverse and is regenerating well following the eradication of goats and pigs, which was carried out three years ago (a total of 28 pigs were killed) (G. Coulston, DOC, pers. comm.). At least three 'At Risk' plant species and six regionally significant plant species inhabit the site. The site also contains one of the few areas of pohutukawa coastal forest remaining in Northland. The site is representative for types (a), (b), (e), (g), (h), (i), (j), (k), (l), (n), (o), (p), (r), (s), (t), (u), (v), (w), (x), and (y).

Weeds include occasional gorse and radiata pine. Approximately 91.3 ha of the site are protected within DOC-administered Conservation Park, *c*.70.5 ha are within WDC-administered covenants, 6.0 ha are protected within WDC-administered reserve, and *c*.1.6 ha are within a Queen Elizabeth II Open Space Covenant. Approximately 2.5 ha of this site are within 'Acutely Threatened' land environments (A5.1a, A5.1c), 1.1 ha are within a 'Chronically Threatened' land environment (A1.1d), 46.3 ha are within an 'At Risk' land environment (A6.1b), 12.7 ha are within 'Critically Underprotected' land environments (A6.1a, A6.1c), 191.7 ha are within an 'Underprotected' land environment (D1.2b), and 230.8 ha are within 'No Threat Category' land environments (D1.1a, D1.1b) (Walker *et al*. 2007).

BREAM ISLANDS SCENIC RESERVE: MOTURAKA AND TARAKANAHI ISLANDS

Survey no.	Q07/079
Survey date	18 September 1998
Grid reference	1742713E 6032910N (AX31)
Area	2.4 ha (0.3 ha shrubland, 2.1 ha rockland)
Altitude	0-10 m asl

Ecological units

(a) Harakeke-coastal toetoe flaxland on island

(b) Kikuyu-taupata grassland on island

(c) Makaokao-remuremu-glasswort-native iceplant rockland on island

Landform/geology

Small rocky islands, formed of eroded Lower Miocene subvolcanic intrusions (Coromandel Group) cutting melange of Cretaceous to Oligocene sedimentary units (Mangakahia and Motatau complexes).

Vegetation

(a) Moturaka Island (the southern island) is mostly bare rock with areas of abundant harakeke and commonly occurring coastal toetoe. *Cyperus ustulatus* is frequent with occasional taupata, pohuehue, *Baumea juncea*, knobby clubrush, *Asplenium haurakiense*, and *A. northlandicum*.

(b) What little vegetation there is on Tarakanahi Island is characterised by locally common kikuyu and taupata with frequent glasswort and occasional makaokao.

(c) Remaining areas of bare rock are occupied by salt-tolerant herbs such as makaokao, remuremu, glasswort, native iceplant, shore groundsel, *Lobelia anceps*, NZ spinach, *Pseudognaphalium luteoalbum*, and batchelor's button.

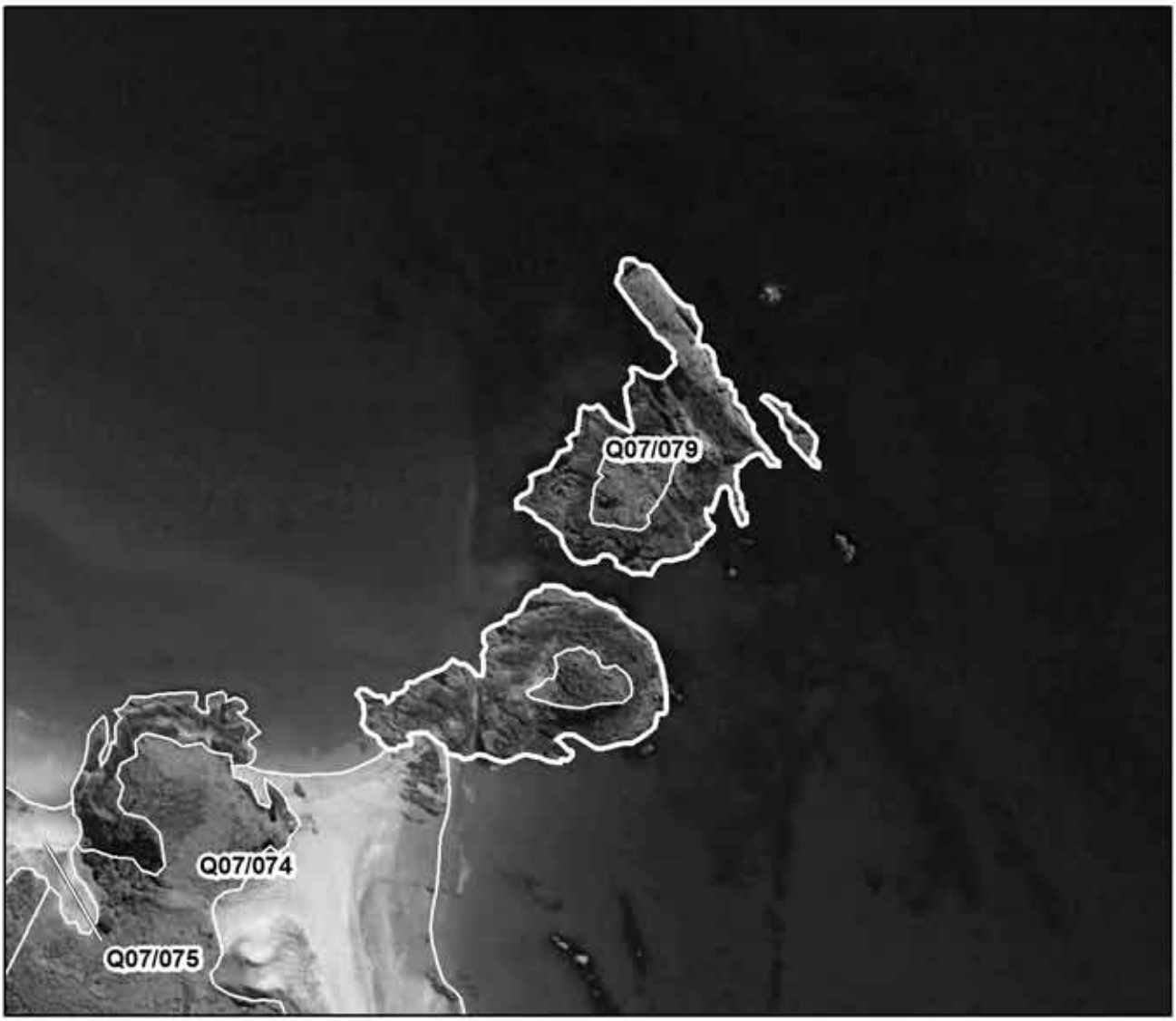
Significant flora

A. northlandicum (regionally significant) is present on Moturaka Island (recorded during this survey).

Fauna - Moturaka Island

Birds

Red-billed gull (Nationally Vulnerable) nesting with chicks, pied shag (Nationally Vulnerable), white-fronted tern (Declining), variable oystercatcher (Recovering) (a pair and chick were recorded in January 2010, W.Holland, DOC, Pers. Comm.), welcome swallow, and silvereye were recorded in 1992-94 (SSBI Q07/R07/H128). One predated fluttering shearwater (Relict) was found in October 1992, but it is likely that it originated from nearby Mauitaha Island or Guano Island where they are known to breed (1992, SSBI Q07/R07/H128). Variable oystercatcher, red-billed gull (nesting with chicks), pied shag, white fronted tern, and black-backed gull were also recorded in 1998 during the PNAP survey.



Aerial photography flown in 2008

Q07/079 Bream Islands Scenic Reserve: Moturaka Island and Tarakanahi Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

Lizards

Two shore skinks were recorded in October 1992 (SSBI Q07/R07/H128).

Other

Golden bell frogs were recorded in one of the brackish ponds in October 1992 (SSBI Q07/R07/H128).

Fauna - Tarakanahi Island

Birds

Red-billed gull (Nationally Vulnerable) and white-fronted tern (Declining) are known to breed on the island (1990, SSBI Q07/R07/H128). Black-backed gulls (possibly nesting) were recorded in September 2009 by Wildland Consultants.

Significance

The site comprises two small rocky islands. At low tide, exposed sand joins Moturaka to the mainland. Moturaka Island and Tarakanahi Island support one regionally significant plant species and nesting and/or roosting habitat for two 'Threatened' and three 'At Risk' bird species. Representative site for types (a) and (c). Moturaka's proximity to Ocean Beach makes it vulnerable to human and animal disturbance. Dogs are known to visit the island (SSBI Q07/R07/H128), thus threatening nesting and roosting seabirds. Moturaka has been burnt in the past and is now host to a number of introduced plant species, which are mainly grasses and herbs. No exotic plant species were recorded from Tarakanahi Island. Approximately 1.1 ha of the site is protected within Bream Island Scenic Reserve (DOC-administered). Approximately 1.4 ha of this site is within a 'Chronically Threatened' land environment (A7.1a) and 0.05 ha is within a 'No Threat Category' land environment (D1.1a) (Walker *et al*. 2007).

BREAM ISLANDS NATURE RESERVE: MAUITAHA ISLAND AND GUANO ISLAND

Survey no.	Q07/080
Survey date	September 1990 and 12 January 1991 (SSBI Q07/R07/H080)
Grid reference	1743913E 6032653N (AX31)
Area	6 ha (2.4 ha shrubland, 3.6 ha rockland)
Altitude	0-40 m asl

Ecological units

(a) Taupata coastal shrubland on island

(b) Harakeke-taupata coastal flaxland on island

(c) Mercury Bay weed-makaokao-NZ celery rockland on island

Landform/geology

Rocky islets comprising the eroded remnants of a Lower Miocene subvolcanic diorite intrusion.

Vegetation

(a) Mauitaha Island is gently sloping on the western side with cliffs on the eastern side. The vegetation consists of dense taupata coastal shrubland with frequent harakeke and coastal mahoe. Taupata extends almost to sea level on the western side. Above the cliffs on the eastern side is a flat area of native ice plant, and a few emergent pohutukawa. Other species present include kanuka, pohuehue, *Cyperus ustulatus*, *Asplenium haurakiense*, *A. northlandicum*, and *Hypolepis distans*.

(b) Gauno Island consists of mainly rounded bare rock with patches of harakeke-taupata coastal shrubland with occasional *Cyperus ustulatus*, native iceplant, *Crassula sieberiana* (2001, AK 252292), and shore groundsel.

(c) A range of salt-resistant herbs are scattered on bare rock on both islands. Species include Mercury Bay weed, makaokao, NZ celery, shore groundsel, and *Crassula siberiana*.

Significant flora - Mauitaha Island

Cook's scurvy grass (Nationally Vulnerable), *Tetragonia tetragonioides* (Naturally Uncommon) (recorded in May 2010, W. Holland, DOC, pers. comm.), (*Asplenium northlandicum* (regionally significant), coastal mahoe (regionally significant), and *Einadia triandra* (regionally significant) (1990-1991, SSBI Q07/R07/H079). Cook's scurvy grass, *Asplenium northlandicum*, and coastal mahoe were reconfirmed in May 2010 (W. Holland, DOC, pers. comm.).

Significant flora - Guano Island

Einadia triandra (regionally significant) (1990, SSBI Q07/R07/H080) and coastal mahoe (recorded in May 2010, W. Holland, DOC, pers. comm.).

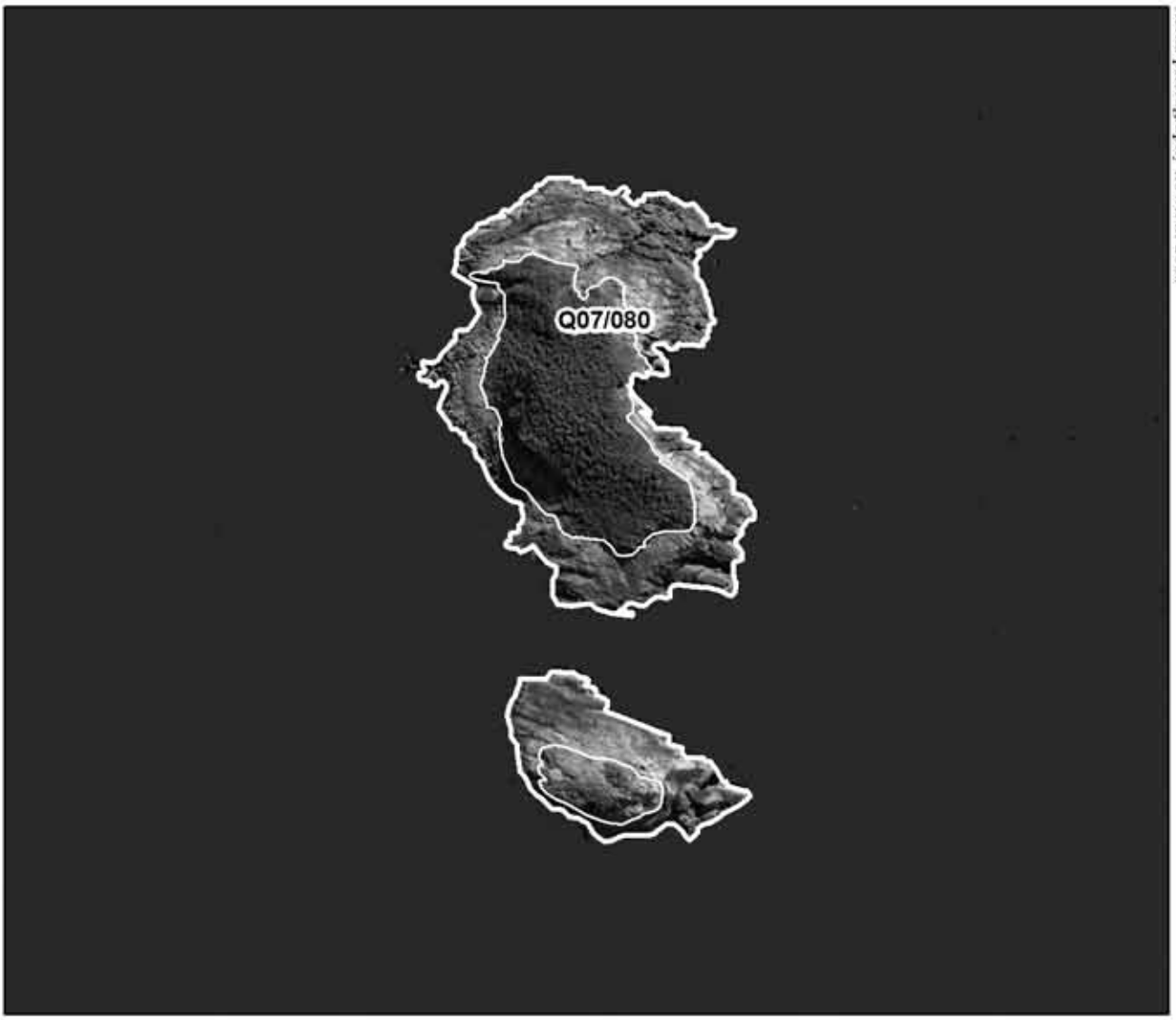
Fauna - Mauitaha Island

Birds

Red-billed gull (Nationally Vulnerable), pied shag (Nationally Vulnerable), northern little blue penguin (breeding, Declining), fluttering shearwater (breeding, Relict), northern diving petrel (breeding, Relict), variable oystercatcher (Recovering), grey-faced petrel (regionally significant), black-backed gull (breeding), Australasian harrier, kingfisher, silvereye, and welcome swallow were recorded between 1990 and 1991 (SSBI Q07/R07/H079). Red-crowned kakariki (Relict) were recorded in 1977 (SSBI Q07/R07/H079).

Lizards

Ornate skink (Gradual Decline) was recorded in 1993 (DOC Bioweb 2009). Pacific gecko (Gradual Decline), Duvaucel's gecko (Sparse), egg-



Aerial photography flown in 2008

Q07/080 Bream Islands Nature Reserve: Mauitaha Island and Guano Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

laying skink (Range Restricted), MacGregor's skink (Range Restricted), common gecko (regionally significant) (1991, DOC Bioweb), and shore skink were recorded in 1990 (SSBI Q07/R07/H079).

Fauna - Guano Island

Birds

Red-billed gull (Nationally Vulnerable), northern little blue penguin (Declining), fluttering shearwater (breeding, Relict), northern diving petrel (breeding, Relict), and black-backed gull were recorded in 1990 (SSBI Q07/R07/H080).

Lizards

Pacific gecko (Gradual Decline) (historical 1968 record, DOC Bioweb 2009), common gecko (regionally significant) (1990, DOC Bioweb 2009; reconfirmed in May 2010, W. Holland, DOC, pers.comm.), and shore skink (1990, SSBI Q07/R07/H079).

Significance

Both islands are rodent-free and provide a protected ecosystem for threatened flora and fauna. Mauitaha Island has always been free of mammalian pests (Pierce *et al.* 2002) and it is an outstanding natural habitat that provides habitat for two 'Threatened' plant species, three regionally significant plant species, two 'Threatened' and five 'At Risk' seabird species, and two 'Threatened', three 'At Risk', and one regionally significant lizard species. MacGregor's skink now only survives on rat-free islands (SSBI Q07/R07/H079). Guano Island supports two regionally significant plant species, one 'Threatened' and three 'At Risk' seabird species, and one 'Threatened' and one regionally significant gecko species. Representative site for all ecological units. The islands are important future sources of seabird recolonisation of Bream Head Scenic Reserve and Surrounds (Q07/074) once pests are removed. Weeds present include pampas, black nightshade, inkweed, sow thistle, and buffalo grass. A follow-up survey is required to establish the current ecological values on these islands. Approximately 3.9 ha of the site are protected within Bream Islands Nature Reserve (DOC-administered). Approximately 0.9 ha of the site is within a 'Chronically Threatened' land environment (A6.1d) and 5.1 ha are within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

KAURI MOUNTAIN WETLAND

Survey no.	Q07/081
Survey date	13 October 1998 and 4 August 2009
Grid reference	1738800E 6038438N (AX31)
Area	4.7 ha
Altitude	18-19 m asl

Ecological units

(a) *Lemna minor*-raupo herbfield in swamp

(b) Open water

(c) Harakeke-*Baumea articulata*-raupo flaxland in swamp

(d) Raupo reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvial deposits.

Vegetation

The site comprises a long, thin valley floor with an artificial dam at the lower end.

(a) The dammed lake consists of 15% vegetation and 85% open water (type b). *Lemna minor* and raupo are locally common around the margins together with occasional soft rush, *Cyperus ustulatus*, ti kouka, *Carex virgata*, crack willow, Mexican devil, and willow weed. Harakeke is present at the head of the lake.

(b) The open water part of this site is extensively infested with hornwort (*Ceratophyllum demersum*), which when the dam overflows, also causes minor infestations downstream (G. Townsend, NRC, pers. comm. 2010). Northland Regional Council is proposing to eradicate this pest plant (*ibid*.).

(c) Above the lake there is a narrow wetland that is open in places. Harakeke, *Baumea articulata*, and raupo are common with frequent swamp sedge, soft rush, Mexican devil, and ti kouka, and occasional swamp millet and gorse.

(d) Further upstream, the wetland becomes densely vegetated and raupo is abundant. *Baumea articulata*, ti kouka, and Mexican devil are frequent with occasional harakeke, swamp kiokio, soft rush, *Juncus edgariae*, *Carex secta*, *Cyperus ustulatus*, watercress, exotic grass (*Festuca* sp.), swamp millet, and pond weed (*Potamogeton* sp.).

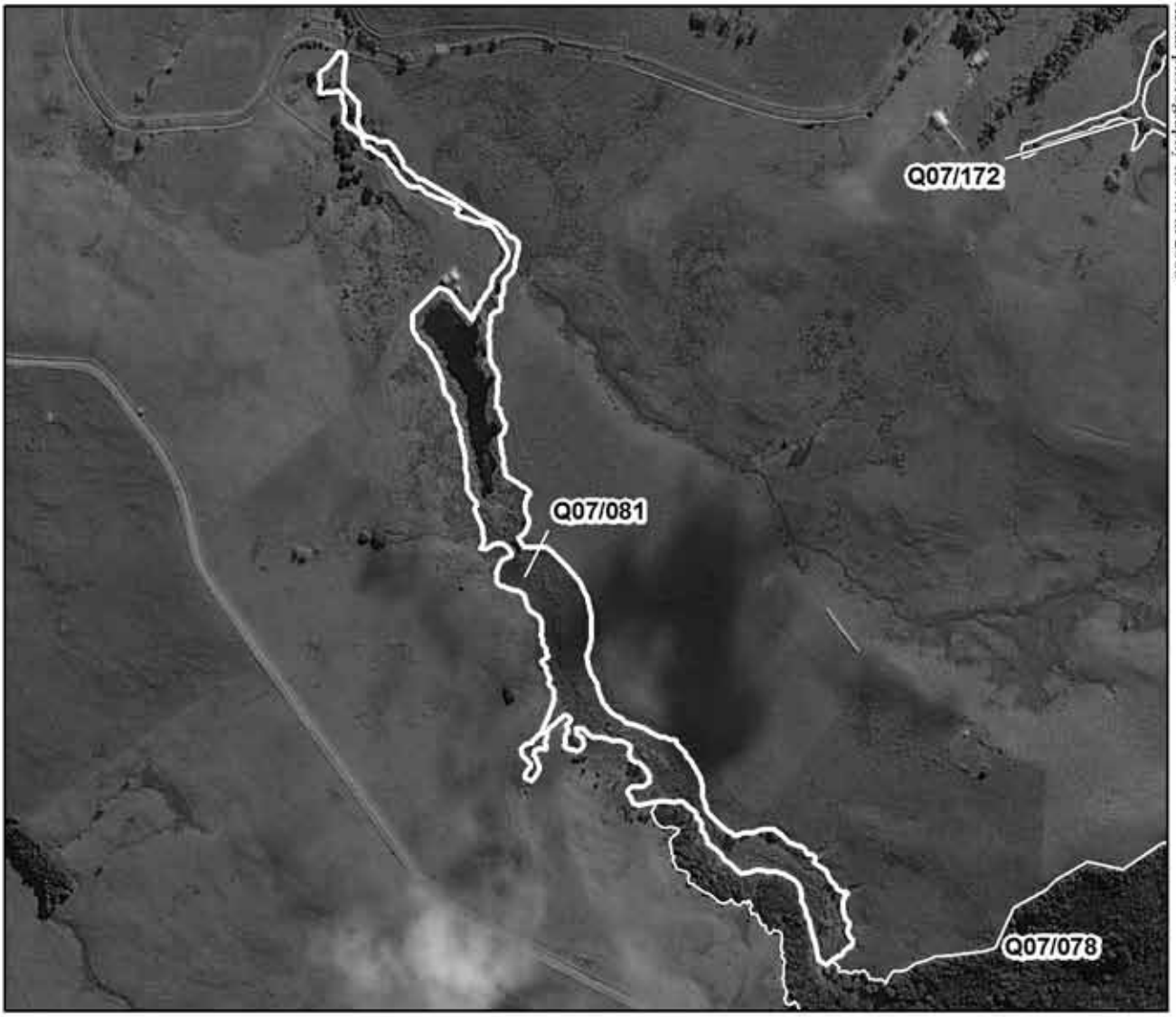
Significant flora

No information.

Fauna

Birds

Large numbers of spotless crake (Relict) were recorded in 1978, together with NI fernbird (Declining). Pukeko, white-faced heron, mallard duck, paradise shelduck, NZ kingfisher, welcome swallow, spur-winged plover,



Q07/081 Kauri Mountain Wetland

0 125 250 500
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

tui, grey warbler, and shining cuckoo were also recorded in 1978 (SSBI Q07/R07/H037) and in 1998. Spotless crake calls were played during the 1998 survey but no response was heard; however, at least seven spotless crake territories were found using taped playback calls in February 2007 (Pierce & Kerr 2007). Australasian bittern (Nationally Endangered) use the pond and the stream for several hundred metres upstream. Little shags (Naturally Uncommon) are also known to visit the pond (Pierce & Kerr 2007). Paradise shelduck, white-faced heron, Australasian harrier, and grey warbler were recorded in 2009.

Fish

Longfin eel (Gradual Decline), banded kokopu (regionally significant), and shortfin eel are known from the site (Pierce & Kerr 2007).

Significance

Kauri Mountain Wetland supports two 'Threatened' and three 'At Risk' species of water birds, one species of 'Threatened' fish, and at least one regionally significant fish. Freshwater wetlands are a regionally and nationally threatened habitat type, and they are critically under-represented in Manaia ED. The dam is partly fenced and the banks of the pond and stream can be accessed by sheep and cattle, but currently there is little impact on water quality and wetland habitats. The upper third of the wetland is buffered by manuka shrubland and is contiguous with Kauri Mountain Conservation Area and Surrounds (Q07/078). The outlet from the dam is piped, but has good fish passage, allowing fish movement into the forested upper reaches within Q07/078 (Pierce & Kerr 2007). Representative site for (a) *Lemna minor*-raupo herbfield and (c) harakeke-*Baumea articulata*-raupo flaxland. Weeds present include hornwort in the dam, and downstream from it is occasional willow, gorse, and Mexican devil, the latter of which is locally common in dense raupo reedland. Approximately 0.1 ha of the site is protected within Kauri Mountain Conservation Area and Surrounds (DOC-administered). Approximately 3.7 ha of this site are within 'Acutely Threatened' land environments (A5.1a, A5.1c) and 0.2 ha is within an 'At Risk' land environment (A6.1b) (Walker *et al.* 2007).

WHANGAREI HEADS ROAD WETLAND

Survey no.	Q07/083
Survey date	14 November 1993 and 15 September 2009
Grid reference	1735191E 6039100N (AX31)
Area	22.1 ha
Altitude	40 m asl

Ecological units

(a) Harakake flaxland in swamp

(b) Gorse shrubland on alluvium

(c) Crack willow treeland in swamp

(d) Raupo reedland in swamp

(e) *Baumea* sp. sedgeland in swamp

(f) Manuka shrubland on alluvium

Landform/geology

Valley floor wetland on Holocene alluvial deposits.

Vegetation

(a) North of Timperley Road, type (a) harakeke flaxland is locally common, occurring with occasional ti kouka, pampas, and gorse, while type (b) gorse shrubland is common on the wetland's drier margins with occasional woolly nightshade. Large areas of the site are dominated by (c) crack willow and deeper area are characterised by small clusters of type (d) raupo reedland. Type (e) *Baumea* sp. sedgeland is locally common throughout the northern part of site.

The wetland becomes more expansive to the south of Timperley Road. Type (a) and type (f) manuka shrubland are locally common with frequent *Baumea articulata*, crack willow, pampas, swamp millet, sheoak, and occasional mamaku, ti kouka, hangehange, eucalyptus, and pine.

Significant flora

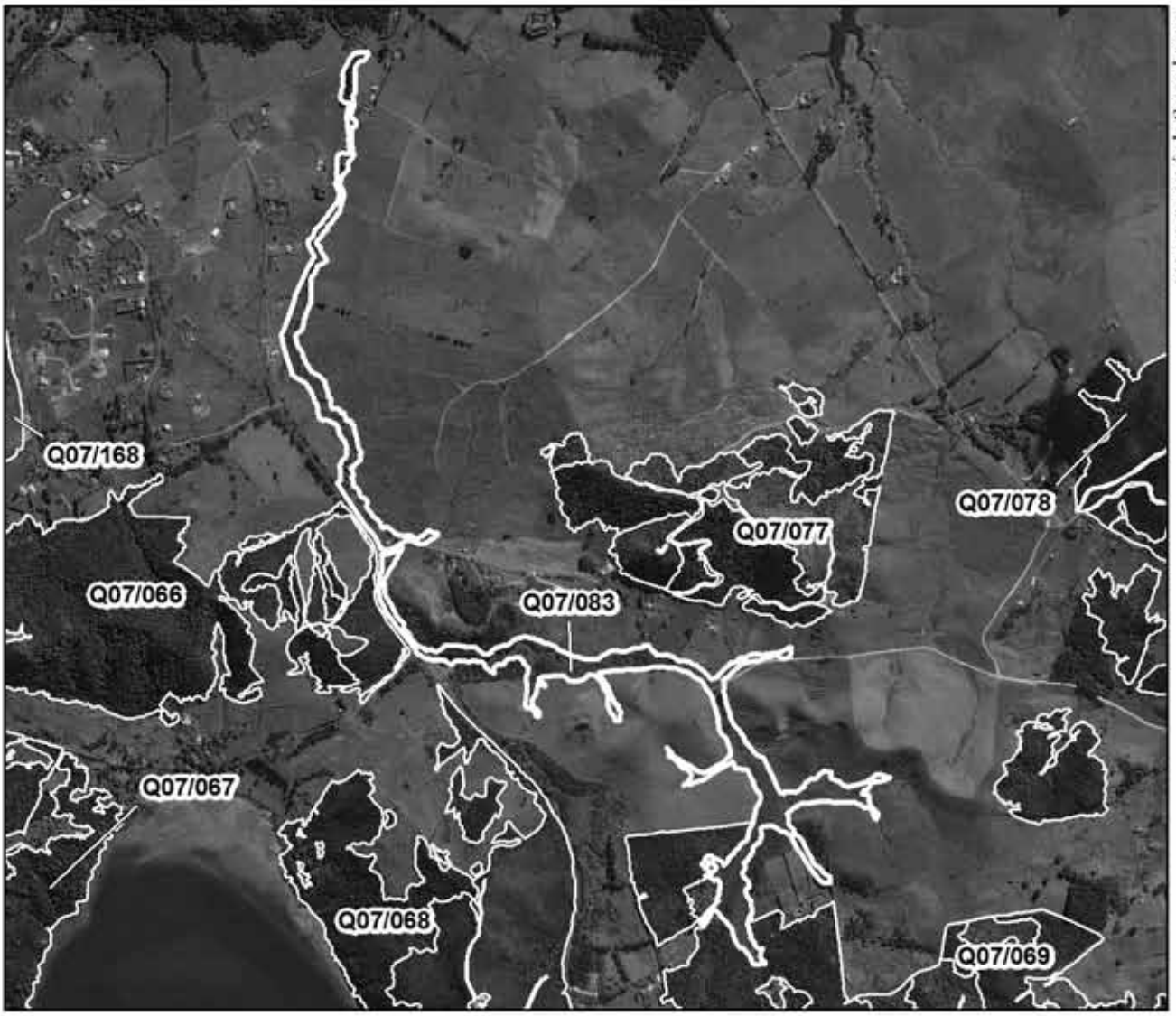
No information.

Fauna

Paradise shelduck (L. Forester, NRC, pers. comm. 2009).

Significance

Whangarei Heads Road Wetland comprises a meandering, narrow wetland corridor that follows the *c.*4 km length of Waikare Creek, the longest watercourse in Manaia ED (Pierce *et al.* 2002). The site has been degraded by weed invasion, stock incursions, and farm run-off, although it still retains significant natural areas, including representative examples of (a) harakeke flaxland and (f) manuka shrubland on alluvium. Wetlands are a nationally threatened habitat type and are particularly uncommon in Manaia ED, and it is for these reasons, together with its size, that the site has been accorded Level 1 status. Whangarei Heads Road Wetland



Aerial photography flown in 2008

Q07/083 Whangarei Heads Road Wetland

0 250 500 1,000
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

has the potential to support 'Threatened' and 'At Risk' water birds such as Australasian bittern (Nationally Endangered), NI fernbird (Declining), and spotless crake (Relict), and it is likely to support other common species such pukeko, spur-winged plover, and kingfisher. Although the site is very weedy, the willows are at least providing riparian buffering and stream bank stability, while shading areas of open water. Access to the site is very restricted, thus the vegetation was only partially observed. Further survey is required to determine the site's full ecological values. 0.8 ha of the site is protected within WDC-administered reserve. Approximately 9.5 ha of this site are within a 'Chronically Threatened' land environment (A6.1d), 9.9 ha are within an 'At Risk' land environment (A6.1b), and 2.8 ha are within an 'Underprotected' land environment (D1.2b) (Walker *et al.* 2007).

KITEONE ROAD SALTMARSH

Survey no.	Q07/168
Survey date	21 September 2009
Grid reference	1733798E 6040146N (AX31)
Area	3.8 ha (3.6 estuarine, 0.2 wetland)
Altitude	0-2 m asl

Ecological units

(a) Mangrove forest in marsh

(b) *Austrostipa stipoides* tussockland on shell bank

(c) Oioi sedgeland in marsh

(d) Sea rush-mangrove rushland in marsh

(e) Makaokao-remuremu herbfield

(f) *Baumea articulata* sedgeland in swamp

Landform/geology

Coastal wetland on Holocene estuarine deposits.

Vegetation

The site comprises a relatively large and intact saltmarsh east of Kirikiri Point, near the northern boundary of Manaia ED. A beach access track bisects the site towards the northern end of the bay.

(a) Mangrove forest dominates the site, covering much of the mud flats within the embayment. A raised shellbank north of the access track delineates the boundary between mangrove forest and most other ecological units, while in the south of the site mangroves are common, having spread further inland. Other species include occasional patches of oioi, sea rush, and saltwater paspalum.

(b) *Austrofestuca stipoides* dominates a thin shell bank in association with occasional saltmarsh ribbonwood, harakeke, toatoa, knobby clubrush, glasswort, makaokao, *Lobelia anceps*, and *Suaeda novae-zelandiae*.

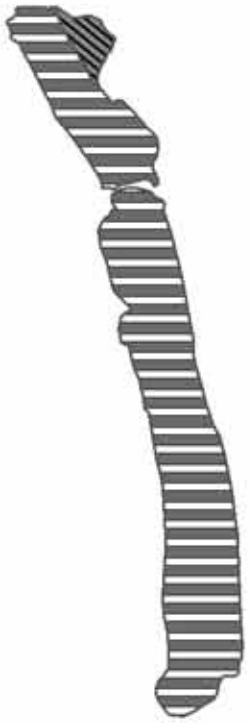
(c) Oioi is dominant in association with frequent sea rush and occasional saltmarsh ribbonwood.

Q07/168 Kiteone Road Saltmarsh

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



(d) Sea rush is common in association with scattered small mangrove shrubs.

(e) Open areas of mudflats are characterised by locally abundant makaokao growing in association with remuremu, glasswort, and saltwater paspalum.

(f) Type (c) grades into a small freshwater wetland characterised by *Baumea articulata* with frequent Mexican devil and occasional *Baumea juncea* and gorse.

Significant flora

Suaeda novae-zelandiae (regionally significant) and arrow grass (regionally significant) (recorded by Wildland Consultants during this survey, 2009).

Fauna

One dead northern little blue penguin (Declining) was found on the shell bank near the access track during the 2009 survey. Pied stilts (Declining) nested here in the early 1990s (R. Pierce pers. comm.).

Significance

Kiteone Saltmarsh is the only example of a saltmarsh-freshwater wetland sequence remaining in Manaia ED, and it represents a habitat type which is rare in the Northland Region. The site supports two regionally significant plant species and supports at least one 'At Risk' bird species. It also provides potential habitat for NI fernbird (Declining) and banded rail (Naturally Uncommon). The northern little blue penguin most likely died of disease or starvation, and was subsequently washed ashore. It is not known if this species normally frequents the site. The site is relatively intact and not yet adversely affected by weeds, although an adjacent sub-division development could result in weeds invading from residential gardens. Representative site for all six ecological units. Weeds currently present in the saltmarsh include occasional pampas, Mexican devil, gorse, sheoak, saltwater paspalum, and dimorphotheca. 3.2 ha are protected within a WDC reserve. Approximately 3.7 ha of this site are within an 'At Risk' land environment (A4.1a) (Walker *et al.* 2007).

AWAROA ISLAND

Survey no.	Q07/170
Survey date	11 January 1991 (SSBI Q07/R07/H078) and 22 September 2009
Grid reference	1740699E 6038743N (AX31)
Area	0.43 ha (0.03 ha shrubland, 0.4 ha rockland)
Altitude	0-5 m asl

Ecological units

(a) Taupata-native iceplant rockland on island

(b) Bare rockland on island

Landform/geology

Sea stack and intertidal reefs of Mesozoic chert (Waipapa Group).

Vegetation

(a) The vegetation comprises a small patch of prostrate taupata growing with native iceplant.

(b) The remainder of the site is bare rock.

Significant flora

No information.

Fauna

Approximately 50 pairs of red-billed gull (Nationally Vulnerable) were recorded in January 1991, along with pied shag (Nationally Vulnerable), white-fronted tern (Declining), and white-faced heron (SSBI Q07/R07/H078). A colony of red-billed gulls was recorded in September 2009 by Wildland Consultants.

Significance

Awaroa Island comprises a small rocky outcrop which lies approximately 390 m offshore from the northern end of Ocean Beach Recreation Reserve and Surrounds (Q07/075). Despite its small size, it supports at least three threatened bird species, including a thriving red-bill gull colony. It is not known if rodents inhabit the site. Representative site for type (a) taupata-native iceplant shrubland on rock. Approximately 0.1 ha of this site is within an 'Acutely Threatened' land environment (A7.2a) and 0.4 ha is within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

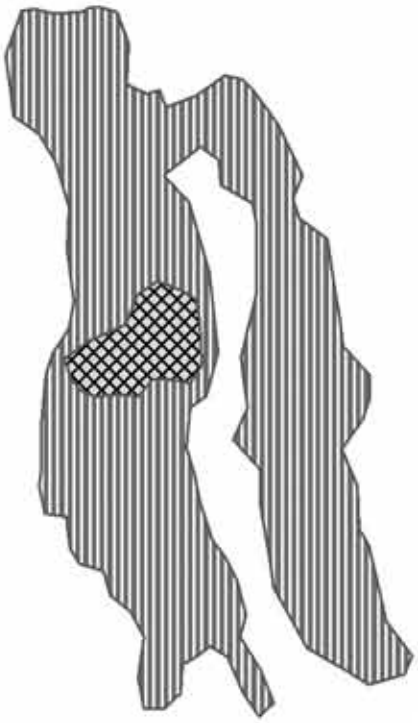
Aerial photography flown in 2008

Q07/170 Awaroa Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



FRENCHMAN ISLAND

Survey no.	Q07/171
Survey date	13 May 1992 (SSBI Q07/R07/H125)
Grid reference	1737920E 6030438N (AX31)
Area	0.24 ha (0.06 ha forest, 0.18 ha rockland)
Altitude	0-20 m asl

Ecological units

(a) Pohutukawa forest on island

(b) Native iceplant-glasswort rockland on island

Landform/geology

Small rocky island formed of Lower Miocene dacite (Coromandel Group).

Vegetation

(a) At the time of the 1992 survey, dead pohutukawa forest fringed the island, while taupata, knobby clubrush, and *Asplenium haurakiense* occur in the understorey. Inspection of 2008 aerial photography indicates that some pohutukawa have recovered.

(b) Most of the island is bare rock on which native ice plant and glasswort are scattered.

Significant flora

No information.

Fauna

The island has been used as a breeding site by red-billed gulls (Nationally Vulnerable) (*c*.200 pairs recorded in 1972 and *c*.100 pairs in 1991/92) and a few pairs of white-fronted terns (Declining) (*c*.150 pairs recorded in 1972, but only a few pairs in 1991/92) (SSBI Q07/R07/H125). Recent observations, however, indicate that white-fronted terns frequently breed on the island, although numbers are very erratic (R. Pierce pers. comm.). Reef herons (Nationally Vulnerable) also visit the island (Pierce 2005).

Significance

Frenchman Island lies approximately 40 m offshore from the west edge of Busby Head. It supports at least two 'Threatened' and one 'At Risk' seabirds, although numbers red-billed gull and white-fronted tern have declined significantly since the first survey in 1972. No explanation for the dead pohutukawa could be found, given there was no sign of possums when the island was last surveyed in 1992. It is not known if rodents and other pests inhabit or access the island. Weeds do not seem to have had adverse impacts on the island, with Scotch thistle the only species to have been recorded in 1992 (SSBI Q07/R07/H125). Representative for type (b) native iceplant-glasswort rockland on island. Further survey is recommended to determine current seabird populations and the presence of reptiles and animal and plant pests. Frenchman Island is protected within DOC-administered scenic reserve. Approximately 0.13 ha of this

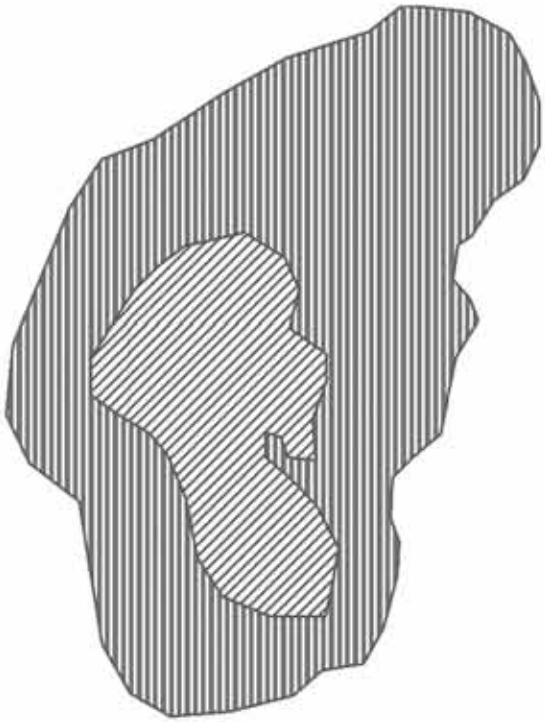
Aerial photography flown in 2008

Q07/171 Frenchman Island

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



site is within an 'Acutely Threatened' land environment (A7.2a) and 0.01 ha is within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

HARAMBEE ROAD SWAMP

Survey no.	Q07/172
Survey date	4 July 2009 and 22 September 2009
Grid reference	1739491E 6042039N (AX31)
Area	9.4 ha
Altitude	20-30 m asl

Ecological units

(a) *Baumea rubiginosa*-kapungawha-raupo sedgeland

(b) *Baumea articulata*-Mexican devil-harakeke sedgeland

Landform/geology

Valley floor wetland on Holocene alluvial deposits.

Vegetation

(a) At the head of the valley, the vegetation is characterised by *Baumea rubiginosa*, kapungawha and raupo, together with frequent harakeke, ti kouka, and manuka, and occasional kiokio, swamp millet, *Cyperus ustulatus*, and soft rush.

(b) Further north, where the wetland abuts Taiharuru Road, *Baumea articulata* is dominant with common Mexican devil and harakeke. There is occasional manuka, mapou, water fern, and *Calystegia sepium*.

Significant flora

No information.

Fauna

Birds

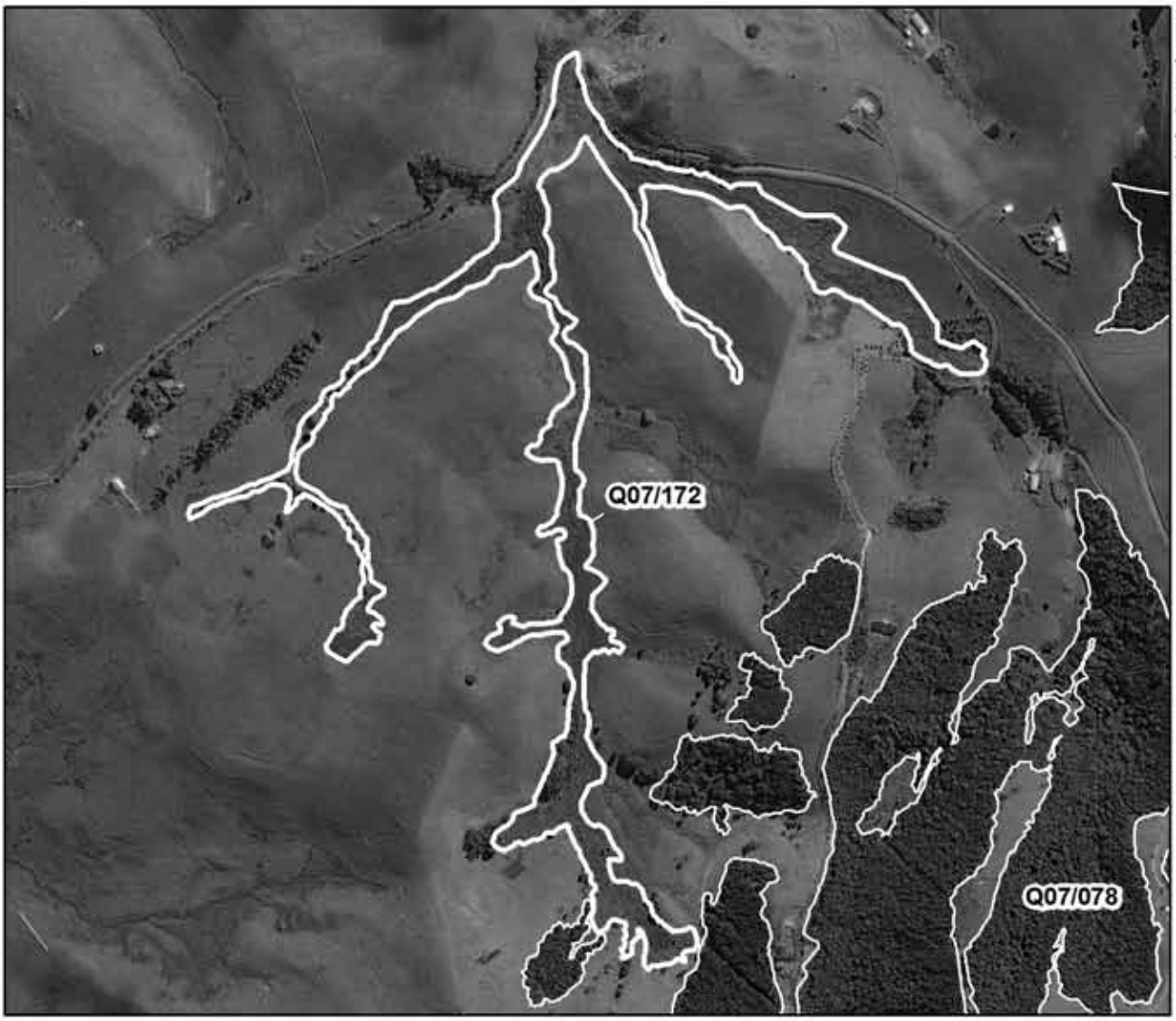
Australasian bittern (Nationally Endangered) and relatively high numbers (10 pairs) of spotless crake (Relict) were recorded in 2006-07 (Pierce & Kerr 2007). One spotless crake was heard calling in September 2009 during this survey. Pukeko were also recorded during the 2009 survey.

Fish

Longfin eel (Gradual Decline), banded kokopu (regionally significant), and shortfin eel are known to the site (Pierce & Kerr 2007).

Significance

Harambee Road Wetland is the central linkage in a full ecological sequence between indigenous forest in the upper valley and the Taiharuru estuary. Wetland vegetation, which would have once been common on the alluvial plains and valleys, now comprises <0.01% of landcover in



Q07/172 Harambee Road Swamp

0 125 250 500
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

Manaia ED (MfE 2004). The small stream that runs through the wetland drains a catchment in the north of Kauri Mountain Conservation Area and Surrounds (Q07/078). It flows through the wetland to an area of saltmarsh before entering Taiharuru Channel. The site is one of the best freshwater wetlands remaining in Manaia ED; it is significant because of its size, diversity of plant species, and the fact that it supports at least one 'Threatened' and one 'At Risk' species of water bird, one 'Threatened' fish species, and one regionally significant fish species. In addition, it is the only site in the Taiharuru estuary catchment where spotless crakes occur (Pierce & Kerr 2007). The stream currently has no barriers to fish movement upstream (Pierce & Kerr 2007), which will allow migration of diadromus fish species. Most of the wetland is fenced and retired, and downstream sections are partially buffered by shrubland and the road. Some parts of the wetland, however, were not able to be surveyed and thus may be vulnerable to grazing.

Representative site for type (a) *Baumea rubiginosa*-kapungawha-raupo sedgeland. Weeds are scarce in the south (upstream) of the site, although Mexican devil has become invasive further north. Other weeds present include gorse and pampas. Approximately 0.2 ha of this site is within an 'Acutely Threatened' land environment (A7.2a), 7.2 ha is within an 'At Risk' land environment (A6.1b), 1.2 are within a 'Critically Underprotected' land environment (A6.1a), and 0.9 ha is within a 'No Threat Category' land environment (D1.1b) (Walker *et al.* 2007).

PEACH COVE STACK A

Survey no.	Q07/173
Survey date	13 May 1992 (SSBI Q07/R07/H126)
Grid reference	1743029E 6030650N (AX31)
Area	2.1 ha
Altitude	0-3 m asl

Ecological units

(a) Pohutukawa-karo-taupata rockland on rock stack

Landform/geology

Steep-sided rocky islet of Lower Miocene massive, fractured andesite (Coromandel Group)

Vegetation

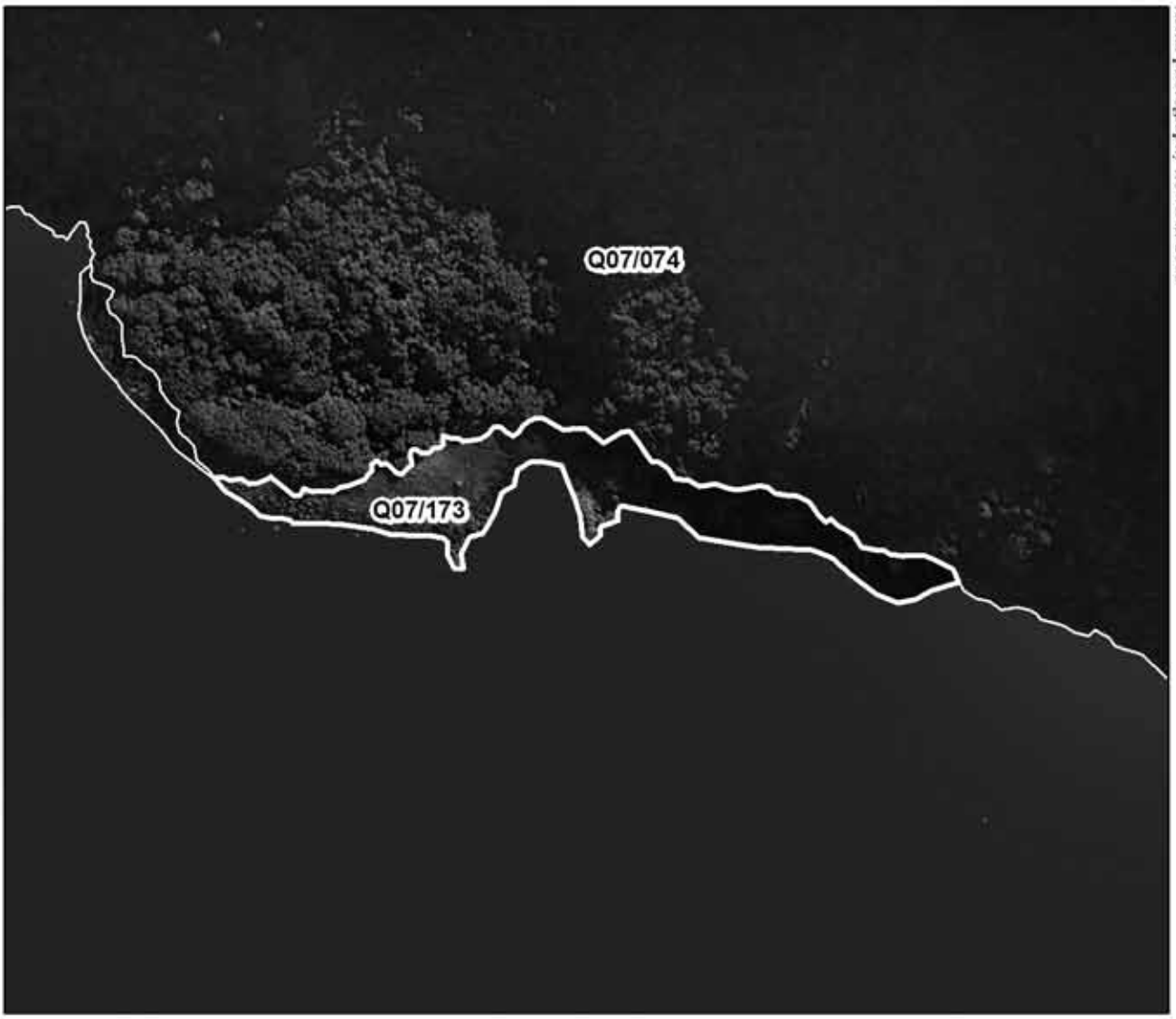
(a) The only vegetation present in the site includes a few small pohutukawa, karo, taupata, and occasional knobby clubrush, native iceplant, *Lobelia anceps*, *Einadia triandra*, and glasswort.

Significant flora

Einadia triandra (regionally significant) (1992, SSBI Q07/R07/H126).

Fauna

No information.

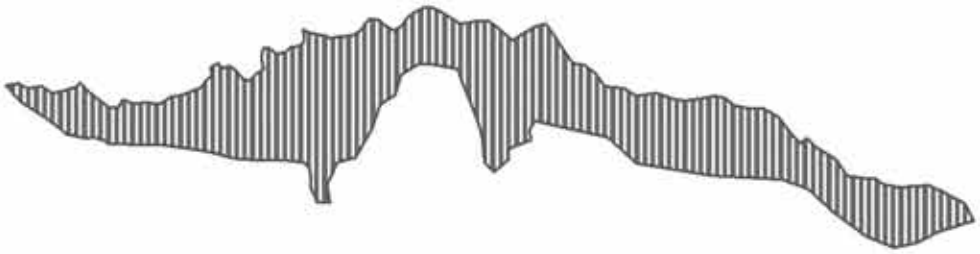


Q07/173 Peach Cove Stack A

0 75 150 300
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



Significance

The site comprises a small low rock stack with sparse vegetation. Despite its relatively small size, the site supports one regionally significant plant species, and it was described as possum-free in 1992 (SSBI Q07/R07/H126). Seabirds are likely to utilise the site intermittently. Representative site for type (a) pohutukawa-karo-taupata rockland on rock stack. Peach Cove Stack A is protected within the Bream Head Scenic Reserve and Surrounds (DOC-administered). This site lies within a 'No Threat Category' land environment (D1.1a) (Walker *et al.* 2007).

PEACH COVE STACK B

Survey no.	Q07/174
Survey date	13 May 1992 (SSBI Q07/R07/H127)
Grid reference	1742030E 6030469N (AX31)
Area	0.1 ha
Altitude	0-3 m asl

Ecological units

(a) Taupata rockland on rock stack

Landform/geology

Steep-sided rocky islet of Lower Miocene andesitic breccia (Coromandel Group).

Vegetation

(a) The site is predominantly bare rock with some taupata and occasional native iceplant and *Lobelia anceps*.

Significant flora

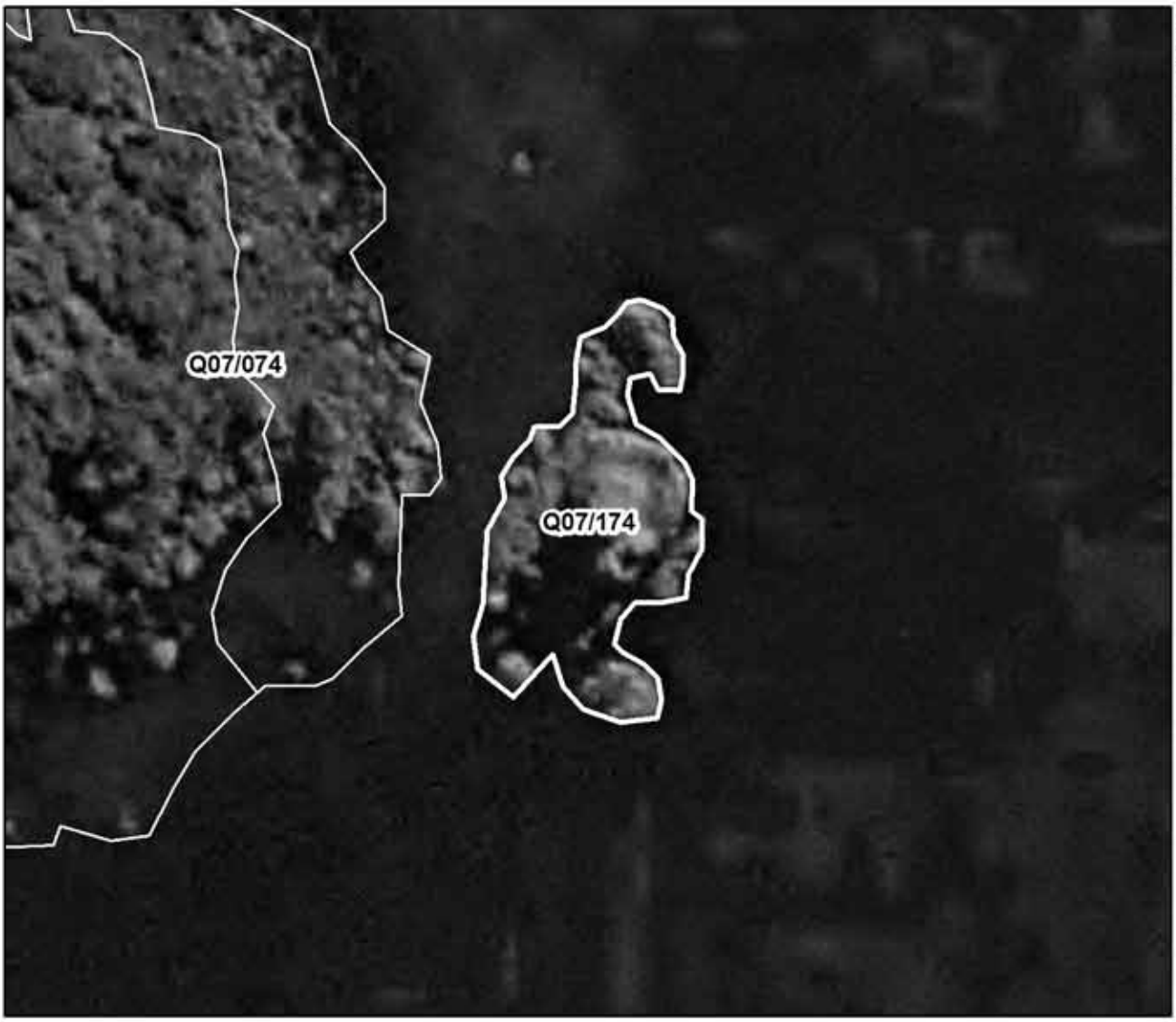
No information.

Fauna

Black-backed gulls have previously used the stack as a breeding site (1992, SSBI Q07/R07/H127).

Significance

The site comprises a small, steep-sided stack with limited vegetation, although it supports at least one species of seabird. Peach Cove Stack B is protected within the DOC-administered Bream Head Scenic Reserve and Surrounds (part of Q07/074). This site lies within a 'No Threat Category' land environment (D1.1a) (Walker *et al.* 2007).

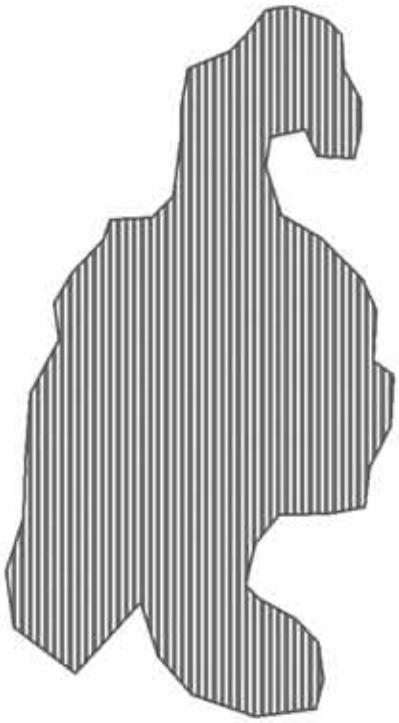


Q07/174 Peach Cove Stack B

0 12.5 25 50
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



KAURI MOUNTAIN ROAD POND AND RAUPO SWAMP

Survey no.	Q07/175
Survey date	22 September 2009
Grid reference	1739463E 6039610N (AX31)
Area	0.3 ha
Altitude	20 m asl

Ecological units

(a) Open water

(b) Raupo reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvial deposits; remnant of formerly extensive Holocene swamp behind coastal dune belt.

Vegetation

(a) Open water comprises *c*.90% of the site, with occasional *Azolla* sp.

(b) Raupo dominates the shallow margins of the pond. There is occasional ti kouka, *Cyperus ustulatus*, and *C. papyrus*.

Significant flora

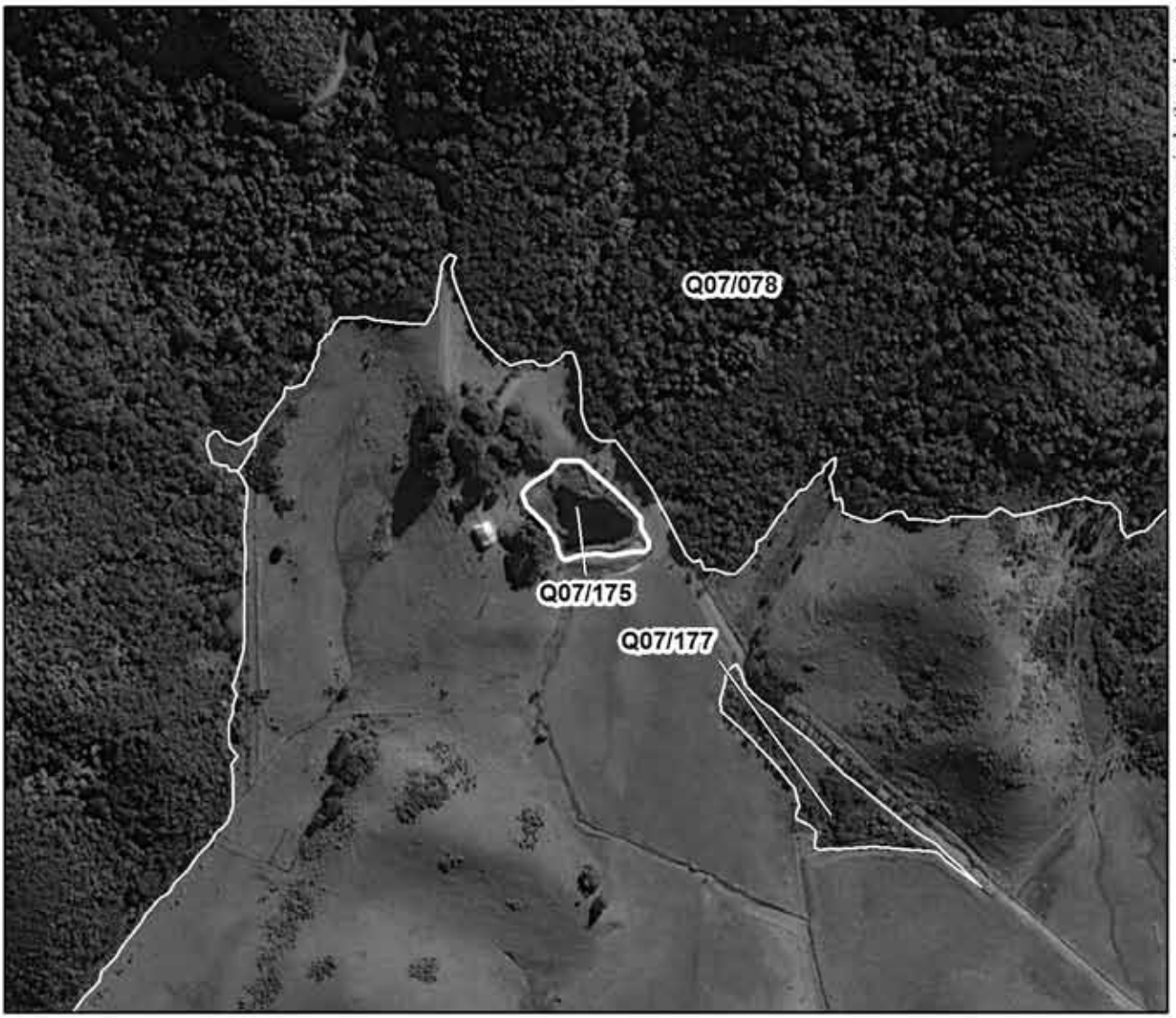
No information.

Fauna

Australasian bittern (Nationally Endangered) are known to use this pond and neighbouring drains (R. Pierce pers. comm.). Two black shags (Naturally Uncommon), paradise ducks with seven ducklings, pukeko, and welcome swallow were recorded in September 2009 by Wildland Consultants during this survey.

Significance

Despite its small size and modified state, the site is utilised by a relatively high number of birds, including one 'Threatened' and one 'At Risk' species. It is also important in the modest network of local wetlands. The site currently lacks buffering and its margins are grazed. Approximately 0.3 ha of this site is within a 'Critically Underprotected' land environment (A6.1a) (Walker *et al*. 2007).

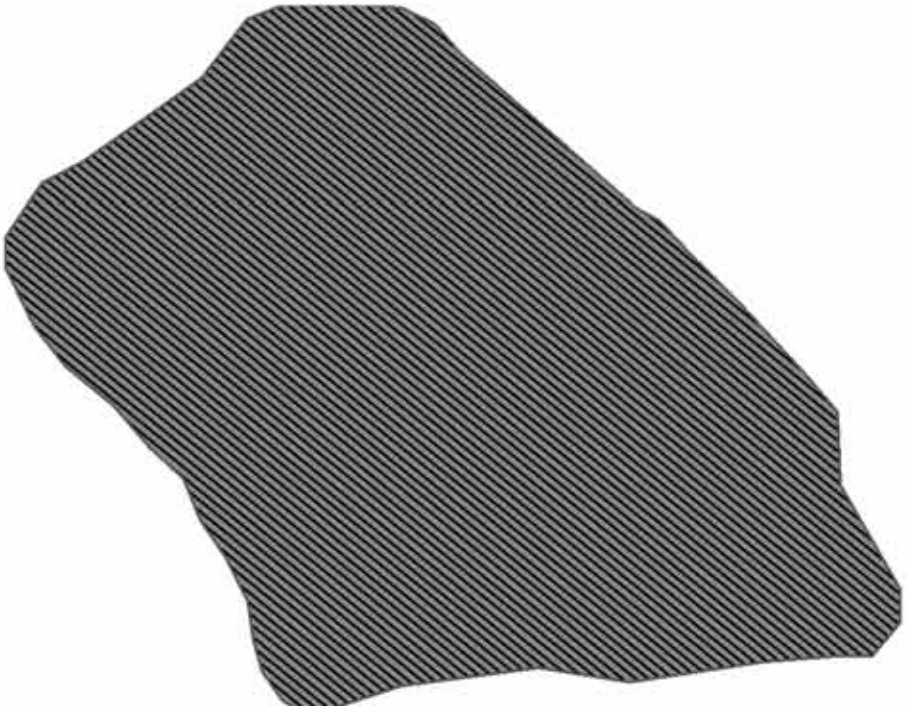


Q07/175 Kauri Mountain Road Pond and Raupo Swamp

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



4.2 LEVEL 2 SITES

SITE	SURVEY NO.	GRID REF.
High Island Stack A	Q07/082	1737012E 6033936N
Kirikiri Point Coastal Forest	Q07/169	1736922E 6034025N
Kauri Mountain Road Seep	Q07/177	1739523E 6039530N

HIGH ISLAND STACK A

Survey no. Q07/082
Survey date 13 May 1992 (SSBI Q07/R07/H122)
Grid reference 1736922E 6034025N (AX31)
Area 0.14ha (0.04 ha forest, 0.1 rockland)
Altitude 0-5 m asl

Ecological units

(a) Pohutukawa treeland on rock stack

(b) NZ spinach-glasswort rockland on rock stack

Landform/geology

Rocky islet comprising the eroded remnant of a Lower Miocene andesite dike.

Vegetation

(a) The site comprises a small, low-lying rock stack characterised by pohutukawa treeland over frequent harakeke, pampas, gorse, kikuyu, buffalo grass, and smilax. There is occasional oioi, *Austrostipa stipoides*, *Astelia banksii*, *Asplenium oblongifolium*, and leather-leaf fern.

(b) Most of the island comprises bare rock with scattered NZ spinach and glasswort.

Significant flora

No information.

Fauna

Over 100 breeding pairs of red-billed gull (Nationally Vulnerable) were recorded in 1978-79 (SSBI Q07/R07/H122). No red-billed gulls were recorded during a subsequent survery in 1992.

Significance

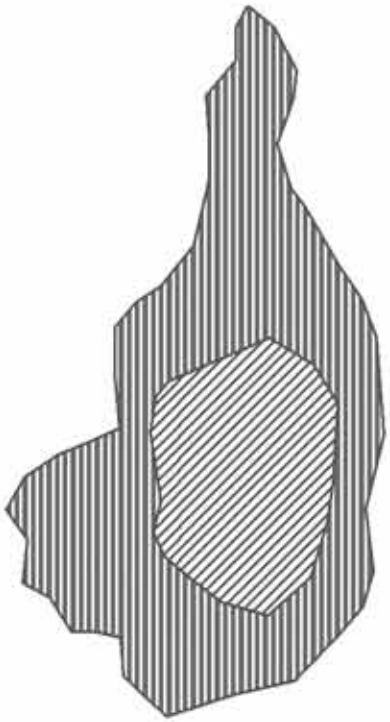
The site is small and its proximity to the mainland has facilitated the invasion of weeds. Weed species include gorse, pampas, kikuyu, buffalo grass, inkweed, fleabane, smilax, dock, and black nightshade. It is not known if pest animals are present. With appropriate restoration, the island will provide suitable habitat for indigenous reptiles as well as a breeding ground for seabirds. In its current state, the site is assigned a Level 2 rank of significance. Approximately 0.1 ha of this site is within an 'At Risk' land environment (A6.1b).

Q07/082 High Island Stack A

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



KIRIKIRI POINT COASTAL FOREST

Survey no.	Q07/169
Survey date	21 September 2009
Grid reference	1733297E 6040424N (AX31)
Area	3.0 ha
Altitude	0-20 m asl

Ecological units

(a) Pohutukawa forest on cliff

Landform/geology

Coastal bank cut in melange of Cretaceous to Paleocene mudstone (Mangakahia Complex).

Vegetation

(a) Open mature pohutukawa forest dominates the coastal vegetation from Kirikiri Point to the easternmost beach within Parua Bay. Totara and puriri are frequent in the canopy with occasional emergent radiata pine and willow. In open areas the understorey is dominated by cotoneaster, with occasional ti kouka, tarata, karo, karamu, and harakeke.

Significant flora

No information.

Fauna

Tui was recorded during this survey by Wildland Consultants, 2009.

Significance

The site is small but contains some healthy mature pohutukawa trees; coastal pouhutukawa forest is a threatened habitat type in Northland. The site, however, suffers from extensive weed invasion and its proximity to private residences means garden plant escapes will be an ongoing problem without appropriate management. The site is therefore assigned a ranking of Level 2 significance. Other weed species present include pampas, shrub balsam, ornamental banana, and black-eyed Susan. Approximately 1.2 ha of the site is protected within a WDC reserve. Approximately 3.0 ha of this site are within an 'At Risk' land environment (A6.1b) (Walker *et al.* 2007).

Q07/169 Kirikiri Point Coastal Forest

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland

KAURI MOUNTAIN ROAD SEEP

Survey no.	Q07/177
Survey date	15 September 2009 and 22 September 2009
Grid reference	1739523E 6039530N (AX31)
Area	0.5 ha
Altitude	18-20 m asl

Ecological units

(a) Manuka-ti kouka shrubland on alluvium

(b) Kapungawha reedland on alluvium

Landform/geology

Valley floor wetland on Holocene alluvial deposits; remnant of formerly extensive Holocene swamp behind coastal dune belt.

Vegetation

(a) Manuka shrubland dominates the canopy with ti kouka as a commonly occurring emergent species. The understorey comprises common *Baumea articulata* with frequent swamp millet and *Baumea juncea*, and occasional kanuka, mapou, *Coprosma tenuicaulis*, mamangi, kiokio, wheki, mamaku, *Schoenus maschalinus*, and *Isolepis prolifer*.

(b) The northern end of the site is characterised by a sward of kapungawha.

Significant flora

Coprosma tenuicaulis (regionally significant) was recorded by Wildland Consultants during the 2009 survey.

Fauna

Pukeko and NI fantail (recorded by Wildland Consultants during the 2009 survey).

Significance

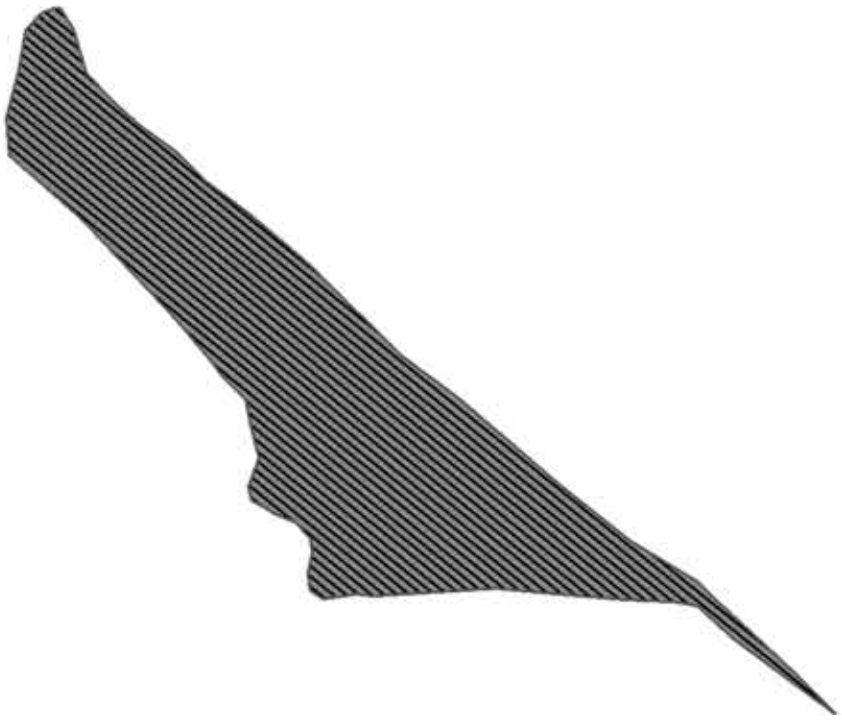
The site comprises a small, fenced area of alluvial vegetation adjacent to Kauri Mountain Road. Representative site for type (a) manuka-ti kouka shrubland on alluvium. However, weeds are frequent throughout the site (mist flower, pampas, kikuyu, and watercress), and despite an electric fence, cattle are still having adverse impacts on parts of the wetland. Animal trails (probably possum) were also observed on the wetland margins. For these reasons this site has been given Level 2 status. Approximately 0.04 ha of this site is within an 'Acutely Threatened' land environment (A5.1a) and 0.47 ha of this site is within a 'Critically Underprotected' land environment (A6.1a) (Walker *et al.* 2007).

Q07/177 Kauri Mountain Road Seep

0 50 100 200
Metres

Habitat type

- Duneland
- Estuarine
- Forest
- Rockland
- Shrubland
- Wetland



5. Summary and conclusions

A total of 27 significant natural areas covering 2,736 ha of significant natural areas were identified: approximately 1,834.8 ha (67%) are forest, 531.1 ha (19%) shrubland, 251.6 ha (9%) duneland/sandfield, 42.2 ha (1.5%) freshwater wetland, 32.3 ha (1.2%) rockland, and 9.8 ha (< 0.1%) estuarine habitat. Contained within these habitats are endemic species only found in Manaia ED: one Nationally Critically plant species (*Pseudowintera insperata*) and two species of land snail: *Liarea turriculata* "Manaia" (Range Restricted) and *Liarea egea* "Bream Head" (Data Deficient).

Key features of Manaia Ecological District - some of which are taken from Pierce *et al.* (2002) and Ritchie (2008) - are outlined below:

- Bream Head contains the most significant remaining stand of coastal broadleaved forest in Northland, with a full zonation of communities from sandy and rocky shores to high forest slopes and rocky outcrops, and has been identified by the Department of Conservation as having outstanding conservation value.
- Mt Manaia stands alongside Bream Head as one of Northland's most significant coastal forests. Bream Head and Mt Manaia are supplemented by the smaller yet significant natural areas of Kauri Mountain, Mt Aubrey, and Taurikura Ridge.
- High number of 'Threatened' and 'At Risk' plant species.
- Examples of vegetation habitats uncommon elsewhere, such as gumland and duneland vegetation.
- Important colonies of indigenous land snails, including the southernmost population of the flax snail *Placostylus bongii*, and only one of two sites supporting Punctidae sp. 223.
- Several sites are rated outstanding geological features, including a lava flow at Reserve Point (The Nook) and a natural jetty at Taurikura Bay.
- Part of the Whangarei Kiwi Sanctuary (one of only five in the country).
- Physical characteristics of geography and geology, the most distinctive being the volcanic rocky outcrops of Bream Head and Mt Manaia.
- Lengthy dunelands, which are poorly represented in the existing protected areas network.
- High floristic diversity, with a total of 423 indigenous vascular species.

Most of Manaia ED's biodiversity values are formally protected; however, priorities for protection are:

- Sites containing 'Threatened' and 'At Risk' species endemic to Manaia Ecological District or Eastern Northland Ecological Region.[32]
- Habitats for nationally 'Threatened', 'At Risk', and regionally significant species.
- Uncommon terrestrial habitat types, particularly swamps and gumland.
- Islands.
- Buffers and linkages.

32 All threatened species endemic to Manaia ED have to date been recorded from formally protected areas. However, future surveys may find such species on currently unprotected land, which could then be considered for formal protection.

6. Protected Natural Areas Network

6.1 ANALYSIS OF EXISTING PROTECTED AREAS

6.1.1 Overview

Manaia Ecological District covers a total extent of *c.*6,444 ha, of which natural areas cover 2,736 ha (42.5% of the Ecological District). The natural areas comprise 1,834.8 ha forest, 531.1 ha shrubland, 251.6 ha duneland/sandfield, 32.3 ha rockland, 42.2 ha freshwater wetland, and 9.8 ha estuarine vegetation.

Approximately 52% (1,402 ha) of the natural areas is formally protected within reserves. This is equivalent to about 21.8% of the total extent of Manaia ED. The various types of protection status within natural areas are summarised in Table 4.

A list of ecological units recorded in Manaia ED and their current protection status is set out in Table 6 and a summary of the site evaluations is given in Table 7.

6.1.2 Ecological units protected

The field survey did not identify which ecological units within each site were protected. Sites **without** protection or with very little protection were identified as follows.

Sites with no formal protection

McDonald Coastal Shrubland (Q07/067)

High Island (Q07/072)

Kauri Mountain Wetland (Q07/081)

High Island Stack A (Q07/082)

Whangarei Heads Road Wetland (Q07/083)

Harambee Road Wetland (Q07/172)

Kauri Mountain Road Pond and Raupo Swamp (Q07/175)

Kauri Mountain Road Seep (Q07/177)

Sites mostly unprotected

Tahunatapu Road Coastal Forest (Q07/066); 1.8% protected

Munro Bay Coastal Bush (Q07/067); < 0.01% protected

Taurikura Ridge Bush (Q07/073); 3.5% protected

Kerr Road Swamp (Q07/076); 15% protected

Sites with large parts unprotected

Kauri Mountain Conservation Area and Surrounds (Q07/078); 33.2% protected

Timperley Road Bush (Q07/077); 34.4% protected

The remaining sites have over 45% of their area within reserves or covenants; however, some ecological units within them may not be protected.

6.1.3 Threatened Land Environments of Manaia Ecological District

Land Environments of New Zealand (LENZ) is an environmental classification system that uses modelling techniques to classify New Zealand into broadly similar environments based on climatic, landform and soil factors, and the distribution of species. The Threatened Environment Classification is a combination of three national databases: Land Environments of New Zealand (LENZ), the Land Cover Database 2 (LCDB2), and Protected Areas of New Zealand (PANZ). The classification divides New Zealand into six categories of 'threatened environments'. Land environments are assigned one of six threat categories on the basis of past habitat loss (percentage indigenous cover remaining) and current legal protection (Walker *et al.* 2007).

Most of Manaia ED is not classified as a threatened land environment (Figure 3). This is because a large proportion of the natural areas are under some form of protection (Table 4). Natural areas within Manaia ED contain 14 land environments (A5.1a, A5.1c, A6.1a, A6.1b, A6.1c, A6.1d, A7.1a, A7.2a, D1.1a, D1.1b, D1.1c, D1.1d, D1.2b, and G1.1a). Approximately 1,558.6 ha (*c*.54.8%) of the land covered by natural areas falls into the 'No Threat Category' category, 15.2 ha (<0.01%) falls into the 'Acutely Threatened' category, 34.3 ha (*c*.0.01%) into the 'Chronically Threatened' category, 149.3 (*c*.5%) ha into the 'Critically Underprotected' category, 478.2 ha (*c*.17%) into the 'Underprotected' category, and 466.1 ha (*c*.14.5%) into the 'At Risk' category. Less than 0.01% of the land in survey sites was unclassified.

TABLE 4. PROTECTED NATURAL AREAS NETWORK IN MANAIA ECOLOGICAL DISTRICT (AREA IN HA)

Key: CP=Conservation Park; MS = Marginal Strip; NR=Nature Reserve; QEII=Queen Elizabeth II Open Space Covenant; RR= Recreation Reserve; SB=Seabed; SCER = Scenic Reserve; CC = Conservation Covenant (WDC); RC = Restrictive Covenant; FA = Fencing Act Covenant; WDC = Whangarei District Council Reserve

SITE	SURVEY NO	STATUS										SUB-TOTAL AREA PROTECTED (EXCLUDING RR)	RR	TOTAL AREA PROTECTED (INCLUDING RR)	TOTAL SITE AREA	PERCENTAGE SITE PROTECTED
		CP	MS	QEII	SB	FA	RC	CC	SCER	NR	WDC					
Tahunatapu Road Coastal Forest	Q07/066			2.3							0.3	2.6		2.6	124.9	2.0%
Munro Bay Coastal Bush	Q07/067							0.03	0.47		0.8	1.3		1.3	100.2	1.2%
MacDonald Coastal Shrubland	Q07/068										0.3	0.3		0.3	67.3	<1%
Manaia Ridge Scenic Reserve and Surrounds	Q07/069			6.9				3.7	330.7		19.1	360.4		360.4	594.4	60.6%
Mt Aubrey Coastal Forest and Shrubland	Q07/070				0.06	0.2		2.4			44.2	46.9		46.9	86.4	54.1%
Motukaroro Island	Q07/071								1.2			1.2		1.2	1.2	100%
Taurikura Ridge Bush	Q07/073			7.4							0.1	7.5		7.5	212.3	3.5%
Bream Head Scenic Reserve and Surrounds	Q07/074	4.8			22.2				518.4		9.7	551.1		555.1	686.5	80.9%
Ocean Beach Recreation Reserve and Surrounds	Q07/075		0.6	12.7							4.4	17.7	213.3	231.0	270.0	85.6%
Kerr Road Swamp	Q07/076							0.5				0.5		0.5	3.3	15%
Timperly Road Bush	Q07/077			13.2								13.2		13.2	38.4	34.4%
Kauri Mountain Conservation Area and Surrounds	Q07/078	91.3		1.6			1.8	68.7			6.0	169.4		169.4	492.6	34.4%
Bream Islands Scenic Reserve: Moturaka Island and Tarakanahi Island	Q07/079								1.1			1.1		1.1	2.4	45.9%
Bream Islands Nature Reserve: Mauitaha Island and Guano Island	Q07/080									3.9		3.9		3.9	6.0	65%
Kauri Mountain Wetland	Q07/081	0.1										0.1		0.1	4.7	2.1%
Whangarei Heads Rd Wetland	Q07/083										0.8	0.8		0.8	22.1	3.6%
Kiteone Road Saltmarsh	Q07/168										3.2	3.2		3.2	3.8	84.2%
Kirikiri Point Coastal Forest	Q07/169										1.2	1.2		1.2	3.0	40%
Frenchman Island	Q07/171								0.24			0.24		0.24	0.24	100%
Peach Cove Stack A	Q07/173								2.1			2.1		2.1	2.1	100%
Peach Cove Stack B	Q07/174								0.1			0.1		0.1	0.1	100%
TOTAL		**96.2**	**0.6**	**48.1**	**22.3**	**0.2**	**1.8**	**75.3**	**854.3**	**3.9**	**90.1**	**1150.5**	**213.3**	**1402.1**	**2,721.9**	

TABLE 5: AREA (HA) OF LENZ LEVEL IV ENVIRONMENTS WITHIN MANAIA ED PNA SITES AND THEIR RESPECTIVE THREAT CATEGORIES.

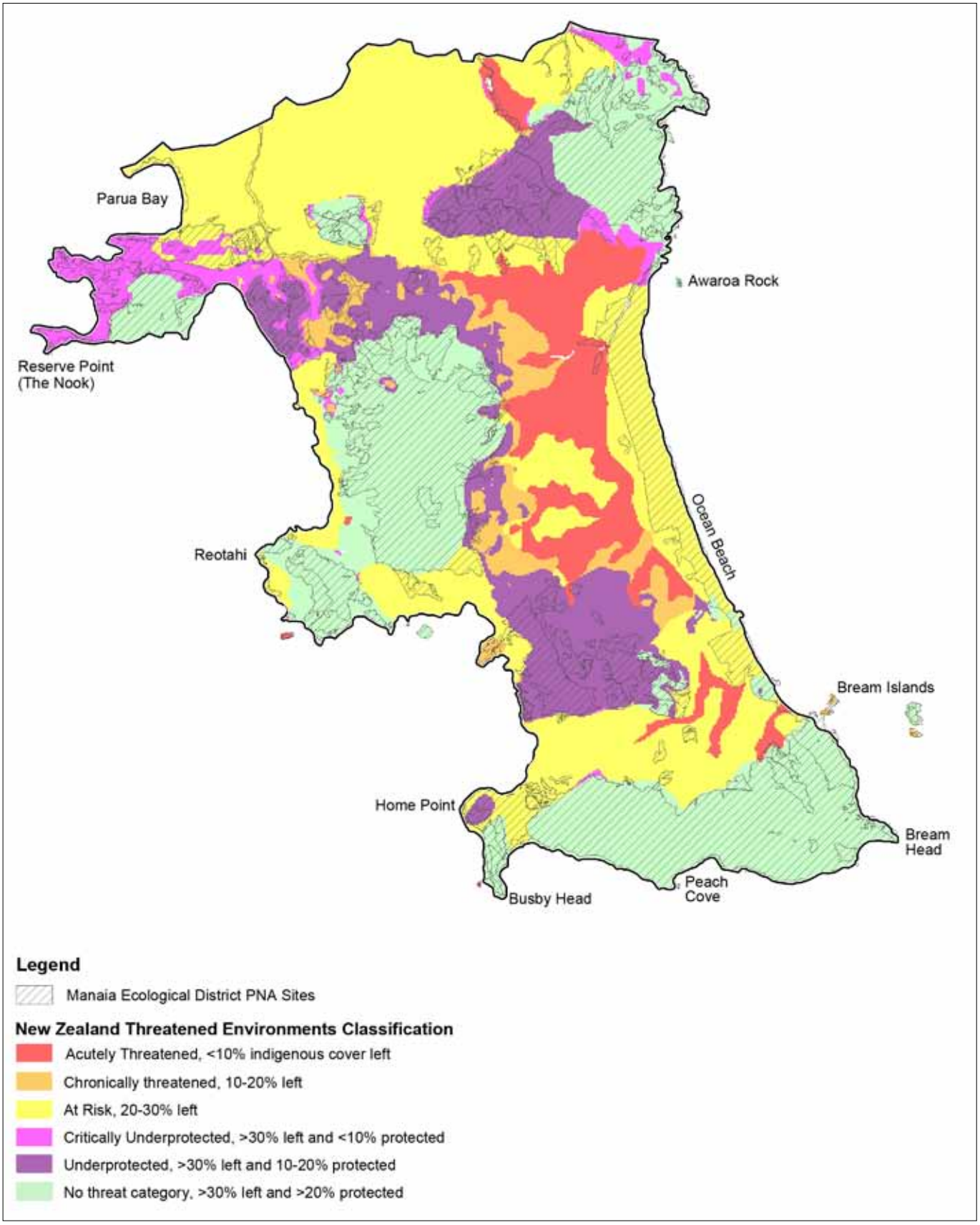
SITE NAME AND NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
Tahunatapu Road Coastal Forest	>30% left, <10% protected	Critically Underprotected	A6.1a	56.6
			A6.1c	20.9
Q07/066		*Subtotal*		77.5
	20-30% left	At Risk	A6.1b	43.4
		Subtotal		43.4
	>30% left,and >10-20% protected	Underprotected	D1.2b	0.2
		Subtotal		0.2
Total LENZ				**121.1**
Munro Bay Coastal Bush	>30% left, <10% protected	Critically Underprotected	A6.1a	20.3
Q07/067		*Subtotal*		20.3
	10-20% left	Chronically Threatened	A6.1d	0.1
		Subtotal		0.1
	>30% left, >20% protected	No Threat Category	D1.1b	77.8
		Subtotal		77.8
Total LENZ				**98.2**
McDonald Coastal Shrubland	20-30% left	At Risk	A6.1b	0.5
Q07/068			A6.1d	3.7
		Subtotal		4.2
	>30% left and <10% protected	Critically Underprotected	A6.1c	14.6
		Subtotal		14.6
	10-20% left	Underprotected	D1.2b	48.3
		Subtotal		48.3
Total LENZ				**67.1**
Manaia Ridge Scenic Reserve and Surrounds	<10% left	Acutely Threatened	A5.1a	0.2
			A5.1c	0.1
Q07/069		*Subtotal*		0.3
	>30% left and <10%	Critically Underprotected	A6.1a	2.4
	protected	*Subtotal*		2.4
	20-30% left	At Risk	A6.1b	25.8
		Subtotal		25.8
	10-20% left	Chronically Threatened	A6.1d	10.9
			A7.1a	1.2
		Subtotal		12.1
	>30% left and 10-20% protected	Underprotected	D1.2b	51.3
		Subtotal		51.3
	>30% left, >20% protected	No Threat Category	D1.1a	316.5
			D1.1b	171.3
			D1.1c	6.6
			D1.1d	7.0
		Subtotal		501.4
Total LENZ				**593.3**
Mt Aubrey Coastal Forest and Shrubland	>30% left and <10% protected	Critically Underprotected	A6.1a	0.1
		Subtotal		0.1
Q07/070	20-30% left	At Risk	A6.1b	1.5
		Subtotal		1.5
	>30% left, >20% protected	No Threat Category	D1.1b	82.5
		Subtotal		82.5
Total LENZ				**84.1**
Motukaroro Island	<10% left	Acutely Threatened	A7.2a	1.0
Q07/071		*Subtotal*		1.0
Total LENZ				**1.0**

SITE NAME AND NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
High Island	>30% left, >20% protected	No Threat Category	D1.1b	2.6
Q07/072				
Total LENZ				**2.6**
Taurikura Ridge Bush	<10% left	Acutely Threatened	A5.1a	0.5
Q07/073		*Subtotal*		0.5
	20-30% left	At Risk	A6.1b	19.2
		Subtotal		19.2
	10-20% left	Chronically Threatened	A6.1d	5.5
		Subtotal		5.5
	>30% left and 10-20% protected	Underprotected	D1.2b	172.5
		Subtotal		172.5
	>30% left, >20% protected	No Threat Category	D1.1b	14.8
		Subtotal		14.8
Total LENZ				**212.5**
Bream Head Scenic Reserve and Surrounds	<10% left	Acutely Threatened	A5.1a	1.7
		Subtotal		1.7
Q07/074	20-30% left	At Risk	A6.1b	6.7
		Subtotal		6.7
	>30% left and <10% protected	Critically Underprotected	A6.1c	0.9
		Subtotal		0.9
	>30% left and 10-20% protected	Underprotected	D1.2b	4.7
		Subtotal		4.7
	>30% left, >20% protected	No Threat Category	D1.1a	480.0
			D1.1b	141.0
		Subtotal		621.0
Total LENZ				**635.0**
Ocean Beach Recreation Reserve and Surrounds	<10% left	Acutely Threatened	A5.1a	5.7
		Subtotal		5.7
Q07/075	>30% left and <10% protected	Critically Underprotected	A6.1a	15.6
		Subtotal		15.6
	20-30% left	At Risk	A6.1b	2.1
			G1.1a	234.2
		Subtotal		236.3
	>30% left and 10-20% protected	Underprotected	D1.2b	0.2
		Subtotal		0.2
	>30% left, >20% protected	No Threat Category	D1.1a	0.1
			D1.1b	2.8
		Subtotal		2.9
Total LENZ				**260.7**
Kerr Road Swamp	<10% left	Acutely Threatened	A5.1a	2.0
Q07/076		*Subtotal*		2.0
	20-30% left	At Risk	A6.1b	1.3
		Subtotal		1.3
Total LENZ				**3.3**
Timperly Road Bush	20-30% left	At Risk	A6.1b	7.3
Q07/077		*Subtotal*		7.3
	>30% left and <10% protected	Critically Underprotected	A6.1c	3.2
		Subtotal		3.2
	>30% left and 10-20% protected	Underprotected	D1.2b	0.2
		Subtotal		0.2
Total LENZ				**10.7**

SITE NAME AND NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
Kauri Mountain Conservation Area and Surrounds	<10% left	Acutely Threatened	A5.1a	0.6
			A5.1c	1.9
Q07/078		*Subtotal*		2.5
	>30% left, <10% protected	Critically Underprotected	A6.1a	7.1
			A6.1c	4.5
		Subtotal		11.6
	20-30% left	At Risk	A6.1b	46.3
		Subtotal		46.3
	10-20% left	Chronically Threatened	A6.1d	1.1
		Subtotal		1.1
	>30% left and 10-20% protected	Underprotected	D1.2b	191.7
		Subtotal		191.7
	>30% left, >20% protected	No Threat Category	D1.1a	5.8
			D1.1b	225
		Subtotal		230
Total LENZ				**492.6**
Bream Islands Scenic Reserve: Moturaka Island and	10-20% left	Chronically Threatened	A7.1a	1.4
		Subtotal		1.4
Tarakanahi Island	>30% left, >20% protected	No Threat Category	D1.1a	0.05
Q07/079		*Subtotal*		0.05
Total LENZ				**1.9**
Bream Islands Scenic Reserve: Mauitaha Island and	10-20% left	Chronically Threatened	A6.1d	0.9
		Subtotal		0.9
Guano Island	>30% left, >20% protected	No Threat Category	D1.1b	5.1
Q07/080		*Subtotal*		5.1
Total LENZ				**6.0**
Kauri Mountain Wetland	>10% left	Acutely Threatened	A5.1a	0.2
Q07/081			A5.1c	3.5
		Subtotal		3.7
	20-30% left	At Risk	A6.1b	0.2
		Subtotal		0.2
Total LENZ				**3.9**
High Island Stack A	20-30% left	At Risk	A6.1b	0.1
Q07/082		*Subtotal*		0.1
Total LENZ				**0.1**
Whangarei Heads Road Wetland	20-30% left	At Risk	A6.1b	9.9
		Subtotal		9.9
Q07/083	10-20% left	Chronically Threatened	A6.1d	9.5
		Subtotal		9.5
	>30% left and 10-20% protected	Underprotected	D1.2b	2.8
		Subtotal		2.8
Total LENZ				**22.1**
Kiteone Road Saltmarsh	20-30% left	At Risk	A4.1a	3.7
Q07/168		*Subtotal*		3.7
Total LENZ				**3.7**
Kirikiri Point Coastal Forest	20-30% left	At Risk	A6.1b	3.0
Q07/169		*Subtotal*		3.0
Total LENZ				**3.0**
Awaroa Island	<10% left	Acutely Threatened	A7.2a	0.1
Q07/170		*Subtotal*		0.1
	>30% left, >20% protected	No Threat Category	D1.1b	0.4
		Subtotal		0.4
Total LENZ				**0.5**

SITE NAME AND NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
Frenchman Island	<10% left	Acutely Threatened	A7.2a	0.1
Q07/171		*Subtotal*		0.1
	>30% left, >20% protected	No Threat Category	D1.1b	0.01
		Subtotal		0.01
Total LENZ				**0.11**
Harambee Road Swamp	>30% left and <10% protected	Critically Underprotected	A6.1a	1.2
Q07/172		*Subtotal*		1.2
	20-30% left	At Risk	A6.1b	7.2
		Subtotal		7.2
	<10% left	Acutely Threatened	A7.2a	0.2
		Subtotal		0.2
	>30% left, >20% protected	No Threat Category	D1.1b	0.9
		Subtotal		0.9
Total LENZ				**9.5**
Peach Cove Stack A	>30% left, >20% protected	No Threat Category	D1.1a	2.1
Q07/173				
Total LENZ				**2.1**
Peach Cove Stack B	>30% left, >20% protected	No Threat Category	D1.1a	0.1
Q07/174				
Total LENZ				**0.1**
Kauri Mountain Road Pond and Raupo Swamp	>30% left and <10% protected	Critically Underprotected	A6.1a	0.3
Q07/175				
Total LENZ				**0.3**
Kauri Mountain Road Seep	<10% left	Acutely Threatened	A5.1a	0.04
Q07/177		*Subtotal*		0.04
	>30% left and <10% protected	Critically Underprotected	A6.1a	0.47
		Subtotal		0.47
Total LENZ				**0.5**
GRAND LENZ TOTAL				**2701.7**

Figure 3: Threatened Land Environments of Manaia Ecological District



6.2 PRIORITY NATURAL AREAS FOR PROTECTION IN MANAIA 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.

The majority of biological diversity in Manaia ED is encompassed within protected areas. Some authors have suggested that all major representative ecosystems are included in protected areas (Conning 2001); however, the nature of this legal protection should be critically examined.

Priorities for protection in Manaia ED include:

1. Protection of habitats for nationally 'Threatened', 'At Risk' and regionally significant species

Manaia ED has a comparatively diverse range of species for its size, not all of which are adequately protected by the current protected natural areas network. At present, 'Threatened' species include six plants, ten birds, three land snail taxa, one spider, three lizards, and one fish. 'At Risk' species include 27 plants, 17 birds, three land snail taxa (including one endemic species), three lizards, and three other terrestrial invertebrates, There are also a further 83 regionally significant species, which are considered rare or threatened in Northland (72 plant, five bird, five reptile, and one fish species).

Large areas which are not protected or are underprotected, and contain threatened and regionally significant species, include Tahunatapu Road Coastal Forest (Q07/066), Munro Bay Coastal Bush (Q07/067), McDonald Coastal Shrubland (Q07/068), Taurikura Ridge Bush (Q07/073), and Kauri Mountain Conservation Area and Surrounds (Q07/078).

2. Protection of freshwater wetlands

While forested habitats are generally well-protected in Manaia ED, no freshwater wetlands are formally protected. These include sites Q07/068, Q07/076, Q07/081, Q07/083, Q07/172, and Q07/177. Wetlands in Manaia ED provide habitat for at least three regionally significant plant species, and at least five threatened and one regionally significant fauna species. Gumland is a particularly uncommon type of wetland throughout Northland, with only one example (Q07/068) recorded in Manaia ED.

3. Protection of uncommon terrestrial habitat types

Shrubland areas are becoming increasingly uncommon in Northland as they are vulnerable to clearance, weed invasion, and fire. While forested habitats are generally well-protected in Manaia ED, shrubland areas are currently underprotected. Sites which contain unprotected and/or underprotected areas of shrubland include Q07/066, Q07/073, and Q07/078.

4. Protection of all islands

Most of the coastal islands have been invaded by plant and animals pests. With the appropriate protection and management, these islands

could provide valuable habitat for threatened plants, birds, lizards, and invertebrates. Islands in Manaia ED that are currently underprotected include Q07/072 and Q07/082.

5. Protection of buffers and linkages to existing protected areas that are being intensively managed

'Islands' of shrubland linking Manaia Ridge Scenic Reserve and Surrounds (Q07/069) with Kauri Mountain Conservation Area and Surrounds (Q07/078).

Taurikura Ridge Bush (Q07/073), which provides a critical link between Manaia Ridge Scenic Reserve and Surrounds (Q07/069) and Bream Head Scenic Reserve and Surrounds (Q07/074).

Shrubland and forest which buffers the eastern boundary of DOC-administered land in Manaia Ridge Scenic Reserve and Surrounds (Q07/069).

TABLE 6. ECOLOGICAL UNITS RECORDED IN MANAIA ECOLOGICAL DISTRICT AND PROTECTION STATUS.

Key: CP=Conservation Park; MS = Marginal Strip; RR= Recreation Reserve; NR=Nature Reserve; QEII=QEII Open Space Covenant; CC=Conservation Covenant; SB=Seabed; SR=Scenic Reserve; pt=part of site is protected but unknown whether ecological unit falls within the protected area; part of=the site is made up of more than one landform/geology type; bold PNA numbers=representative ecological units; *=Level 2 sites

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
FRESHWATER WETLANDS														
Baumea articulata											**Q07/076 ptCC**	**Q07/168**		
Baumea articulata-Bolboschoenus fluviatilis-Mexican devil											Q07/076 ptCC			
Baumea articulata-kuta-raupo											**Q07/075 ptMS ptQEII ptRR (part of)**			
Baumea articulata -Mexican devil-harakeke											Q07/172			
Baumea rubiginosa-kapungawha-raupo											**Q07/172**			
Baumea sp.											Q07/076 ptCC Q07/083			
Baumea teretifolia														
Bolboschoenus fluviatilis	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOECENE DACITE DOME	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Bolboschoenus fluviatilis-swamp millet-raupo-Mexican devil											Q07/076 ptCC			
Crack willow treeland											Q07/083			
Cyperus ustulatus														
Cyperus ustulatus-exotic grass spp.											Q07/076 ptCC			
Gorse											Q07/083			
Harakeke											**Q07/083**			
Harakeke-*Baumea articulata*-raupo											**Q07/081** **ptCP**			
Harakeke-manuka-*Baumea articulata*											**Q07/076** **ptCC**			
Kahikatea-*Bolboschoenus fluviatilis*											**Q07/076** **ptCC**			
Kapungawha											Q07/177*			
Lemna minor-raupo											**Q07/081** **ptCP**			
Manuka											**Q07/083**			
Manuka-exotic grass-soft rush-*Baumea* sp.		Q07/066 ptSR (part of)							Q07/066 ptSR (part of)					
Manuka-ti kouka											**Q07/177***			
Mexican devil-raupo-*Bolboschoenus fluviatilis*											Q07/076 ptCC			
Open water											Q07/081 ptCP Q07/175*			

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Raupo											**Q07/076 ptCC** Q07/081 ptCP Q07/083Q07 /175*			
SALTMARSH														
Austrostipa stipoides												**Q07/168**		
Makaokao-remuremu												**Q07/168**		
Mangrove												**Q07/168**		
Oioi												**Q07/168**		
Sea rush											**Q07/075 ptMS ptQEII ptRR (part of)**	**Q07/168**		
Sea rush-mangrove rushland												**Q07/168**		
SANDFIELDS/COASTAL ASSOCIATIONS														
Buffalo grass-pohuehue-spinifex										Q07/075 ptMS ptQEII ptRR (part of)			Q07/075 ptMS ptQEII ptRR part of)	
Buffalo grass-spinifex										Q07/075 ptMS ptQEII ptRR (part of)			Q07/075 ptMS ptQEII ptRR (part of)	

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Gorse-kikuyu-pohuehue									Q07/075 ptMS ptQEII ptRR (part of)				Q07/075 ptMS ptQEII ptRR (part of)	
Gorse-smilax			Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)										
Harakeke-*Astelia banksii*	**Q07/075 ptMS ptQEII ptRR (part of)**					**Q07/075 ptMS ptQEII ptRR (part of)**			**Q07/075 ptMS ptQEII ptRR (part of)**					
Harakeke-gorse			Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)										
Harakeke-houpara			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Harakeke-pohuehue									**Q07/075 ptMS ptQEII ptRR (part of)**				**Q07/075 ptMS ptQEII ptRR**	
Harakeke-taupata						**Q07/080 ptNR**								
Harakeke-toetoe							**Q07/079 ptSR (part of)**		**Q07/079 ptSR (part of)**					
Kikuyu			Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)										
Kikuyu-harestail			Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)										

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOECENE DACITE DOME	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Kikuyu-taupata						Q07/079 ptSR (part of)			Q07/079 ptSR (part of)					
Makaokao-remuremu-Mercury Bay weed	**Q07/075 ptMS ptQEII ptRR (part of)**					**Q07/075 ptMS ptQEII ptRR (part of)**			**Q07/075 ptMS ptQEII ptRR (part of)**					
Oioi														
Pampas-pohuehue									Q07/075 ptMS ptQEII ptRR (part of)				Q07/075 ptMS ptQEII ptRR (part of)	
Pohuehue-kikuyu-gorse									Q07/075 ptMS ptQEII ptRR (part of)				Q07/075 ptMS ptQEII ptRR (part of)	
Saltwater paspalum									Q07/075 ptMS ptQEII ptRR (part of)				Q07/075 ptMS ptQEII ptRR (part of)	
Spinifex									**Q07/075 ptMS ptQEII ptRR (part of)**				**Q07/075 ptMS ptQEII ptRR (part of)**	
ROCKLAND														
Bare rock			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										Q07/170

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Exotic grass					Q07/071									
Native iceplant-glasswort			**Q07/171**											
Makaokao-remuremu-glasswort- native iceplant							**Q07/079 ptSR (part of)**		**Q07/079 ptSR (part of)**					
Mercury Bay weed-makaokao-NZ celery						**Q07/080 ptNR**								
Mixed fern				**Q07/070 ptSB pt SR ptCC (part of)**			**Q07/070 ptSB pt SR ptCC(part of)**		**Q07/070 ptSB pt SR ptCC(part of)**					
Pohutukawa					Q07/082									
Pohutukawa-karo-taupata							**Q07/173**							
Taupata						**Q07/080 ptNR**		Q07/174						
Taupata-native iceplant														**Q07/170**
Tetragonia implexicoma-glasswort					Q07/082									
COASTAL SHRUBLANDS														
Gorse			Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)										
Gorse-pampas				Q07/069 ptQEII ptSR										

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	LOWER MIOECENE DACITE DOME	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Gorse-woolly nightshade	Q07/066 ptSR (part of)								Q07/066 ptSR (part of)					
Kanuka/manuka	Q07/066 ptSR (part of)	Q07/067 ptSR (part of)	**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**					Q07/066 ptSR (part of)					
				Q07/069 ptQEII ptSR					Q07/067 ptSR (part of)					
			Q07/077											
	Q07/078 ptCP (part of)	Q07/068			Q07/078 ptCP (part of)				Q07/078 ptCP (part of)					
				Q07/070 ptSB pt SR ptCC(part of)			Q07/070 ptSB pt SR ptCC(part of)		Q07/070 ptSB pt SR ptCC(part of)					
			Q07/073 ptQEII (part of)						Q07/073 ptQEII (part of)					
Kanuka/manuka-bracken					**Q07/073 ptQEII (part of)**				**Q07/073 ptQEII (part of)**					
Kanuka/manuka-*Hebe* sp.			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kanuka/manuka-mamangi			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kanuka/manuka-mamangi-mapou	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Kanuka/manuka-mapou	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kanuka/manuka-woolly nightshade	Q07/066 ptSR (part of)								Q07/066 ptSR (part of)					
Kanuka/manuka-tanekaha	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kanuka/manuka-totara	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kunzea ericoides var. *linearis*													**Q07/075 ptMS ptQEII ptRR (part of)**	
Manuka			**Q07/068**	**Q07/069 ptQEII ptSR**										
			Q07/074 ptSB ptSR (part of)	**Q07/074 ptSB ptSR (part of)**										
Manuka-pampas				Q07/069 ptQEII ptSR										
Ti kouka			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
INLAND SHRUBLANDS														
Exotic grass-gorse			Q07/077											
Gorse			Q07/077											

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	LOWER MIOECENE DACITE DOME	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Gorse-kanuka/ manuka	Q07/078 ptCP (part of)				Q07/078 ptCP (part of)				Q07/078 ptCP (part of)					
Pampas-gorse		Q07/077												
Houpara-karaka		**Q07/074 ptSB ptSR (part of)**		**Q07/074 ptSB ptSR (part of)**										
Kahikatea	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kahikatea-kanuka/ manuka-taraire	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kahikatea-puriri	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kanuka		Q07/067 ptSR (part of)	Q07/068	**Q07/069 ptQEII ptSR**					Q07/067 ptSR (part of)					
Kanuka/manuka	Q07/066 ptSR (part of)		**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**		Q07/072			Q07/066 ptSR (part of)					
			Q07/073 ptQEII (part of	**Q07/069 ptQEII ptSR**					Q07/073 ptQEII (part of)					
	Q07/078 ptCP (part of)				Q07/078 ptCP (part of)				Q07/078 ptCP (part of)					
Kanuka/manuka-kahikatea				**Q07/069 ptQEII ptSR**										

	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT	HOLOCENE DUNEFIELD	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	LOWER MIOCENE ANDESITIC BRECCIA	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOECENE DACITE DOME	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	MESOZOIC CHERT AND GREYWACKE
Kanuka/manuka-kauri											**Q07/069 ptQEII ptSR**			
Kanuka/manuka-kauri-totara											**Q07/069 ptQEII ptSR**			
Kanuka/manuka-kowhai						**Q07/073 ptQEII (part of)**					**Q07/069 ptQEII ptSR**	**Q07/073 ptQEII (part of)**		
											Q07/074 ptSB ptSR (part of)	**Q07/074 ptSB ptSR (part of)**		
Kanuka/manuka-kowhai-puriri											**Q07/069 ptQEII ptSR**			
Kanuka/manuka-mamangi												**Q07/073 ptQEII (part of)**		
Kanuka/manuka-pohutukawa	Q07/066 ptSR (part of)										**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**	Q07/066 ptSR (part of)	
								Q07/070 ptSB pt SR ptCC(part of)			Q07/070 ptSB pt SR ptCC(part of)	Q07/070 ptSB pt SR ptCC(part of)		
Kanuka/manuka-puriri	Q07/066 ptSR (part of)										**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**	Q07/066 ptSR (part of)	
						Q07/073 ptQEII (part of)					**Q07/069 ptQEII ptSR**		Q07/073 ptQEII (part of)	
								Q07/070 ptSB pt SR ptCC(part of)			Q07/070 ptSB pt SR ptCC(part of)	Q07/070 ptSB pt SR ptCC(part of)		

	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT	HOLOCENE DUNEFIELD	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	LOWER MIOCENE ANDESITIC BRECCIA	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOECENE DACITE DOME	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	MESOZOIC CHERT AND GREYWACKE
Kanuka/manuka-puriri-totara											**Q07/069 ptQEII ptSR**			
Kanuka/manuka-rewarewa											**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**		
Kanuka/manuka-rewarewa-totara											**Q07/069 ptQEII ptSR**			
Kanuka/manuka-tanekaha	Q07/078 ptCP (part of)					Q07/078 ptCP (part of)					**Q07/069 ptQEII ptSR**			
Kanuka/manuka-taraire											**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**		
Kanuka/manuka-totara	Q07/078 ptCP (part of) Q07/066 ptSR (part of)					Q07/078 ptCP (part of)					**Q07/069 ptQEII ptSR**			
Kanuka-pohutukawa	**Q07/067 ptSR (part of)**													**Q07/067 ptSR (part of)**
Kanuka-tanehaka											**Q07/068**			
Karaka-kohekohe-puriri											**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**		
Karaka-kowhai											**Q07/073 ptQEII (part of)**			**Q07/073 ptQEII (part of)**
Karaka-nikau-pohutukawa											**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**		

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Karaka-puriri-nikau			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kauri	**Q07/078 ptCP (part of)**		**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)** **Q07/069 ptQEII ptSR**	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kauri-tanehaka	Q07/066 ptSR (part of) **Q07/078 ptCP (part of)**			**Q07/069 ptQEII ptSR**	**Q07/078 ptCP (part of)**				Q07/066 ptSR (part of) **Q07/078 ptCP (part of)**					
Kauri-totara				**Q07/069 ptQEII ptSR**										
Kohekohe-kowhai			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kohekohe-taraire			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kowhai			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kowhai-pohutukawa			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										
Kowhai-puriri			**Q07/074 ptSB ptSR (part of)**	**Q07/074 ptSB ptSR (part of)**										

	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT	HOLOCENE DUNEFIELD	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	LOWER MIOCENE ANDESITIC BRECCIA	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOECENE DACITE DOME	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	MESOZOIC CHERT AND GREYWACKE
Kowhai-puriri-taraire						Q07/073 ptQEII (part of)					Q07/074 ptSB ptSR (part of)	Q07/074 ptSB ptSR (part of)		
Kowhai-rewarewa						Q07/073 ptQEII (part of)						Q07/073 ptQEII (part of)		
Mamaku											Q07/069 ptQEII ptSR			
Mamaku-kauri											Q07/069 ptQEII ptSR			
Mamaku-nikau											Q07/069 ptQEII ptSR			
Mamaku-pohutukawa-totara											Q07/069 ptQEII ptSR			
Mamaku-rewarewa											Q07/069 ptQEII ptSR			
Mamaku-tanekaha	Q07/078 ptCP (part of)									Q07/078 ptCP (part of)			Q07/078 ptCP (part of)	
Nikau-puriri											Q07/069 ptQEII ptSR			

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Nikau-puriri-taraire			**Q07/073 ptQEII (part of)**						**Q07/073 ptQEII (part of)**					
			Q07/074 ptSB pt SR (part of)	**Q07/074 ptSB pt SR (part of)**										
Pohutukawa	**Q07/075 ptMS ptQEII ptRR (part of)**		Q07/171	**Q07/069 ptQEII ptSR**	**Q07/071**	**Q07/075 ptMS ptQEII ptRR (part of)**			**Q07/075 ptMS ptQEII ptRR (part of)**	Q07/169*				
		Q07/067 ptSR (part of)							**Q07/067 ptSR (part of)**					
				Q07/070 ptSB pt SR ptCC(part of)			**Q07/070 ptSB pt SR ptCC (part of)**		**Q07/070 ptSB pt SR ptCC(part of)**					
			Q07/073 ptQEII (part of)						Q07/073 ptQEII (part of)					
			Q07/074 ptSB pt SR (part of)	**Q07/074 ptSB pt SR (part of)**										
	Q07/078 ptCP (part of)				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Pohutukawa-houpara			**Q07/074 ptSB pt SR (part of)**	**Q07/074 ptSB pt SR (part of)**										

	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT	HOLOCENE DUNEFIELD	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	LOWER MIOCENE ANDESITIC BRECCIA	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOECENE DACITE DOME	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	MESOZOIC CHERT AND GREYWACKE
Pohutukawa-puriri											Q07/074 ptSB pt SR (part of)	Q07/074 ptSB pt SR (part of)		
Pohutukawa-taraire						Q07/073 ptQEII (part of)					Q07/074 ptSB pt SR (part of)	Q07/073 ptQEII (part of)		
Pohutukawa-totara											Q07/069 ptQEII ptSR			
Pohutukawa-puriri-tawa											Q07/069 ptQEII ptSR			
Puriri						Q07/073 ptQEII (part of)					Q07/069 ptQEII ptSR	Q07/073 ptQEII (part of)		
											Q07/074 ptSB pt SR (part of)			
Puriri-kanuka												Q07/068		
Puriri-kanuka/ manuka						Q07/073 ptQEII (part of)							Q07/073 ptQEII (part of)	
Puriri-taraire						Q07/074 ptSB pt SR (part of)					Q07/074 ptSB pt SR (part of)			

	MESOZOIC CHERT AND GREYWACKE	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOCENE ANDESITIC DIKES	LOWER MIOCENE DACITE DOME	LOWER MIOCENE ANDESITIC STRATOVOLCANO	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE ANDESITIC BRECCIA	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	CRETACEOUS TO PALEOCENE MUDSTONE	HOLOCENE ALLUVIAL SWAMP DEPOSITS	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE DUNEFIELD	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT
Puriri-totara	**Q07/066 ptSR (part of)**								**Q07/066 ptSR (part of)**					
Rewarewa				**Q07/069 ptQEII ptSR**										
Taraire			**Q07/074 ptSB pt SR (part of)**	**Q07/074 ptSB pt SR (part of)**										
Taraire-puriri			**Q07/073 ptQEII (part of)**						**Q07/073 ptQEII (part of)**					
Taraire-tawapou			**Q07/074 ptSB pt SR (part of)**	**Q07/074 ptSB pt SR (part of)**										
INLAND FOREST														
Kahikatea-kanuka/ manuka-kauri	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kahikatea-totara			**Q07/077**											
Kanuka/manuka-kauri	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**					
Kanuka/manuka-kauri-tanekaha	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**									
Kanuka/manuka-kohuhu	**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of**									

	SEA STACK AND INTERTIDAL REEF WITH MESOZOIC CHERT	HOLOCENE DUNEFIELD	HOLOCENE ESTUARINE DEPOSITS	HOLOCENE ALLUVIAL SWAMP DEPOSITS	CRETACEOUS TO PALEOCENE MUDSTONE	MELANGE OF CRETACEOUS TO OLIGOCENE SEDIMENTARY UNITS	LOWER MIOCENE ANDESITIC BRECCIA	LOWER MIOCENE MASSIVE, FRACTURED / BLOCKY ANDESITE	LOWER MIOCENE SUBVOLCANIC INTRUSION	LOWER MIOCENE ANDESITE INTRUSION/ DIKE	LOWER MIOECENE ANDESITIC STRATOVOLCANO	LOWER MIOECENE DACITE DOME	MESOZOIC GREYWACKE, EOCENE CONGLOMERATE, LIMESTONE AND SANDSTONE, AND LOWER MIOECENE ANDESITIC DIKES	MESOZOIC CHERT AND GREYWACKE
Kanuka/manuka-puriri-totara										**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**
Kanuka/manuka-rimu										**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**
Kanuka/manuka-tanekaha-totara												**Q07/077**		
Kanuka/manuka-towai										**Q07/078 ptCP (part of)**				**Q07/078 ptCP (part of)**
Manaku treefernland												**Q07/077**		
Mamaku-totara treefernland												**Q07/077**		
Mamaku-towai												**Q07/077**		
Puriri-taraire forest												Q07/077		**Q07/078 ptCP (part of)**
Puriri-taraire-totara												**Q07/077**		
Totara-mahoe-kanuka												**Q07/077**		

TABLE 7. SUMMARY OF SITE EVALUATIONS

Key: reg. significant = regionally significant; e.u.= ecological unit

LEVEL 1 SITES	SURVEY NUMBER	REPRESENT-ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE	SIZE & SHAPE
Tahunatapu Road Coastal Forest	Q07/066	1 e.u.	Coastal forest on headland Fauna: 2 Threatened. 2 reg. significant.	10 e.u. Forest/shrubland.	Some weeds present.	Borders Q07/067 to the south.	124.9 ha, 1 large and 3 small parts.
Munro Bay Coastal Bush	Q07/067	2 e.u.	Coastal forest and shrubland on headland Flora: 1 reg. significant. Fauna: 4 Threatened, 2 At Risk, 2 reg. significant.	4 e.u. Forest/shrubland.		Borders Q07/066 to the north.	100.2 ha, 1 large and 2 small parts.
McDonald Coastal Shrubland	Q07/068	3 e.u.	Coastal shrubland on volcanic dome. Contains gumland. Flora: 3 reg. significant. Fauna: 1 Threatened, 1 At Risk.	4 e.u. Forest/shrubland.	Some weeds incl. contorta pine and *Hakea* spp.	Coastal link between Q07/067 and Q07/069.	67.3 ha, 1 compact area.
Manaia Ridge Scenic Reserve and Surrounds and Surrounds	Q07/069	30 e.u.	Coastal forest, treefernland and shrubland. Flora: 2 Threatened, 15 At Risk, 40 reg. significant. Fauna: 4 Threatened, 3 At Risk, 4 reg. significant.	30 e.u. Forest/shrubland.		Link between Q07/073 and indigenous areas in the north.	594.4 ha, 1 large area and 6 small parts.
Mt Aubrey Coastal Forest and Shrubland	Q07/070	2 e.u.	Coastal forest and shrubland. Flora: 1 Threatened, 4 At Risk, 4 reg. significant. Fauna: 4 Threatened, 4 At Risk, 1 re. significant.	5 e.u. Forest/shrubland.		Near Q07/069 to the east.	86.4 ha, 1 large compact area and 10 peripheral parts.
Motukaroro Island	Q07/071	1 e.u.	Island covered with coastal forest. Flora: 1 reg. significant. Fauna: 3 Threatened, 1 At Risk.	2 e.u. Forest.	Weeds present.	Near Q07/070 to the north-east.	1.2 ha, 1 compact area.
High Island	Q07/072		Island covered with coastal forest. Fauna: 3 Threatened, 1 At Risk.	1 e.u. Forest.	Weeds present in disturbed areas.		2.6 ha, 1 compact area.
Taurikura Ridge Bush	Q07/073	11 e.u.	Coastal forest and shrubland Flora: 3 At Risk, 5 reg. significant. Fauna: 4 Threatened, 1 At Risk, 4 reg. significant.	15 e.u. Forest/shrubland.	Weeds present.	Important link between Q07/069 and Q07/074.	212.3 ha, 1 large convoluted area and *c.*14 small parts.

LEVEL 1 SITES	SURVEY NUMBER	REPRESENT-ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE	SIZE & SHAPE
Bream Head Scenic Reserve and Surrounds	Q07/074	34 e.u.	Best example of coastal forest and shrubland in Manaia ED. Flora: 2 Threatened, 11 At Risk. 30 reg. significant. Fauna: 15 Tthreatened, 11 At Risk, 8 reg. significant.	38 e.u. Forest/shrubland/ rockland/duneland/ grassland.	Some weeds.	Coastal buffer. Important link with offshore islands (Hen and Chicken Islands).	686.5 ha, 1 large compact area, 1 smaller elongated part, and *c.*14 peripheral parts.
Ocean Beach Recreation Reserve and Surrounds	Q07/075	7 e.u.	Contains the only dunelands in Manaia ED. Flora: 5 At Risk, 4 reg. significant. Fauna: 6 Threatened, 8 At Risk, 2 reg. significant.	14 e.u. Grassland/tussockland/ forest/shrubland.	5 weed e.u., predominantly exotic grasses.	Coastal buffer.	270 ha, 1 large elongated area and 4 small parts.
Kerr Road Swamp	Q07/076	3 e.u.	Freshwater wetland. Fauna: 1 At Risk.	9 e.u. Wetland.	Some weeds.	Adjoins Q07/078 to the north.	3.3 ha, 2 compact parts.
Timperly Road Bush	Q07/077	7. e.u.	Forest. Flora: 1 reg. significant. Fauna: 1 Threatened, 1 At Risk. 1 reg. significant.	12 e.u. Forest/treefernland/ shrubland.	2 weed e.u.	Links Q07/078 to natural areas to the west.	38.4 ha, 1 large compact area and 3 small parts.
Kauri Mountain Conservation Area and Surrounds	Q07/078	18 e.u.	Forest. Flora: 3 At Risk, 6 reg. significant. Fauna: 2 At Risk, 3 reg. significant.	25 e.u. Forest/treefernland/ shrubland.	Some weeds, incl. radiata pine.	Coastal-inland corridor.	492.6 ha, 1 large area and *c.*34 peripheral parts.
Bream Islands Scenic Reserve: Moturaka Island and Tarakanahi Island	Q07/079	2 e.u.	Two islands. Flora: 1 reg. significant. Fauna: 2 Threatened, 3 At Risk	3 e.u. Flaxland and grassland	One weed e.u.	Part of a small island network.	2.4 ha, 2 small compact parts.
Bream Islands Nature Reserve: Mauitaha Island and Guano Island	Q07/080	3 e.u.	Two islands, rat free. Flora: 2 threatened, 3 reg. significant. Fauna: 4 Threatened, 7 At Risk, 2 reg. significant.	3 e.u. Shrubland and flaxland.		Part of a small island network.	6.0 ha, 2 small compact parts.
Kauri Mountain Wetland	Q07/081	2 e.u.	Freshwater wetland. Fauna: 2 Threatened, 3 At Risk, 1 reg. significant.	4 e.u. Wetland.	Contains an artificial dam. Weeds present.	Contiguous with Q07/078.	4.7 ha, 1 narrow elongated area.
Whangarei Heads Road Wetland	Q07/083	2 e.u.	Mosaic of wetland habitat types.	6 e.u. Wetland.	Weeds common throughout.	Corridor linking Q07/069 to vegetation north of the ED.	22.1 ha, 1 narrow elongated part and 1 narrow area with convoluted edges.

LEVEL 1 SITES	SURVEY NUMBER	REPRESENT-ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE	SIZE & SHAPE
Kiteone Road Saltmarsh	Q07/168	6 e.u.	One of two saltmarsh areas in Manaia ED. Flora: 1 reg. significant. Fauna: 1 At Risk.	6 e.u. Forest/tussockland/ rushland/sedgeland.	Very good mangrove-saltmarsh-freshwater wetland sequence. Occasional weeds.	Coastal buffer. Contigous with coastal forest (Q07/078).	3.8 ha, 1 large and 1 small part.
Awaroa Island	Q07/170	1 e.u.	Bare rock island. Fauna: 2 Threatened, 1 At Risk.	2 e.u. Rockland.	Very little vegetation.		0.43 ha, 1 very small area.
Frenchman Island	Q07/171	1 e.u.	Island. Fauna: 2 Threatened, 1 At Risk.	2 e.u. Forest/rockland.	Very few weeds.		0.24 ha, 1 very small area.
Harambee Road Swamp	Q07/172	1 e.u.	Freshwater wetland. Fauna: 2 Threatened, 1 At Risk, 1 reg. significant.	2 e.u. Wetland.	Some weeds present.	Contiguous with Q07/078; connects to saltmarsh beyond northern boundary of ED.	9.4 ha, 1 area with 3 narrow convoluted arms.
Peach Cove Stack A	Q07/173	1 e.u.	Rock stack. Flora: 1 reg. significant.	1 e.u. Rockland.			2.1 ha, 1 small narrow area.
Peach Cove Stack B	Q07/174		Rock stack.	1 e.u. Rockland.			0.1 ha, 1 small narrow area.
Kauri Mountain Road Pond and Raupo Swamp	Q07/175		Freshwater wetland. Fauna: 1 Threatened, 1 At Risk.	2 e.u. Wetland.	Highly modified, grazed.		0.3 ha, 1 small compact area.
Subtotal Level 1 Sites							**2,698.4 ha**

LEVEL 2 SITES	SURVEY NUMBER	REPRESENT-ATIVENESS	RARITY/SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE	SIZE & SHAPE
Kirikiri Point Coastal Forest	Q07/169		Coastal forest.	1 e.u. Forest.	Very weedy.		3.0 ha, 1 narrow area.
High Island Stack A	Q07/082		Rock stack. Fauna: 1 threatened.	2 e.u. Rockland.	Weeds present.	Contiguous with mainland.	0.1 ha, 1 small area.
Kauri Mountain Road Seep	Q07/177	1 e.u.	Freshwater wetland. Flora: 1 reg. significant.	2 e.u. Wetland.	Fenced. Some weeds.	Relatively isolated.	0.5 ha, 1 small narrow area.
Subtotal Level 2 Sites							**3.6 ha**
Total area							**2702.1 ha**

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Appendix 1

FIELD SURVEY FORM

PROTECTED NATURAL AREAS PROGRAMME

TANGIHUA ECOLOGICAL DISTRICT

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:

Appendix 2

LETTER TO RATEPAYERS

Department of Conservation
Te Papa Atawhai

WHANGAREI DISTRICT COUNCIL

Dear Landowner

Department of Conservation officers are currently surveying and updating information on ecologically significant areas, eg bush, wetlands, gumland etc within the Whangarei District. This has involved mapping ecological areas from roadsides or (with the permission of landowners) from other viewpoints, and recording information on their type and condition.

You may well have already been contacted by departmental staff or are currently engaged in discussions with them on the subject. If this is not the case you may, at a later stage, be contacted by someone for permission to enter your land to gather more detailed information on the property's natural areas.

Why are we doing this survey? Northland's natural areas, especially bush pockets, make a significant contribution to the character and quality of the region. Many of these areas are habitat for some of our increasingly rare native wildlife and plants. The Department's existing database on natural areas is now out of date, and because of this may no longer be accurate. The information will be valuable as a reference point for assessing habitat changes over time.

You may be aware that the Whangarei District Council has decided to protect some native bush and wetlands under its new District Plan. The Council has written to all landowners affected about this. The results of the survey to be carried out by the Department of Conservation will be given to the Council and used to update and correct the Council's maps and information about the plants and wildlife present in particular locations.

Perhaps the principal value of this survey will be to provide you, the landowners; with information on the significance and makeup of ecological areas that you have had preserved on your property so you can better plan ways of managing these areas.

If you have any questions or concerns about the survey process, please contact your local Department of Conservation (attention Peter Anderson) at their Whangarei Office, telephone 09-438 0299, fax 09-438 9886.

If you wish to contact the Whangarei District Council about this aspect of the District Plan, please phone Neil Taylor at the Whangarei Office 09-438 4879.

Gerry Rowan
REGIONAL CONSERVATOR
Department of Conservation

LR Jacobson
GENERAL MANAGER
Whangarei District Council

Appendix 3

CATEGORIES OF THREAT

In this report the categories of threat are based on the New Zealand Threat Classification developed by Molloy *et al.* (2002). The classification system was reviewed in 2007, resulting in several new threat categories, and redefinition of some existing categories (see Townsend *et al.* 2008). This refined system is a uniquely New Zealand-based conservation status assessment tool, which has been used to assess the conservation status of vascular plants and birds only. In the coming three years, however, it will be applied to the bats, marine mammals, frogs, reptiles, freshwater and marine fish, freshwater, marine, and terrestrial invertebrates, bryophytes, macro-algae, and fungi which are indigenous to New Zealand (Hitchmough *et al.* 2007; Townsend *et al*. 2008). In the meantime, this report has used threat categories from Molloy *et al.* (2002) to cover rankings for everything other than plants and birds, and 'Threatened' and 'At Risk' categories from Townsend *et al.* 2008 for plants and birds.

Below is the structure diagram and Sections 3 and 7 from Molloy *et al*. (2002) to explain the categories under this system followed by the structure diagram and Sections 8, 9 and 10 from Townsend *et al.* (2008) to explain the refined classification system. Reproduced below are sections 3 and 7 of Molloy *et al.* (2002) which explain the classification system.

Classification structure - Molloy *et al*. (2002)

Below are Sections 3 and 7, taken from Molloy *et al*. (2002), to explain the new species classification system. The categories are shown in Figure 4.

Figure 4. 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. Examples include the red-kneed dotterel (*Erythrogonys cinctus*) and the blue moon butterfly (*Hypolimnas*

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 longfin 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, *Gunnera hamiltonii* and *Tecomanthe speciosa* where every wild individual is known, while at the other extreme there

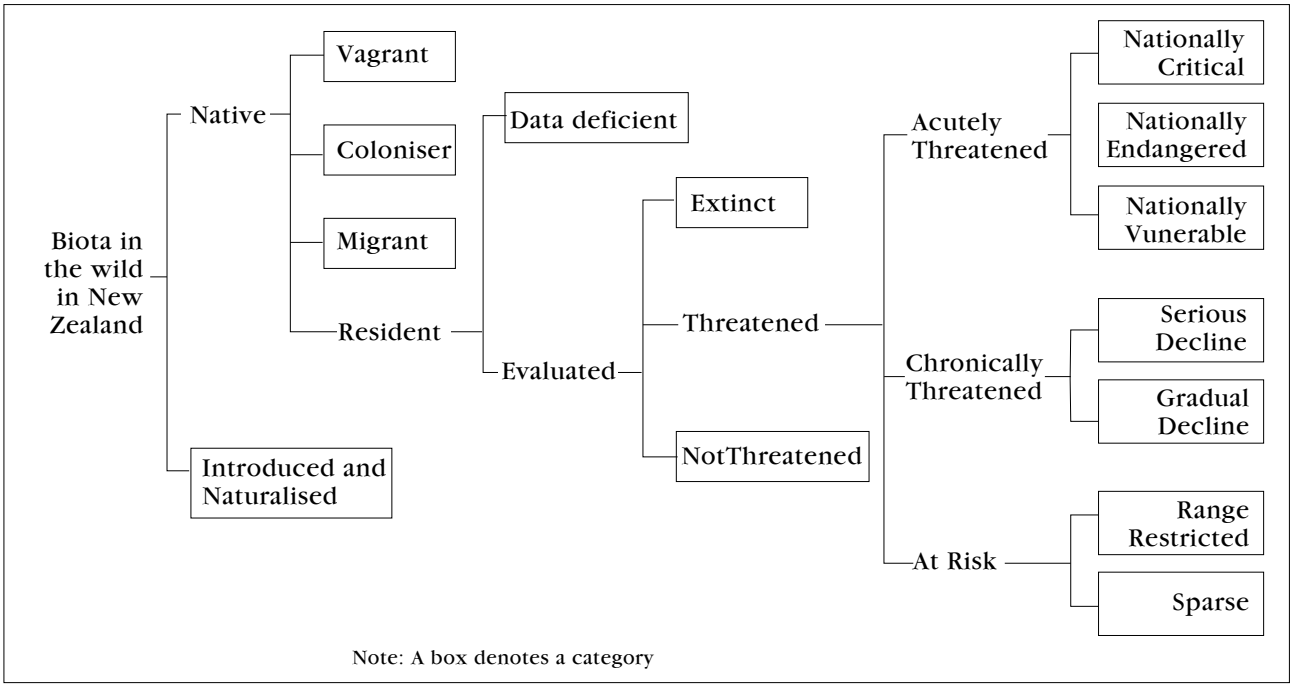

Figure 1. Structure of the New Zealand Threat Classification System

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 urveys 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 lUCN 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.

At Risk

Taxa that do not meet the criteria for Acutely Threatened or Chronically Threatened, but have either restricted ranges or small scattered subpopulations, 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.

Criteria for the Acutely Threatened and Chronically Threatened categories - Molloy *et al.*(2002)

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 > 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 > 30% in the total population or habitat area in the last 100 years.
2. There is a predicted decline of > 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 (0.1–1 km2).

Trend criteria

1. There has been a decline of > 60% in the total population or habitat area in the last 100 years.
2. There is a predicted decline of > 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 km^2).

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 km^2).

Trend criterion

1. There is a predicted decline of > 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 km^2).

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 fisted 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.

Threatened and At Risk categories - Townsend *et al.* (2008)

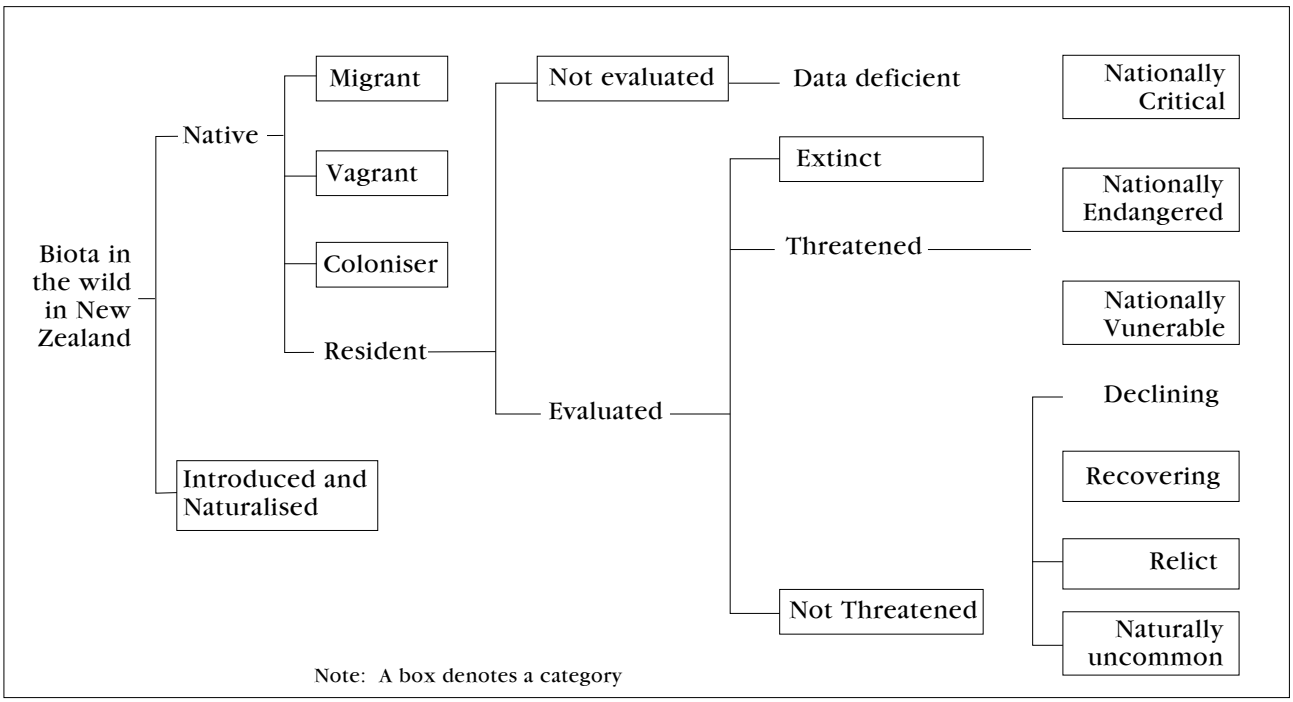

Figure 2. Structure of the New Zealand Threat Classification System

'Threatened' taxa are grouped into three categories: 'Nationally Critical', Nationally Endangered' and 'Nationally Vulnerable'.

Taxa with populations that are small (< 250 mature individuals) are considered highly susceptible to stochastic events and so are listed as 'Nationally Critical', regardless of whether their small population size is due to human-induced or natural causes

Nationally Critical

A. Very small population (natural or unnatural)

A taxon is 'Nationally Critical', regardless of population trend and regardless of whether the population size is natural or unnatural, when evidence indicates that:

1. There are fewer than 250 mature individuals; or
2. There are ≤ 2 sub-populations and ≤ 200 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1 ha (0.01 km^2).

B. Small population (natural or unnatural) with a high ongoing or predicted decline

A taxon is 'Nationally Critical' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The population comprises 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or

3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Population (irrespective of size or number of sub-populations) with a very high ongoing or predicted decline (> 70%)

A taxon is 'Nationally Critical' when the population has an ongoing trend or predicted decline of > 70% in the total population due to existing threats taken over the next 10 years or three generations, whichever is longer.

Nationally Endangered

A. Small population (natural or unnatural) that has a low to high ongoing or predicted decline

A taxon is 'Nationally Endangered' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Small stable population (unnatural)

To trigger this pathway to 'Nationally Endangered', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Endangered' when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is stable (± 10%) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population and high ongoing or predicted decline

A taxon is 'Nationally Endangered' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or

2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

Nationally Vulnerable

A. Small, increasing population (unnatural)

To trigger 'Nationally Vulnerable', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Vulnerable' when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250–1000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is increasing (> 10%) and is predicted to continue to increase over the next 10 years or three generations, whichever is longer.

B. Moderate, stable population (unnatural)

To trigger 'Nationally Vulnerable', taxa must have current population sizes that result from unnatural causes. Such taxa are defined as 'Nationally Vulnerable' when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest

sub-population; or

3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

The population is stable (± 10%) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population, with population trend that is declining

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1000–5000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

D. Moderate to large population and moderate to high ongoing or predicted decline

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion and the Trend criteria as follows:

Status

1. The total population size is 5000–20 000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 1000 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1000 ha (10 km^2).

Trend

There is an ongoing or predicted decline of 30–70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

E. Large population and high ongoing or predicted decline

A taxon is 'Nationally Vulnerable' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 20 000–100 000 mature individuals; or
2. The total area of occupancy is ≤ 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 50–70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

Criteria for 'At Risk' taxa - Townsend *et al.* (2008)

Taxa that qualify as 'At Risk' do not meet the criteria for any of the 'Threatened' categories. However, they are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations.

Four 'At Risk' categories exist: 'Declining', 'Recovering', 'Relict' and 'Naturally Uncommon'. Definitions for each are provided below.

Declining

'Declining' taxa do not qualify as 'Threatened' because they are buffered by a large total population size and/or a slower decline rate. However, if the declining trends continue, these taxa may be listed as 'Threatened' in the future.

A. Moderate to large population and low ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 5000–20 000 mature individuals; or
2. The total area of occupancy is ≤ 1000 ha (10 km^2).

Trend

There is an ongoing or predicted decline of 10–30% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Large population and low to moderate ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 20 000–100 000 mature individuals; or
2. The total area of occupancy is ≤ 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 10–50% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Very large population and low to high ongoing or predicted decline

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is > 100 000 mature individuals; or
2. The total area of occupancy is > 10 000 ha (100 km^2).

Trend

There is an ongoing or predicted decline of 10–70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

Recovering

Taxa that have undergone a documented decline within the last 1000 years and now have an ongoing or predicted increase of > 10% in the total population or area of occupancy, taken over the next 10 years or three generations, whichever is longer. Note that such taxa that are increasing but have a population size of < 1000 mature individuals (or total area of occupancy of < 10 ha) are listed in one of the 'Threatened' categories, depending on their population size.

A. Moderate population

A taxon is eligible for listing as 'Recovering (A)' if its total population size is between 1000 and 5000 mature individuals or its area of occupancy is ≤ 100 ha (1 km^2).

B. Moderate to large population

A taxon is eligible for listing as 'Recovering (B)' if its total population size is between 5000 and 20 000 mature individuals or its area of occupancy is ≤ 1000 ha (10 km^2).

Relict

Taxa that have undergone a documented decline within the last 1000 years, and now occupy less than 10% of their former range and meet one of the following criteria:

A. Have 5000–20 000 mature individuals and are stable (± 10%)

B. Have more than 20 000 mature individuals and are stable or increasing at > 10%

The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. 'Relict' can also include taxa that exist as reintroduced and self- sustaining populations within or outside their former known range.

Naturally Uncommon

Taxa whose distribution is naturally confined to specific substrates (e.g. ultramafic rock), habitats (e.g. high alpine fellfield, hydrothermal vents), or geographic areas (e.g. subantarctic islands, sea-mounts), or taxa that occur within naturally small and widely scattered populations. This distribution is not the result of past or recent human disturbance. Populations may be stable or increasing. Note that a naturally uncommon taxon that has fewer than 250 mature individuals qualifies for 'Nationally Critical'. Taxa that have more than 20 000 mature individuals are not considered 'Naturally Uncommon', unless they occupy an area of less than 100 000 ha (1000 km^2).

Other categories - Townsend *et al.* (2008)

Introduced and Naturalised

Taxa that have become naturalised in the wild after being deliberately or accidentally introduced into New Zealand by human agency. If an 'Introduced and Naturalised' taxon has an IUCN Red Listing in its country or countries of origin, then 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 southern bell frog (*Litoria raniformis*), which is listed as 'Endangered' in Australia; and the parma wallaby (*Macropus parma*), which is listed as 'Lower Risk/Near Threatened' there. These taxa are thus listed as: southern bell frog (*Litoria raniformis*) Introduced and $Naturalised_{TO}$, EN A2ae (IUCN 2006); and parma wallaby (Macropus parma) Introduced and NaturalisedSO, LR/nt (IUCN 2006). Note the use of qualifiers 'TO' (Threatened Overseas) and 'SO' (Secure Overseas) as subscripts after 'Introduced and Naturalised'.

Migrant

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (a minimum of 15 individuals known or presumed to visit per year), but do not breed here. Where the number of individuals visiting per annum is uncertain, the evidence used by the relevant Expert Panel to determine whether a taxon is either 'Migrant' or 'Vagrant' will be documented and held on file by DOC. Examples include eastern bar-tailed godwit (*Limosa lapponica baueri*) 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 longfin eel (*Anguilla dieffenbachii*), are not included in this category. If a taxon in the 'Migrant' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN Red List category and source of the listing is included. For example, southern bluefin tuna (*Thunnus maccoyii*) has an IUCN listing of Critically Endangered (CR) and is a migratory visitor to New Zealand. This taxon would then be listed as: southern bluefin tuna (*Thunnus maccoyii*) $\text{Migrant}_{\text{TO}}$, CR A1bd (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Migrant'.

Vagrant

Taxa that are found unexpectedly in New Zealand and whose presence in this region is naturally transitory, or migratory species with fewer than 15 individuals known or presumed to visit per year.

These are invariably taxa that have failed to establish themselves beyond their point of arrival due to reproductive failure, because they typically breed elsewhere, or for other specific ecological reasons (see de Lange & Norton 1998).

Examples include the red-kneed dotterel (*Erythrogonys cinctus*), blue moon butterfly (*Hypolimnas bolina nerina*) and ant orchid (*Myrmechila trapeziformis*) from Australia, the spotted sawtail (*Prionurus maculatus*) from the tropical southwest Pacific Ocean, and the broad-billed sandpiper (*Limicola falcinellus*), a holarctic migrant.

If a taxon in the 'Vagrant' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list. For example, green turtle (*Chelonia mydas*) has an IUCN listing of Endangered (EN), and the bristle-thighed curlew (*Numenius tahitiensis*) has an IUCN listing of Vulnerable (VU); both are vagrants in New Zealand. These taxa would then be listed as: green turtle (*Chelonia mydas*) $\text{Vagrant}_{\text{TO}}$, EN A2bd (IUCN 2006); and bristle-thighed curlew (*Numenius* tahitiensis) $\text{Vagrant}_{\text{TO}}$, VU C2a(ii) (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Vagrant'.

Coloniser

Taxa that otherwise trigger 'Threatened' categories because of small population size, but have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild since 1950.

Three examples are the Nankeen night heron (*Nycticorax caledonicus*), the scoliid wasp *Radumeris tasmaniensis*, and the herb *Achyranthes velutina.*

If a taxon in the 'Coloniser' category has been listed in an IUCN Red List in its country or countries of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list. For example, Indian yellow-nosed albatross (*Thalassarche carteri*) has an IUCN listing of Endangered (EN) and is a coloniser in New Zealand. This taxon would then be listed as: Indian yellow-nosed albatross (*Thalassarche carteri*) $\text{Coloniser}_{\text{TO}}$ EN A4bde (IUCN 2006). Note the use of the qualifier 'TO' (Threatened Overseas) as a subscript after 'Coloniser'.

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 (*Strigops habroptilus*), *Gunnera hamiltonii* and *Tecomanthe speciosa*, where every wild individual is known, while at the other extreme there are taxa for which we have no population data, e.g. New Zealand storm-petrel (*Oceanites maorianus*) or the strap fern (*Grammitis gunnii*).

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. Some data deficient taxa that have not been seen for many years may well be extinct.

Collection of sufficient demographic data to allow evaluation is a high priority for 'Data Deficient' taxa, as such data may confirm whether these taxa are 'Threatened' or 'At Risk'.

Extinct

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 the shrub *Logania depressa*. Taxa that have become extinct since human settlement (here defined as the last 1000 years) 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 instead as 'Nationally Critical' with qualifier 'EW' (Extinct in the Wild).

Not Threatened

Taxa that are assessed and do not fit any of the other categories are listed in the 'Not Threatened' category.

Appendix 4

CATEGORIES OF IMPORTANCE FOR GEOLOGICAL SITES AND SOILS

Important geological sites

Ranking criteria for important geological sites and landforms in the Northland Region follow Kenny and Hayward (1996). The importance assessment given to each site has been assessed by those informants familiar with the site.

Sites are listed in this inventory 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.

Important soil sites

Ranking criteria for important soils in the Northland Region follow Arand *et al.* (1993).

The three importance categories are:

1 International

- contains the best or a "classic" example of a soil (either a soil group or a mapping unit) or a soil-vegetation or soil-landform association in New Zealand.
- contains a soil or soil-vegetation or 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.

2 National

- contains the best or a "classic" example of a soil (either a soil group or a mapping unit) or a soil-vegetation or soil-landform association in New Zealand.
- contains a soil or soil-vegetation or 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.

3 Regional

- contains the best regional examples of a soil (generally a mapping unit) or a soil-vegetation or soil-landform association.
- contains a limited range of soils under vegetation that is relatively unmodified.

Appendix 5

CHECKLIST OF VASCULAR PLANT SPECIES IN MANAIA ECOLOGICAL DISTRICT

This is a preliminary list is based on records from herbaria (AK, WELT), SSBI database from the Northland Conservancy, and field surveys undertaken between 1997-1999, and in September 2009 by Wildland Consultants.

Key

Following the format in the rest of the report, current threat classification by de Lange *et al.* (2009) is listed in upper case and regionally significant status in indicated in lower case (DOC 2007 in prep.).

Qualifiers (Molloy *et al.* 2002; Townsend *et al*. 2008):

CD	Conservation Dependent	Likely to move to a higher threat category if current management ceases
DP	Data Poor	Confidence in the listing is low due to the poor data available for assessment
RC	Recovering	Total population showing a sustained recovery
ST	Stable	Total population stable
SO	Secure Overseas	Secure in other parts of its natural range outside New Zealand
TO	Threatened Overseas	Threatened in those parts of its natural range outside New Zealand
RF	Recruitment Failure	Current population may appear stable but the age structure is such that catastrophic declines are likely in the future
EF	Extreme Fluctuations	Extreme unnatural population fluctuations, or natural fluctuations overlaying human-induced declines, that increase the threat of extinction
Inc	Increasing	There is an ongoing or predicted increase of > 10% in the total population, taken over the next 10 years or three generations, whichever is longer. Note that this qualifier is redundant for taxa ranked as 'Recovering'.
RR	Range Restricted	Taxa confined to specific substrates, habitats or geographic areas of less than 1000 km2 (100 000 ha).
Sp	Sparse	Taxa that occur within typically small and widely scattered populations.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
GYMNOSPERMS			
Indigenous			
Agathis australis	kauri		
Dacrycarpus dacrydioides	kahikatea		
Dacrydium cupressinum	rimu		
Libocedrus plumosa	kawaka	Naturally Uncommon	Sp
Phyllocladus toatoa	toatoa	Regionally significant	
Phyllocladus trichomanoides	tanekaha		
Podocarpus hallii	Hall's totara		
Podocarpus totara	totara		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Prumnopitys ferruginea	miro		
Prumnopitys taxifolia	matai		
Adventive			
Pinus contorta	contorta pine		
Pinus pinaster	maritime pine		
Pinus radiata	radiata pine		
DICOTS			
Indigenous			
Acaena anserinifolia	piripiri		
Ackama rosifolia	makamaka		
Alectryon excelsus subsp. *excelsus*	titoki		
Alseuosmia quercifolia			
Alseuosmia banksii			
Alseuosmia macrophylla	toropapa		
Apium prostratum subsp. *prostratum*	tuutae kooau, NZ celery		
Aristotelia serrata	makomako, wineberry		
Ascarina lucida var. *lucida*	hutu	Regionally significant	
Avicennia marina subsp. *australasica*	manawa, mangrove		
Beilschmiedia tarairi	taraire		
Beilschmiedia tawa	tawa		
Beilschmiedia tawa (including *B. tawaroa*)	tawaroa	Regionally significant	
Brachyglottis kirkii var. *kirkii*	kohurangi, Kirk's tree daisy	Declining	DP
Brachyglottis kirkii var. *angustior*	kohurangi, Kirk's tree daisy	Regionally significant	
Brachyglottis repanda	rangiora		
Callitriche muelleri			
Callitriche stagnalis	starwort		
Calystegia marginata		Naturally Uncommon	SO, Sp
Calystegia sepium	pohue		
Calystegia soldanella	panahi		
Calystegia tuguriorum	powhiwhi, native bindweed		
Cardamine debilis agg.	panapana		
Carmichaelia australis	NZ broom		
Carpodetus serratus	putaputaweta		
Celmisia adamsii var. *rugulosa*		Naturally Uncommon	Sp
Centella uniflora			
Clematis cunninghamii	ngakau-kiore		
Clematis foetida	akakaiku	Regionally significant	
Clematis forsteri	poangana		
Clematis paniculata	puawananga		
Coprosma acerosa	tarakupenga, sand coprosma	Declining	DP
Coprosma arborea	mamangi		
Coprosma areolata			
Coprosma grandifolia	kanono		
Coprosma lucida	karamu, glossy karamu		
Coprosma macrocarpa × *C. propinqua*			
Coprosma macrocarpa subsp. *minor*	karamu		
Coprosma neglecta		Naturally Uncommon	RR

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Coprosma propinqua			
Coprosma propinqua × *C. robusta*			
Coprosma repens	taupata		
Coprosma rhamnoides			
Coprosma rigida		Regionally significant	
Coprosma robusta	karamu		
Coprosma rotundifolia		Regionally significant	
Coprosma spathulata subsp. *spathulata*			
Coprosma tenuicaulis	hukihuki, swamp coprosma	Regionally significant	
Coriaria arborea var. *arborea*	tutu		
Corokia buddleioides	korokio	Regionally significant	
Corokia cotoneaster	korokio	Regionally significant	
Corynocarpus laevigatus	karaka		
Cotula australis	soldier's button		
Cotula coronopifolia	bachelor's button		
Crassula sieberiana			
Dactylanthus taylorii	pua o te reinga	Nationally Vulnerable	CD, PD, RF, Sp
Dichondra repens	Mercury Bay weed		
Disphyma australe subsp. *australe*	horokaka		
Dodonaea viscosa	akeake		
Dracophyllum latifolium	neinei		
Dracophyllum sinclairii		Regionally significant	
Drosera auriculata	wahu, sundew		
Drosera peltata	wahu, sundew	Coloniser	DP, EF, SO
Dysoxylum spectabile	kohekohe		
Einadia triandra		Regionally significant	
Elaeocarpus dentatus	hinau		
Entelea arborescens	whau		
Epacris pauciflora	tumingi	Regionally significant	
Epilobium pallidiflorum	tawarewa	Regionally significant	
Euchiton audax			
Euchiton collinus			
Euchiton delicatus			
Euchiton involucratus		Regionally significant	
Fuchsia excorticata	kotukutuku	Regionally significant	
Fuchsia procumbens		Naturally Uncommon	Sp
Gaultheria antipoda	tawiniwini		
Geniostoma ligustrifolium var. *ligustrifolium*	hangehange		
Geranium homeanum	pinakitere		
Geranium solanderi	matuia-kumara	Regionally significant	
Gonocarpus incanus	piripiri		
Gonocarpus montanus	piripiri		
Griselinia littoralis (unconfirmed)	kapuka	Regionally significant	
Griselinia lucida	puka		
Haloragis erecta subsp. *erecta*	toatoa		
Hebe ligustrifolia (includes *H.* "Whangarei")	koromiko	Regionally significant	
Hebe macrocarpa var. *latisepala*	koromiko	Regionally significant	

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Hebe macrocarpa var. *macrocarpa*	koromiko	Regionally significant	
Hebe parviflora	tree hebe, koromiko taranga	Regionally significant	
Hebe stricta var. *stricta*	koromiko		
Hedycarya arborea	porokaiwhiri, pigeonwood		
Helichrysum lanceolatum	niniao	Regionally significant	
Hibiscus sp.[33]			
Hoheria populnea	houhere, lacebark		
Hydrocotyle elongata			
Hydrocotyle microphylla		Regionally significant	
Hydrocotyle novae-zeelandiae var. *novae-zeelandiae*			
Knightia excelsa	rewarewa		
Kunzea ericoides	kanuka		
Kunzea ericoides var. *linearis*	Northland kanuka	Declining	
Lagenifera cuneata			
Laurelia novae-zelandiae	pukatea		
Leionema nudum	mairehau	Regionally significant	
Lepidium oleraceum	nau, Cook's scurvy grass	Nationally Endangered	CD, EF, RR, Sp
Leptecophylla juniperina var. *juniperina*	prickly mingimingi		
Leptospermum scoparium agg.	manuka		
Leptostigma setulosa		Regionally significant	
Leucopogon fasciculatus	mingimingi		
Leucopogon fraseri	patotara		
Linum monogynum	rauhuia, linen flax	Regionally significant	
Litsea calicaris	mangeao		
Lobelia anceps	punakuru		
Lophomyrtus bullata	ramarama		
Lophomyrtus obcordata	rohutu	Regionally significant	
Macropiper excelsum subsp. *excelsum*	kawakawa		
Melicope simplex	poataniwha		
Melicope ternata	wharangi		
Melicytus macrophyllus			
Melicytus micranthus	mahoe-wao		
Melicytus novae-zelandiae	coastal mahoe	Regionally significant	
Melicytus ramiflorus subsp. *ramiflorus*	mahoe		
Metrosideros carminea	akakura	Regionally significant	
Metrosideros diffusa	rata		
Metrosideros excelsa	pohutukawa		
Metrosideros fulgens	rata		
Metrosideros perforata	aka		
Metrosideros robusta	northern rata	Regionally significant	
Muehlenbeckia australis	puka		
Muehlenbeckia complexa	pohuehue		
Myoporum laetum	ngaio	Regionally significant	
Myosotis spathulata		Naturally Uncommon	DP, EF, Sp
Myrsine australis	mapou		
Myrsine salicina	toro		

33 Has not been formally described as *Hibiscus richardsonii*, and is most likely to be the introduced species *H. trionum*.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Nertera dichondrifolia			
Nestegis apetala	coastal maire	Regionally significant	
Nestegis cunninghamii	black maire	Regionally significant	
Nestegis lanceolata	white maire		
Nestegis montana		Regionally significant	
Olearia albida	tanguru	Regionally significant	
Olearia angulata		Naturally Uncommon	Sp
Olearia furfuracea	akepiro		
Olearia rani var. *rani*			
Oxalis exilis			
Oxalis magellanica		Regionally significant	
Oxalis rubens	sand oxalis		
Ozothamnus leptophyllus	tauhinu		
Parietaria debilis			
Parsonsia capsularis	akakiore		
Parsonsia heterophylla	akakaikiore		
Passiflora tetrandra	kohia	Regionally significant	
Pelargonium inodorum	kopata		
Pennantia corymbosa	kaikomako	Regionally significant	
Peperomia tetraphylla		Naturally Uncommon	SO, Sp
Peperomia urvilleana			
Persicaria decipiens	tutunawai		
Pimelea acra		Naturally Uncommon	RR
Pimelea tomentosa		Nationally Vulnerable	PD
Pimelea villosa subsp. *villosa*	autetaranga	Declining	PD, RF
Pisonia brunoniana	parapara	Relict	TO
Pittosporum cornifolium	tawhirikao		
Pittosporum crassifolium	karo		
Pittosporum ellipticum		Naturally Uncommon	Sp
Pittosporum eugenioides	tarata		
Pittosporum tenuifolium	kohukohu		
Pittosporum umbellatum	haekaro		
Pittosporum virgatum		Naturally Uncommon	Sp
Plagianthus divaricatus	makaka, saltmarsh ribbonwood		
Pomaderris amoena			
Pomaderris kumeraho	kumarehou		
Pomaderris paniculosa subsp. *novae-zelandiae*		Naturally Uncommon	RR, Sp
Pomaderris. prunifolia var. *egderleyi*			
Pouteria costata	tawapou	Regionally significant	
Pseudognaphalium luteoalbum agg.	pukatea		
Pseudopanax arboreus	whauwahupaku, five-finger		
Pseudopanax crassifolius	horoeka, lancewood		
Pseudopanax crassifolius × *P. lessonii*			
Pseudopanax lessonii	houpara		
Pseudowintera insperata	Northland horopito	Nationally Critical	DP
Pseudowintera axillaris	horopito	Regionally Sgnificant	
Quintinia serrata	tawheowheo		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Ranunculus reflexus	maruru		
Rhabdothamnus solandri	taurepo		
Rubus australis	tataramoa		
Rubus cissoides agg.	tataramoa, bush lawyer		
Rubus schmidelioides var. *schmidelioides* (unconfirmed)	akatataramoa, bush lawyer	Regionally significant	
Rubus squarrosus		Regionally significant	
Samolus repens var. *repens*	makaokao		
Sarcocornia quinqueflora	ureure, glasswort		
Scandia rosifolia	kohepiro	Declining	DP
Schefflera digitata	pate		
Selliera radicans	remuremu		
Senecio biserratus		Regionally significant	
Senecio glomeratus	pukatea		
Senecio hispidulus			
Senecio lautus var. *lautus*			
Senecio minimus			
Senecio quadridentatus		Regionally significant	
Senecio scaberulus		Nationally Critical	EF
Solanum americanum	raupeti		
Solanum sp.			
Sophora chathamica	kowhai		
Sophora fulvida	kowhai	Naturally Uncommon	RR
Stellaria parviflora	kohukohu		
Streblus banksii	turepo	Relict	Sp
Streblus heterophyllus	turepo		
Suaeda novae-zelandiae		Regionally significant	
Tetragonia implexicoma			
Tetragonia tetragonioides	kokihi	Naturally Uncommon	EF, SO
Toronia toru	toru	Regionally significant	
Urtica ferox	ongaonga, tree nettle	Regionally significant	
Vitex lucens	puriri		
Wahlenbergia littoricola subsp. *vernicosa*			
Wahlenbergia violacea	rimuroa		
Naturalised			
Acacia dealbata	silver wattle		
Acacia mearnsii	black wattle		
Acacia melanoxylon	Tasmanian blackwood		
Acacia paradoxa	Kangaroo acacia		
Acanthus mollis	bear's breeches		
Achillea millefolium	yarrow		
Ageratina adenophora	Mexican devil		
Ageratina riparia	mist flower		
Ageratum houstonianum			
Allocasuarina littoralis	she-oak		
Anagallis arvensis	scarlet pimpernel		
Anthemis cotula	stinking mayweed		
Araujia sericifera	moth plant		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Arctotheca calendula	cape weed		
Artemisia verlotiorum	Chinese mugwort		
Aster subulatus	sea aster		
Atriplex prostrata	orache		
Banksia intermedia			
Bellis perennis	lawn daisy		
Berberis glaucocarpa	barberry		
Blackstonia perfoliata			
Cakile maritima	sea rocket		
Calystegia silvatica	greater bindweed		
Cardamine sp.			
Centaurium erythraea	centaury		
Cerastium fontanum subsp. *vulgare*	mouse-ear chickweed		
Ceratophyllum demersum	hornwort		
Chrysanthemum segetum	corn marigold		
Cirsium arvense	California thistle		
Cirsium vulgare	Scotch thistle		
Conium maculatum	hemlock		
Conyza sumatrensis	broad-leaved fleabane		
Cotoneaster glaucophyllus	cotoneaster		
Crepis capillaris	hawksbeard		
Daucus carota	wild carrot		
Delairea odorata	cape ivy		
Dipogon lignosus	mile-a-minute		
Elaeagnus ×reflexa	elaeagnus		
Epilobium tetragonum			
Erigeron karvinskianus	Mexican daisy		
Eriobotrya japonica	loquat		
Erodium cicutarium	storksbill		
Erythrina ×sykesii	coral tree		
Euphorbia peplus	milkweed		
Foeniculum vulgare	fennel		
Fragaria vesca	wild strawberry		
Fumaria muralis	scrambling fumitory		
Galeobdolon luteum	aluminium plant		
Galium aparine	cleavers		
Galium divaricatum	slender bedstraw		
Gamochaeta coarctata	purple cudweed		
Geranium robertianum	herb Robert		
Geranium sp.	geranium		
Gunnera tinctoria	Chilean rhubarb		
Hakea drupacea			
Hakea salicifolia	willow-leaved hakea		
Hakea sericea	prickly hakea		
Hedera helix	ivy		
Helminthotheca echioides	oxtongue		
Hydrangea macrophylla	hydrangea		
Hypochoeris radicata	catsear		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Impatiens sodenii	shrub balsam		
Jacobaea vulgaris	ragwort		
Jasminum sp.			
Lactuca serriola	prickly lettuce		
Lapsana communis	nipplewort		
Lathyrus latifolius	everlasting pea		
Lepidium didymum	twin cress		
Leucanthemum vulgare	oxeye daisy		
Leontodon taraxacoides	hawkbit		
Ligustrum lucidum	tree privet		
Ligustrum sinense	Chinese privet		
Linum bienne	pale flax		
Linum monogynum	rauhuia, linen flax		
Lonicera japonica	Japanese honeysuckle		
Lotus angustissimus	slender birdsfoot trefoil		
Lotus pedunculatus	lotus		
Lupinus arboreus	lupin		
Lycium ferocissimum	boxthorn		
Lythrum hyssopifolia	hyssop loosestrife		
Malus ×domestica	apple tree		
Malva sp.	mallow		
Matricaria discoidea	rayless chamomile		
Melilotus indica	King Island melilot		
Mentha pulegium	penny royal		
Monstera deliciosa	fruit salad plant		
Myosotis sylvatica	garden forget-me-not		
Nasturtium officinale	watercress		
Nerium oleander	oleander		
Ochna serrulata	Mickey Mouse plant		
Orobanche minor	broomrape		
Osteospermum fruticosum	rain daisy, dimorphotheca		
Oxalis corniculata	horned oxalis		
Paraserianthes lophantha	brush wattle		
Passiflora tripartita var. *mollissima*	banana passionfruit		
Persicaria maculosa	willow weed		
Phytolacca octandra	inkweed		
Plantago australis	swamp plantain		
Plantago coronopus	buck's-horn plantain		
Plantago lanceolata	narrow-leaved plantain		
Plantago major	broad-leaved plantain		
Populus nigra	Lombardy poplar		
Populus sp.	poplar		
Prunella vulgaris	selfheal		
Pyracantha sp.			
Ranunculus repens	creeping buttercup		
Ranunculus sp.			
Raphanus raphanistrum subsp. *raphanistrum*	wild raddish		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Roldana petasitis	velvet groundsel		
Rosa sp.	climbing rose		
Rubus sp. (*R. fruticosus* agg.)	blackberry		
Rumex acetosella	sheep's sorrel		
Rumex conglomeratus	clustered dock		
Rumex obtusifolius	broad-leaved dock		
Sagina procumbens	pearlwort		
Salix fragilis	crack willow		
Salix matsudana	tortured willow		
Schedonorus arundinaceus	tall fescue		
Senecio bipinnatisectus	Australian fireweed		
Senecio elegans	purple groundsel		
Senecio skirrhodon	gravel groundsel		
Senecio sylvaticus	wood groundsel		
Senecio vulgaris	groundsel		
Senna multiglandulosa	buttercup bush		
Sigesbeckia orientalis	Indian weed		
Silene gallica	catchfly		
Solanum linnaeanum	Apple of Sodom		
Solanum mauritianum	woolly nightshade		
Solanum nigrum	black nightshade		
Sonchus asper	prickly puha		
Sonchus oleraceus	puha, sow thistle		
Stellaria media	chickweed		
Taraxacum officinale	dandelion		
Thunbergia alata	black-eyed Susan		
Torilis arvensis	spreading hedge parsley		
Trifolium pratense	red clover		
Trifolium repens	white clover		
Tropaeolum majus	garden nasturtium		
Ulex europaeus	gorse		
Verbena bonariensis	purple-top		
Veronica anagallis-aquatica	water speedwell		
Veronica arvensis	field speedwell		
Veronica serpyllifolia	turf speedwell		
Vicia sativa	vetch		
Vinca major	periwinkle		
Wisteria sinensis	wisteria		
PTERIDOPHYTES			
Indigenous			
Adiantum aethiopicum	huruhuru tapairu, maidenhair fern	Regionally significant	
Adiantum cunninghamii	huruhuru tapairu, maidenhair fern		
Adiantum diaphanum	huruhuru tapairu, maidenhair fern		
Adiantum fulvum	huruhuru tapairu, maidenhair fern		
Adiantum hispidulum	huruhuru tapairu, maidenhair fern		
Adiantum viridescens	huruhuru tapairu, maidenhair fern		
Arthropteris tenella			

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Asplenium bulbiferum	mouku, hen and chicken fern		
Asplenium flabellifolium	necklace fern	Regionally significant	
Asplenium flaccidum	makawe		
Asplenium gracillimum	petako-paraharaha	Regionally significant	
Asplenium haurakiense			
Asplenium hookerianum	petako-paraharaha	Regionally significant	
Asplenium lamprophyllum	petako-paraharaha		
Asplenium northlandicum		Regionally significant	
Asplenium oblongifolium	huruhuruwhenua		
Asplenium polyodon	petako		
Blechnum chambersii	rereti		
Blechnum filiforme	panako		
Blechnum fraseri			
Blechnum membranaceum			
Blechnum minus	swamp kiokio		
Blechnum novae-zelandiae	kiokio		
Blechnum procerum			
Blechnum triangularifolium		Regionally significant	
Cheilanthes distans		Regionally significant	
Cheilanthes sieberi		Regionally significant	
Ctenopteris heterophylla			
Cyathea cunninghamii	punui, gully tree fern	Regionally significant	
Cyathea dealbata	ponga, silver fern		
Cyathea medullaris			
Cyathea smithii	katote, soft tree fern		
Deparia petersenii subsp. *congrua*			
Dicksonia squarrosa	wheki		
Diplazium australe			
Doodia australis	pukupuku		
Doodia mollis		Naturally Uncommon	Sp
Doodia squarrosa		Naturally Uncommon	Sp
Gleichenia dicarpa	tangle fern		
Gleichenia microphylla	waewaekaka, swamp umbrella fern		
Grammitis billardierei		Regionally significant	
Grammitis ciliata		Regionally significant	
Histiopteris incisa	matata, water fern		
Huperzia varia			
Hymenophyllum atrovirens	maku, filmy fern	Naturally Uncommon	DP, RR, Sp
Hymenophyllum demissum	maku, filmy fern		
Hymenophyllum dilatatum	maku, filmy fern		
Hymenophyllum flexuosum	maku, filmy fern		
Hymenophyllum lyallii	maku, filmy fern	Regionally significant	
Hymenophyllum multifidum	maku, filmy fern		
Hymenophyllum rarum	maku, filmy fern		
Hymenophyllum revolutum	maku, filmy fern		
Hymenophyllum sanguinolentum	piripiri, filmy fern		
Hypolepis ambigua			
Lastreopsis glabella			

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Lastreopsis hispida			
Lastreopsis velutina			
Lindsaea linearis			
Loxogramme dictyopteris			
Loxsoma cunninghamii		Regionally significant	
Lycopodiella cernua	maatukutuku		
Lycopodium deuterodensum	puakarimu		
Lycopodium volubile	waewaekoukou		
Lygodium articulatum	mangemange		
Microsorum pustulatum	kowaowao, hounds tongue fern		
Microsorum scandens	mokimoki		
Ophioglossum coriaceum		Regionally significant	
Paesia scaberula	matata		
Pellaea rotundifolia	tarawera, button fern		
Pneumatopteris pennigera	pakau		
Polystichum neozelandicum subsp. *neozelandicum*			
Polystichum sp.			
Pteridium esculentum	rarahu, bracken		
Pteris comans			
Pteris macilenta	sweet fern		
Pteris saxatilis			
Pteris tremula	turawera, shaking brake		
Pteris comans × *P. macilenta*			
Pyrrosia eleagnifolia	leather-leaf fern		
Schizaea fistulosa			
Sticherus cunninghamii	waekura	Regionally significant	
Sticherus flabellatus			
Tmesipteris elongata			
Tmesipteris lanceolata			
Tmesipteris tannensis			
Tmesipteris sigmatifolia			
Trichomanes reniforme			
Trichomanes sp.			
Adventive			
Azolla pinnata	ferny azolla		
Nephrolepis cordifolia	tuber ladder fern		
Selaginella kraussiana	creeping clubmoss, selaginella		
GRASSES			
Indigenous			
Austrostipa stipoides			
Chionochloa bromoides			
Chionochloa conspicua subsp. *cunninghamii*		Regionally significant	
Cortaderia splendens			
Deyeuxia avenoides			
Dichelachne crinita	patiti, plume grass		
Isachne globosa	swamp millet		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Lachnagrostis billardierei	perehia		
Lachnagrostis filiformis	perehia		
Microlaena avenacea	bush rice grass		
Microlaena carsei		Naturally Uncommon	DP
Microlaena polynoda			
Microlaena stipoides	patiti, meadow rice grass		
Oplismenus hirtellus subsp. *imbecillis*			
Poa anceps agg.			
Poa imbecilla			
Rytidosperma biannulare			
Rytidosperma gracile			
Spinifex sericeus	kowhangatara, spinifex		
Zoysia minima		Regionally significant	
Zoysia pauciflora			
Naturalised			
Agrostis stolonifera	creeping bent		
Aira caryophyllea subsp. *caryophyllea*	silver hairy grass		
Ammophila arenaria	marram		
Anthoxanthum odoratum	sweet vernal		
Arundo donax	giant reed		
Axonopus fissifolius	narrow-leaved carpet grass		
Briza minor	shivery grass		
Bromus diandrus	ripgut brome		
Bromus willdenowii	prairie grass		
Cortaderia jubata	purple pampas		
Cortaderia selloana	pampas		
Cynodon dactylon	Indian doab		
Dactylis glomerata	cocksfoot		
Ehrharta erecta	veldt grass		
Eragrostis brownii	bay grass		
Festuca rubra			
Glyceria declinata	blue sweetgrass		
Glyceria maxima	reed sweetgrass		
Holcus lanatus	Yorkshire fog		
Lagurus ovatus	harestail		
Lolium perenne	rye grass		
Miscanthus nepalensis	Himalayan fairy grass		
Parapholus incurva	sickle grass		
Paspalum dilatatum	paspalum		
Paspalum urvillei	Vasey grass		
Paspalum vaginatum	saltwater paspalum		
Pennisetum clandestinum	kikuyu grass		
Poa annua	annual poa		
Polypogon monspeliensis	beard grass		
Rytidosperma pilosum	hairy wallaby grass		
Rytidosperma racemosum	danthonia		
Sporobolus africanus	ratstail		
Stenotaphrum secundatum	buffalo grass		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
SEDGES			
Indigenous			
Baumea articulata			
Baumea juncea			
Baumea rubiginosa			
Baumea tenax			
Baumea teretifolia			
Bolboschoenus fluviatilis	purua grass		
Carex breviculmis			
Carex dissita			
Carex flagellifera	manaia		
Carex forsteri		Regionally significant	
Carex lambertiana			
Carex lessoniana	toetoe-rautahi		
Carex ochrosaccus		Regionally significant	
Carex pumila			
Carex raoulii			
Carex solandri			
Carex spinirostris			
Carex testacea			
Carex virgata	purei		
Cyperus ustulatus f. ustulatus	toetoe, upokotangata		
Ficinia spiralis	pingao	Relict	CD, Inc, Sp
Eleocharis acuta			
Eleocharis sphacelata	kuta		
Ficinia nodosa	wiwi		
Gahnia lacera	tarangarara		
Gahnia pauciflora	takahikahi		
Gahnia xanthocarpa	tupari-maunga		
Isolepis cernua			
Isolepis habra			
Isolepis prolifera			
Lepidosperma australe			
Lepidosperma laterale			
Morelotia affinis			
Schoenoplectus tabernaemontani	kapungawha		
Schoenus apogon			
Schoenus brevifolius			
Schoenus maschalinus			
Schoenus nitens			
Schoenus tendo	wiwi		
Tetraria capillaris		Regionally significant	
Uncinia banksii	matau		
Uncinia uncinata	kamu matau a Maui		

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Adventive			
Carex ovalis	oval sedge		
Cyperus brevifolius	globe sedge		
Cyperus congestus	purple umbrella sedge		
Cyperus eragrostis	umbrella sedge		
RUSHES			
Indigenous			
Apodasmia similis	oioi		
Juncus edgariae	wi		
Juncus kraussii var. *australiensis*	wi, sea rush		
Juncus planifolius			
Juncus sarophorus	wi		
Luzula picta var. *picta*		Regionally significant	
Adventive			
Juncus articulatus	jointed rush		
Juncus bufonius var. *bufonius*	toad rush		
Juncus effusus var. *effusus*	soft rush, leafless rush		
Juncus tenuis var. *tenuis*	track rush		
ORCHIDS			
Indigenous			
Acianthus sinclairii			
Calochilus sp.			
Diplodium alobulum			
Drymoanthus adversus			
Earina autumnalis	raupeka		
Earina mucronata	peka-a-waka		
Ichthyostomum pygmaeum	piripiri		
Microtis unifolia agg.	maikaika		
Nematoceras macranthum			
Orthoceras novae-zeelandiae	maikaika		
Pterostylis banksii	tutukiwi		
Pterostylis graminea			
Singularybas oblongus			
Thelymitra colensoi			
Thelymitra cyanea			
Thelymitra longifolia	maikuku		
Thelymitra pauciflora	slender sun orchid		
Winika cunninghamii			
MONOCOTS (OTHER THAN GRASSES, SEDGES, RUSHES AND ORCHIDS)			
Indigenous			
Arthropodium cirratum	rengarenga		
Astelia banksii	kakaha		
Astelia solandri	kowharawhara		
Astelia trinervia	mauri		
Collospermum hastatum	kahakaha		
Collospermum microspermum		Regionally significant	

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Cordyline australis	ti kouka, cabbage tree		
Cordyline banksii	ti ngahere, forest cabbage tree		
Cordyline pumilio	dwarf cabbage tree		
Dianella nigra	turutu		
Freycinetia banksii	kiekie		
Libertia grandiflora	mikoikoi	Regionally significant	
Phormium cookianum subsp. *hookeri*	whaririki, mountain flax	Regionally significant	
Phormium tenax	harakeke, flax		
Rhopalostylis sapida	nikau		
Ripogonum scandens	kareao, supplejack		
Triglochin striata	arrow grass	Regionally significant	
Typha orientalis	raupo		
Naturalised			
Agave sp.			
Allium triquetrum	onion weed		
Allium vineale var. *compactum*			
Aristea ecklonii	aristea		
Arum italicum	Italian arum		
Asparagus asparagoides	smilax		
Asparagus scandens	climbing asparagus		
Canna indica	canna lily, Indian shoot		
Crocosmia × *crocosmiiflora*	montbretia		
Freesia refracta	freesia		
Furcraea spp.			
Gladiolus undulatus	gladiolus		
Hedychium gardnerianum	kahili ginger, wild ginger		
Kniphofia uvaria	red hot poker		
Phoenix canariensis	Phoenix palm		
Sisyrinchium iridifolium	purple-eyed grass		
Tradescantia fluminensis	tradescantia		
Watsonia sp.	watsonia		
Zantedeschia aethiopica	arum lily		

Appendix 6

COMMON PLANT NAMES USED IN TEXT

* = exotic species

*	apple of Sodom	*Solanum linnaeanum*
*	aristea	*Aristea ecklonii*
	arrow grass	*Triglochin striata*
*	black-eyed Susan	*Thunbergia alata*
	black maire	*Nestigis cunninghamii*
*	black nightshade	*Solanum nigrum*
	bracken	*Pteridium esculentum*
*	buddleja	*Buddleja davidii*
*	buffalo grass	*Stenotaphrum secundatum*
	bush lawyer	*Rubus* sp.
	carmine rata	*Metrosideros carminea*
*	catsear	*Hypochoeris radicata*
*	cleavers	*Galium aparine*
	coastal mahoe	*Melicytus novae-zelandiae*
	coastal maire	*Nestegis apetala*
	coastal toetoe	*Cortaderia splendens*
*	contorta pine	*Pinus contorta*
	Cook's scurvy grass	*Lepidium oleraceum*
*	coral tree	*Erythrina ×sykesii*
*	cotoneaster	*Cotoneaster glaucophyllus*
*	crack willow	*Salix fragilis*
*	creeping bent	*Agrostis stolonifera*
*	dimorphotheca	*Osteospermum fruticosum*
*	dock	*Rumex* sp.
*	elaeagnus	*Elaeagnus ×reflexa*
*	eucalyptus	*Eucalyptus* sp.
	five-finger	*Pseudopanax arboreus*
*	fleabane	*Conzya albida*
*	freesia	*Freesia refracta*
*	German ivy	*Senecio mikanioides*
*	ginger	*Hedychium garderanium*
	glasswort	*Sarcocornia qinqueflora*
*	gorse	*Ulex europaeus*
*	grey willow	*Salix cinerea*
	pakau	*Pneumatopteris pennigera*
	gully tree fern	*Cyathea cunninghamii*
	hangehange	*Geniostoma ligustrifolium* var. *ligustrifolium*
	harakeke, flax	*Phormium tenax*
*	harestail	*Lagurus ovatus*
*	hawksbeard	*Crepis capillaris*
	hook grass	*Uncinia unicinata*

	houhere	*Hoberia populnea*
	houpara	*Pseudopanax lessonii*
	hutu	*Ascarina lucida var. lucida*
*	hydrangea	*Hydrangea macrophylla*
*	inkweed	*Phytolacca octandra*
*	Japanese honeysuckle	*Lonicera japonica*
*	Jerusalem cherry	*Solanum pseudocapsicum*
	kahikatea	*Dacrycarpus dacrydioides*
	kaikomako	*Pennantia corymbosa*
	kanuka	*Kunzea ericoides*
	kapungawha	*Schoenoplectus tabernaemontani*
	karaka	*Corynocarpus laevigatus*
	karamu	*Coprosma robusta*
	karearea	*Lemna minor*
	karo	*Pittosporum crassifolium*
	kauri	*Agathis australis*
	kawaka	*Libocedrus plumosa*
	kawakawa	*Macropiper excelsum* subsp. *excelsum* f. *excelsum*
	kiekie	*Freycinetia banksii*
*	kikuyu	*Pennisetum clandestinum*
	kiokio	*Blechnum novae-zelandiae*
	kohekohe	*Dysoxylum spectabile*
	kohia	*Passiflora tetrandra*
	kohuhu	*Pittosporum tenuifolium*
	koromiko	*Hebe stricta* var. *stricta*
	kotukutuku	*Fuchsia excorticata*
	kowhai	*Sophora chathamica*
	kowhai	*Sophora fulvida*
	knobby clubrush	*Ficinia nodosa*
	kumarehou	*Pomaderris kumerahou*
	kuta	*Eleocharis sphacelata*
	lancewood, horoeka	*Pseudopanax crassifolius*
*	lantana	*Lantana camara*
	leather-leaf fern	*Pyrrosia eleagnifolia*
*	lotus	*Lotus pedunculatus*
*	lupin	*Lupinus arboreus*
*	madeira vine	*Anredera cordifolia*
	mahoe	*Melicytus ramiflorus* subsp. *ramiflorus*
	mairehau	*Leinema nudum*
	makamaka	*Ackama rosifolia*
	makaokao	*Samolus repens*
	mamaku	*Cyathea medullaris*
	mamangi	*Coprosma arborea*
	mangrove	*Avicennia marina* subsp. *australasica*
	manuka	*Leptospermum scoparium*
	mapou	*Myrsine australis*
*	marram grass	*Ammophila arenaria*
	matai	*Prumnopitys taxifolia*
	Mercury Bay weed	*Dichondra repens*

*	Mexican daisy	*Erigeron karvinskianus*
*	Mexican devil	*Ageratina adenophora*
	mida	*Mida salicifolia*
	mingimingi	*Leucopogon fasciculatus*
	miro	*Prumnopitys ferruginea*
*	mist flower	*Ageratina riparia*
*	moth plant	*Araujia sericifera*
	native iceplant	*Disphyma australe* subsp. *australe*
	ngaio	*Myoporum laetum*
	nikau	*Rhopalostylis sapida*
*	Norfolk pine	*Araucaria heterophylla*
	northern rata	*Metrosideros robusta*
	Northland kanuka	*Kanuka ericoides* var. *linearis*
	NZ celery	*Apium prostratum* subsp. *prostratum* var. *filiforme*
	NZ spinach	*Tetragonia* sp.
	oioi	*Apodasmia similis*
	ongaonga, tree nettle	*Urtica ferox*
*	onion weed	*Allium triquetrum*
*	ornamental banana	*Ensete ventricosum*
*	oval sedge	*Carex ovalis*
*	palm grass	*Setaria palmifolia*
*	pampas	*Cortaderia selloana* and *C. jubata*
	parapara	*Pisonia brunoniana*
*	paspalum	*Paspalum dilatatum*
	pate	*Schefflera digitata*
*	Phoenix palm	*Phoenix canariensis*
	pigeonwood	*Hedycarya arborea*
	pohue	*Calystegia sepium*
	pohuehue	*Muehlenbeckia complexa*
	pingao	*Ficinia spiralis*
	pohutukawa	*Metrosideros excelsa*
	pondweed	*Potamogeton* sp.
	ponga, silver fern	*Cyathea dealbata*
*	poplar	*Populus* sp.
*	prickly hakea	*Hakea sericea*
*	privet	*Ligustrum lucida* and *L. sinense*
	puka	*Griselinia lucida*
	pukatea	*Laurelia novae-zelandiae*
	puriri	*Vitex lucens*
*	purple groundsel	*Senecio elegans*
	putaputaweta	*Carpodetus serratus*
*	Queensland poplar	*Homalanthus populifolius*
*	radiata pine	*Pinus radiata*
	rangiora	*Brachyglottis repanda*
*	ratstail	*Sporobolus africanus*
	rauhuia	*Linum monogynum*
	raupo	*Typha orientalis*
	remuremu	*Sellieria radicans*
	rengarenga lily	*Arthropodium cirratum*

	rewarewa	*Knightia excelsa*
	rimu	*Dacrydium cupressinum*
*	ripgut brome	*Bromus diandrus*
	rohutu	*Lophomyrtus obcordata*
	saltmarsh ribbonwood	*Plagianthus divaricatus*
*	saltwater paspalum	*Paspalum vaginatum*
	sand daphne	*Pimelea villosa* subsp. *villosa*
*	Scotch thistle	*Cirsium vulgare*
	sea rush	*Juncus kraussii* var. *australiensis*
*	selaginella	*Selaginella kraussiana*
*	sheoak	*Allocasuarina littoralis*
	shore bindweed	*Calystegia soldanella*
	shore groundsel	*Senecio lautus* var. *lautus*
*	shrub balsam	*Impatiens sodenii*
*	smilax	*Asparagus asparagoides*
*	soft rush	*Juncus effusus*
*	sow thistle	*Sonchus oleraceus*
	spinifex	*Spinifex sericeus*
	supplejack	*Ripogonum scandens*
	swamp coprosma	*Coprosma tenuicaulis*
	swamp millet	*Isachne globosa*
	swamp willowherb	*Epilobium pallidiflorum*
*	Taiwan cherry	*Prunus campanulata*
	tanekaha	*Phyllocladus trichomanoides* var. *trichomanoides*
	taraire	*Beilschmiedia tarairi*
	tarata	*Pittosporum eugenioides*
	tauhinu	*Ozothamnus leptophyllus*
	taupata	*Coprosma repens*
	tawa	*Beilschmiedia tawa*
	tawapou	*Pouteria costata*
	tawaroa	*Beilschmiedia tawa* (incl. *B. tawaroa*)
	ti kouka, cabbage tree	*Cordyline australis*
	ti ngahere, forest cabbage tree	*Cordyline banksii*
	titoki	*Alectryon excelsus* var. *excelsus*
	toatoa	*Haloragis erecta* subsp. *erecta*
	toro	*Myrsine salicina*
	toru	*Toronia toru*
	totara	*Podocarpus totara*
	towai	*Weinmannia silvicola*
	tree hebe	*Hebe parviflora*
	turepo	*Streblus heterophyllus*
*	vulpia hair grass	*Vulpia* sp.
*	watercress	*Nastutium officinale*
	water fern	*Histiopteris incisa*
	wheki	*Dicksonia squarrosa*
*	willow	*Salix* sp.
*	willow-leaved hakea	*Hakea salicifolia*
*	willow weed	*Persicaria persicaria*
	wineberry, makomako	*Aristotelia serrata*

	wharangi	*Melicope ternata*
	whararikí, mountain flax	*Phormium cookianum* subsp. *hookeri*
	whau	*Entelea arborescens*
	woolly cloak fern	*Cheilanthes distans*
*	woolly nightshade	*Solanum mauritianum*

Appendix 7

CHECKLIST OF FAUNA SPECIES IN MANAIA ECOLOGICAL DISTRICT

Bird data from Dr. Ray Pierce and SSBI data. Reptile records from DOC Herpetofauna database and SSBI data. Fish records from New Zealand Freshwater Fish Database (NIWA 2009) and SSBI data. Land snail records from Dr. Fred Brook and SSBI data.

SCIENTIFIC NAME	COMMON NAME	
MAMMALS		
Indigenous		
Chalinolobus tuberculatus	longtail bat	unconfirmed
Introduced (feral)[34]		
Bos taurus	cattle	
Canis familiaris	feral dog	
Capra hircus	feral goat	
Erinaceus europaeus occidentalis	European hedgehog	
Felis catus	house cat	
Lepus europaeus	brown hare	
Mus musculus	house mouse	
Mustela furo	stoat	
Mustela furo	ferret	
Mustela nivalis	weasel	
Oryctolagus cuniculus	European rabbit	
Rattus norvegicus	Norway rat	
Rattus rattus	ship rat; black rat	
Sus scrofa	feral pig	
Trichosurus vulpecula	brushtail possum	
BIRDS		
Indigenous		
Anas superciliosa	grey duck, parera	
Anthornis melanura	North Island bellbird, korimako	
Anthus n. novaeseelandiae	NZ pipit, pihoihoi	
Apteryx mantelli	North Island brown kiwi	
Ardea novaehollandiae	white-faced heron	
Botaurus poiciloptilus	Australasian bittern, matuku	
Bowdleria punctata vealeae	North Island fernbird, matata	
Charadrius obscurus aquilonius	northern NZ dotterel, tuturiwhatu	
Chrysococcyx lucidus	shining cuckoo, pipiwharauroa	
Circus approximans	Australasian harrier, kahu	
Cyanoramphus novaeseelandiae	red-crowned kakariki	

34 Goats and pigs have been eradicated from Bream Head (N. Miller, pers. comm. 2009).

SCIENTIFIC NAME	COMMON NAME
Egretta sacra	reef heron, matuku moana
Eudynamis taitensis	long-tailed cuckoo, koekoea
Eudyptula minor iredalei	northern little blue penguin, korora
Falco novaeseelandiae	bush falcon
Gerygone igata	grey warbler, riroriro
Haematopus finschi	NZ pied oystercatcher, torea
Haematopus unicolor	variable oystercatcher, torea
Hemiphaga novaeseelandiae	kukupa, NZ pigeon
Himantopus himantopus	pied stilt, poaka
Hirundo tahitica neoxena	welcome swallow
Larus dominicanus	black-backed gull, karoro
Larus novaehollandiae	red-billed gull, tarapunga
Morus serrator	Australasian gannet, takapu
Nestor meridionalis septentrionalis	NI kaka
Ninox novaeseelandiae	ruru, morepork
Pelecanoides urinatrix urinatrix	northern diving petrel
Pelagodroma marina	white-faced storm petrel, takahikare-moana
Petroica macrocephala toitoi	North Island tomtit
Phalacrocorax carbo	black shag, kawau
Phalacrocorax melanoleucos	little shag, kawaupaka
Phalacrocorax sulcirostris	little black shag
Phalacrocorax varius	pied shag, karuhiruhi
Porphyrio porphyrio	pukeko
Porzana tabuensis	spotless crake, puweto
Prosthemadera novaeseelandiae	tui
Pterodroma macroptera	grey-faced petrel, oi
Puffinus gavial	fluttering shearwater
Rallus philippensis	banded rail, moho-pereru
Rhipidura fuliginosa placabilis	North Island fantail, piwakawaka
Hydroprogne caspia	Caspian tern, taranui
Sterna striata striata	white-fronted tern, tara
Tadorna variegata	paradise shelduck, putangitangi
Todiramphus sanctus vagans	NZ kingfisher
Vanellus miles	spur-winged plover
Zosterops lateralis	silvereye, tahou, whiteye
Introduced	
Acridotheres tristis	myna
Alauda arvensis	skylark
Anas platyrhynchos	mallard
Callipela californica	California quail
Carduelis carduelis	goldfinch
Carduelis flammea	redpoll
Carduelis chloris	greenfinch
Columba livia	rock pigeon
Cygnus atratus	black swan
Emberiza citrinella	yellowhammer
Fringilla coelebs	chaffinch

SCIENTIFIC NAME	COMMON NAME
Gymnorhina tibicen	Australian magpie
Meleagris gallopavo	feral turkey
Passer domesticus	house sparrow
Phasianus colchicus	ring-necked pheasant
Platycercus eximius	eastern rosella
Prunella modularis	dunnock, hedge sparrow
Streptopelia roseogrisea	barbary dove
Sturnus vulgaris	starling
Synoicus ypsilophorus	brown quail
Turdus merula	blackbird
Turdus philomelos	song thrush
REPTILES	
Indigenous	
Chelonia mydas	green turtle
Cyclodina aenea	copper skink
Cyclodina macgregori	MacGregor's skink
Cyclodina ornata	ornate skink
Dermochelys coriacea	leatherback turtle
Hoplodactylus granulatus	forest gecko
Hoplodactylus maculatus	common gecko
Hoplodactylus pacificus	Pacific gecko
Naultinus elegans elegans	Auckland green gecko
Oligosoma smithii	shore skink
Pelamis platurus	yellow-bellied sea snake
Introduced	
Litoria aurea	green and golden bell frog
FISH	
Indigenous	
Anguilla dieffenbachii	longfin eel
Anguilla australis	shortfin eel
Galaxias fasciatus	banded kokopu
Gobiomorphus cotidianus	common bully
LAND SNAILS	
Indigenous	
Amborhytida dunniae (Gray)	
Delos coresia	
Liarea egea sp. "Bream Head"	
Liarea turriculata "Manaia"	
Phenacohelix giveni (Cumber)	
Placostylus (*Maoristylus*) *hongii* (Suter)	
Punctidae sp. 223 (NMNZ M.151458) (Brook 2002)	
Punctid attenuispira	
Punctid corella	
Punctid lampra	
Schizoglossa worthyae	
Therasiella aff. *elevata* (Cumber)	

SCIENTIFIC NAME	COMMON NAME
Introduced	
Helix aspersa	common garden snail
Oxychilus cellarius	
OTHER INVERTEBRATES [35]	
Indigenous	
Actizeta sp.	
Anthicus hesperi	
Arthracanthus	
Bathyllus albicinctus	
Brontopriscus pleuralis	
Carystoterpa ikana	
Chaerodes sp.	seaweed darkling beetle
Clivinia sp.	
Ctenognathus sulcitarsis	
Dicrochile maura	
Diomocoris ostiolum	
Drepanacra binocula	
Eucolaspis sp.	bronze beetle
Gnaphalopoda brookesi	
Halyles sp.	
Hemiandrus furcifer	cave weta
Hexanodes vulgata	
Hybolasius pedator	
Hypharpax sp.	
Kaveinga orbitosa	
Kupeus arcuatus	
Lagrioida brounii	
Lasiorhynchus barbicornis	giraffe weevil
Lucilia sericata	green blowfly
Macroscytus australis	
Mecodema sp. aff. *M. curvidens*	carabid beetle
Mecodema ? spiniferum	carabid beetle
Mecyclothorax rotundicollis	
Menimus oblongus	darkling beetle
Menimus obscurus	darkling beetle
Menimus thoracicus	darkling beetle
Micromus tasmaniae	Tasmanian lacewing
Novothymbris sp.	
Novothymbris notata	
Nyxetes bidens	two-spined weevil
Oncacontias vittatus	forest shield bug
Parabaris atratus	
Paralissotes planus	stag beetle
Phycosecis limbata	
Phymatophaea fuscitarsis	
Phymatophaea opiloides	

35 This is not an exhaustive list of invertebrates.

SCIENTIFIC NAME	COMMON NAME
Reichardtia pedatrix	
Rhytisternus miser	
Rhyzodiastes proprius	
Sapintus aucklandensis	
Scolopterus sp.	four-spined weevil
Scopodes fossulatus	
Stethaspis longicornis	green chafer
Tridiplous penmani	
Unas piceus	weevil
Xylophilus nitidus	
Introduced	
Radumeris tasmaniensis (Saussure, 1855)	yellow flower wasp
*Steatoda capensis (*Hann, 1990)	black cobweb spider, false katipo spider

Appendix 8

GLOSSARY OF TERMS

Allochthonous

Geologic units that have been transported to their present position.

Alluvial

Deposited by a river or other running water.

Basalt

A type of igneous rock consisting of feldspar and other silicate minerals rich in iron and magnesium. Basalt has a relatively low silica content of 40-50 percent and is the main component of the oceanic crust of the earth.

Conglomerate

A sedimentary rock composed of welded fine-grained and coarse-grained rock fragments.

Biodiversity

The variability among living organisms from all sources including, *inter alia*, 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 (IUCN 1993).

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.

Dune complex/duneland/dunefield

An association of mobile and consolidated sand dunes, which may include small interdune lakes, wetlands, and shrubland communities.

Dune lake

A lake formed behind a dune.

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 other living organisms 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.

Fernland

Vegetation in which the cover of ferns in the canopy is 20-100% and in which the fern cover exceeds that of any other growth form or bare ground. Tree ferns >10 cm dbh are excluded as trees (cf. forest) (Atkinson 1985). In Manaia ED, fernlands are dominated by ferns such as *Gleichenia dicarpa* and *G. microphylla*, bracken, and tree ferns, with occasional woody plants also present.

Foredune

Mobile and fixed transverse dunes along coastal margins.

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).

Gabbro

A usually coarse-grained igneous rock composed chiefly of calcic plagioclase and pyroxene.

Grassland

Vegetation in which the cover of grass in the canopy is 20-100% and in which grass cover exceeds that of any other growth form or bare ground. Tussock grasses are excluded from the grass growth-form (Atkinson 1985).

Gumland

Wardle (1991) defines gumlands as wet heathlands occupying areas which were previously kauri (*Agathis australis*) forests.

Habitat

The part of the environment where a plant or animal lives. It includes both the living and non-living features of the area.

Herbfield

Vegetation in which the cover of herbs in the canopy is 20-100% and in which herb cover exceeds that of any other growth form or bare ground. Herbs include all herbaceous and low-growing semi-woody plants that are not separted as ferns, tussocks, grasses, sedges, rushes, reeds, plants, mosses, or lichens (Atkinson 1985).

Holocene

Period of geologic time from the end of the Pleistocene Ice Age (about 10,000 years before present) until the present day.

Igneous

Formed by solidification of molten rock that has come from within the earth.

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

A part of the land's surface with distinctive naturally formed physical characteristics e.g. hillslope, gully, ridge top, etc.

Linkages/corridors

An area of habitat which links two or more other habitat areas. Depending on the habitat type, this a 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 utilisable. Small remnants can act as stepping stones between two larger habitats.

Miocene

A geologic epoch within the Tertiary period (about 24 to 5 million years before present).

Mudstone

A fine-grained sedimentary rock consisting mainly of clay mineral particles.

Natural area

A tract of land which supports natural landforms and predominantly indigenous 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 i.e. to what extent indigenous species are functioning according to natural processes.

Ophiolitic

Of igneous and metamorphic rocks, rich in iron and magnesium, whose origin is associated with an early phase of the development of a geosyncline (continental margin downwarping in the earth's crust that has seen sedimentation and volcanic activity).

Pliocene

The geological epoch from 5.2 - 1.64 million years ago. The Pliocene was a period of gradual cooling leading up to the Pleistocene ice ages.

Pleistocene

An epoch of the Quaternary period, after the Pliocene of the Tertiary and before the Holocene. It began one to two million years ago and lasted until the start of the Holocene, some 10,000 years ago. When the Quaternary is designated as an era, the Pleistocene is considered to be a period.

Plutonic

Of igneous rock that has solidified beneath the earth's surface; granite or diorite or gabbro.

Podzol

A soil type formed under some types of forest and characterised by very strong vertical leaching of nutrients in the profile and the development of whitish-grey sub-soils.

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 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 forest is an extremely rare ecosystem type in Northland, and indeed nationally, even though it contains 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 and 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 (in this case, the reference area is the part of Otamatea ED which falls within Northland Conservancy boundaries). 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 today's environment. 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).

Riparian zone

An area of land immediately adjacent to a watercourse.

Rushland

Vegetation in which the cover of rushes in the canopy is 20-100% and in which the rush cover exceeds that of any other growth form or bare ground. Included in the rush growth form are some species of *Juncus* and all species of *Empodisma*. Tussock-rushes are excluded (Atkinson 1985).

Saltmarsh

A wetland class embracing estuarine habitats of mainly mineral substrate in the intertidal and subtidal zones, but also including those habitats in the supratidal zone (such as wet coastal platforms) and in the inland saline hydrosystem, which although non-tidal have similar saline substrates and constancy of soil moisture. Water source is from groundwater and adjacent saline or brackish estuary waters. The saltmarsh wetland class includes non-vegetated habitats such as mudflats, and the full range of vegetation types typical of the intertidal zone, from herbfield to rushland, scrub, and mangrove scrub or low forest (Johnson and Gerbeaux 2004).

Sandfield

Land in which the area of bare sand (grain size 0.02-2 mm diameter) exceeds the area covered by any one class of plant growth-form. Dune vegetation often includes sandfields which are named from the leading plant species when plant cover ≥1% (Atkinson 1985).

Sandstone

A sedimentary stone made of sand that has been fused with some cementing element like clay or quartz.

Scrub

In this study, scrub refers to seral communities, often dominated by or with a large component of exotic species such as gorse, *Hakea*, woolly nightshade etc and/or commonly lacking a closed canopy and in which an understorey is either absent or composed primarily of exotic species.

Secondary vegetation

Indigenous vegetation established after destruction or disturbance of the previous vegetation and which is essentially different from the original vegetation.

Sedgeland

Vegetation in which the cover of sedges in the canopy is 20-100% and in which the sedge cover exceeds that of any other growth form or bare ground. Included in the sedge growth form are species of *Carex*, *Isolepis*, and *Bolboschoenus* (Atkinson 1985).

Sedimentary

Rocks formed from material, including debris of organic origin, deposited as sediment by water, wind, or ice and then compressed and cemented together by pressure.

Seral

Describes a plant community in an early stage of plant succession following natural or human-caused disturbance. The seral stage may succeed towards the pre-disturbed state or to an alternative climax community.

Shrubland

In this report areas of shrubland are defined as vegetation dominated by shrubs, with a closed canopy, and in more advanced stages containing an understorey of indigenous species.

In Manaia ED, there are two main types:

(i) Successional vegetation dominated by seral species such as manuka, kanuka, mahoe, etc., or shrubs such as hangehange, bracken, and kumarahou.

As used in this report it implies a closed canopy and in more advanced stages contains an understorey of indigenous species.

(ii) Seral vegetation where the rate of further succession is extremely slow, being limited by abiotic factors such as soil structure and fertility, wind shear, etc., e.g. gumland manuka shrubland, pohuehue shrubland on dunes.

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. small forest remnants and farm ponds in the within same catchment. Its boundaries may be defined by the edge of the habitat (where discrete), catchment or other geographical feature e.g. river, vegetation type or legal title.

Subfossil

A partly fossilised organism.

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 plants (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.

Survey no.

A sequential number given to each site (e.g. M02/007). The first letter and two figures refer to the NZMS 260 topographical map sheet which covers the site.

Swamp

A wetland that receives a relatively rich supply of nutrients and often also sediment via surface runoff and groundwater from adjacent land. Swamps usually have a combination of mineral and peat substrates. Leads of standing water or surface channels are often present, with gentle permanent or periodic flow, and the water table is usually permanently above some of the ground surface, or periodically above much of it (Johnson and Gerbeaux 2004). In Manaia ED, swamps are usually dominated by raupo, *Carex*, *Baumea articulata*, harakeke, and ti kouka.

Taxonomically indeterminate

Species for which information on their taxonomic relationships has either not been formally evaluated or remains in doubt. These species may warrant further conservation attention once their taxonomic status is clarified (de Lange *et al.* 2004).

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 discontinous 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 Otamatea ED Northland in which sparse totara trees form the canopy over an understorey of mainly exotic grasses. Treeland is mainly induced by grazing.

Tussockland

Vegetation in which the cover of tussocks in the canopy is 20-100% and in which tussock cover exceeds that of any other growth form or bare ground. Tussocks include all grasses, sedges, rushes, and other herbaceous plants with linear leaves that are densely clumped and >10 cm height. Examples include toetoe and species of *Cyperus* (Atkinson 1985).

Ultramafic

Igneous rocks or magmas that are rich in iron and magnesium and very poor in silica. The high concentration of magnesium inhibits plant growth. Ultramafic areas in New Zealand have a high number of endemic species.

Vegetation type

The most detailed vegetation descriptive name, 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 an area's natural communities 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

Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions (Resource Management Act 1991). Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres (Ramsar Convention on Wetlands 1971).

Index of sites