Natural areas of Rodney Ecological District (Northland Conservancy)

Reconnaissance survey report for the Protected Natural Areas Programme

2012

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Te Papa Atawhai

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Reconnaissance survey report for the Protected Natural Areas Programme

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2012

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Cover: *Poa billardierei* on Mangawhai Sandspit. Photo Courstesy of Wildland Consultants Limited (photographer Nick Goldwater).

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Foreword

The Rodney Ecological District (Northland) 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 38 significant natural areas of the part of Rodney Ecological District (ED) that occurs within Northland Conservancy. The natural areas were surveyed at various times between 2010 and 2012. A rapid ecological survey report for the PNAP was undertaken over the entire Rodney ED (Northland and Auckland Conservancies) in 1983–1984 by Mitchell et al. (1992); however, only three sites were identifed in that survey as best representing the ecological character of the Northland part of the ED.

Rodney ED (Northland) contains a mixture of low forested ranges and volcanic cones, areas of rolling pasture and alluvial plains, and extensive areas of estuarine and duneland habitats. Like much of Auckland and Northland, large areas of indigenous habitat in the ED (Northland) have been cleared and modified since human settlement, and the small forested areas that do remain are under constant pressure from surrounding land use, pest animals, and weeds. This survey has shown that habitats such as freshwater wetlands (including gumlands), alluvial floodplain forest, and coastal forest have been reduced significantly from their former extent in the Northland part of the ED.

The ED (Northland) has a rich history of Maori and European settlement. For early Maori, the close proximity of the Mangawhai Harbour to the Kaipara Harbour enabled portage of their waka (canoes) from coast to coast. The fertile volcanic soils of the Tara Valley provided excellent growing conditions for kūmara (sweet potato), while the sea and the foreshore provided an abundance of kaimoana. The arrival of the Europeans saw further clearance of the land and the rise of industries such as logging, gumdigging and farming, the latter of which is the predominant land use today. Nowadays, the spiritual and cultural values remain as strong for tangata whenua as in ancestral times. In particular, the maunga/mountains of Pukekararo, Pukeareinga and Pukepohatu are sacred to the local iwi, Te Uri o Hau.

Although large areas of indigenous forest in Rodney ED (Northland) suffer from a lack of ecological management, the stories of Mangawhai Sandspit and the Marunui Conservation Area demonstrate how much a group of determined and hard-working volunteers can achieve. Restoration of the extensive dunelands on the sandspit has been spearheaded by a local group known as the Mangawhai Harbour Restoration Society, which has worked alongside the Department of Conservation to revegetate the dunes with indigenous sand-binding plants, and to carry out pest animal and weed control. Further inland, local landowners in the Brynderwyn Hills have placed a large tract of forest under a QEII covenant, which is now known as the Marunui Conservation Area. Volunteers have been carrying out intensive pest animal and plant

control in the forest and shrublands, and it is hoped that North Island brown kiwi can be re-introduced into Marunui in the not too distant future. Of course, there are many other people in the ED (Northland) who quietly and determinedly carry out conservation work on their land, and their efforts also need to be recognised.

This report contains a significant amount of information on the ecological values of Rodney ED (Northland), which can be used to effectively guide conservation priorities within the Ecological District. Most importantly, it will help protect and restore natural areas by providing a key resource to a wide range of stake-holders, including landowners, local iwi, the Department of Conservation, local government agencies, planners, scientists, conservation groups, community groups, and the general public. It rests with these stake-holders to continue with their existing conservation efforts and to recognise the threats and opportunities upon which the future of our natural areas so often lies.

Chris Jenkins

Conservator Northland

Abstract

Rodney Ecological District (Northland Conservancy), hereafter Rodney ED (Northland), spans the boundaries of the Department of Conservation (DOC) Northland and Auckland Conservancies. This report covers the part of Rodney ED that occurs within the Northland Conservancy. Rodney ED (Northland) covers approximately 21 022 ha in the southeastern corner of the Northland Region, and is bordered by Otamatea ED to the west, Waipu ED to the north, and Rodney ED (Auckland) to the south (Fig. 1). A total of 38 significant natural areas covering 4694 ha (22.3% of the ED; 97% terrestrial and 3% harbour and estuary) were identified during a reconnaissance field survey undertaken between 2010 and 2012 (Fig. 2). Existing databases and reports were also used to provide information on natural areas. These natural areas comprise forest (3750.8 ha; 80%), estuarine habitat (597.6 ha; 12.7%), duneland/sandfield (249.7 ha; 5.3%), shrubland (48.4 ha; 1%), freshwater wetland (46.8 ha; 1%, 32.8 ha of which is open water), and rockland (0.4 ha; <0.01%). It should be noted that a significant proportion of shrubland was not identified in the larger natural areas because of the mosaic nature of these sites and the lack of accessible vantage points from which to view them. Data from LCDB2[1] shows that there are approximately 448 ha of kānuka/mānuka shrubland remaining in Rodney ED (Northland).

Rodney ED (Northland) is one of the most depauperate ecological districts for terrestrial natural areas in Northland. It contains a reasonable diversity of indigenous flora and fauna, including a range of 'Threatened', 'At Risk' and regionally significant species, as well as several rare ecosystem types. 'Threatened' species present include 8 birds; 'At Risk' species include 11 plants, 11 birds, 2 land snail species, 1 lizard, 1 frog, 3 fish, and 1 aquatic invertebrate. There are also a further 28 regionally significant species, which are considered uncommon or threatened in Northland (22 plants, 5 birds, 1 lizard, and 1 fish species).

The majority of 'Threatened', 'At Risk' and regionally significant species occur in the four largest sites: Pukeareinga Scenic Reserve and Surrounds (ROD001), Pukepohatu, Cattlemount and Surrounds (ROD003), Pukekaroro Scenic Reserve and Surrounds (ROD004), and Mangawhai Harbour, Sandspit and Surrounds (ROD014), although a few smaller sites such as Mangawhai North Head Remnants (ROD013), Sentinel Rock (ROD031) and Mangawhai Heads Dune Lake and Wetland (ROD039) support high numbers of threatened species relative to their size. The size, ownership and accessibility of these sites are commensurate with the scale of survey that has been undertaken. That is to say, survey effort has generally taken place in the larger natural areas, and biodiversity values are mostly not known for the many privately owned remnants that are scattered across the rolling hills and alluvial plains of Rodney ED (Northland). Only two sites could not be viewed at all during the 2010–11 survey. The four largest sites are all legally protected to varying

[1] Land Cover Database series 2 uses existing satellite images of New Zealand from 2001/2002, and translates them into information describing different types of land cover that exist on the ground (Ministry for the Environment).

degrees, with ecological management by DOC and volunteers primarily focused on the Sandspit within site ROD014 and a substantial part of forest within the Marunui Conservation Area (in ROD003). Conservation work is also being undertaken a smaller scale on private land by landowners who have indigenous remnants protected under covenants.

Dunelands/sandfields, estuarine habitats, and inland forests are the dominant vegetation types in Rodney ED (Northland). Freshwater wetlands and originally nationally rare ecosystems such as gumlands are poorly represented in the ED, and most have been degraded by weeds, stock, subdivision development and drainage. Mangawhai Harbour, Sandspit and Surrounds (ROD014) contains key habitats for indigenous birds, supporting a disproportionately high number of 'Threatened' and 'At Risk' bird species relative to other habitats in the ED. Rodney ED (Northland) is a national stronghold for New Zealand fairy terns, which breed on the Mangawhai Sandspit.

Approximately 18.6% (876.3 ha) of the natural areas identified are formally protected within reserves and covenants, which is equivalent to about 4% of the total extent of Rodney ED (Northland). The dunes at Mangawhai Sandspit are of national ecological significance and are currently protected within Mangawhai Government Purpose Wildlife Refuge Reserve. Priorities for protection include saltmarsh, coastal pōhutukawa forest and gumland within Mangawhai Harbour, Sandspit and Surrounds (ROD014), which contain nationally and regionally uncommon habitat types and support a number of 'Threatened', 'At Risk' and regionally significant species. Other priorities for protection include:

1. Mangawhai Heads Dune Lake and Wetland (ROD039), which comprises a high-quality freshwater wetland and the only example of a dune lake in Rodney ED (Northland)
2. Sentinel Rock (ROD031)
3. Protection of critical buffers and linkages, particularly those that extend along the Hakaru River in Hakaru River Forest Ribbon (ROD008) and Valley Road Remnants (ROD009).

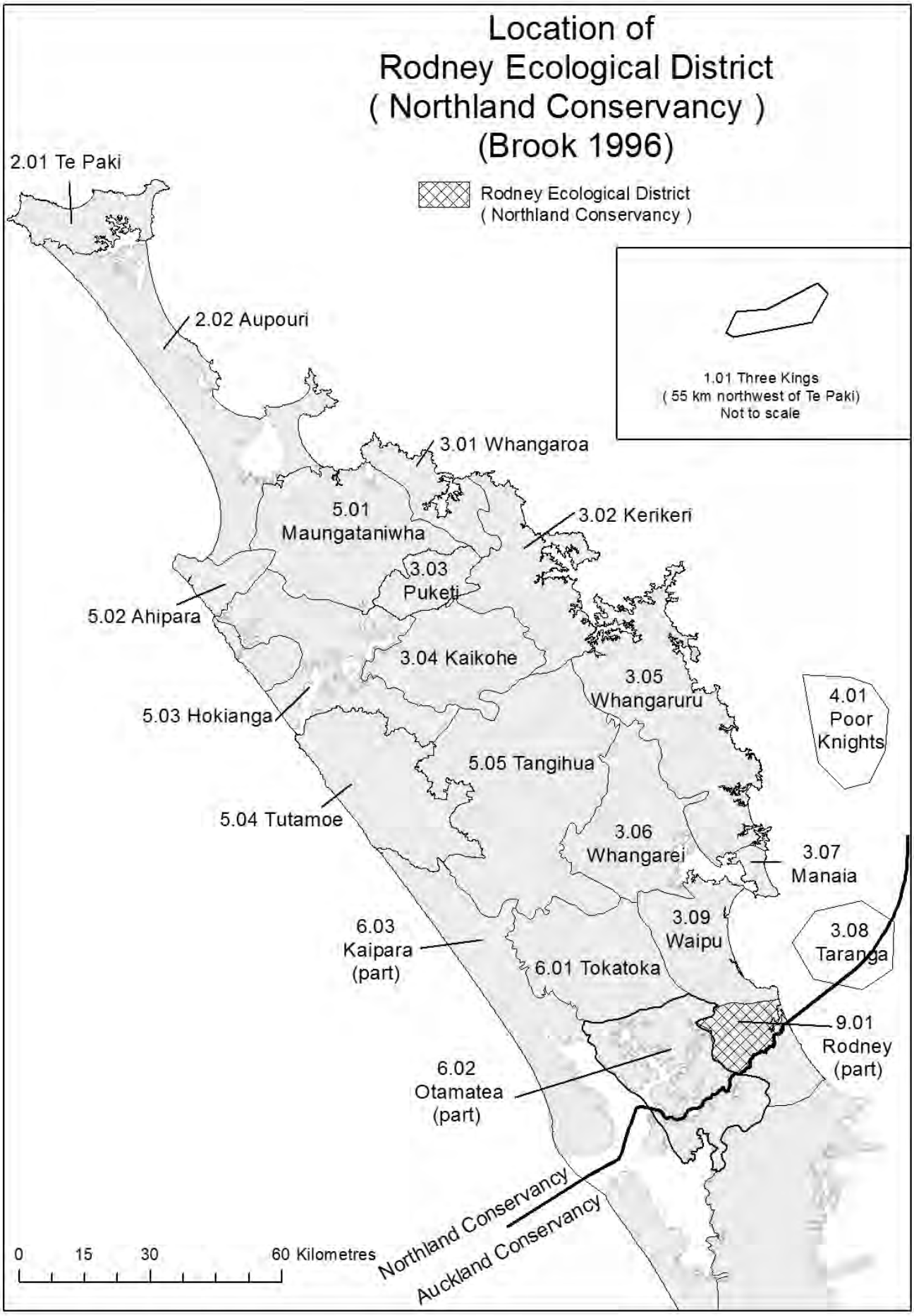

Figure 1. Location of Rodney Ecological District (Northland Conservancy) (Brook 1996)

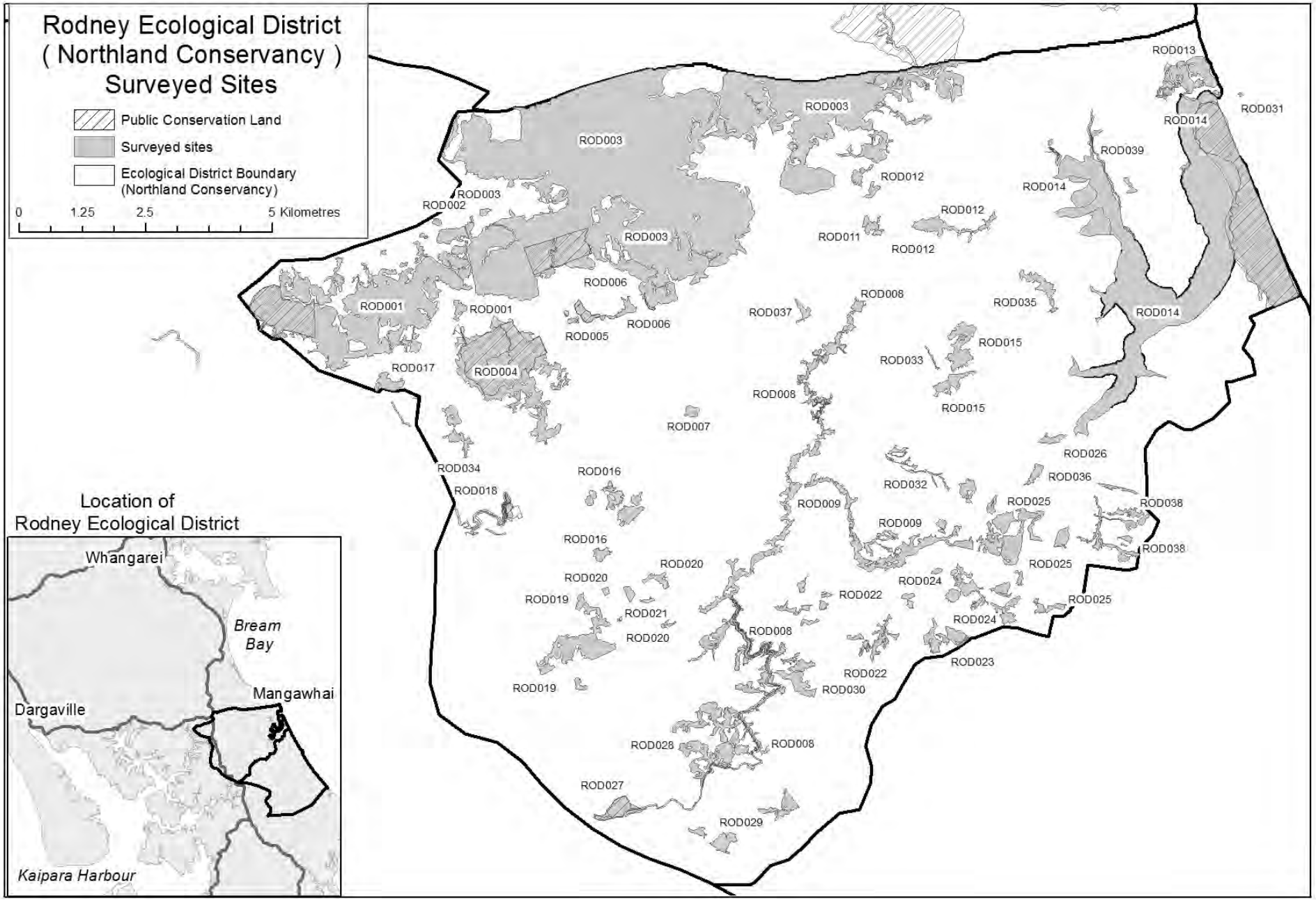

Figure 2. Map of surveyed sites, Rodney Ecological District (Northland Conservancy)

1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

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

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

The goal of the programme is:

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

The specific aim of the PNAP is to identify, by a process of field survey and evaluation, natural areas of ecological significance throughout New Zealand that are not well represented in existing protected natural areas, and to retain the greatest possible diversity of landform and vegetation patterns characteristic of the ecological district, and 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 maintain the diversity of lesser known species.

This report is based on reconnaissance surveys undertaken between 2010 and 2011, and in 2012 and existing published and unpublished data, and includes descriptions of significant natural areas within Rodney ED (Northland).

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 (DOC) that arise 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. The New Zealand Biodiversity Strategy (MfE & DOC 2000) sets out the importance of New Zealand's indigenous biological diversity in a national and international context, and a strategy for halting the decline of our indigenous biodiversity.

National priorities for the protection of indigenous biodiversity on private land have been provided by the Ministry for the Environment (MfE 2007). These priorities provide guidance to local authorities who have responsibility for the maintenance of indigenous biodiversity under Sections 30 and 31 of the Resource Management Act. The four national biodiversity priorities include: the protection of indigenous vegetation associated with land environments with less than 20% remaining in indigenous vegetation; habitats of threatened and at risk indigenous species; originally rare vegetation types; and indigenous vegetation and habitats associated with wetlands and sand dunes.

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, and developed the Protected Natural Area Programme. 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 Rodney ED (Northland). It includes maps and brief descriptions of most of the indigenous natural areas within the ecological district, together with an analysis of the main vegetation types and information on threatened species and other species of scientific interest. Natural areas in Rodney (ED) Northland were surveyed by DOC between 2010 and 2011, and six sites were also surveyed by Wildland Consultants Ltd in 2010 and 2012. The first rapid ecological survey of Rodney ED was undertaken as one of four pilot studies for the development of the PNAP (Kelly & Park 1986; Mitchell et al. 1992). This survey provided detailed indigenous vegetation maps, and identified 27 high-level 'Priority Places for Protection'. Significant vegetation sites and Sites of Special Wildlife Interest (SSWI) were also identified.

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.

2. Methods

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. Between 1997 and 2012, survey work on a further six[3] ecological districts was completed.

The survey of Rodney ED (Northland) was part of this larger study. Field work was carried out between 2010 and 2012, mainly by Peter Graham (DOC), assisted by Wendy Holland (DOC), and co-ordinated in the Whangarei Office of Northland Conservancy.

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 land tenure. Consequently, many natural areas which are administered by DOC, as well as other protected areas, were also surveyed using the same methods. This provided a consistent approach to determining representativeness of unprotected natural areas.

Each site was mapped and described using aerial photography from 2002 and 2008. Following evaluation (see assessment criteria in Section 2.5 below), sites 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).

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 & Hayward (1996) (See Appendix 4).

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 (available at fwdb.niwa.cri.nz), published information, and DOC internal reports when compiling this report.

In order to compile up-to-date plant records for Rodney ED (Northland), herbarium records were consulted from the Auckland Institute and Museum (AK). Geographical and geological information was gained from existing published and unpublished maps. Landform and geological information (Section 3.2) for Rodney ED (Northland) was supplied by Bob Cathcart.

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[2] Te Paki, Aupouri, Maungataniwha, Ahipara, Whangaroa, Hokianga, Puketi, Kerikeri, Kaikohe, Tutamoe, Tangihua, Whangaruru, and Whangarei.

[3] The EDs are Rodney (Northland), Tokatoka, Otamatea (Northland), Waipu, Kaipara (Northland), and Manaia.

Although a few sites were not surveyed in detail during 2010–2011, large amounts of data have been collected, considerably expanding the information base for Rodney ED (Northland Conservancy). However, 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 survey being undertaken. A Landowner letter (see Appendix 2) was hand delivered into letterboxes when this was able to be done during the course of the survey and letters were handed out to those encountered whilst conducting the survey.

In some instances, permission for access was sought from landowners either by telephone or direct visit, and was generally given.

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 areas were not sighted or surveyed in full due to limited views and 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 2010–11 surveys did not differentiate between mānuka and kānuka in many sites, possibly because the sites were observed from too great a distance. In such cases, 'kānuka/mānuka' 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 & Rogers 1996;) and in other parts of the world (see Mueller-Dombois & Ellenberg 1974; Park & Walls 1978; Kershaw & Looney 1985). 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 favored 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 Wildland Consultants using information from published and unpublished maps, reports and topographical maps. Bob Cathcart also provided information on soils and geology for the Rodney ED (Northland). This information was combined with vegetation types to determine ecological units defined by particular vegetation-geomorphological characteristics, e.g. kānuka 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 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 DOC, Northland Conservancy Office, Whangarei.

2.3.2 Fauna

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

- SSBI files held at the Northland Conservancy office, DOC.
- The Bioweb Herpetofauna database.
- The New Zealand Freshwater Fish Database. (available at fwdb.niwa.cri.nz)
- Incidental field observations during this PNAP survey by DOC (2010–11) and Wildland Consultants Ltd in 2010 and 2012.
- Atlas of Bird Distribution in New Zealand 1999–2004 (Robertson et al. 2007).

2.4 NATIONALLY THREATENED, 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, O'Donnell et al. (2010) for bats, Newman et al. (2010) for frogs, Allibone et al. (2010) for fish, Hitchmough et al. (2010) for reptiles, Baker et al. (2010) for marine mammals (suborders Cetacea and Pinnipedia), Freeman et al. (2010) for marine invertebrates, Glenny et al. (2011) for bryophytes and Hitchmough et al. (2007) for all other biota.

The threat classification system used in this report for birds, reptiles, frogs, fish and vascular plants is based on Townsend et al. (2008) (see Appendix 3).

The classification system for remaining biota (i.e. aquatic 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 Rodney ED (Northland) 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'.

Species classified as 'regionally significant' by DOC Northland Conservancy (DOC, unpubl. data; W. Holland pers. comm.) are those which are not 'Threatened' or 'At Risk', but those that are currently considered to be uncommon or threatened within the Northland Region.

Nomenclature follows Miskelly et al. (2008) for threatened indigenous bird species, de Lange et al. (2009) for vascular plants, O'Donnell et al. (2010) for bats, Allibone et al. (2010 for fish, Newman et al. (2010) for frogs, Hitchmough et al. (2010 for reptiles, and Hitchmough et al. (2007) for all threatened indigenous invertebrates. 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 (2005). The individual site descriptions detail known significant fauna only. Most of the common bird species of Northland and Auckland, both indigenous and introduced, are to be found in Rodney ED (Northland).

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, and the structure and characteristics of a natural area that are important for the maintenance of ecosystem viability (including the presence of a buffer, linkage or corridor, and the size, and shape of a natural area).

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 Rodney ED (Northland) (i.e. 'regionally significant' species).
3. Contain the best representative examples in Rodney ED (Northland) of a particular ecological unit or combination of ecological units.
4. Have high diversity of taxa or habitat types for Rodney ED (Northland).
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 Rodney ED (Northland) 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 Rodney ED (Northland).

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 details the links between the PNAP criteria and Levels 1 and 2.

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. mature 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.

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

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness	Contains the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units (3). Supports good populations of taxa that 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 pattern	Has a high diversity of taxa or habitat types for the Ecological District. (4).	May contain only one habitat type and/or have a low diversity of taxa relative to other areas of a similar type.
Naturalness	Exhibits a higher level of naturalness than other examples of its type.	Exhibits a lower level of naturalness than other examples of its type.
Buffering/corridors and linkages	Forms ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna (5).	May be heavily impacted by external influences or may be fragmented and isolated from other natural areas
Size and shape	Covers a large geographic area relative to other similar habitat types within the Ecological District (9).	Is likely to be small relative to other similar examples of its type, or if large, is not the best example of its type and meets no other criteria for a Level 1 site.
Long-term ecological viability	If the long-term viability of the site is high or medium, it is likely to meet one or more of the other criteria above, or if low, may nevertheless be the best or only example of its type in the Ecological District.	May require a high degree of management to achieve viability or may never be viable under present circumstances or if viable, may not meet any other criteria for a Level 1 site.

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

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 Section 5.1.3 and Table 5).

3. Ecological character

3.1 LOCATION AND SETTING

The northern part of Rodney ED that lies within the Northland Conservancy covers approximately 21 022 ha and is located in the southeastern corner of the Northland Region. This part of Rodney ED shares key features with adjacent ecological districts. The Brynderwyn Range to the north straddles the boundary dividing Rodney ED (Northland) and Waipu ED. On the east coast of the ED, the dominant feature of Mangawhai Sandspit is part of an extensive duneland habitat that extends south towards Te Arai and Pakiri in Rodney ED (Auckland). The Auckland Conservancy part of Rodney ED covers approximately 157 912 ha, from the Topuni River southwards. Interestingly, Rodney ED (Northland) has watersheds that feed into both the Kaipara and Mangawhai harbours.

The dunes and prominent headlands and coastal cliffs at Mangawhai Heads that define the east coast of Rodney ED (Northland) contrast with the western part of the ED, which borders Otamatea ED. This part of the ED is characterised by the estuarine inlets of the Kaiwaka and Wairau Rivers, which are dominated by mangroves and extensive mudflats that abut pockets of indigenous forest. Key habitat types in Rodney ED (Northland) include inland forests dominated by kauri, tōtara, kahikatea and kānuka/mānuka, and dunelands and saltmarsh. Freshwater wetlands and originally rare ecosystem types such as gumland are poorly represented. Gumlands were once a feature of this ED, but they have nearly all been modified or developed. The majority of the remaining indigenous vegetation is situated in the northwest of the ED, contiguous with the larger tract of forest in the Brynderwyn Range, one of the most significant forested areas remaining in Northland. The central and southern parts of Rodney ED (Northland) are characterised by numerous small forest remnants scattered across a sea of pastoral land. These remnants typically comprise common indigenous species such as tōtara, kahikatea and kānuka/mānuka.

Te Uri o Hau, Ngatiwai and its hapū Patuharakeke all have traditional links with the area spanning from Bream Tail across to the Brynderwyn Hills (Pierce & Marunui Conservaton Ltd 2010). Mangawhai was of strategic importance for both the local iwi and early European settlers. The close proximity of the Mangawhai Harbour to the Kaipara Harbour enabled portage of Maori waka from coast to coast. The rich volcanic soils of the Tara Valley provided excellent growing conditions for kūmara, while the sea and the foreshore provided prolific shellfish and seafood. Early European settlement depended significantly on Mangawhai Harbour as a point of access for the first settler farmers who included the former soldiers. Albertlanders, who settled further to the west on the Kaipara, used Mangawhai as a place of entry and Nova Scotians also were among the early arrivals (Mangawhai Historical Society 2012).

3.2 TOPOGRAPHY/GEOLOGY

The southern side of the Brynderwyn Range forms the northern boundary of the Rodney ED (Northland). This is a steep scarp face of a greywacke fault block that is tilted to the north, with the fault running along the base of the scarp and is the southern-most outcropping of greywacke in the Northland Region. Waitemata Banded Sandstones underly much of the undulating to gently rolling land that extends to Dome Valley (near Warkworth, outside the extent of Rodney ED (Northland). Mangawhai Heads, Cattlemount, Pukekaroro and the steeper and higher hills that extend westward through to Maungaturoto along the northern part of the ED are Parahaki (dacite) volcanics. The main rock type is rhyolite (almost totally silica, with very little iron or aluminium) and at the opposite end of the scale chemically to the iron and aluminium-rich basalts that formed Tara, the lone basaltic dome in this volcanic group.

Rodney ED (Northland) is also the southern (remaining) extent of the Northland Allochthon with calcareous mudstones and soft limestones forming a gently rolling to undulating landscape throughout the district. Ash showers from central North Island rhyolite volcanoes deposited on the area have washed off the hills and concentrated in or around the edges of basins. This silica-rich alluvium podzolises more rapidly than alluvium from other sources, creating the gumfields found in the Mangawhai area. Sand drifts along the eastern coast and alluvium carried by rivers have dammed off valleys leading to the formation of peat basins.

The sand deposits range in age from recent drifts of dune sand through to strongly podzolised old dunes and estuarine deposits. Hollows within the dunes have also filled with peat.

3.2.1 Soils

The greywacke scarp face of the Brynderwyn Range has skeletal Te Ranga soils, although some of the easier slopes have older Marua soils. Soils on the Waitemata Sandstones in the district range in age from Puhoi clay loam, weakly to moderately leached Yellow Brown Earth, Wharekohe fine sandy loam, a mature podzol often with a silica pan, including at least four soil types of increasing maturity. The ash alluvium deposits on higher terraces and around the edges of alluvial flats and peat swamps mature more quickly than other alluvial soils in the area, resulting in mature or podzolised soils such as those of the Waitemata Suite, which range from moderately leached Otao silt loam through to highly podzolised Wharekohe fine sandy loam (ash variant). Soils on sand deposits range in age also, from recent dunes with little or no soil development through Redhill sand, which has developed under broadleaved forest, through to Te Kopuru Sand, a mature podzol developed under the influence of dense stands of kauri, but which would have only carried gumland shrubland at the time of or soon after the arrival of Maori.

Soils formed on rocks of the Northland Allochthon are heavier clays and would have supported mainly podocarp forest and shrubland, except on more unstable or steeper land where land disturbance would have rejuvenated the soil and supported broadleaved forest.

3.3 CLIMATE

3.3.1 General

Northland's climate is influenced by its northerly location (latitudes 34°S to 36°S), the narrowness of the peninsula (no areas are more than 50 km from the sea), and its generally low topography (most areas are below 150 m a.s.l.). Summers are warm and humid, and winters mild. Mean annual air temperatures vary from 14°C to 16°C. Air frosts are infrequent in Northland, but ground frosts (± 1°C at 2.5 cm above ground) are not uncommon, especially inland. Annual sunshine hours vary little across Northland, with 2000 hours at low altitudes, decreasing to 1700 hours at higher altitude sites. Rainfall peaks in winter, with the driest seasons being summer and early autumn, and there are usually one or two 'dry spells' (periods of fifteen or more consecutive days with less than 1 mm of rain on any one day) between December and March. Mean annual rainfall ranges from 1200 mm to 2400 mm. Winds are from the southwest, with inland areas being more sheltered than exposed coastal sites (mean annual wind speeds range from 10 to 30 km/hour). Gale force winds can occur at any time, but are most common in winter. The occurrence of fog and thunderstorms varies from 1 to 75 and 3 to 16 days per year, respectively (Moir et al. 1986).

3.3.2 Climate of Rodney ED (Northland)

Rodney ED (Northland) experiences a warm and moist climate with high sunshine hours (2000 p.a.), high humidity and a prevailing westerly wind. Temperatures average 19°C in summer and 10°C in winter. Mean annual temperatures in eastern Northland (including Rodney ED (Northland)) vary from 15.5°C to 16°C, similar to those on the Aupouri Peninsula and slightly warmer than in western Northland. The annual average rainfall at Tara is 1600 mm. Generally, the area is sheltered in the east by the Hauraki Gulf Islands and in the west by the Kaipara South Head dune barrier and Kaipara Harbour (Moir et al. 1986; Mitchell et al. 1992).

3.4 VEGETATION AND FLORA

A preliminary plant species checklist for Rodney ED (Northland) is presented in Appendix 5. The species list was prepared based on herbarium records, existing literature, the 2010/2012 reconnaisance survey, and a field survey by Wildland Consultants carried out in April 2012. Because of the reconnaissance nature of the survey, 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

In pre-human times, Rodney ED (Northland) would have been dominated by old-growth podocarp-broadleaved forests reflecting a temperate climate with plentiful rain (McEwen 1987; Mitchell et al. 1992; Lux et al. 2007). These forest communities would have included tall kauri forest on the inland ridges and slopes and moderately diverse podocarp-broadleaved forest throughout.

Some of the valley floors (e.g. tributaries of Tara Creek) would have supported dense taraire, tōtara and kahikatea forest (Mitchell et al. 1992; Lux et al. 2007) merging with extensive swamp forests, wetlands and saltmarshes in the lower reaches of Mangawhai Estuary. Coastal headlands and beaches at Mangawhai Heads would have featured pōhutukawa-dominant coastal forest. Some of the species which are now less common, such as tawāpou, karo, milk tree, coastal maire, puka, and parapara, may have been present. Harakeke, wiwi and kakaha would have festooned the steep coastal cliffs. Holocene dunefields would have supported shrubland dominated by *Kunzea ericoides* var. *linearis* and mānuka, while extensive mobile dune systems would have been characterised by spinifex, pīngao, and shore spurge with occasional *Pimelea villosa* and *Poa billardierei*.

Significant areas of primary forest were cleared during Maori settlement in Rodney ED (Northland), and by the time Europeans arrived and settled during the latter half of the 19th and early 20th centuries, much of the ED was covered in kānuka/mānuka shrubland (Lindsay et al. 2009). However, the arrival of the Europeans saw the exploitation of kauri and other forest timbers from the Brynderwyn Hills (known then as 'Waipu Hills'). Permanent European settlement occurred when further land was obtained from Maori and cleared for livestock farming. Some early farming families conserved pockets of bush during land clearance (Mangawhai Historical Society 2012), and stands of indigenous forest were occasionally retained on steeper slopes as a source of domestic timber and food (Lux et al. 2007). Overall, however, the forest cover was decimated. After the timber boom of the 1870s–90s, farming and, later, exotic forestry activities became prevalent.

3.4.2 Present day vegetation

Rodney ED (Northland) has a long history of human occupation and modification of the natural landscape. The natural areas of the ED are highly modified and most of the remaining indigenous vegetation is fragmented. There are, however, sizeable areas of regenerating forest in the area, often dominated by kānuka, kauri, tōtara, taraire, pūriri and kahikatea. Small, scattered remnants dominated by tōtara are a feature of the ED. Areas of kānuka- or mānuka-dominant shrubland are rare in Rodney ED (Northland), and are largely restricted to Mangawhai Heads.

Freshwater wetlands and swamp forests have been significantly reduced from their original extent and are now very under-represented in Rodney ED (Northland). Many former wetlands have been modified or destroyed by vegetation clearance and drainage. Existing wetlands are small and scattered in the district and consist mainly of raupō and *Machaerina* spp. reedlands. Gumland soils would have once been a feature of this ED, particularly around Mangawhai, but most of these have either been developed or degraded by weeds. Conversely, large areas of intact saltmarsh and estuarine intertidal flats are still present in Mangawhai Harbour.

Large, intact areas of dunelands are present at Mangawhai Sandspit, supporting extensive sand dune communities characterised by pīngao, spinifex and the 'At Risk' indigenous grass *Poa billardierei*. These communities continue to be threatened by human activities such as quad-biking and invasive weeds such as marram, Sydney golden wattle, pampas and lupin.

3.4.3 Main vegetation types

FORESTS

Inland forest on low hills is the most abundant indigenous habitat type in Rodney ED (Northland). The largest tract of forest remaining in the ED is within Pukepohatu, Cattlemount and Surrounds (ROD003), which includes approximately half of the Marunui Conservation Area in the Brynderwyn Range. Other significant areas of forest include Pukeareinga Scenic Reserve and Surrounds (ROD001), and Pukekaroro Scenic Reserve and Surrounds (ROD004). The rapid urban development around the villages of Mangawhai Heads and Mangawhai on the east coast of the ED has resulted in the removal of virtually all coastal forest. The three examples of coastal forest that remain in the ED occur at Mangawhai North Head Remnants (ROD013), Mangawhai Harbour, Sandspit and Surrounds (ROD014) and Old Waipu Road Remnant (ROD035).

Podocarp and kauri forest

Kauri forest

The most significant area of kauri-dominant forest in Rodney ED (Northland) occurs at Pukekaroro Scenic Reserve and Surrounds (ROD004). Other kauri-dominant areas are present at Pukeareinga Scenic Reserve and Surrounds (ROD001), Pukepohatu, Cattlemount and Surrounds (ROD003), Cooks Stream Scenic Reserve (ROD005) and Cames Road Forest Remnants (ROD025). In the ED, kauri forest largely occupies moderate to steep slopes, where it commonly occurs with tānekaha, tōtara, kahikatea and kānuka and/or mānuka.

Tōtara forest

Tōtara typically occurs on alluvium (e.g. Hakaru River Forest Ribbon (ROD008)) and in small, inland forest remnants such as Valley Road Remnant (ROD009), Settlement Road Forest Remnants (ROD020), Pritchard Road Forest Remnants (ROD022) and Topuni Farm Bush Remnants (ROD030).

Kahikatea forest

Kahikatea occurs as a co-dominant canopy species on hillslopes in small forest remnants such as Pretty Bush (ROD002), Valley Road Remnant (ROD009), Kaiwaka Mangawhai Road Remnants (ROD016), Otioro Road Forest Remnants (ROD019) and Settlement Road Forest Remnants (ROD020).

Broadleaved Forest

Pōhutukawa forest

Pōhutukawa forest is restricted to three sites within Rodney ED (Northland). Pōhutukawa is the dominant canopy species in coastal forest at Mangawhai North Head Remnant (ROD013) and Mangawhai Harbour, Sandspit and Surrounds (ROD014). Unusually, it also occurs at the inland site Lois Wintles Bush and Pōhutukawa Remnant (ROD011), which is beyond the influence of the coastal bioclimatic zone. This particular forest is described as the only pōhutukawa forest on inland lowland hills in the entire ED (both Northland and Auckland) (Mitchell et al. 1992).

Taraire forest

Taraire is the most common broadleaved canopy species in Rodney ED (Northland) and occurs on north- and south-facing slopes of Pukeareinga

Scenic Reserve and Surrounds (ROD001), in Pukekaroro Scenic Reserve and Surrounds (ROD004), Otioro Road Forest Remnants (ROD019) and Cames Road Forest Remnants (ROD025). It is occasionally co-dominant with tōtara and kahikatea.

Kānuka and/or Mānuka Forest

Forest characterised by mature kānuka and/or mānuka is probably the most widespread forest type in the ED, occurring both in coastal and inland sites where it is co-dominant with a range of species such as tōtara, kauri, mamaku and nīkau.

SHRUBLANDS

Shrubland habitats (excluding estuarine shrubland) comprise only a minor part of the indigenous vegetation surveyed in Rodney ED (Northland). It should be noted, however, that shrubland is significantly more common in the ED than the survey indicates. Data from Land Cover Database 2 shows that there are approximately 448 ha of kānuka/mānuka shrubland remaining in the district (Northland). It is likely that a large proportion of this was either missed during the survey and/or classified as 'kānuka/mānuka forest' rather than 'kānuka/mānuka shrubland'.

Shrublands are likely to contain moderate to high biodiversity values and provide important habitat for threatened and uncommon fauna and flora. Kānuka and/or mānuka are the most common canopy shrubland species. Gorse-dominant shrubland also occurs frequently, some of which has been included in significant natural areas (e.g. ROD003, ROD019, and ROD032).

Kānuka and/or Mānuka Shrubland

Kānuka/mānuka shrubland occurs at Mangawhai North Head Remnant (ROD013), where it occurs with mamaku, kūmarahou, sedges, gorse, banksia, tānekaha, hangehange, tī kōuka, pōhutukawa, pampas, woolly nightshade, prickly hakea, and emergent pine. Mānuka is dominant in gumland areas at ROD013 and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (see below for detailed descriptions). As previously discussed, this survey has not described the full extent of shrubland remaining in this ED.

Harakeke flaxland

Harakeke occurs with coastal toetoe, wīwī, kakaha, and pōhuehue on Sentinel Rock (ROD031).

ESTURINE WETLANDS

Rodney ED (Northland) contains some significant areas of saltmarsh, albeit restricted to one site: Mangawhai Harbour, Sandspit and Surrrounds (ROD014). In Mangawhai Harbour, mangroves are the dominant species. Along the southern margin of the harbour, mangroves grade into sea rush, oioi, saltmarsh ribbonwood, *Austrostipa stipoides* and glasswort, with local exotic iceplant and saltwater paspalum. Further inland, near the King Road-Cove Road intersection, oioi and saltmarsh ribbonwood saltmarsh occurs with tī kōuka, harakeke, mānuka, māpou and *Olearia solandri*. The saltmarsh near Cove Road is characterised by oioi and sea rush with occasional mangroves, saltmarsh ribbonwood, *Olearia solandri* and māpou.

Freshwater wetlands

Swamps

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 nutrients when river or lake levels are high. Very few fertile freshwater wetlands have been recorded from Rodney ED (Northland), although the ones that are known are largely characterised by associations of raupō reedland, *Machaerina* spp. and reed sweetgrass. The best example of a freshwater wetland in the ED occurs at Mangawhai Heads Dune Lake and Wetland (ROD039), which contains representative examples of *Machaerina articulata-Eleocharis sphacelata* reedland and *M. rubiginosa* sedgeland in swamp. It is likely that several very small swamps are present on rural land across the ED.

Gumland

Gumland is recognised as an originally rare ecosystem type (Williams et al. 2007) that is restricted to Northland, Auckland and Coromandel. Gumlands were once a feature of Rodney ED (Northland), although they are now rare due to extensive modification and development. Gumlands are typically dominated by mānuka occurring on strongly leached, podzolised, infertile soils where drainage is impeded. Mānuka dominates drier gumlands (better drained sites under lower rainfall), and tangle fern wetter gumlands (poorly drained sites under higher rainfall), with mixed communities occurring on intermediate sites (Clarkson et al. 2011). This habitat type is very rare in the ED, with only two examples recorded during this survey: Mangawhai Harbour, Sandspit and Surrounds (ROD013) and Mangawhai North Head Remnant (ROD014). Mānuka shrubland is the dominant canopy species at both sites. At ROD014, associated understorey species include *Gleichenia microphylla*, *Schoneus tendo*, *S. brevifolius*, *Lepidosperma laterale* and clubmoss (*Lycopodium deuterodensum*). Weed species are common on the margins of the gumland this site and include banksia, cotoneaster, hakea, wild ginger, wilding pine, Dally pine, climbing asparagus and gorse.

ROCKLANDS

Sentinel Rock (ROD031), at Mangawhai Heads, is a rock island and is the only example of its type in the Rodney ED (Northland). The vegetation is characterised by harakeke, coastal toetoe, wīwī, kakaha, and pōhuehue with scattered exotic grass species and giant umbrella sedge, and local patches of salt-resistant herbs such as native iceplant, glasswort and sea primrose. Natural regeneration of larger woody species such as pōhutukawa and karo is slowly occurring, following a fire in 1954. Rock outcrops are conspicuous at Pukepohatu, Cattlemount and Surrounds (ROD003), but have not been specifically mapped in this survey.

DUNELANDS

Dunelands in Rodney ED (Northland) are restricted to Mangawhai Harbour, Sandspit and Surrounds (ROD014), which comprises most of the eastern boundary of the ED. The site contains substantial areas of mobile marine sands which form part of a dune system that extends south to Pakiri Beach.

- Where the foredunes are vegetated, pīngao[4] is the dominant species, occurring with frequent spinifex and occasional marram and shore bindweed. On steep, exposed dune faces, the 'At Risk' grass *Poa billardierei* is locally abundant amongst pīngao.
- Ephemeral dune slacks are dominated by *Carex pumila* with scattered herbaceous species such as *Lobelia anceps*, *Limosella lineata*, *Microtis unifolia*, *Senecio biserratus* and *Pseudognaphalium luteoalbum*. The native grass *Lachnagrostis billardierei* is also present. Wīwī and oioi are co-dominant in other dune slacks, occurring with common *Carex pumila* and *Lobelia anceps*, and occasional coastal toetoe and pampas.
- On back dunes, Sydney golden wattle is dominant with scattered gorse, blackberry and coastal toetoe.

3.4.4 Nationally Threatened and At Risk plants

There are no records of Threatened plants from Rodney ED (Northland). There are records of 12 At Risk species: 2 are classed as Declining, 7 as Naturally Uncommon, 2 as Relict, and 1 as Coloniser (Table 2).

TABLE 2. NATIONALLY THREATENED AND AT RISK PLANT SPECIES (AS PER CLASSIFICATIONS IN DE LANGE ET AL. 2009) RECORDED IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY).
* = NOT RECORDED RECENTLY, I.E. PRE 1980s—SEE SECTION 3.4.6

TAXON	COMMON NAME	PLANT GROUP	THREAT CATEGORY	QUALIFIER
Kunzea ericoides var. *linearis*	Rawiri	Dicot shrub	Declining	
Poa billardierei	Sand tussock	Grass	Declining	SO
Halocarpus kirkii	Monoao	Gymnosperm	Naturally Uncommon	RF
Hypolepis dicksoniiodes		Fern	Naturally Uncommon	SO, EF
Libocedrus plumosa	Kawaka	Gymnosperm	Naturally Uncommon	Sp
Molloybas cryptanthus	Hidden spider orchid	Orchid	Naturally Uncommon	
Petalochilus alatus		Orchid	Naturally Uncommon	
Schizaea dichotoma	Fan fern	Fern	Naturally Uncommon	SO
Tetragonia tetragonioides	Kōkihi	Dicot herb	Naturally Uncommon	EF, SO
Ficinia spiralis	Pingao	Sedge	Relict	CD, Inc, Sp
Pisonia brunoniana	Parapara	Dicot shrub	Relict	TO
Drosera peltata	Sundew	Dicot herb	Coloniser	DP, EF, SO

[4] Volunteers have planted thousands of pīngao and spinifex plants on the Mangawhai Sandspit.

AT RISK

***Kunzea eriociodes* var. *linearis* (Declining $_{SO}$)**
This small shrub is endemic to the northern North Island where it is most abundant from Kaitaia north. It occurs in coastal shrublands and on cliff faces, usually on sand, sand podzols, and/or sandy peats, and is occasionally found inland (NZPCN 2012). In Rodney ED (Northland), it has been recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Townsend 2012), where it is common throughout sand dunes and sandy soils (DOC Bioweb database, viewed 2011). It was been recorded from Cove Road in 2000 (P.J. de Lange, DOC, pers. comm. 2012).

***Poa billardierei* sand tussock (Declining $_{SO}$)**
This grass species used to occur throughout the country on coastal sand dunes; however, its range has been severely reduced by grazing and browsing mammals, and weeds such as marram grass (NZPCN 2012). In Rodney ED (Northland), a good population of over 400 plants was located on the steep foredunes of Mangawhai Harbour, Sandspit and Surrounds (ROD014) during a survey by Wildland Consultants in 2012.

***Halocarpus kirkii* monoao (Naturally Uncommon $_{RF}$)**
Monoao is a small conifer endemic to the upper half of the North Island and Great Barrier Island. The species is associated with kauri forest. In mature kauri forest it is most usually found in apparently even aged cohorts of 10 or fewer trees along ridge lines, in swampy hollows or at gully heads. Monoao appears to thrive on disturbance and it is at its most abundant on the margins of kauri and gumland vegetation sites originating from past fires, gum-digging and/or kauri logging (NZPCN 2012). In Rodney ED (Northland), this species was recorded from Valley Road Remnants (ROD009) during the 2010 survey.

***Hypolepis dicksonioides* (Naturally Uncommon $_{SO, EF}$)**
Hypolepis dicksonioides is an indigenous fern that has a wide distribution across the New Zealand archipelago. In the North Island, it is known from Te Paki south to Wellington, mainly in coastal areas, and is absent from large parts of the island. In Rodney ED (Northland), this species has only been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Beever 1986).

***Libocedrus plumosa* kawaka (Naturally Uncommon $_{Sp}$)**
In the North Island, this endemic cypress is present from Te Paki (Radar Bush) south to about the southern Kawhia Harbour and near Gisborne. It occurs in the South Island in northwest Nelson, where it grows locally around the Golden Bay area from about Puponga in the north to the Anatori River in the south. In Northland, it often occurs in association with kauri, often on ridge lines, spurs, or areas of major wind throw damage (NZPCN 2012). Within Rodney ED (Northland), it is known from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Beever 1986).

***Molloybas cryptanthus* hidden spider orchid (Naturally Uncommon)**
This orchid is saprophytic and prefers areas with deep leaf litter under forest and shrubland. Most records come from either kānuka or beech (*Nothofagus* sp.) forest. The flowers occur within the leaf litter layers, and only the

fruiting stems extend above the ground; the species is therefore likely to be overlooked (NZPCN 2012). It has been recorded from Mangawhai North Head Remnant (ROD013) (AK 239456, collected in 1996).

***Petalochilus alatus* (Naturally Uncommon)**
An orchid species of gumlands, peat bogs, rocky ridges, clay pans, and shrubland. The orchid has a naturally sparse distribution due to its preference for open, infertile habitats where competition with other plants is limited. It has been recorded from Mangawhai North Head Remnant (ROD013) (SSBI R08/H002, recorded in 1996).

***Schizaea dichotoma* fan fern (Naturally Uncommon $_{SO}$)**
An indigenous fern that is confined to the Kermadec Islands (Raoul Island) and North Island from Te Paki south to Kawhia and Mt Maunganui and, locally, close to geothermally active sites around Rotorua and Taupo. This species is usually associated with lowland kauri forest, but is also found in coastal areas and offshore islands under pōhutukawa-dominated forest (NZPCN 2012). In Rodney ED (Northland), it has only been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Beever 1986). In Rodney ED (Auckland), it has also been recorded from Hubbards Bush, Tawharanui Peninsula (Myers & Jamieson 2003).

***Tetragonia tetragonioides* kōkihi (Naturally Uncommon $_{EF, SO}$)**
Commonly known as New Zealand 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 2012). In Rodney ED (Northland), this species was recorded from the estuarine margins of Mangawhai Harbour, Sandspit and Surrounds (ROD014) in 1999 (AK 239847) and in 2012 (Wildland Consultants).

***Ficnia spiralis* pīngao (Relict $_{CD, Inc, Sp}$)**
Pīngao is an endemic sand-binding sedge, which has declined in abundance throughout New Zealand's coastal dunes in response to weed competition (especially with marram grass), dune stabilisation and compaction, harvesting, trampling, vehicle traffic, and browsing animals (NZPCN 2012). In Rodney ED (Northland), pīngao is present in large quantities on the dunes at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (much of it planted by volunteers). This area is now likely to be a stronghold for the plant in eastern Northland.

***Pisonia brunoniana* parapara (Relict $_{TO}$)**
Parapara is a small, coastal broadleaved tree that is now uncommon on the Northland mainland because of browsing by introduced mammals. It 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 in the north to Mangawhai. It formerly occurred in Coromandel and on the East Cape. It is now virtually extinct on the mainland and, where present, is usually represented by only one or a few trees (NZPCN 2012); however, a relatively large population occurs at Bream Head Scenic Reserve in the Manaia ED (Goldwater & Beadel 2010). In Rodney ED (Northland), several large trees were recorded in 1989 from coastline below the Mangawhai Walkway at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (AK 184308).

NON-RESIDENT INDIGENOUS

***Drosera peltata* (Coloniser DP, EF, SO)**

This species of sundew occurs in the North Island from Te Paki in the north to about Auckland in the south. It is found on consolidated sand dunes, on clay pans, and sometimes on peat, but usually occupies low gumland shrubland and adjacent shrublands (NZPCN 2012). It has been recorded from Mangawhai North Head Remnant (ROD013) (SSBI R08/H002), recorded in 1996) and the Marunui Conservation Area within Pukepohatu, Cattlemount and Surrounds (ROD003) (recorded in 1998, L. Forester, NRC, pers. comm. 2012).

3.4.5 Regionally significant plants

Rodney ED (Northland) has 22 regionally significant plants (Northland Conservancy, DOC, unpubl. data; Table 3). Each of these species and its occurrence in Rodney ED (Northland) is treated briefly in the following sections.

TABLE 3. REGIONALLY SIGNIFICANT PLANT SPECIES (CLASSIFICATION FROM DOC UNPUBL. DATA) RECORDED IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY).

TAXON	COMMON NAME	PLANT GROUP
Astelia fragrans		Monocot herb
Beilschmiedia tawa (including *B. tawaroa*)	Tawaroa	Dicot tree
Coprosma propinqua var. *propinqua*		Dicot shrub
Coprosma rigida		Dicot shrub
Coprosma tenuicaulis	Swamp coprosma	Dicot shrub
Empodisma minus	Wire rush	Rush
Fuchsia excorticata	Kōtukutuku	Dicot tree
Grammitis ciliata		Fern
Hebe macrocapa var. *macrocarpa*		Dicot shrub
Metrosideros robusta	Northern rātā	Dicot tree
Nertera scapanioides		Dicot herb
Nestegis cunninghami	Black maire	Dicot tree
Olearia solandri	Coastal tree daisy	Dicot tree
Passiflora tetrandra	Kohia	Dicot liane
Pelargonium inodorum		Dicot herb
Phormium cookianum subsp. *hookeri*	Whaririki, mountain flax	Monocot herb
Phyllocladus toatoa	Toatoa	Gymnosperm
Plagianthus regius	Mānatu	Dicot tree
Potamogeton ochreatus	Blunt pondweed	Monocot herb
Tetraria capillaris		Sedge
Thelymitra aemula	Gumland shrubland orchid	Orchid
Triglochin striata	Arrow grass	Monocot herb

Astelia fragrans

Astelia fragrans is a monocot herb of the forest floor (Moore & Edgar 1976), but can also occur as an epiphyte. The species is rare north of latitude 38°. Within Rodney ED (Northland) this species has been recorded within Pukekaroro Scenic Reserve and Surrounds (ROD004) (Wildland Consultants 2012).

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

Some authorities do not recognise tawaroa as separate from tawa (*B. tawa*) (NZPCN 2012). 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 Pukekaroro Scenic Reserve and Surrounds (ROD004) (Clunie & Esler 1982).

Coprosma propinqua* var. *propinqua

Coprosma propinqua var. *propinqua* is a divaricating shrub found in swamp, shrubland, and forest throughout New Zealand (Poole & Adams 1994). It was recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) during the 2010 survey. The species is found frequently in brackish wetlands near King Road (AK 319092) and has also been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (AK 220099, collected in 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 Rodney ED (Northland) it is only known from Pukekaroro Scenic Reserve and Surrounds (ROD004) (AK 220102, recorded in 1996).

***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 2012) and is becoming local in Northland due to habitat loss. It was recorded once during the 2010 survey growing with *Coprosma propinqua* var. *propinqua* at Mangawhai Harbour, Sandspit and Surrounds (ROD014).

***Empodisma minus* wire rush**

This species is the dominant peat-forming species of transitional low moor and high moor (raised bogs with acidic soil), and low-nutrient wetland systems in New Zealand. It is uncommon in the North Island north of Auckland and south of the Ruahine Range (NZPCN 2012). In Rodney ED (Northland), it has been recorded from Black Swamp Road near the edge of a farm drain (AK 239846, collected in 1999). It is also present at Lake Tomarata in the Auckland part of Rodney ED and near Te Arai (S. Myers, Wildland Consultants, pers. comm. 2012).

***Fuchsia excorticata* kōtukutuku, tree fuchsia**

The largest member of the *Fuchsia* genus, kōtukutuku (tree fuchsia) is common throughout much of New Zealand as far south as the Auckland Islands, but is uncommon in Northland. It grows from sea level to about 1000 m a.s.l., particularly alongside creeks and rivers. The species is highly palatable to browsing mammals. In Rodney ED (Northland), it has been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Clunie & Esler 1982).

Grammitis ciliata

An endemic fern with erect, 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 Pukekaroro Scenic Reserve and Surrounds (ROD004) (AK 218500, collected in 1993).

Hebe macrocarpa* var. *macrocarpa

This variety of *H. macrocarpa* is endemic to the northern North Island, but is not common in Northland. In Rodney ED (Northland), it was recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) in 1993 (AK 220091) and in 2012 by Wildland Consultants.

***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 in the north south to Wellington, but it is now uncommon over large parts of this area, mainly because of defoliation by possums, which causes tree mortality. In Rodney ED (Northland), it has been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Clunie & Esler 1982), Topuni Bush Fragments (ROD028) (recorded during the 2010 survey) and Topuni Farm Bush Remnants (ROD030) (also recorded during the 2010 survey).

Nertera scapanioides

This scrambling herb favours wetland habitats, but is now uncommon in Northland because of the drainage and clearance of wetlands. It was recorded from the northern margins of the Mangawhai Harbour (within site ROD014) in 1996 (AK 232629).

***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 Rodney ED (Northland), it is known from Cooks Stream Scenic Reserve (ROD005) (SSBI Q08/H022, recorded in 2000), Tara Creek Remnants (ROD012) (SSBI Q08/H058, recorded in 1994) and Pukekaroro Scenic Reserve and Surrounds (ROD004) (Wildland Consultants 2012).

***Olearia solandri* coastal tree daisy**

Coastal tree daisy is endemic to the North Island and northern South Island, where it inhabits coastal and estuarine margins. In Rodney ED (Northland), it is known from Mangawhai Harbour, Sandspit and Surrounds (ROD014) and Topuni Scenic Reserve and Saltmarsh (ROD027) (both recorded during the 2010/11 survey).

Passiflora tetrandra kohia

This endemic liane in the passionfruit family 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 Rodney ED (Northland), it has been recorded from Tara Creek Remnants (ROD012) (SSBI Q08/H058, collected in 1994).

***Phormium cookianum* subsp. *hookeri* whaririki, mountain flax**

This endemic herb is common throughout New Zealand, although it only occurs locally in Northland. It is common from lowland and coastal areas through montane forest to subalpine habitats, and is often found inland on cliff faces and exposed rock ledges in the northern part of its range (NZPCN 2012). In Rodney ED (Northland), this plant has been recorded from near the base of Pukepohatu within site ROD003 (Wildland Consultants 2012).

Phyllocladus toatoa **toatoa**

Toatoa is endemic to the North Island and is generally associated with relatively infertile soils on exposed ridges, around bog margins, and on other poorly drained land. It is somewhat uncommon and often absent over large parts of its range (NZPCN 2012). In Rodney ED (Northland), it has only been recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (AK 220106, collected in 1993).

Plagianthus regius **mānatu**

This endemic species occurs in the North, South and Stewart Islands and is often a prominent tree in lowland alluvial forest. Mānatu was recorded from two sites during the 2010 survey: Valley Road Remnant (ROD009) and Kaiwaka Township Bush (ROD018).

Tetraria capillaris

Tetraria capillaris occurs in North Island from Te Paki south to about Taranaki and Hawkes Bay, and in the South Island it has been recorded from the Nelson area and Westland. This species usually occurs in seral vegetation within swamps, peat bogs, pakihi, gumland shrubland, on sand podzols, in dune slacks or in open ground within regenerating kauri forest (NZPCN 2012). In Rodney ED (Northland), the species was collected from Mangawhai Harbour, Sandspit and Surrounds (ROD014) in 1996 (AK 249161).

Thelymitra aemula **gumland shrubland orchid**

This is a blue-flowered sun orchid of gumland shrubland, clay pans and kauri forest (NZPCN 2012). It has been recorded from Pukepohatu, Cattlemount and Surrounds (ROD003) (AK 327815, collected in 2010).

Pelargonium inodorum

This is an annual to biennial low-growing sparsely hairy herb with pink to red flowers. It occurs locally in open habitats such as gumland and grassland throughout New Zealand, but is not common in Northland. In Rodney ED (Northland), it was recorded from mown lawn adjacent to the Mangawhai Heads Dune Lake and Wetland (ROD039) (Wildland Consultants 2012).

Potamogeton ochreatus **blunt pondweed**

This is a submerged aquatic plant of slow-flowing rivers and streams, and lakes and ponds in coastal and lowland areas. This species is found throughout New Zealand and is also indigenous to Australia and South-East Asia (NZPCN 2012). In Rodney ED (Northland), this species was recorded from the Pukekaroro Stream in Pukekaroro Scenic Reserve and Surrounds (ROD004) (AK 298678, collected in 2007).

Triglochin striata **arrow grass**

Arrow grass is widespread throughout New Zealand, mainly in damp muddy ground along coastal areas, salt marsh, estuaries, and damp seepages on coastal cliffs, boulder beaches and within damp coastal turf. In Rodney ED (Northland), it has been recorded from a drain on the margins of saltmarsh at Kings Road by Wildland Consultants (2012).

UNCONFIRMED RECORDS

Anzybas rotundifolius **helmet orchid (Naturally Uncommon)**

Anzybas rotundifolius is a small orchid of gumlands or regenerating shrublands, usually found in areas with deep leaf litter and waterlogged soils. As it was recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), it is also likely to occur in Cattlemount and Surrounds (ROD003) in Rodney ED (Northland), as the two areas are contiguous.

Brachyglottis kirkii **var. *angustior* (regionally significant)**

This endemic tree daisy is restricted to the north of the North Island, typically being found from Te Puke and Ngaruawahia northwards (NZPCN 2012). A species described only as '*Brachyglottis kirkii*' was recorded from Pukekaroro Scenic Reserve and Surrounds (ROD004) (Clunie & Esler 1982), and it is not known if this refers to the terrestrial or epiphytic species.

Cyathea cunninghamii **pūnui, gully tree fern (regionally significant)**

This indigenous tree fern is of local distribution in the North and South Islands, usually occurring in damp gullies or near river banks (Brownsey & Smith-Dodsworth 2000). This species is similar to mamaku, but with thinner stipes and shorter fronds that curl upwards slightly at the ends. Gully tree ferns were recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003). Gully tree ferns may therefore be present in Rodney ED (Northland).

Lobelia angulata **(regionally significant)**

This creeping herb is found throughout New Zealand where it is frequent in lowland to subalpine damp places in open forest, streamsides, grassland and herbfield (Allan 1982). *Lobelia angulata* was recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003). Both sites are therefore likely to share the same ecological features.

Metrosideros carminea **akakura, carmine rata (regionally significant)**

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 2012). Carmine rata was recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003). Both sites are therefore likely to share the same ecological features.

3.5 FAUNA

Rodney ED (Northland) has nine nationally 'Threatened' and 22 'At Risk' fauna species. A checklist of fauna (along with their species names) recorded in Rodney ED (Northland) is included in Appendix 7.

3.5.1 Nationally Threatened and At Risk birds

The following key features of Rodney ED (Northland) make it important habitat for indigenous birds, including several threatened species:

- Dunelands at Mangawhai Sandspit provide nationally important nesting grounds for New Zealand's rarest and most threatened bird species—NZ fairy tern, northern New Zealand dotterel and the Caspian tern.
- The close proximity of the Hen and Chicken Islands and Hauturu (Little Barrier Island) promotes the movement of indigenous birds to and from the mainland.
- Mangawhai harbour and estuary contains relatively large breeding, feeding and roosting sites for seabirds and waders.

There are records of 8 nationally 'Threatened' bird species (1 Nationally Critical, 1 Nationally Endangered, and 6 Nationally Vulnerable) and 11 'At Risk bird species (5 Declining, 5 Naturally Uncommon, and 1 Recovering) (Miskelly et al. 2008) from Rodney ED (Northland). The distribution of each of these species in Rodney ED (Northland) is described briefly below.

THREATENED

New Zealand fairy tern, tara-iti, *Sternula nereis davisae*
(Nationally Critical $_{CD, RR}$)
Endemic
This is the rarest bird species in New Zealand and is known from only four locations in the country (Hansen 2006), one of which is within Mangawhai Harbour, Sandspit and Surrounds (ROD014). In the 2011/2012 breeding season there were three breeding pairs within the DOC-adminstered Mangawhai Government Purpose Wildlife Refuge Reserve, with four separate birds seen over the entire season (M. Mataira, DOC, pers. comm. 2012). The decline of the NZ fairy tern is largely the result of degradation of breeding habitat, disturbance by people during the breeding season and predation by blackbacked gulls, harriers and introduced mammals (M. Mataira, DOC, pers. comm. 2012).

Australasian bittern, matuku, *Botaurus poiciloptilus*
(Nationally Endangered $_{Sp, TO}$)
Indigenous[5]
Australasian bitterns mainly inhabit freshwater wetlands, but may utilise estuarine wetlands in autumn and winter (Heather & Robertson 2005). They are likely to breed only in the larger freshwater wetlands in Northland, and utilise a wider range of wetlands for feeding. Bitterns have only been recorded from two locations in Rodney ED (Northland): Mangawhai Heads Dune Lake and Wetlands (ROD039) (Forester et al 2007) and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Tony Beauchamp, pers. comm. 2011).

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[5] Breeds in New Zealand, Australia, New Caledonia and the Loyalty Islands (Heather & Robertson 2005). The New Zealand populations are the healthiest of the species (R. Pierce, pers. comm.).

Wrybill, ngutuparore, *Anarhynchos frontalis* (Nationally Vulnerable $_{RR}$)
Endemic
Wrybills breed over the summer months on the braided rivers of the eastern South Island, and overwinter in estuarine habitats in the northern North Island. The national population had reduced to c. 5000 birds in 1994. The species is threatened by loss of braided river beds through hydroelectric developments, water extraction, and weed invasion, and predation by introduced predators (Heather & Robertson 2005). In Rodney ED (Northland), this species has been recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Robertson et al. 2007).

Northern New Zealand dotterel, tūturiwhatu, *Charadrius obscurus aquilonius* (Nationally Vulnerable $_{CD}$)
Endemic
Northern New Zealand dotterels breed on sandspits, at stream mouths, on beaches, shellbanks and sandbanks and among low dunes. The main threat to the subspecies is predation, mostly by introduced mammals, but there are also increasing impacts from disturbance (caused by human recreational use of beaches), and from habitat loss and degradation caused by development. A national census conducted in 2004 counted 1700 birds (Dowding & Davis 2007). In Rodney ED (Northland), the species is mostly seen at Mangawhai Harbour, Sandspit and Surrounds (ROD014), with up to 130 birds roosting there in winter (Sagar et al. 1999; Tony Beauchamp, pers. comm. 2011).

Caspian tern, tarā nui, *Hydroprogne caspia* (Nationally Vulnerable $_{SO}$)
Indigenous[6]
This is 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 their stronghold (R. Pierce, pers. comm.). 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 2005), and the ongoing impacts of carnivourous mammals. Mangawhai Harbour and the southern shores of Whangarei Harbour are important breeding sites for this species. In Rodney ED (Northland), Caspian terns have been recorded from Cook Creek Lakes (ROD006) (Wildland Consultants 2010) and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Sagar et al. 1999; Tony Beauchamp, pers. comm. 2011).

Red-billed gull, tarāpunga, *Larus novaehollandiae scopulinus* (Nationally Vulnerable)
Endemic[7]
A highly gregarious species that is widespread and locally common in New Zealand, frequenting estuaries, harbours and open coastlines, parks 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

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6 Breeds locally in temperate parts of all continents except South America (Heather & Robertson 2005).

7 Different subspecies are present in South Africa, Australia, and the south western Pacific (Heather & Robertson 2005).

have adversely affected red-billed gull numbers (Heather & Robertson 2005). In Rodney ED (Northland), red-billed gulls have been recorded from Sentinel Rock (ROD031) (SSBI R08/H010, recorded in 1993).

North Island kākā, *Nestor septentrionalis*
(Nationally Vulnerable $_{CD, PD, RF}$)
Endemic
North Island kākā 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). It is possible that kākā are breeding at Bream Head Scenic Reserve in the Manaia ED (Goldwater & Beadel 2010). They are most numerous on the larger offshore islands, e.g. Hen and Chickens, Great Barrier, Little Barrier/Hauturu, Mayor and Kapiti (Heather & Robertson 2005). North Island kākā were recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), and thus are likely to visit the area. In 1994, kākā were observed flying over Tara Creek Remnants (ROD012) (SSBI Q08/H058). In the Auckland part of Rodney ED, kākā currently breed at Tawharanui Open Sanctuary and are often seen visiting the mainland from Little Barrier Island in this area.

Pied shag, kāruhiruhi, *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 common in pines, pōhutukawa, or northern rātā growing on cliffs and overhanging the sea (Heather & Robertson 2005). In Rodney ED (Northland), pied shags have been recorded from Cook Creek Lakes (ROD006) (recorded during the 2010 survey) and from mangroves at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (recorded during the 2011 survey).

AT RISK

New Zealand pipit, pīhoihoi, *Anthus novaeseelandiae* (Declining)

The species has a wide distribution with many subspecies, four of which are found only in New Zealand, where they favour open habitats such as beaches, road verges and rough pasture. In Rodney ED (Northland), one pipit was observed in dunefields at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Wildland Consultants 2012).

North Island fernbird, mātātā, *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 2005). In Rodney ED (Northland), North Island fernbird has been recorded from gumland at Mangawhai North Head Remnants (ROD013) (SSBI R08/H002, recorded in 1987), and from saltmarsh at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (during the 2011 survey and by Wildland Consultants in 2012).

New Zealand pied oystercatcher, tōrea, *Haematopus finschi* (Declining)
Endemic[8]

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. More than 1000 birds use Whangarei Harbour as a wintering site (Heather & Robertson 2005). In Rodney ED (Northland), pied oystercatchers are known to roost and feed at Sentinel Rock (ROD031) (SSBI R08/H010, recorded in 1993) and there is a historical record (1979) from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (SSBI R08/H003).

Pied stilt, poaka, *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 2005). In Rodney ED (Northland), this species has been recorded from estuarine areas within Mangawhai Harbour, Sandspit and Surrounds (ROD014) (recorded in 2010 and 2012 by Wildland Consultants).

White-fronted tern, tara, *Sterna striata striata* (Declining DP)
Endemic
White-fronted terns are locally common in some parts of Northland (such as Whangarei Harbour and the adjacent coastline). Within Rodney ED (Northland), this species has been recorded from Cook Creek Lakes (ROD006) (Wildland Consultants 2010), Sentinel Rock (ROD031) (SSBI R08/H010, recorded in 1993).

Black shag, kawau, *Phalacrocorax carbo novaehollandiae* (Naturally Uncommon SO, SP)
Indigenous[9]
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 2005). In Rodney ED (Northland), black shags have only been recorded from mangroves at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Wildland Consultants 2010).

Royal spoonbill, kōtuku-ngutupapa, *Platalea regia* (Naturally Uncommon INC, RR, SO, SP)
Indigenous
Royal spoonbills occurred as vagrants from Australia until the first successful breeding occurred near Okarito in 1949. The nearest known breeding site to Rodney ED (Northland) is Parengarenga Harbour in the Far North. During autumn, the birds disperse widely to harbours and estuaries throughout

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

[9] Subspecies also breeds in Australia and New Guinea (Heather & Robertson 2005).

New Zealand (Heather & Robertson 2005). In Rodney ED (Northland), this species has been recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Robertson et al. 2007).

Little shag, teoteo, *Phalacrocorax melanoleucos* (Naturally Uncommon $_{Inc}$)
Indigenous[10]
Little shags are found in sheltered coastal waters, estuaries, harbours, rivers, dams and lakes up to the subalpine zone (Heather & Robertson 2005). In Rodney ED (Northland), little shags have been recorded from Sentinel Rock (ROD031) (SSBI R08/H010, recorded in 1993) and from mangroves at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (recorded in 2010 by Wildland Consultants and during the 2011 survey).

Little black shag, kawau tui, *Phalacrocorax sulcirostris* (Naturally Uncommon $_{RR, SO}$)
Indigenous[11]
Little black shags are regular visitors to fresh and saltwater habitats. In Rodney ED (Northland), high numbers (> 20 birds) have been recorded from Cook Creek Lakes (ROD006) (recorded during 2010 survey).

Banded rail, katatai, *Rallus philippensis* (Naturally Uncommon $_{DP}$)
Indigenous[12]
In New Zealand, banded rails were formerly common throughout the main islands but had declined by the 1930s because of habitat loss and the introduction of mammalian predators. They are now mainly found in mangrove forests, saltmarshes, and rushland in Northland (including Manawatawhi/ Three Kings Islands and the Poor Knights Islands), as well as Great Barrier Island (Aotea Island), Coromandel Peninsula and the Bay of Plenty (Heather & Robertson 2005). Banded rails have only been recorded from one site in Rodney ED (Northland): from mangroves at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (recorded during the 2011 survey and by Wildland Consultants in 2010 and 2012).

Variable oystercatcher, tōrea pango, *Haematopus unicolor* (Recovering)
Endemic
Variable oystercatchers inhabit the coasts of the North Island, South Island and offshore islands, but not New Zealand's outlying islands. Northland is a stronghold for this species (Heather & Robertson 2005) and in Rodney ED (Northland) this species has been recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Sagar et al. 1999; Tony Beauchamp, pers. comm. 2011).

OTHER CATEGORIES

Australasian little grebe, *Tachybaptus novaehollandiae novaehollandiae* (Coloniser $_{SO}$)
Indigenous
This species self-introduced from Australia in the 1960s and 1970s and inhabits ponds and lakes in the northern North Island, although they are considered regionally uncommon in Northland. The total New Zealand population was

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[10] Breeds in Australasia east of Borneo and Java, and in New Caledonia (Heather & Robertson 2005).

[11] Breeds in Australasia east of Borneo and Java, and in New Caledonia (Heather & Robertson 2005).

[12] Breeds in New Zealand Indonesia, Phillipines, Melanesia, Australasia, Niue, and western Polynesia (Heather & Robertson 2005).

c. 50 birds in 1995 (Heather & Robertson 2005) and may now be as high as 100–200 (Ray Pierce, pers. comm.). A pair of Australasian little grebes was recorded from Wallbank Way Dam (ROD036) during the 2011 survey.

Bar-tailed godwit, kuaka, *Limosa lapponica* (Migrant SO)
Indigenous
The bar-tailed godwit is the most common transequatorial migrant wader species that reaches New Zealand, with approximately 85,000–105,000 arriving each year (Dowding & Moore 2006). Bar-tailed godwits have been recorded as being present on the Mangawhai Sandspit in site ROD014 in summer since the mid-1980s, in numbers of up to 500 birds (Sagar et al. 1999; Tony Beauchamp pers. comm. 2011).

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 (Northland Conservancy, DOC, unpubl. data).

New Zealand shoveler, kuruwhengi, *Anas rhynchotis variegata*
Endemic
New Zealand shovelers are wetland birds that prefer fertile shallow wetlands, ponds and lakes. The species is widespread from Auckland in the north to Otago in the south (Heather & Robertson 2005), but is less commonly found in Northland and the western South Island (Robertson et al. 2007). In Rodney ED (Northland), this species has been recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) (Robertson et al. 2007).

North Island bellbird, korimako, *Anthornis melanura melanura*
Endemic
Bellbirds inhabit forest and shrubland areas on the North Island, South Island, Stewart Island, Auckland Islands, and many offshore islands. However, they became extinct on the mainland north of the Waikato Region in the 1860s (Heather & Robertson 2005). Subsequently, in the mid-2000s, a population re-established in the predator-free Tawharanui Open Sanctuary within Rodney ED (Auckland), and breeding has also been recorded at the Bream Head Scenic Reserve in the Manaia ED to the north. In Rodney ED (Northland), bellbirds have been recorded from Cooks Stream Scenic Reserve and Surrounds (ROD005) (SSBI Q08/H022, recorded in 2000). Bellbirds are also known from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu Ecological ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003) in Rodney ED (Northland), and therefore may visit the site. Most bellbirds visiting the ED are likely to originate from Taranga Island (to the northeast of Mangawhai Heads; N. Miller, DOC, pers. comm. 2012).

Kūkupa, New Zealand pigeon, *Hemiphaga novaeseelandiae*
Endemic
The survival and productivity of kūkupa 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 2005). In Rodney ED (Northland), kūkupa are known from throughout the ED, with records from Pukeareinga Scenic Reserve and Surrounds (ROD001) (SSBI Q08/H024, recorded in 1997), Pukepohatu, Cattlemount and Surrounds

(ROD003) (recorded during the 2010 survey), Cooks Stream Scenic Reserve and Surrounds (ROD005) (SSBI Q08/H022, recorded in 2000), Lois Wintles Bush and Pōhutukawa Remnant (ROD011) (recorded during the 2010 survey), Tara Creek Remnants (ROD012) (SSBI Q08/H058, recorded in 1994), Garbolino Road Bush (ROD015), Kaiwaka Township Bush (ROD018), Pritchard Road Forest Remnants (ROD022), Staniforth Paper Road Forest Remnants (ROD023) (all recorded during the 2010 survey), and Topuni Scenic Reserve and Saltmarsh (ROD027) (SSBI Q08/H061, recorded in 1996).

North Island tomtit, miromiro, *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 2005). Birds are reportedly resident and increasing in numbers in the Marunui QEII covenant area on the boundary of Rodney ED (Northland) and Waipu ED.In Rodney ED (Northland), North Island tomtits are known from Pukeareinga Scenic Reserve and Surrounds (ROD001) (SSBI Q08/H024, recorded in 1997) and Pukepohatu, Cattlemount and Surrounds (ROD003) (Wildland Consultants 2012).

Grey-faced petrel, oi, *Pterodroma macroptera gouldi*

Endemic

The grey-faced petrel is the most common petrel breeding in the New Zealand region (Heather & Robertson 2005). The main breeding colonies are on offshore islands off the upper North Island (including one colony at the nearby Taranga Island), and the few remaining mainland colonies are restricted to headlands and clifftops, due to declines inflicted by rats, cats, dogs, mustelids, and humans (Heather & Robertson 2005). This species is present on Sentinel Rock in the north-east of the Rodney ED (Northland). Cameron & Taylor 1997 state:

> *On 5 March 1991 many large overgrown burrows were noted on the northern summit of the island. On 19 July 1992 more than 50 burrows in good deep soil were located and most were occupied by breeding grey-faced petrels.*

3.5.3 Nationally Threatened land snail species

AT RISK

***Amborhytida dunniae* (Gradual Decline)**

Endemic

This landsnail is endemic to Auckland and Northland with a sporadic distribution resulting from extensive habitat destruction. The main threats to the species are predation by mammalian predators and loss or degradation of habitat, especially through browsing and trampling by livestock or land clearance (Brook 2002). Within Rodney ED (Northland), a dead *Amborhytida* sp. (probably *A. dunniae*; (W. Holland and P. Graham, DOC, pers. comm. 2011) was recorded from Pukeareinga Scenic Reserve and Surrounds (ROD001) during the 2010 survey.

Kauri snail *Paryphanta busbyi* (Gradual Decline)

Endemic

The kauri snail is endemic to Northland and north Auckland with a fragmented distribution resulting from the extensive destruction of indigenous vegetation. Predation by pigs, rats, possums, and possibly hedgehogs, and continued loss of habitat are the main threats to the species (Brook 2002). Dead kauri snails have been recorded from Pukeareinga Scenic Reserve and Surrounds (ROD001) (recorded during 2010 survey). The species is also known from Pukepohatu, Cattlemount and Surrounds (ROD003) (SSBI Q08/H021, recorded in 2006).

AT RISK

Freshwater crayfish, kōura, *Paranephrops planfrons* (Gradual Decline)

In Rodney ED (Northland), koura have been recorded from Pukepohatu, Cattlemount and Surrounds (ROD003) (NIWA Freshwater Fish database, viewed 2012), Kereru Lane Forest Remnants (ROD024) (NIWA Freshwater Fish database, viewed 2012, record made in 2010) and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (NIWA Freshwater Fish database, viewed 2012, record made in 2003).

3.5.4 At Risk herpetofauna

AT RISK

Hochstetter's frog *Leiopelma hochstetteri* (Declining $_{DP, RR}$)

Endemic

Hochstetter's frog is New Zealand's most widely distributed endemic frog and is currently found from central Northland in the north as far south as Whareorino Forest in the southern King Country, central North Island. This species is semi-aquatic and is found in or near small, forested streams (Gill & Whitaker 1996). The northernmost limit of Hochstetter's frog is the forest remnants of the central Waipu ED, which forms the northern boundary of the Rodney ED (Northland). Recent surveys for Hochstetter's frog within the neighbouring Waipu ED have raised concerns regarding the effects of cattle, pigs, or goats on frog populations. These potential causes of decline may also be affecting Hochstetter's frog populations in the Rodney ED (Northland). Hochstetter's frogs have been recorded from Pukepohatu, Cattlemount and Surrounds (ROD003) (SSBI Q08/H023, recorded in 1997) and there are also several records from the same site dated 1993 (DOC Bioweb database, viewed 2011).

Moko skink *Oligosoma moco* (Relict)

Endemic

This is a diurnal skink of the North Island and associated offshore islands that is found from Northland to the Bay of Plenty. Moko skink prefers open coastal habitats such as shrubland and grassland. It is abundant on islands without rodents but is very rare and in severe decline in mainland habitats. A moko skink was caught on the Mangawhai Sandspit (part of site ROD014) in an invertebrate pitfall trap in 2003 (DOC Bioweb database, viewed 2012).

OTHER CATEGORIES

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

Migrant

The green turtle is likely to be a rare visitor to Mangawhai Harbour. There is a 1999 record from Mangawhai Sandspit (within site ROD014) (DOC Bioweb database, viewed 2012).

3.5.5 At Risk fish species

Longfin eel, tuna, *Anguilla dieffenbachii* (Declining)

Endemic

Longfin eels are found throughout New Zealand, but are threatened by over-harvesting (especially of large females) and habitat modification. This species has been recorded at Mangawhai Harbour, Sandspit and Surrounds (ROD014) (NIWA Freshwater Fish database, viewed 2012, record made in 2003). It is also known from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), and is therefore are likely to inhabitat watercourses within this site.

Inanga, whitebait, *Galaxias maculatus* (Declining)

Indigenous

Inanga is a small migrant freshwater fish that inhabits the lower reaches of slow flowing rivers and streams, coastal lagoons, and swamps (McDowall 2000). The species is the most important of the whitebait fishery and is dependant on unimpeded access between the sea and its freshwater habitat to complete its life cycle. Inanga is also an important food source for a wide range of other indigenous fauna including gulls, kahawai, white-faced heron, eels, and flounder (McDowall 2000). Inanga is threatened by land drainage, clearance, and loss of lowland wetlands and streams, grazing of spawning habitats within saltmarsh, and the construction of barriers that halt migration (e.g. dams, weirs and perched culverts). This species have been recorded from Kereru Lane Forest Remnants (ROD024) (NIWA Freshwater Fish database, viewed 2012, record made in 2010) and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (NIWA Freshwater Fish database, viewed 2012, record made in 2003). Inanga is likely to be widespread in Rodney ED (Northland) in the lower reaches of rivers and streams below barriers to upstream migration.

Redfinned bully *Gobiomorphus huttoni* (Declining)

Endemic

Redfinned bully is a widespread and common species in fast-flowing coastal streams throughout New Zealand (McDowall 2000). The species is diadromous; spawning occurs in freshwater habitats in cavities under rocks or other objects on the stream bed, and upon hatching, the larvae are swept out to sea. The young bullies then migrate back into freshwater habitats and are able to migrate up past small waterfalls. Migration is halted by larger falls, dams, weirs, and perched culverts (McDowall 2000). In Rodney ED (Northland), the species is probably threatened by the construction of migration barriers, and the modification and degradation of lowland stream habitats by the intensification of agriculture, dairying in particular. Redfinned

bullies have been recorded from Kereru Lane Forest Remnants (ROD024) (NIWA Freshwater Fish database, viewed 2012, record made in 2010) and Mangawhai Harbour, Sandspit and Surrounds (ROD014) (NIWA Freshwater Fish database, viewed 2012, record made in 2003).

3.5.6 Nationally threatened fauna not recorded recently in Rodney Ecological District (Northland Conservancy)

North Island brown kiwi *Apteryx mantelli* (Nationally Vulnerable $_{CD, PD RF}$)
Endemic
North Island brown kiwi were originally present 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). In Rodney ED (Northland), a 1997 survey of Pukeareinga Scenic Reserve and Surrounds (ROD001) recorded probe holes and kiwi scat (SSBI Q08/H024). There is a breeding population now present at Tawharanui Open Sanctuary in the Auckland Conservancy part of Rodney ED after kiwi were released in 2008 as part of a mainland island project managed by Auckland Council and the local community.

Reef heron, matuku-moana, *Egretta sacra sacra* (NationallyVulnerable $_{SO, St}$)
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 pōhutukawa (Heather & Robertson 2005). Nationally, the species is less widespread than it used to be, most probably because of increased human disturbance on the coast (Heather & Robertson 2005). However, birds inhabit the Whangarei Harbour and nearby coastlines. In Rodney ED (Northland), the last record of reef herons was at Mangawhai Harbour, Sandspit and Surrounds (ROD014) in 1979 (SSBI R08/H003).

3.5.7 Regionally significant fauna not recorded recently in Rodney ED (Northland Conservancy)

Banded kōkopu *Galaxias fasciatus*
Endemic
Banded kōkopu is primarily a coastal species that favours shaded streams throughout New Zealand. In Rodney ED (Northland), it was last recorded from Mangawhai Harbour, Sandspit and Surrounds (ROD014) in 1982 (NIWA Freshwater Fish database, viewed 2012), although it is very likely to be currently widespread throughout the wider District (Northland).

Forest gecko *Hoplodactylus granulatus*
Endemic
This species has a widespread distribution in forest and shrubland habitats throughout New Zealand, including several offshore islands. Forest geckos are arboreal and favour vegetation that provides refuges such as loose bark or crevices (Gill & Whitaker 1996). Similar to other New Zealand arboreal gecko

species, this species is affected by habitat loss and predation by mammalian predators, in particular ship rats (*Rattus rattus*). Forest geckos were recorded on the edge of Mangawhai Harbour within Mangawhai Harbour, Sandspit and Surrounds (ROD014) in 1949 and 1965 (DOC Bioweb database, viewed 2012).

UNCONFIRMED RECORDS

Grey duck *Anas superciliosa superciliosa* (Nationally Critical)
Endemic[13]
The preferred habitat of the grey duck includes small lakes, slow-flowing rivers, and tidal water surrounded by forest (Heather & Robertson 2005). Introgressive hybridisation and competition with the introduced mallard, along with habitat loss, are key reasons for the decline of this species. Grey ducks were recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), so it is possible that grey ducks may visit this site.

Long-tailed bat, pekepeka, *Chalinobolus tuberculatus* (Nationally Vulnerable $_{Dp}$)

Although there are no confirmed records of this species from Rodney ED (Northland), it is known from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003). There is a possibility that this species may also have persisted in this site (ROD003). There are also records of long-tailed bats from parts of Rodney ED (Auckland) (R. Gillies, Wildland Consultants, pers. comm. 2012).

Red-crowned kākāriki *Cyanoramphus novaezelandiae novaezelandiae* (Relict)
Endemic
In Northland, red-crowned kākāriki are mainly restricted to pest-free offshore islands (Hen and Chickens, Poor Knights and Manawatāwhi/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 2005). The species has been recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), and it is therefore likely that kākāriki also visit ROD003.

Bush falcon, kārearea, *Falco novaeseelandiae* (Nationally Vulnerable $_{DP, St}$)
Endemic
The nearest breeding population of bush falcons to Rodney ED (Northland) is in the Coromandel Range. Juveniles disperse widely in the autumn and winter (Heather & Robertson 2005) and these may account for sightings of this species in Northland. Bush falcons have been recorded from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), and it is possible that they could also visit this site.

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[13] Different subspecies are present in the southwestern Pacific (Heather & Robertson 2005).

Long-tailed cuckoo, koekoeā, *Eudynamys taitensis* (Naturally Uncommon $_{DP}$)

Migrant

Long-tailed cuckoos pass through Rodney ED (Northland) 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, its key host species in the North Island (Heather & Robertson 2005). Long-tailed cuckoos have been recorded in the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED) (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003), and this species may occasionally utilise this site.

Auckland green gecko *Naultinus elegans elegans* (Declining)

Endemic

An arboreal species endemic to Auckland and Northland (north to approximately Hokianga). It inhabits forest and shrubland, and is most commonly found in vegetation dominated by kānuka or mānuka. The decline of this species is probably driven by habitat loss, particularly of shrublands, and predation by mammalian predators. The species is known from the Brynderwyn Hills Complex (Q08/225 (a–j)) in the Waipu ED (Lux et al. 2007), which is contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003) and it may therefore occur at this site.

Spotless crake, pūweto, *Porzana tabuensis plumbea* (Relict $_{SO}$)

This secretive weltand bird species has been recorded from five sites in Waipu ED (Lux et al. 2007), although its presence has not yet been confirmed in Rodney ED (Northland). There are also records of spotless crake from near Topuni (Robertson et al. 2007), but it is not clear if they occur within the boundary of Rodney ED (Northland).

3.6 THREATS

Rodney ED (Northland) 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. As with other parts of Northland and Auckland, the modification and loss of indigenous habitats, human hunting activities, and predation by mammalian pests through the periods of Maori and European settlement have combined to bring about the demise of many of these species. During the middle of the 20th century, habitat loss and modification accelerated via forest clearance and agricultural activities. Habitat loss and pressure on the remaining fauna and flora continues into the present.

3.6.1 Pest animals

There are 15 species of introduced mammals present in Rodney ED (Northland): dogs, cats, ship rats, Norway rats, mice, three mustelid species (stoats, ferrets, weasels), hedgehogs, rabbits, hares, possums, goats, pigs and fallow deer[14]. These are all known to have varying adverse impacts

[14] There are no known wild populations of fallow deer in the ED (Northland), although there are likely to be instances of deer escaping from farms and deliberate releases by people (G. Coulston, DOC, pers. comm. 2012).

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 eat seeds, insects, land snails and lizards. All three, can compete for resources with indigenous birds. Hedgehogs are particularly serious predators of groundnesting birds such as NZ dotterels and NZ fairy terns. Rabbits damage indigenous herbs and orchids and modify indigenous sand-binding vegetation in fragile coastal environments through soil disturbance and direct browsing (DOC 1999). Possums can affect kūkupa either through direct predation of eggs and nestlings or competition for resources such as food and habitat. The marked decline of kūkupa 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.). Land snails and other invertebrates are particularly heavily preyed upon by introduced mammals and birds (e.g. rats, mice, possums, hedgehogs, pigs, and song thrushes).

The possum is the most destructive browser in Rodney ED (Northland) 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 Rodney ED (Northland) (e.g. kohekohe, pōhutukawa, tōtara, northern rātā, tōwai and five-finger) are very susceptible to possum browsing. Loss of foliage also contributes to a lower volume of litter on the forest floor with consequential reductions in nutrient cycling (Cowan 2001).

Rainbow skinks are present in Rodney ED (Northland) and are currently classified as a 'Risk Assessment Animal Pest' under the Northland Regional Pest Management Strategy 2010–15 and are 'Unwanted Organisms' under the Biosecurity Act 1993. Rainbow skinks reproduce rapidly, laying up to eight eggs three times per year (more than five times as fast as most native lizards), and mature in less than half the time of native lizards. They can reach high population densities in a relatively short time, competing with indigenous lizards and other fauna for food and habitat, and increasing predation pressure on indigenous invertebrates (DOC 2011). Rainbow skinks were observed at high densities at the top of the track leading up to Pukepohatu in site ROD003 (Wildland Consultants 2012).

Introduced species of wasps (e.g. German wasps) and ants (e.g. Argentine ants) are present in Rodney ED (Northland) and are likely to impact on ecological processes and indigenous species, although data are scarce from New Zealand. Argentine ants are readily transported into new subdivisions via vehicles or goods.

3.6.2 Habitat modification and loss

Rodney ED (Northland) has lost the majority of its natural cover, which now comprises only c. 22.3% of total land cover. Habitat loss has been more severe on the gentle rolling hill and alluvial country in the central and southern areas of the ED. Presently, the most extensive areas of indigenous forest are restricted to the north, on the lower foothills and outliers of the

Brynderwyn Range. Rodney ED (Northland) is at significant risk of further loss and fragmentation of forest and shrubland habitats, particularly through accidental fires, grazing, and subdivision.

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

Past land clearance has lead to severe habitat fragmentation throughout the central and southern parts of Rodney ED (Northland), where the natural cover has been reduced to a patchwork of small, convoluted and often isolated forest remnants. Such sites have a greater ratio of edge to area, and are therefore more vulnerable to processes that are often referred to as 'edge effects'. Edge effects include:

1. Increased penetration by invasive weeds and pest animals
2. More light entering the understorey from the sides, which changes conditions for plant growth and, hence, vegetation composition
3. Increased wind in the understorey and consequent drying effects.

Some forest remnants are so small and exposed that the edge effects render them ecologically dysfunctional. They no longer contain palatable species and regeneration is limited by the combined impacts of stock grazing and trampling and infestation by pest animals and plants. If these remnants are not fenced so that stock is excluded, and allowed to regenerate, then they will be lost from the landscape after the canopy trees mature and die. Smaller habitats are also vulnerable to pollution from human activities, e.g. septic tank overflows. Habitat loss for less-mobile animal species (such as lizards and land snails) can result in local extinctions, while a reduction of habitat size will inevitably lower the carrying capacity of an area by diminishing the habitat and food resources available.

3.6.3 Land development

The desirability of the Mangawhai area as a place to live or visit has resulted in increased subdivision pressures. Development has the potential to bring new pets (especially dogs and cats) into the area, posing a serious risk to threatened shorebirds (such as NZ fairy tern, northern NZ dotterel and oystercatcher) unless appropriate controls on pets are implemented. Residential developments can also be sources of weed invasions through 'garden escapees'. Sullivan et al. (2005) recently demonstrated a clear link between the number of exotic plant species in forest remnants and proximity to gardens in coastal Northland. The recent increase in residential developments (particularly in the eastern coastal areas and the Brynderwyn

foothills) will likely result in further weed invasion and degradation of remaining indigenous habitats. Gumland, a historically rare ecosystem type, has been hugely impacted by the rapid development of the Mangawhai area. Unfortunately, such areas are often regarded as unproductive land or an 'eyesore'. One of the last remaining good quality gumlands in the ED occurred behind the local school at Mangawhai; however, 20 years ago it was dug up and converted to a cornfield (M. Young, pers. comm. 2012). The few areas of gumland that still persist in the ED are under constant threat from weeds and further development.

The rapid development of Mangawhai has resulted in a significant increase in the demand for fresh water, most of which is sourced from local aquifers. Without sufficient recharge, a permanently lowered water table could adversely affect the hydrology of the only remaining dune lake in Rodney ED (Northland). Land development such as plantation forestry, clearance of shrubland for agricultural land, and residential subdivision is also a threat to some snail populations (Brook 1999b), and is likely to further reduce the availability of habitat for lizards that favour early successional habitats, such as Auckland green gecko. Residential subdivision developments near or within natural areas can lead to small-scale clearances for house sites or gardens that may appear to be of little consequence when considered individually, but may collectively contribute to a high level of loss or degradation of habitat.

3.6.4 Invasive plants

Pest plants are a major threat to the indigenous biodiversity of Rodney ED (Northland). Northland has one of the highest numbers of environmental weed species of all the regions in New Zealand, due largely to the same mild climatic conditions that encourage enhanced growth of indigenous vegetation. Exposed margins of shrubland and forest areas are particularly vulnerable to weed invasion by species such as pampas, woolly nightshade, brush wattle, Japanese honeysuckle, climbing asparagus, wild ginger, and radiata pine. Shrublands are more readily invaded by weeds because of relatively higher light levels reaching the ground, although dense, intact areas of forest are also vulnerable to invasion by shade-tolerant plants such as tradescantia, wild ginger and climbing asparagus. Dunefields are prone to weed invasion because of the low stature and frequent disturbance of their vegetation, mild winter temperatures, and the close proximity of residential gardens. Dunes are susceptible to a range of invasive weeds, including marram grass, pampas, evening primrose, Sydney golden wattle and gorse. Marram grass is present on the foredunes of the Mangawhai Sandspit (part of ROD014), and it now threatens indigenous sand binders such as pīngao, sand tussock, and spinifex. Sydney golden wattle is also present, albeit in small amounts. Wherever pest plants become dominant, the natural processes of germination and growth of indigenous plants are impaired.

Wetlands comprise only a small proportion of the natural habitats present in Rodney ED (Northland), and most of these have been degraded to varying degrees by hydrological modifications, grazing, and/or invasive weeds. Lack of buffering vegetation around many wetlands facilitates weed establishment although, in the case of the Mangawhai Heads Dune Lake and Wetland (ROD039), the presence of dense Sydney golden wattle and gorse is actually

helping to buffer the site from wind, and human and animal disturbances. In Rodney ED (Northland), the exotic grass species reed sweetgrass is likely to be the most prolific weed in small, fragmented freshwater wetlands that lack sufficient buffering. Gumlands in the ED are vulnerable to invasion by hakea, gorse, wattles, pultanaea, and Dally pine. Saltwater paspalum is present within the Mangawhai Estuary in relatively small quantities and poses a serious future threat to indigenous estuarine vegetation through, in particular, the displacement of indigenous salt meadow species such as arrow grass, remeremu and sea primrose. Saltwater paspalum also excludes burrowing fauna, reduces access to feeding and roosting sites of shore birds, alters fish spawning and feeding grounds, and changes estuarine hydrology by accumulating sediment (Graeme & Kendal 2001; Shaw & Allen 2003).

3.6.5 Kauri dieback disease

Kauri dieback disease is a fungus-like disease that is specific to kauri and can kill trees of all ages and sizes. Also known as *Phytophthora* taxon Agathis (PTA), it is spread mainly through soil movement and within soil on equipment such as footwear, machinery and mountain bike. Kauri dieback has been found in Northland (including near Kaiwaka), on Great Barrier Island (Aotea Island) and around the Auckland region. Staying on tracks and off kauri roots and cleaning gear before and after visiting kauri forests (i.e. shoes, bike tyres and other equipment) are extremely important in helping to stop the spread of this disease (see www.kauridieback.co.nz for more information).

3.6.6 Poaching of kūkupa

Kūkupa are in chronic decline in some parts of New Zealand. They occur throughout forest and shrubland remnants in Rodney ED (Northland). Although it is an offence to kill or harm kūkupa; it is possible that illegal poaching of them may occur in the ED from time to time.

3.6.7 Legal protection versus conservation management action

Although several large areas in Rodney ED (Northland) have some legal protection status in the form of DOC-administered reserves, very little active management is being carried out, particularly in forest habitats. These areas are currently plagued by pest animal species and they will continue to lose indigenous biodiversity without active conservation management. The exception is the Marunui Conservation Area, a large tract of indigenous frest (c. 437 ha) of which approximately half lies within Rodney ED (Northland), with the rest in Waipu ED. The Marunui Conservation Area is protected under a Queen Elizabeth II Open Space Covenant and is actively managed by local landowners. Elsewhere in Rodney ED (Northland) there are many small areas of indigenous forest legally protected under Queen Elizabeth II Open Space Covenants, most of which are fenced and likely to receive some form of pest animal control.

With the exception of the Mangawhai Sandspit, all of the larger protected areas in the ED are on areas of steeper topography and many ecological units (particularly those of coastal areas, wetlands, and forest on alluvium) are absent from or under-represented in protected areas. As a bare minimum,

the following actions need to be undertaken to protect the immediate and long-term viability of the natural areas:

- Fencing of remnants of indigenous habitat to exclude livestock.
- Reducing the impact of invasive plants through targeted control programmes.
- Sustained control of mammalian pests.
- Funding and incentives for landowners to protect natural areas and undertake appropriate management, including fencing, pest animal control, and weed control.
- Education of local residents about the negative impacts that can result from residential developments and how to reduce these impacts, particularly in areas relatively remote from the main urban centres.

A lack of active conservation management within many of the existing natural areas, in the face of all the pressures discussed above, is probably the greatest threat to the future viability of these areas in Rodney ED (Northland). Priority areas for protection are described in Section 6.

3.7 RESTORATION WORK UNDERTAKEN BY THE COMMUNITY

Mangawhai Harbour Restoration Society (MHRS) is a community-based, voluntary organisation whose mission is to restore the Mangawhai Harbour to its past prime condition and, in doing so, to create an environmental, recreational and historic resource for the enjoyment of all. The society liaises with local bodies and other community groups, and has carried out a large amount of work towards reinstating the natural dune systems at Mangawhai, including building windbreak fences along the sand dunes to collect drifting, wind-blown sand, and planting locally occurring native plants such as pīngao and spinifex between the fences to further stabilise the sand and introduce organic material to the ecosystem. To date, more than 100,000 plants have been planted on the Sandspit, and each years thousands more plants are added to both the seaward and harbour sides of the Sandspit. MHRS's fencing and planting programmes are carried out with the support of DOC (Northland Conservancy). (MHRS 2012)

In the Brynderwyn Range, there is a large area (c. 437 ha) known as the Marunui Conservation Area, which is protected under a QEII covenant. The covenanted area is bisected by the boundary that separates the Rodney ED (Northland) and Waipu ED. This area has been subject to intermittent pest control for the past 25 years, although in the last 3 years, efforts have been intensified by local landowers to significantly reduce pest mammals such as mustelids, ferrets, ship rats, possums, and pigs, as well as invasive weeds such as climbing asparagus, wild ginger, alligator weed, and moth plant. The effectiveness of this sustained programme of integrated pest control has seen DOC give approval (in principal) to Marunui Conservation Ltd to reintroduce North Island brown kiwi into the area in April 2013. It is hoped that the presence of such an iconic species in the reserve will serve as catalyst to surrounding landowners to carry out regular pest control activities (J. Hawley, Marunui Conservation Ltd, pers. comm. 2012).

4. Site descriptions

The 38 natural areas identified in the study of Rodney ED (Northland) are described and mapped below. Level 1 sites (n = 32) are listed before Level 2 sites (n = 6). 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. Vegetation types within ecological units describe abundant/dominant (>50% of the canopy) species and/or common (20–50% of the canopy) species (refer to Section 2.3). Where possible, the percentage cover of ecological units has been included in the site descriptions.

Records of threatened flora and fauna have been sourced from herbaria and other databases mentioned in Section 2.1, or were direct observations by DOC 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. Declining) in capitals. 'None noted' 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 2002 and 2008 was used to produce the site maps.

4.1 LEVEL 1 SITES

A list of Level 1 sites identified in Rodney Ecological District (Northland) is provided in Table 4.

TABLE 4. LIST OF LEVEL 1 SITES IDENTIFIED IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND).

SITE	SURVEY NO.	GRID REFERENCE
Pukeareinga Scenic Reserve and Surrounds	ROD001	1726240E 6001510N
Pretty Bush	ROD002	1728747E 6002993N
Pukepohatu, Cattlemount and Surrounds	ROD003	1730100E 6002535N
Pukekaroro Scenic Reserve and Surrounds	ROD004	1729777E 6000616N
Cooks Stream Scenic Reserve	ROD005	1731330E 6001477N
Cooks Creek Lakes	ROD006	1732379E 6002317N
Hakaru River Forest Ribbon	ROD008	1735120E 5993979N
Valley Road Remnant	ROD009	1738172E 5996954N
Lois Wintles Bush and Pohutukawa Remnant	ROD011	1737062E 6003161N
Tara Creek Remnants	ROD012	1738319E 6003211N
Mangawhai North Head Remnant	ROD013	1743197E 6006119N
Mangawhai Harbour, Sandspit and Surrounds	ROD014	1744270E 6003568N
Garbolino Road Bush	ROD015	1738812E 6000555N
Kaiwaka Mangawhai Road Remnants	ROD016	1732249E 5997478N
Kaiwaka Township Bush	ROD018	1729880E 5997779N
Otioro Road Forest Remnants	ROD019	1731607E 5994866N
Settlement Road Forest Remnants	ROD020	1732645E 5996232N
Settlement Road Matai Remnants	ROD021	1732262E 5995924N
Pritchard Road Forest Remnants	ROD022	1737246E 5995024N
Staniforth Paper Road Forest Remnants	ROD023	1738670E 5995067N
Kereru Lane Forest Remnants	ROD024	1738931E 5995992N
Cames Road Forest Remnants	ROD025	1739790E 5996765N
Wallbank Way Bush	ROD026	1740464E 5998964N
Topuni Scenic Reserve and Saltmarsh	ROD027	1732032E 5991653N
Topuni Bush Fragments	ROD028	1734017E 5992751N
Topuni Farm Bush Remnants	ROD030	1735590E 5994153N
Sentinel Rock	ROD031	1744333E 6005767N
Garbolino Road Swamp	ROD033	1738240E 6000571N
State Highway 1 Remnant	ROD034	1728848E 5999395N
Old Waipu Road Remnant	ROD035	1740145E 6002136N
Wallbank Way Dam	ROD036	1728848E 5999395N
Carter Road Remnants	ROD038	1741750E 5996861N
Mangawhai Heads Dune Lake and Wetland	ROD039	1742074E 6004726N

PUKEAREINGA SCENIC RESERVE AND SURROUNDS

Survey no.	ROD001
Survey date	10 and 15 November 2010
Grid reference	1726240E 6001510N (AY30)
Area	473.7 ha
Altitude	45–291 m a.s.l.

Ecological units

(a) Kānuka/mānuka-tōtara forest on moderate hillslope

(b) Taraire forest on moderate-steep hillslope

(c) Pūriri forest on hillslope

(d) Kānuka/mānuka forest on hillslope

(e) Kauri forest on upper hillslope

(f) Mamaku-tōtara forest on hillslope

(g) Tōtara forest on hillslope

(h) Mamaku-māpou-rewarewa forest on hillslope

Landform/geology

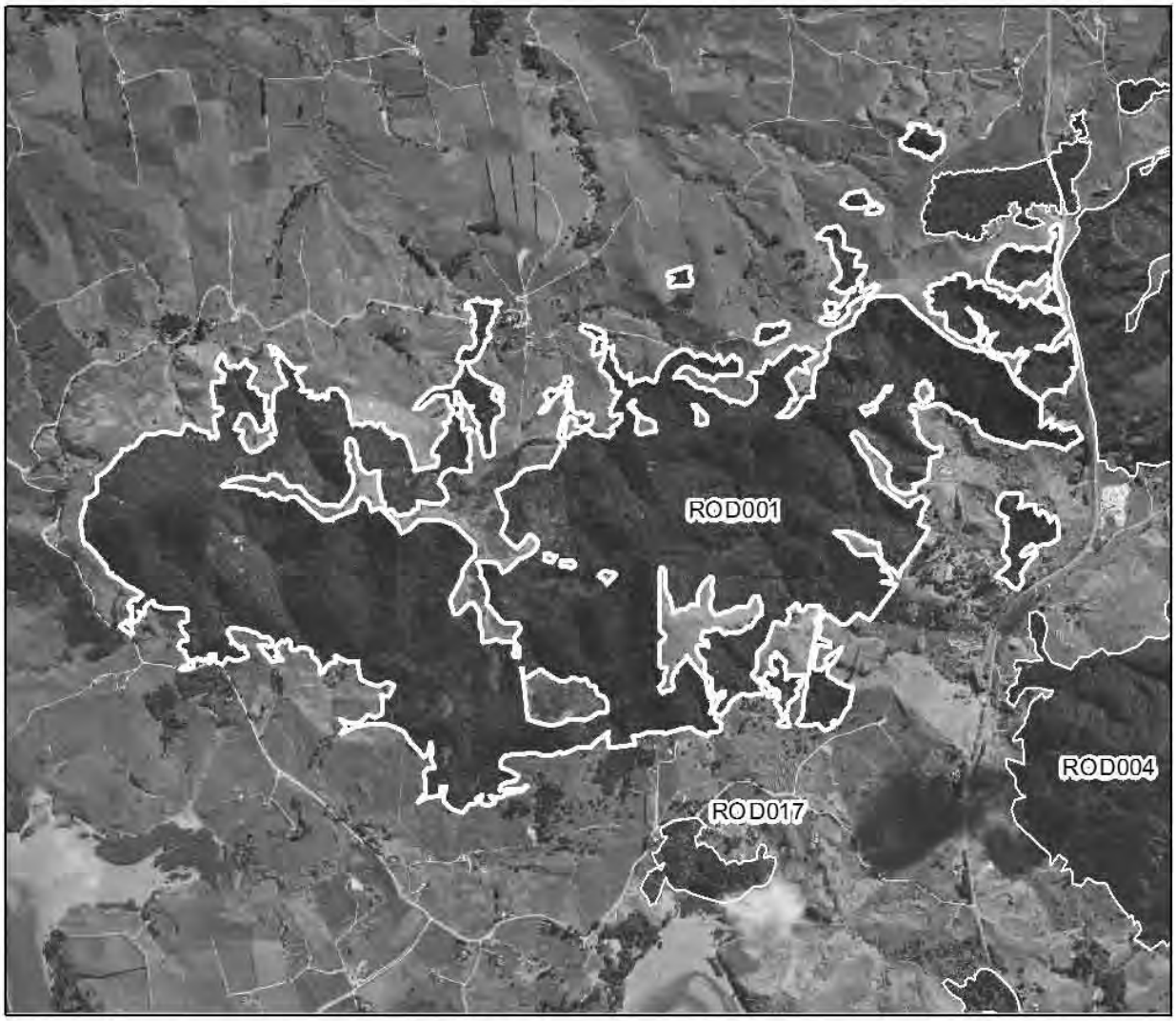
Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone and greensand; areas of deeply weathered Miocene flow dacite.

Vegetation

Aerial photography shows some areas of indigenous shrubland and what looks like exotic shrubland (probably gorse), that were not viewed from vantage points during this survey. These areas have not been mapped separately.

In the northeastern end of the site, type (a) kānuka/mānuka and tōtara is common with occasional kahikatea, pūriri, rewarewa, mamaku and two exotics—willow and pine. Around a 291 m a.s.l. highpoint on the north-facing slope, type (b) taraire is common with frequent kahikatea and occasional kauri, pūriri, and nīkau, particularly on the toeslope. On the northern side at the base of the hill by Tain Road there is a small area where type (c) pūriri is common with frequent kahikatea and occasional nīkau, tī kōuka and kauri. Small patches of abundant (d) kānuka/mānuka are also present here. At the northwestern end of the site, kānuka/mānuka is common, with frequent rimu and taraire. Occasional species include pūriri, nīkau, mamaku, rewarewa, kahikatea, pukatea, tarata, mature kauri, toru, tī kōuka, puka, northern rātā and emergent pine. There are also small localised patches of type (e) ricker kauri.

On the southern side of the site, type (b) taraire is common in several areas. At the eastern end, as well as taraire there are occasional tawa, kauri and rewarewa. Towards the central area there are frequent kānuka/mānuka, mamaku and ricker and mature kauri, and occasional kohekohe, kauri, rimu, tawa, rewarewa, nīkau and tī kōuka. Other vegetation types that occur locally include a small area of type (e) where kauri is abundant, with type (f) mamaku and tōtara co-dominant, and occasional gorse; abundant type (d) kānuka/mānuka with frequent tōtara and mamaku and occasional rewarewa, kahikatea, rimu, pūriri, and ricker kauri; an area where type (g) tōtara is

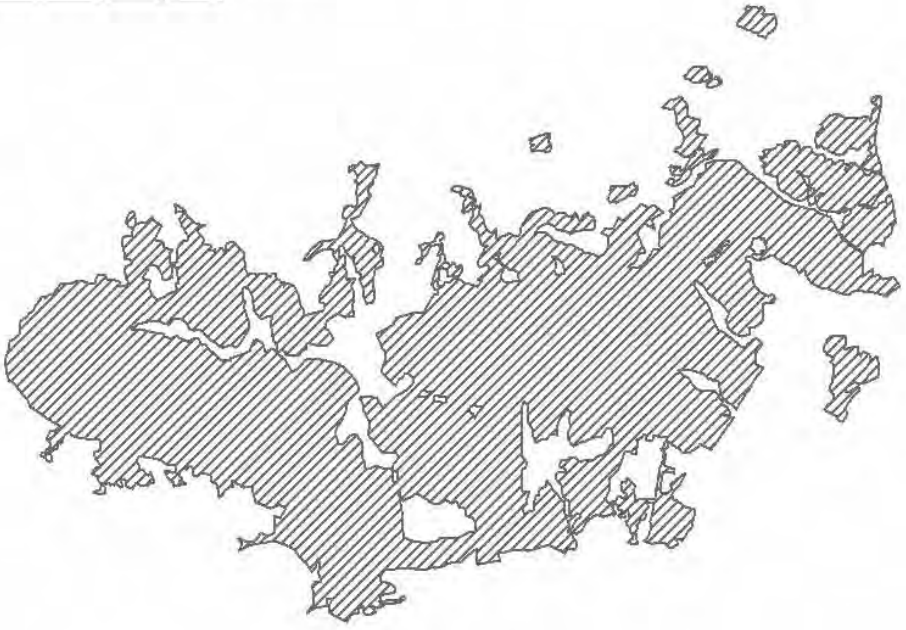


ROD001 Pukeareinga Scenic Reserve and Surrounds

0 500 1,000 2,000 Metres

Habitat type

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



Aerial photography flown in 2008

common with frequent gorse and taraire and occasional nīkau, kahikatea, mamaku, pūriri and ricker kauri; an area where type (h) mamaku, māpou and rewarewa are co-dominant with frequent tōtara and kānuka/mānuka. Occasional mature kauri were noted, along with pūriri and kahikatea. At the eastern end, there is an area where type (d) kānuka/mānuka is common with frequent taraire and occasional kahikatea, kauri, pukatea, rimu, nīkau, tōtara, māhoe, mamaku and puawānanga.

Within the Pukeareinga Scenic Reserve, abundant to common type (b) taraire occurs with a range of species including frequent pūriri, occasional tarata, nīkau, rewarewa, rimu, tawa, tōtara, kauri (ricker and mature), kōwhai, kohekohe, tī kōuka, kānuka/mānuka, puka and a few pines. Kānuka/mānuka type (d) is common with frequent pūriri, taraire and kohekohe, and occasional kauri (including mature trees), tī kōuka, rewarewa, rimu, tōtara, kahikatea, tarata, tōwai, mamaku, karaka, pukatea and nīkau.

Fauna

Birds

A 1997 survey (SSBI Q08/H024) recorded the following species: NI brown kiwi (Nationally Vulnerable) (probe holes and kiwi scat seen), kūkupa (regionally significant species), pied tit (regionally significant species), shining cuckoo, NZ kingfisher, grey warbler, NI fantail, and tūi. Kūkupa (regionally significant species) and Australasian harriers were recorded during the 2010 survey.

Frogs

Introduced frogs were heard in a pond within pasture near this site during the 2010 survey.

Invertebrates

The 2010 survey also recorded a dead kauri snail (Gradual Decline) and a dead *Amborhytida* species (probably *Amborhytida dunniae*; W. Holland and P. Graham, DOC, pers. comm. 2011) (Gradual Decline).

Significance

Pukeareinga Scenic Reserve and Surrounds (ROD001) is located in the northwestern corner of Rodney ED (Northland) and is contiguous with the larger site of Pukepohatu, Cattlemount and Surrounds (ROD003) to the east which, in turn, is connected to the Brynderwyn Range (in Waipu Ecological District). There are records of brown kiwi from the site, but these are 15 years old, and it is widely acknowledged that kiwi are no longer present in the Bryndrwyns (G. Coulston, DOC, pers. comm. 2012). The site supports two regionally significant bird species and is likely to support two species of 'At Risk' land snails. The site contains good examples of Parakiore soils, which are regionally uncommon (Arand et al. 1993). Very little or no pest mammal control is undertaken by DOC at this site, hence pests such as pigs, goats, possums, rodents and mustelids currently threaten its ecological integrity. Recreational hunting is likely to have some impact on pig numbers (G. Coulston, DOC, pers. comm. 2012). The site is representative for vegetation types (a), (b), (c), (d), (e) and (h). Approximately 79.5 ha of the site are protected within the Pukeareinga Scenic Reserve (DOC-administered), 1.5 ha is protected within a Queen Elizabeth II Open Space Covenant, and 0.6 ha is protected within a Te Uri O Hau Conservation Covenant (DOC-administered). Approximately

3.3 ha of this site is within a 'Chronically Threatened' land form environment (A6.1d), 9.3 ha is within an 'At Risk' land form environment (A6.1b), 3.8 ha is within a 'Critically Underprotected' land environment (A6.1c), 84.2 ha is within an 'Underprotected' land form environment (D1.2b), and 373 ha is within a 'No Threat Category' land environment (D1.1a, D1.1b) (Walker et al. 2007).

PRETTY BUSH

Survey no.	ROD002
Survey date	5 November 2010
Grid reference	1728747E 6002993N (AY30)
Area	17.3 ha
Altitude	91–117 m a.s.l.

Ecological units

(a) Kahikatea forest on gentle hillslope

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

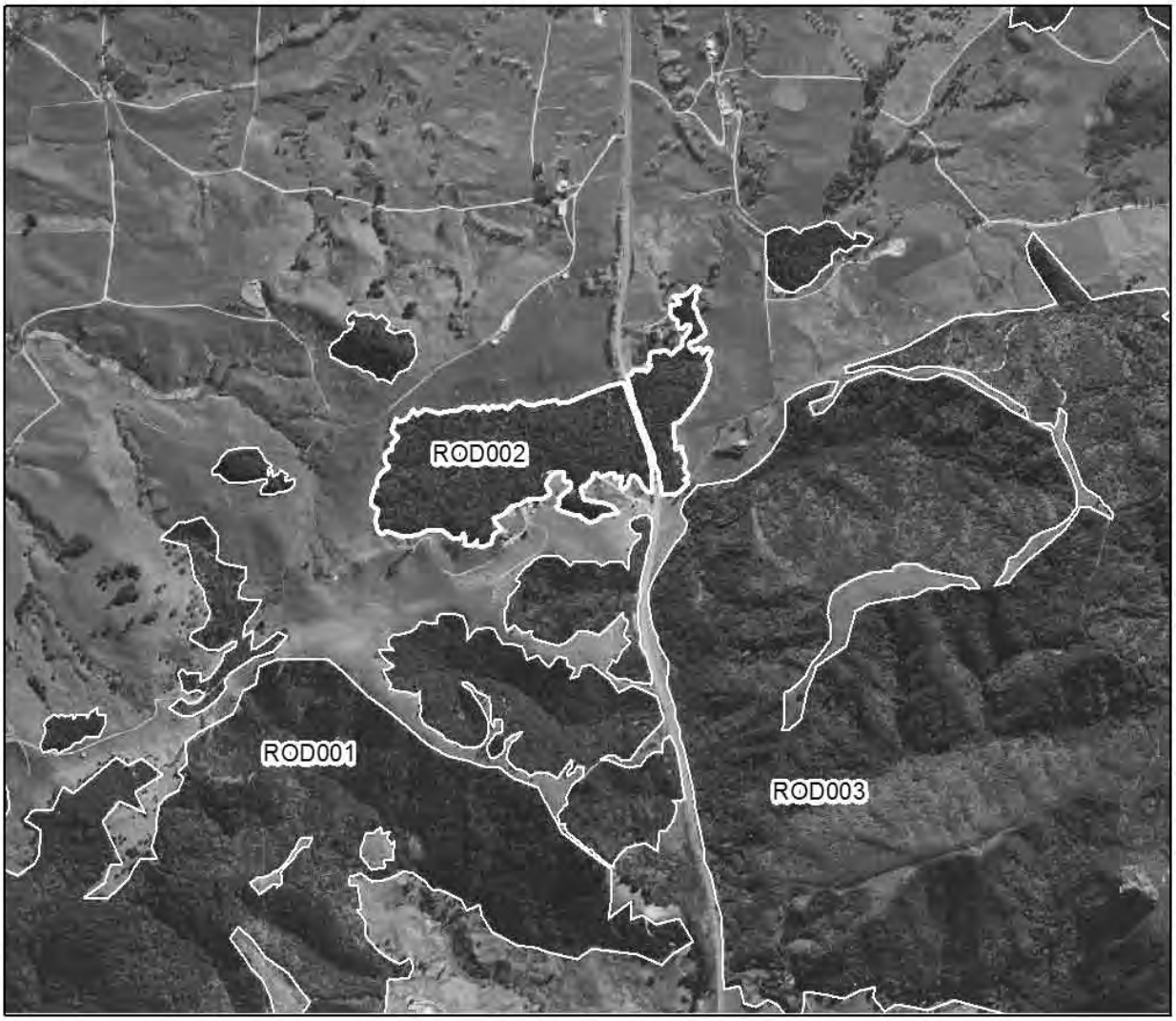
The two remnants are dominated by type (a) kahikatea forest. Kahikatea is common with frequent rimu, kauri and tōtara, and occasional rewarewa, tānekaha, nīkau, ponga, tī kōuka and kānuka/mānuka.

Fauna

None noted.

Significance

Pretty Bush consists of two small forest remnants bisected by State Highway 1, which are semi-contiguous with Pukepohatu, Cattlemount and Surrounds (ROD003). Although little is known of the site's flora and fauna, it is likely to share some of the biological values as those recorded from ROD003. Over half of the site (10.6 ha) is protected within a Queen Elizabeth II Open Space Covenant, which means stock are likely to be excluded and pests controlled. Approximately 8.9 ha of this site is within a 'Chronically Threatened' land form environment (A6.1d, A7.1a) and 8.2 ha is within a 'No Threat Category' land environment (D1.1b) (Walker et al. 2007).

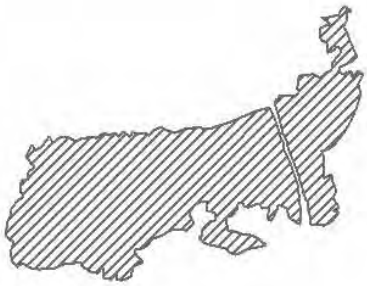


ROD002 Pretty Bush

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

PUKEPOHATU, CATTLEMOUNT AND SURROUNDS

Survey no.	ROD003
Survey date	5, 10, 11 November 2010; 4 March 2011, 20 April 2012
Grid reference	1730100E 6002535N (AY30, AY31)
Area	2138.9 ha
Altitude	40–430 m a.s.l.

Ecological units

(a) Kauri forest on moderate hillslope

(b) Kānuka/mānuka-tānekaha forest on moderate to steep hillslope

(c) Tānekaha forest on moderate to steep hillslope

(d) Kānuka/mānuka-kauri forest on hillslope

(e) Mānuka forest on hillslope

(f) Kānuka/mānuka-tōtara forest on moderate hillslope

(g) Kānuka/mānuka forest on steep hillslope

(h) Gorse scrubland on steep hillslope

(i) Kānuka/mānuka-mamaku forest on moderate hillslope

(j) Kānuka/mānuka-pine forest on steep hillslope

(k) Kānuka/mānuka-kauri-tānekaha forest in gully

Landform/geology

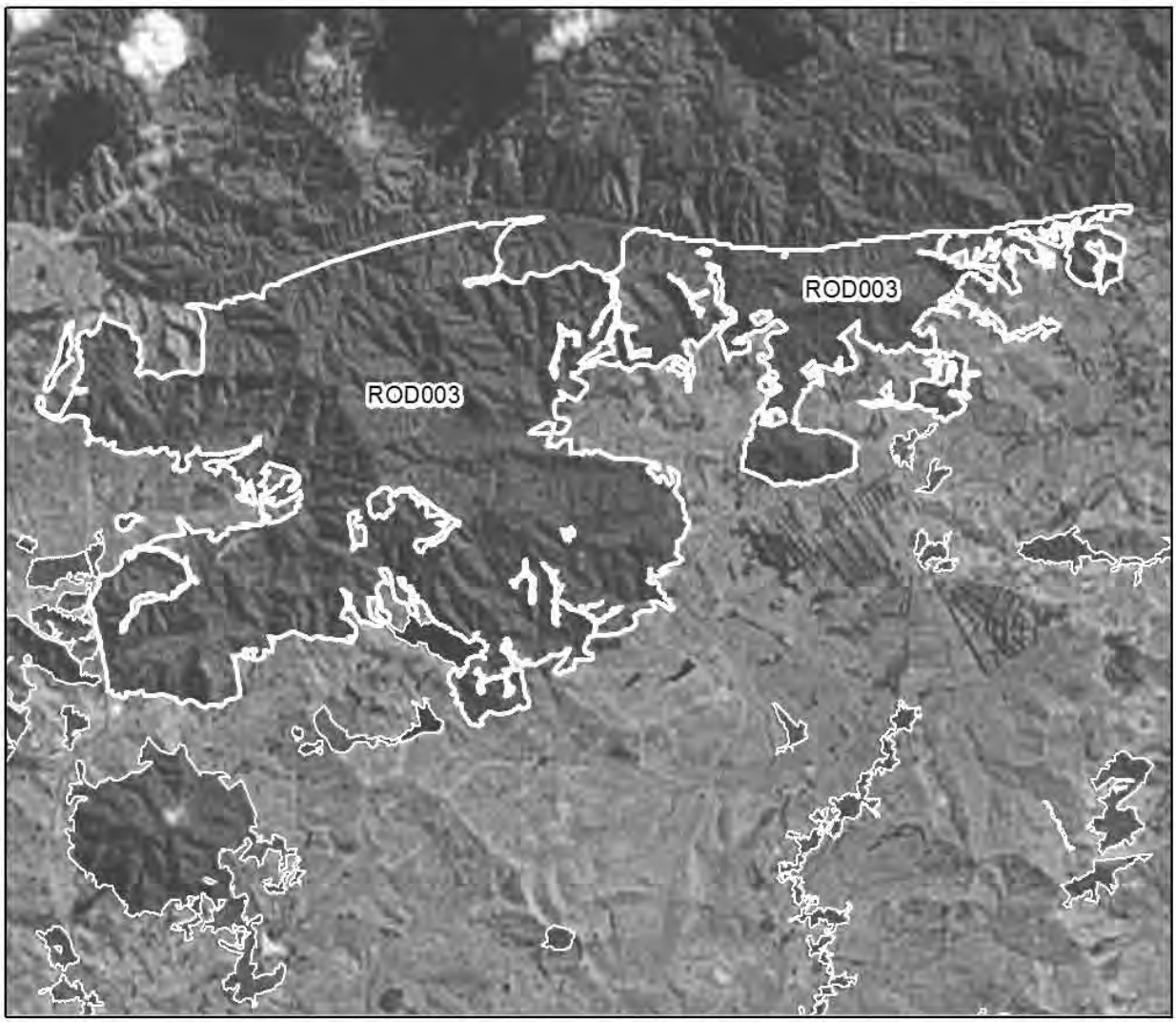
Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, and greensand; areas of deeply weathered flow dacite (Miocene) and Late Quaternary alluvium.

Vegetation

The identification of vegetation types occurring within this very large site has been limited to vantage points from roadsides. There are undoubtedly many more vegetation types than those identified here. Overall, this site is a mosaic of regenerating tōtara, kānuka/mānuka, tānekaha and kauri.

A mosaic of shrublands occurs within this site; however, these areas were not specifically mapped and have been included as forest on the map. From Pebblebrook Road, in the southeast of the site, abundant type (a) kauri (both mature trees and rickers) occurs with frequent kānuka/mānuka and rimu and tānekaha. Co-dominant type (b) kānuka/mānuka and tānekaha occur with frequent rewarewa, pūriri, kauri (clusters on ridges and spurs) and occasional rimu.

At the top end of Tara Road, a prominent hill occurs alongside the road. The main vegetation types viewed from Tara Road include abundant type (c) tānekaha with frequent tōtara and kānuka/mānuka, and occasional rimu, rewarewa and emergent pine, and abundant type (d) kānuka/mānuka with common kauri (pole and mature) and occasional rewarewa, tōwai, rimu, tōtara, tānekaha and emergent pine. On the western end of this hillslope on flats next to Tara Road, occasional kahikatea, tōtara and pūriri occur next to the creek. At Kauri Grove, in the west of the site, type (e) mānuka is common with frequent kauri (20%) and rimu, and occasional tānekaha, pūriri, mamaku, and tōtara. One emergent pine is present. On the hills out from Kauri Grove, a mosaic of vegetation occurs, including abundant type (f)

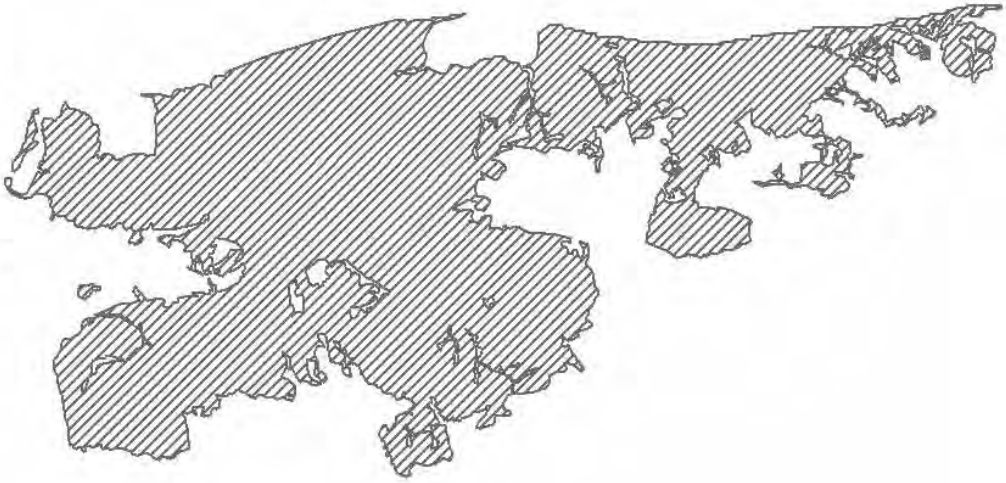


ROD003 Pukepohatu, Cattlemount and Surrounds

0 1,250 2,500 5,000 Metres

Habitat type

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



Aerial photography flown in 2008

kānuka/mānuka with common tōtara, frequent rimu and tānekaha, and very small patches of *Eucalyptus* sp. Also present is abundant type (g) kānuka/mānuka with frequent emergent tānekaha and occasional pine, *Acacia* sp., rimu and rewarewa.

In and around Pukepohatu, type (b) kānuka/mānuka and tānekaha are co-dominant with frequent rewarewa and mamaku, and occasional kauri (including mature trees), nīkau, tōwai, lancewood, rimu, tōtara, flowering puawānanga, taraire and tī kāuka. Behind the quarry below Pukepohatu, type (g) kānuka/mānuka occurs with frequent emergent rewarewa and tānekaha and mamaku in the gullies, along with occasional pines. Type (b) kānuka/mānuka and emergent tānekaha also occurs in this area, with frequent emergent rewarewa and occasional kohekohe, tī ngahere and pine. Mamaku also occurs in gullies. Type (b) kānuka/mānuka and emergent tānekaha also extends to the east of Pukepohatu with frequent to occasional rewarewa and occasional mature kauri trees. Around Pukepohatu, type (h) gorse is common in places with occasional mamaku and *Astelia* sp. Whahariki occurs at the base of Pukepohatu rock. Localised patches of type (a) kauri forest are present, as well as type (c) tānekaha forest. To the east of Pukepohatu on the eastern side of State Highway 1, areas where type (i) kānuka/mānuka and mamaku are co-dominant are present, with occasional emergent kauri, rewarewa, rimu, tānekaha, tōwai, lancewood, māpou and māhoe.

On the western side of State Highway 1, abundant type (j) kānuka/mānuka with common pine occurs. Mamaku is frequent with occasional tōwai, privet, pampas and gorse. From the end of Gibbons Road, around the middle of the site at the southern end, abundant type (g) kānuka/mānuka, is common with occasional emergent rewarewa, tānekaha and pine and some mamaku and gorse. Kahikatea occurs occasionally on the toeslope. Also in the area is commonly occurring type (k) kānuka/mānuka with emergent kauri and tānekaha, and frequent kahikatea, together with patches of dominant type (a) kauri forest.

Significant flora

This site contains approximately half of the Marunui Conservation Area and is contiguous with the Brynderwyn Hills Complex Q08/225 (a–j) (Waipu Ecological District), and therefore shares similar values. Significant flora records from the Brynderwyn Hills Complex (site number Q08/225—subsites Q08/225a to Q08/225j from Lux et al. 2007) and the Marunui Conservation Area (SSBI Q08/H021) include: *Anzybas rotundiflous* (Naturally Uncommon), *Calystegia marginata* (Naturally Uncommon), *Doodia mollis* (Naturally Uncommon), kawaka (Naturally Uncommon), *Blechnum fluviatile*, *Brachyglottis kirkii* var. *angustior*, carmine rātā, *Grammitis ciliata*, gully tree fern, *Hebe macrocarpa* var. *macrocarpa*, northern rātā, *Pelargonium inordorum*, *Lobelia angulata*, *Schizaea bifida*, *Pterostylis agathicola*, *Solanum aviculare*, and kōtukutuku (all regionally significant species). Note that there no confirmed records of the aforementioned species from ROD003. Specific plant records from the site include *Drosera peltata* (Coloniser) (recorded from the Marunui Conservation Area in 1998; L. Forester, NRC, pers. comm. 2012), whahariki (regionally significant) (Wildland Consultants 2012), and the orchid *Thelymitra aemula* (regionally significant) (AK 327815, collected in 2010).

Fauna

The following fauna species have been recorded from with the Brynderwyn Hills Complex (Q08/225 a–j) (Waipu Ecological District) as per Lux et al. (2007), which is contiguous with ROD003 and therefore this site is part of and shares

the values of this large forest complex: grey ducks (Nationally Critical), NI kākā (Nationally Vulnerable), bush falcon (Nationally Vulnerable), NI long-tailed bat (Nationally Vulnerable), long-tailed cuckoo (Naturally Uncommon), red-crowned kākāriki (Relict), Auckland green gecko (Declining), *Amborhytida dunniae* (Gradual Decline), longfin eel (Declining), Hochstetter's frog (Declining), and the regionally significant species kūkupa, tomtit, bellbird, and giant bully. The following additional species have been recorded from forest, shrubland and aquatic habitats throughout Brynderwyns–Bream Tail (Pierce & Marunui Conservaton Ltd 2010): Australasian bittern (Nationally Endangered), NZ dabchick (Nationally Vulnerable), kauri snail (Gradual Decline), NI fernbird (Declining), pied stilt (Declining), little shags (Naturally Uncommon), black shag (Naturally Uncommon), longfin eel (Declining), and banded kōkopu (regionally significant).

Specific records for this site

Birds

Kākupa (regionally significant) and silvereyes were recorded on the day of survey. At Tara Road, beside a prominent hillslope (grid reference 1735750E 6004142N), kūkupa, Australasian harriers, and white-faced herons were recorded on the day of survey. Wildland Consultants surveyed the indigenous forest to the northwest of Brown Road in 2006 and 2007. Bird species recorded from forested habitats included sacred kingfisher, grey warbler, tomtit (regionally significant), silvereye, tūī, and fantail. A subsequent survey by Wildland Consultants in 2012 recorded tomtit from forest on Pukepohatu.

Land snails

Kauri snails (Gradual Decline) are known from the site (SSBI Q08/H021, recorded in 2006).

Frogs

Hochstetter's frog (Declining) was recorded near Tara Road in 1977 (SSBI Q08/H023). There are also several Hochstetter frog records (1993) from the site (DOC 2011).

Fish

A search of the freshwater fish database (NIWA Freshwater Fish database, viewed 2012) shows an unidentified eel, bully and galaxiid species recorded (in 1994). The exotic fish species rudd was recorded in 2009.

Invertebrates

Kōura (Gradual Decline) has been recorded from the site (NIWA Freshwater Fish database, viewed 2012).

Significance

Pukepohatu, Cattlemount and Surrounds is a large site contiguous with more than 3200 ha of indigenous forest within the PNAP site Brynderwyn Hills Forest Complex (Q08/225 a–j) in the Waipu ED. It provides a large and diverse habitat for a range of species including 'Threatened', 'At Risk' and regionally significant flora and fauna species. Approximately half of the 437 ha Marunui Conservation Area is situated in ROD003. This area has been subjected to intermittent pest control for the past 25 years, although in the last 3 years efforts have been intensified in order to significantly reduce pest mammals such as mustelids, ferrets, ship rats, possums, and pigs. Approximately 80 mustelid traps and 600 rat bait stations have been installed along the extensive network of tracks throughout Marunui. Pig numbers are kept in

check by a local hunter, while a contractor is employed to control possums on annual basis. The effectiveness of a sustained programme of integrated pest control has seen DOC give approval (in principal) to reintroduce North Island brown kiwi into the area in April 2013. It is hoped that the presence of such an iconic species in the reserve will serve as catalyst for inspiring surrounding landowners to partake in regular pest control activities (J. Hawley, Marunui Conservation Ltd, pers. comm. 2012).

Beyond the boundary of the Marunui Conservation Area, little or no pest mammal control is undertaken by DOC, hence pests such as pigs, goats, possums, rodents and mustelids currently threaten its ecological integrity. Recreational hunting is likely to have some impact on pig numbers (G. Coulston, DOC, pers. comm. 2012). Rainbow skinks were commonly observed near the summit of Pukepohatu (Wildland Consultants 2012). This introduced species of skink is currently classified as a 'Risk Assessment Animal Pest' under the Northland Regional Pest Management Strategy 2010–2015 and is an 'Unwanted Organism' under the Biosecurity Act 1993. The area is representative for vegetation types (a), (b), (c), (d), (e), (f), (g), (i), and (k). Approximately 248.1 ha is protected in reserves administered by the Whangarei and Kaipara District Councils, approximately 62.6 ha of this site lie within the Te Uri O Hau Scenic Reserve (DOC-administered), 1.6 ha lie within the Brynderwyn Hills Scenic Reserve (DOC-administered), 1.1 ha are protected within the Cook Creek Marginal Reserve (DOC-adminstered), and 248.01 ha protected within a Queen Elizabeth II Open Space Covenant (Marunui Conservation Area). Approximately 1.8 ha of this site is within an 'Acutely Threatened' land environment (A5.1a), 21.9 ha lies within a 'Chronically Threatened' land form environment (A6.1d, G3.1b), 176.8 ha lies within an 'At Risk' land environment (A6.1b), 40 ha is within a 'Critically Underprotected' land environment (A6.1a, A6.1c), 1785.3 ha is within an 'Underprotected' land environment (D1.2b), and 108.9 ha is within a 'No Threat Category' land environment (D1.1a, D1.1b, D1.2a, D1.1c) (Walker et al. 2007).

PUKEKARORO SCENIC RESERVE AND SURROUNDS

Survey no	ROD004
Survey date	5, 21 October, 10 November 2010; 20 April 2012
Grid reference	1729777E 6000616N (AY30)
Area	235.6 ha
Altitude	40–300 m a.s.l.

Ecological units

(a) Kauri forest on steep hillslope (80%)

(b) Kauri-tānekaha forest on moderate to steep hillslope

(c) Kānuka/mānuka forest on steep hillslope

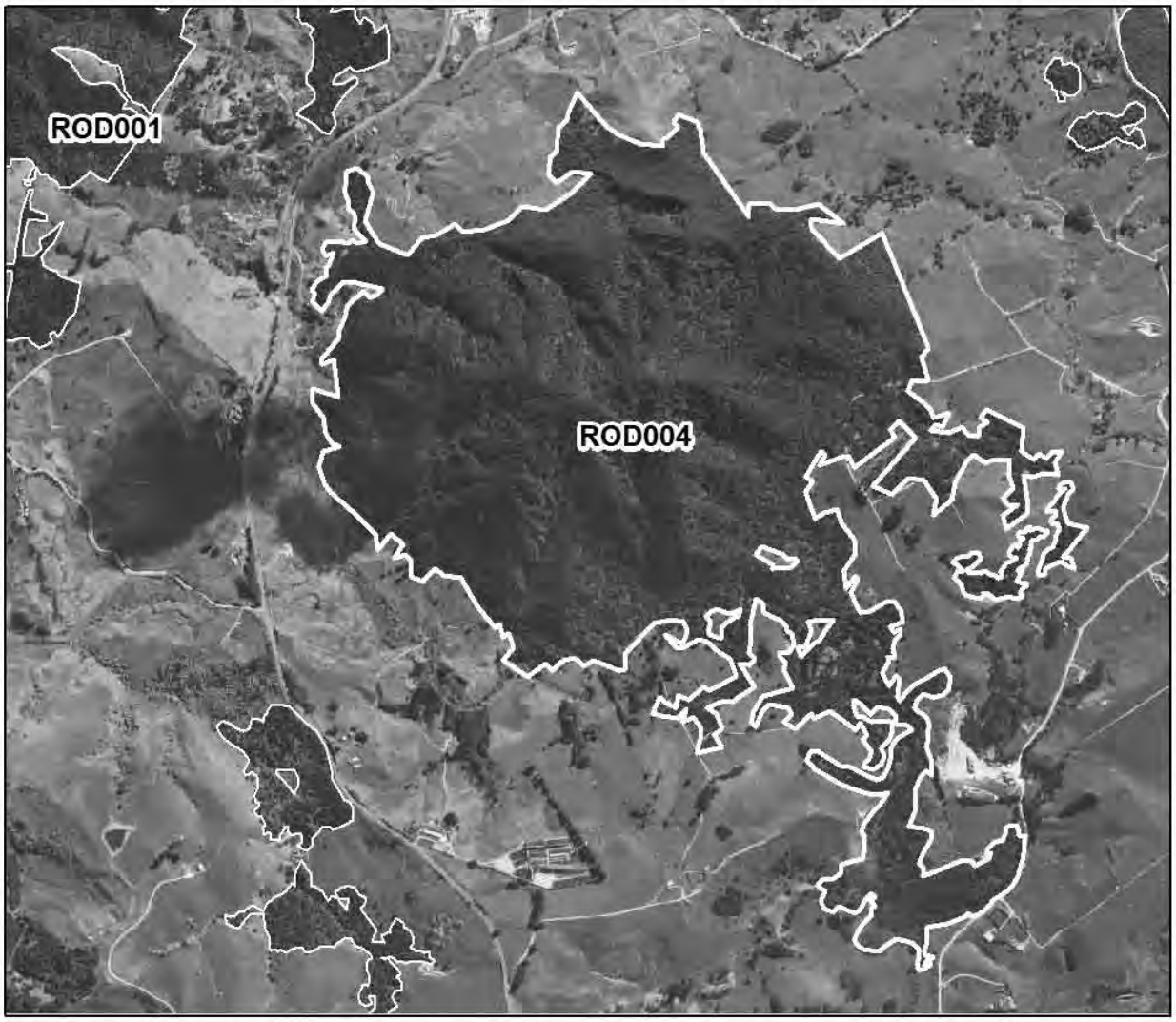
(d) Tōwai forest on steep hillslope

(e) Kānuka/mānuka-kauri-tānekaha forest on steep hillslope

(f) Kahikatea-kōwhai-tōtara forest on gentle hillslope

(g) Taraire forest on moderate to steep hillslope

(h) Kahikatea-taraire forest on gentle hillslope



ROD004 Pukekaroro Scenic Reserve and Surrounds

0 375 750 1,500 Metres

Habitat type

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

Aerial photography flown in 2008

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, and greensand; areas of deeply weathered Miocene flow dacite. Pukepohatu is a remnant of an ancient volcano comprising Parahaki dacite.

Vegetation

Most of this site is characterised by abundant type (a) kauri forest, both rickers and mature trees. Mature kauri is more prevalent in eastern gullies and on the upper slopes of the western side of the site. On the steep upper slopes of the northern side, mostly ricker and mature kauri is abundant with occasional tānekaha, rimu, and some kānuka/mānuka and tōtara towards the very top. On the western side kauri is abundant with occasional rewarewa and kānuka/mānuka and tōtara on the toeslopes. On the eastern side, kauri (mostly rickers) occurs with occasional taraire, tōtara, rimu, mature kauri, mamaku, and pūriri. On the northern side of Pukekaroro on the lower slopes, type (b) kauri and tānekaha are common with frequent rimu and kānuka/mānuka. Occasional species include rewarewa, and *Clematis* sp. was evident in the canopy. In a small area on the western side of this site, type (c) kānuka and/or mānuka is common with frequent kauri, tānekaha, and tōtara and occasional rewarewa. Kahikatea and willow are evident on the toeslope by the stream. A small area of type (d) tōwai occurs on a southwestern spur with occasional kauri, tānekaha and rimu. On the southeastern side lower slope, type (e) kānaka/mānuka, kauri and tānekaha are common with frequent rimu and tōtara and occasional northern rātā, mamaku and *Clematis* sp. An association of type (f) kahikatea, kōwhai and tōtara occurs commonly on the lower slopes on the eastern side, with frequent rimu and occasional kauri, pūriri, nīkau and kānuka/mānuka on the fringe. Two emergent pines were noted on the edge. An area of abundant type (g) taraire occurs on the northeastern side of the site, with frequent kohekohe and occasional nīkau, tawa, rimu, northern rātā, pūriri, rewarewa and puka. The small remnants alongside Gibbons Road are defined by type (h) kahikatea and taraire that occur commonly, along with frequent tōtara and kānuka/mānuka. Pūriri, rewarewa, tānekaha, nīkau, karaka and māpou are occasional. Poplars and willows were noted along the creek edge at the roadside. Two dead kauri were noted on the northwestern side of the site towards the ridge.

Significant flora

Kawaka, *Schizaea dichotoma*, and *Hypolepis dicksonioides* (all Naturally Uncommon) were recorded by Beever (1986). Regionally significant species recorded from the site include toatoa (AK 220106), *Coprosma propinqua* var. *propinqua* (AK 220099, recorded in 1993), *Astelia fragrans* (Wildland Consultants 2012), *Coprosma rigida* (AK 220102, recorded in 1993), *Grammitis ciliata* (AK 218500, recorded in 1993), *Hebe macrocarpa* var. *macrocarpa* (AK 220091, recorded in 1993), black maire (Wildland Consultants 2012), northern rātā (recorded during the 2010 survey), tawaroa (Clunie & Esler 1982), and kōtukutuku (Clunie & Esler 1982). *Potamogeton ochreatus* (regionally significant) was recorded from the Pukekaroro Stream in 2007 (AK 298678). *Brachyglottis kirkii* was recorded in 1982 by Clunie & Esler (1982), but it is unknown whether this is *Brachyglottis kirkii* var. *kirkii* (Declining) or *B. kirkii* var. *angustior* (regionally significant).

Fauna

Australasian harriers were recorded on the day of the survey.

Significance

Pukekaroro Scenic Reserve displays an impressive stand of regenerating kauri that is a conspicuous and familar feature to those who travel on State Highway 1, about 3 km north of Kaiwaka. The site supports three 'At Risk' and at least 11 regionally significant plants. There is a range of orchid species present in the kauri forest, and a targeted orchid survey would be advantageous. Weeds are almost absent from the site and a deer-proof fence protects some of the site from stock and wild deer (N Goldwater, Wildland Consultants, pers. obs. 2012). A local landowner undertakes possum control throughout part of the site, although rodents and mustelids are not managed. The size, shape and location of Pukekaroro Scenic Reserve make it an ideal candidate for a 'mainland island', which could be managed under a programme of integrated pest control. The site is representative for all ecological units. Approximately 133.4 ha of the site is protected within the Pukekaroro Scenic Reserve (DOC-administered) and 12.2 ha is within a Te Uri O Hau Conservation Covenant (DOC-administered). Approximately 53.3 ha of this site lies within a 'Chronically Threatened' land form environment (A6.1c, G3.1b), 33.4 ha lies within an 'At Risk' land environment (A6.1b), 2.2 ha is within a 'Critically Underprotected' land environment (A6.1a), 124.2 ha is within an 'Underprotected' land environment (D1.2b), and 22.5 ha is within a 'No Threat Category' land environment (D1.1b) (Walker et al. 2007).

COOKS STREAM SCENIC RESERVE AND SURROUNDS

Survey no.	ROD005
Survey date	5 October 2010
Grid reference	1731330E 6001477N (AY30)
Area	12.3 ha
Altitude	63–110 m a.s.l.

Ecological units

(a) Kauri forest on gentle hillslope

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

Two small outlier remnants to the southwest of Baldrock Road were not surveyed.

From Baldrock Road, within the scenic reserve, type (a) kauri is common, mostly defined by rickers, but there is also the occasional large mature tree. Rimu, tōtara, kahikatea and kānuka/mānuka are frequent, while pūriri, rewarewa, tōwai, tānekaha, nīkau, puawānanga and tī kōuka occur occasionally. A dead mature kauri was noted on the edge of the reserve and two pines and a small number of pampas clumps were also noted on the edge.

Significant flora

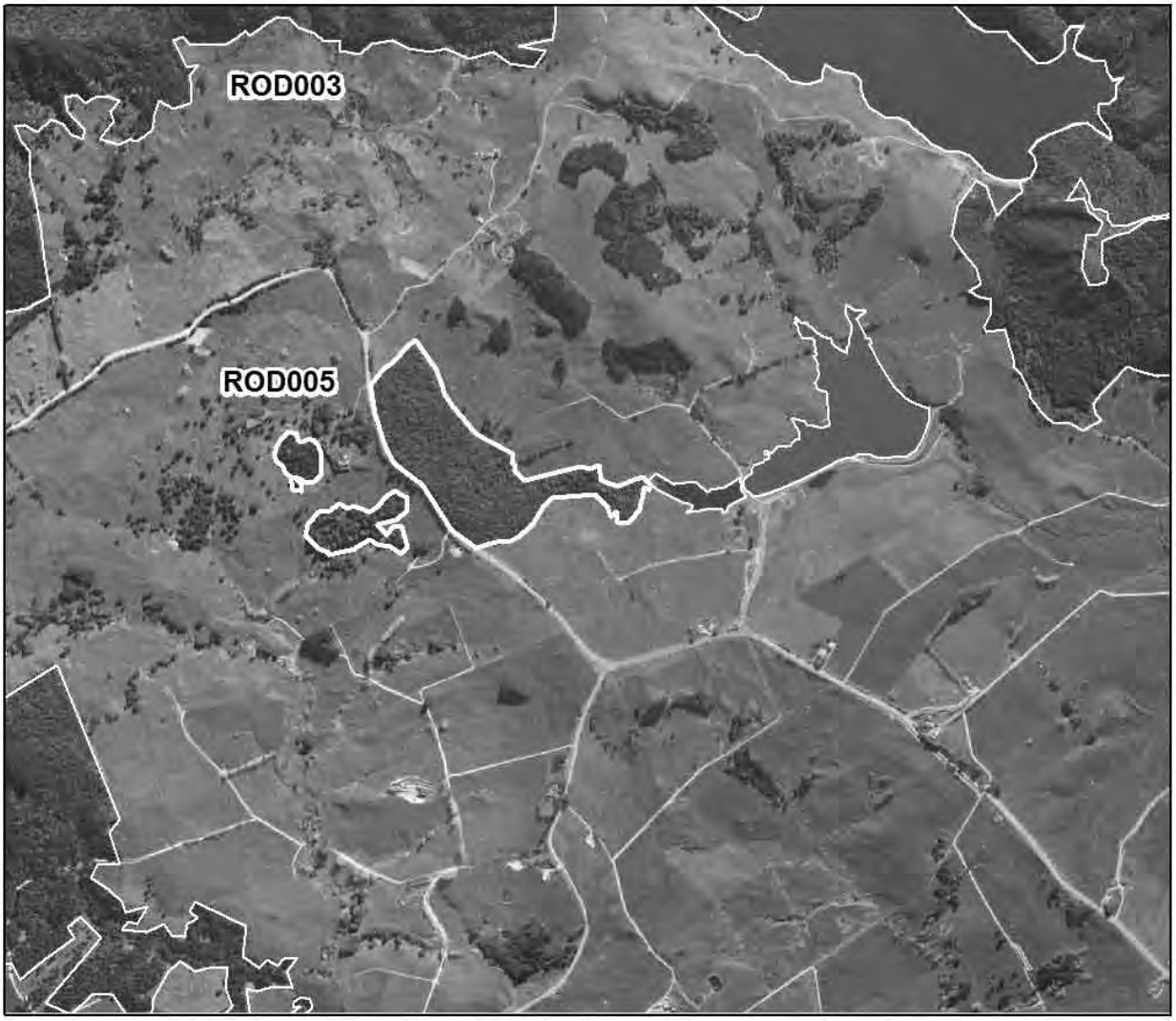
Black maire (regionally significant) was recorded in a 2000 survey (SSBI Q08/H022).

Fauna

Kūkupa and bellbird (both regionally significant species) were recorded in 2000, along with grey warbler and NI fantail (SSBI Q08/H022).

Significance

Cooks Creek Scenic Reserve and Surrounds is an important, mature forested site providing stepping stone habitat and floristic diversity within a highly modified ED (Rodney ED Northland). It supports at least one regionally significant plant and two regionally significant birds. In a survey in 2000 (SSBI Q08/H022) the reserve was noted as being 'absolutely shot' with possums, with browse particularly severe on lancewood and maire, and this survey noted a dead kauri on the edge of the reserve. This is a representative site. Little or no pest animal control is undertaken in the reserve (G. Coulston, DOC, pers. comm. 2012), which will result in a steady decline of the site's ecological values and integrity. The site may form part of a terrestrial–freshwater sequence with the Cooks Creek Lakes (ROD006) site. Approximately 8.3 ha of the site lie within the Cooks Stream Scenic Reserve (DOC-administered), and the entire site is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

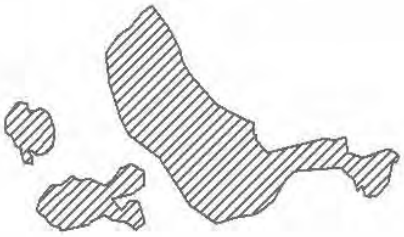


ROD005 Cooks Stream Scenic Reserve and Surrounds

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

COOKS CREEK LAKES

Survey no.	ROD006
Survey date	5 October 2010
Grid reference	1732379E 6002317N (AY31)
Area	27.3 ha
Altitude	70 m a.s.l.

Ecological units

(a) Open water in artificial lake

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

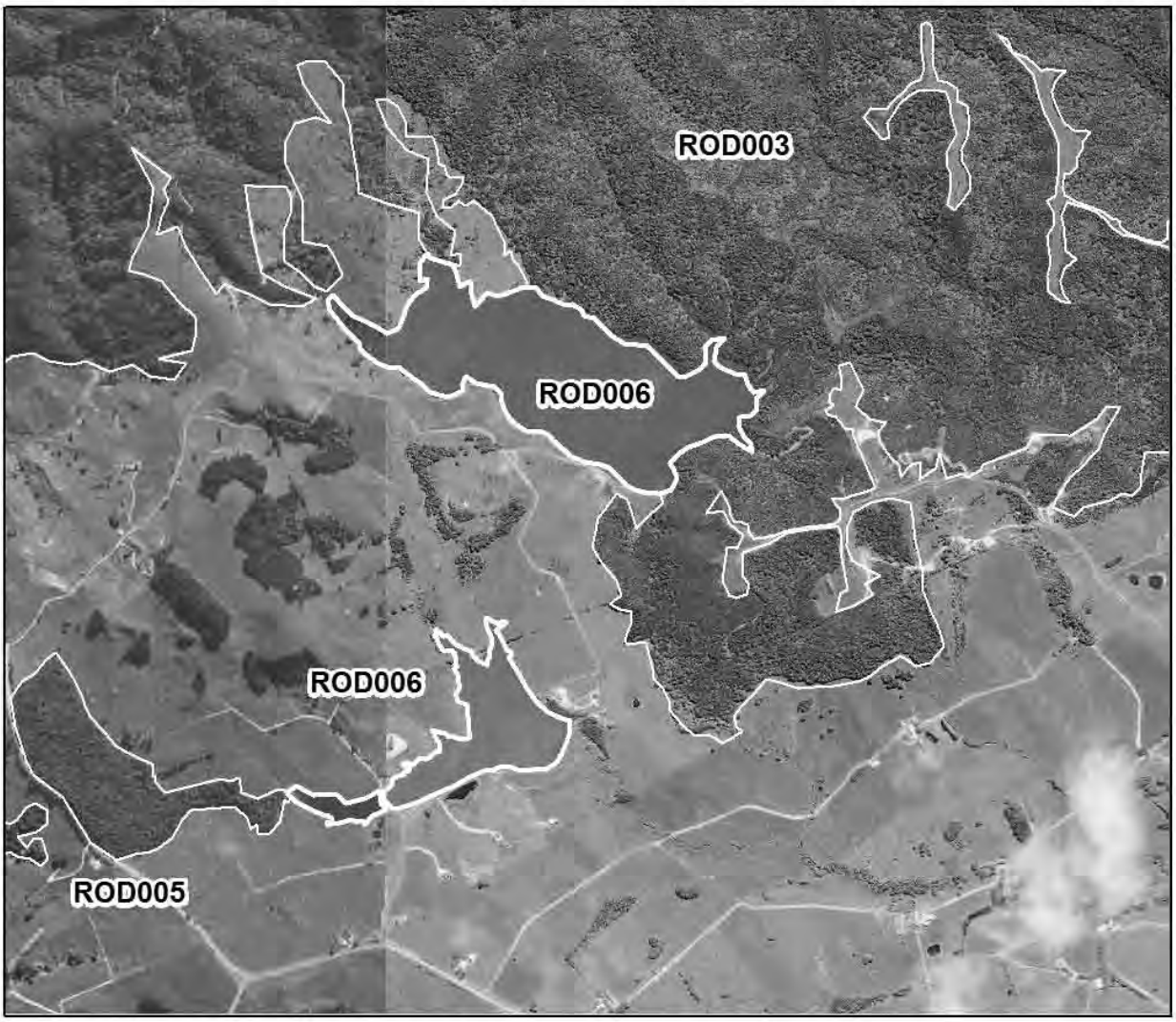
The large northern lake was not surveyed. The smallest lake largely comprises type (a) open water with a fringe of scattered tī kōuka, harakeke, pūrei, willow weed (species not known) and pampas. This lake appears to be fenced. Around the middle lake, patches of willow weed and pasture grasses occur along with occasional harakeke, mānuka, willow, soft rush, gorse and pampas. There is a causeway (Ti kouka Way) separating the small and middle lakes.

Fauna

At least 20 little black shags (Naturally Uncommon) were recorded in the middle lake on the day of survey. Pied shags (Nationally Vulnerable), welcome swallows, spur-winged plovers, black swans, paradise shelducks, and pukeko were also recorded. In 2010, Wildland Consultants recorded pied shags, little black shags (c. 20 roosting on a dead tree within the lake), Caspian terns (Nationally Vulnerable) and white-fronted terns (Declining) from the middle and smallest lakes.

Significance

Cooks Creek Lakes comprise two man-made lakes that are used for farm irrigation and water supply to Fonterra (L. Forester, NRC, pers. comm. 2012). The northern lake is partially buffered by forest within Pukepohatu, Cattlemount and Surrounds (ROD003). Although it is an artificial wetland habitat, the site provides important refugia and feeding grounds for at least two 'Threatened' and two 'At Risk' bird species. The site may form part of a terrestrial-freshwater sequence with Pukepohatu, Cattlemount and Surrounds (ROD003) and Cooks Creek Scenic Reserve and Surrounds (ROD005). Less than 0.01 ha of this site is within a 'Chronically Threatened' land environment (G3.1b), 7.7 ha lies within an 'At Risk' land environment (A6.1b), 0.2 ha is within a 'Critically Underprotected' land environment (A6.1a), 0.8 ha is within an 'Underprotected' land environment (A6.1c), and 0.2 ha is within a 'No Threat Category' land environment (D1.1b) (Walker et al. 2007).

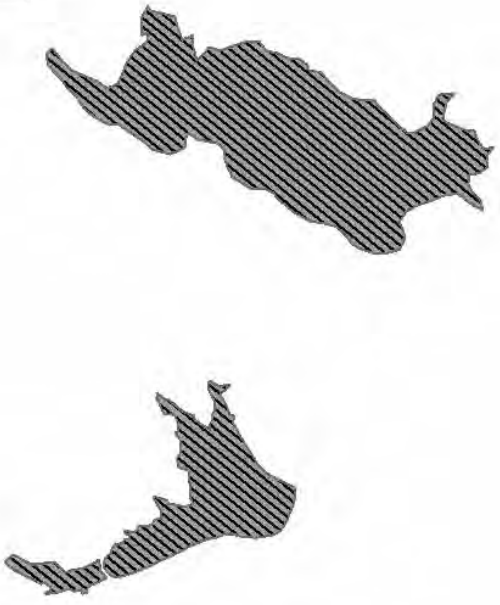


ROD006 Cooks Creek Lakes

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008 and 2002

HAKARU RIVER FOREST RIBBON

Survey no.	ROD008
Survey date	10, 18 November 2010; 27 January 2011
Grid reference	1735120E 5993979N (AY31)
Area	199.8 ha
Altitude	37–115 m a.s.l.

Ecological units

(a) Tōtara forest along riparian margin (c. 85%)

(b) Tōtara-gorse forest along riparian margin

(c) Tōtara-kānuka/mānuka forest on gentle hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone; areas of Late Quaternary alluvium.

Vegetation

The forest along the Hakaru River riparian ribbon is discontinuous in places. There are patches of pasture and gorse that occur within this site, but these areas have not been specifically mapped. Plantation pine forestry adjoins the site in couple of areas. The riparian ribbon along the Hakaru River is dominated by abundant regenerating type (a) tōtara in association with a variety of species including occasional kōwhai, kahikatea, tītoki, tī kōuka, matai, and kānuka/mānuka. Emergent pine, poplar and willow occur in some areas. On a hillslope above the river, (grid reference: 1735186E 5992944N), at the very southern end of the site, tōtara is dominant, with frequent kohekohe and kōwhai, and occasional pūriri, matai, kahikatea, tītoki, rewarewa, mamaku, nīkau and kānuka/mānuka. Tōtara is common, with frequent kahikatea and occasional kauri, kōwhai, rimu, kānuka/mānuka, and emergent pine and *Eucalyptus* sp. around the middle of the site (grid reference: 1735145E 5996787N).

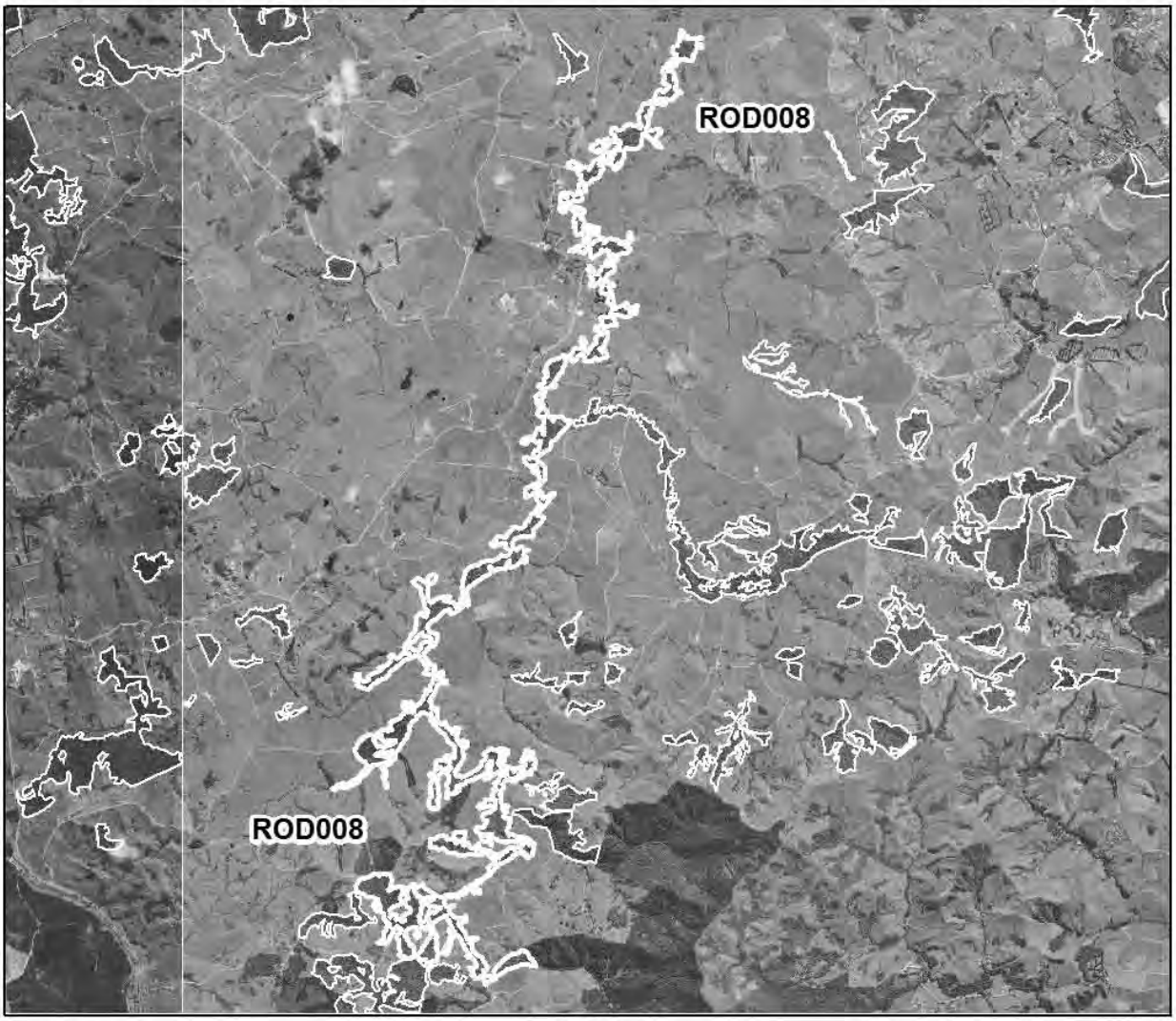
In the south of the site an area of type (b) tōtara and gorse are co-dominant and with frequent kānuka/mānuka and occasional kahikatea, mamaku, rewarewa and poplar. In the south of the site, type (c) tōtara is abundant with kānuka/mānuka common and matai, kahikatea, rimu, tī kōuka, mamaku, and willow occasional.

Fauna

None noted.

Significance

The site comprises an important indigenous riparian corridor and hillslope habitat along the Hakaru River. Together with the contiguous Valley Road Remnant (ROD009), it provides extensive riparian buffering to the river and it tributaries, helping to protect it from the effects of surrounding land use, while also providing a wildlife corridor that extends more than 9 km through predominantly pastoral land. The site is representative for vegetation types (a) and (c), although the presense of pine, poplar and willow may affect the



ROD008 Hakaru River Forest Ribbon

0 750 1,500 3,000 Metres

Habitat type

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

Aerial photography flown in 2008

quality of vegetation in the long-term. Approximately 16.1 ha of this site are protected within the Hakaru River Marginal Strip (DOC-administered). Approximately 6.1 ha of this site is within an 'Acutely Threatened' land environment (A5.1a, A7.2a); 68.7 ha lies within a 'Chronically Threatened' land environment (G3.1b), and 125.1 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

VALLEY ROAD REMNANTS

Survey no.	ROD009
Survey date	4 November 2010
Grid reference	1738172E 5996954N (AY31)
Area	71.8 ha
Altitude	37–100 m a.s.l.

Ecological units

(a) Tōtara forest along riparian margin and on hillslope

(b) Kauri-tānekaha-tōtara forest along riparian margin

(c) Kahikatea-kauri-tōtara forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

Some areas are fenced but it is unknown if there is fencing around the whole site. Along the riparian margin, abundant type (a) tōtara occurs with frequent kahikatea, and occasional tītoki, kōwhai, rimu, matai, mānatu, tī kōuka, pine, privet, and willow. At the very western end, by Cames Road, tōtara is abundant on a hillslope, along with frequent rimu and kānuka/mānuka, and occasional tānekaha, kauri and rewarewa. Where the site adjoins Lawrence Road (1737767E 5996999N), type (b) kauri is abundant in association with tānekaha and tōtara, which are both common, and there is occasional rimu, monoao, kahikatea, kānuka/mānuka, mamaku and māpou. In the small separate remnant that adjoins Lawrence Road (1738459E 5997293N), type (c) kahikatea, kauri and tōtara are co-dominant with occasional pukatea, rewarewa, nīkau and tī kōuka. In various locations along this site, kauri occurs frequently in association with occasional species such as kahikatea, tōtara, rimu, nīkau and kānuka/mānuka.

Significant flora

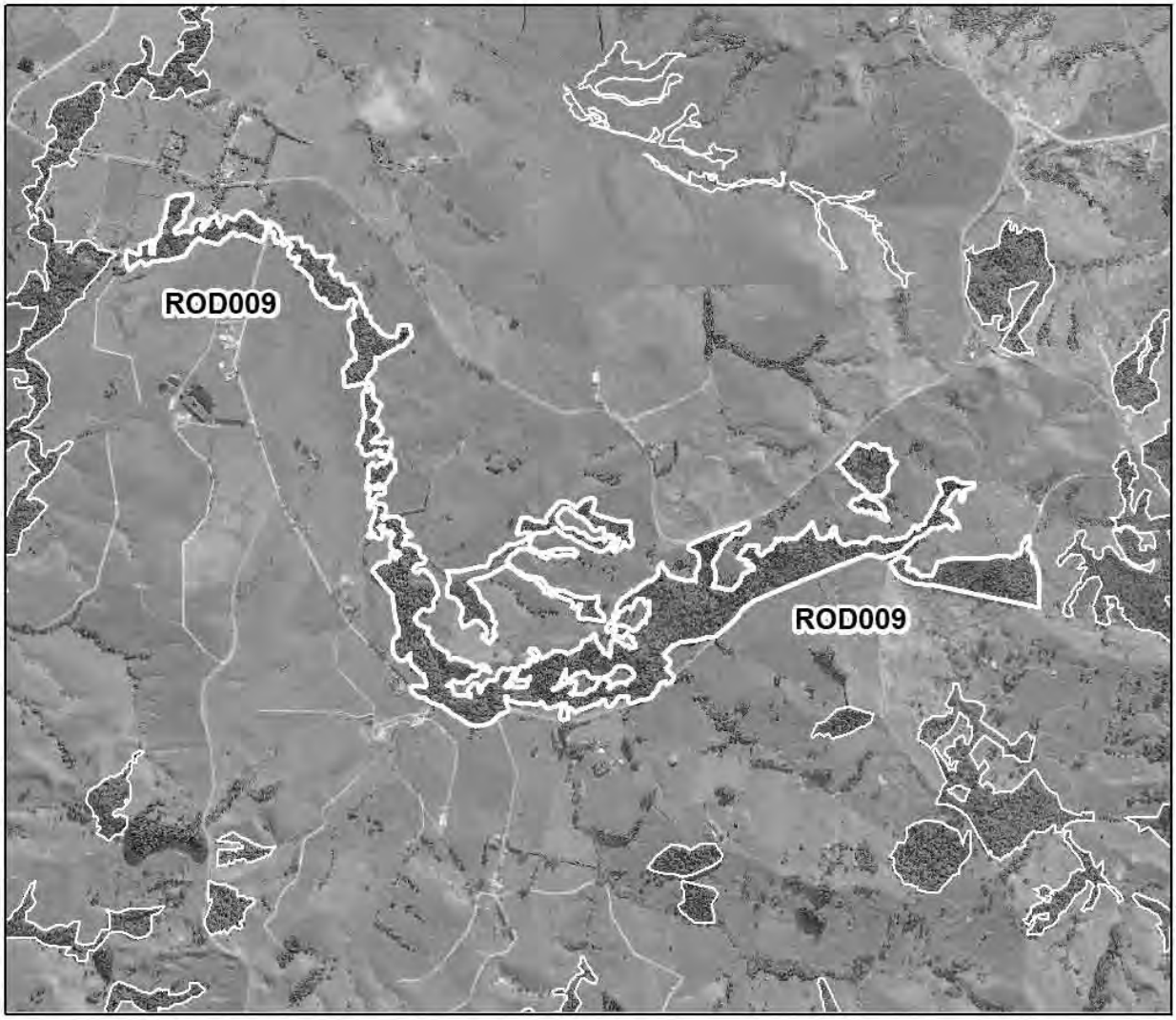
Monoao (Naturally Uncommon) and mānatu (regionally significant species) was recorded on the day of survey.

Fauna

None noted.

Significance

The site comprises a convoluted series of forest remnants near the Hakaru River (contiguous with ROD008) that provide important riparian buffering to the river, helping to protect it from the effects of surrounding land use, while



ROD009 Valley Road Remnants

0 250 500 1,000 Metres

Habitat type

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

Aerial photography flown in 2008

also providing a wildlife corridor through predominantly pastoral land. The site supports one 'At Risk' and one regionally significant plant species. The site is representative for all ecological units. An SSWI survey was conducted in 1977 of the largest area of bush in the western part of this site (at grid reference 1737800E 5996805N). It was noted that this was *one of the very few bush areas in the region which is fenced off and stock kept out* (refer to SSBI Q08/H024). Approximately 12.4 ha is protected within a Queen Elizabeth II Open Space Covenant. Approximately 1.8 ha of this site is within an 'Acutely Threatened' land environment (A5.1a, A7.2a), 25.4 ha lies within a 'Chronically Threatened' land form environment (G3.1b), and 44.6 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

LOIS WINTLES BUSH AND POHUTUKAWA REMNANT

Survey no.	ROD011
Survey date	10 November 2010
Grid reference	1737062E 6003161N (AY31)
Area	7.8 ha
Altitude	68–120 m a.s.l.

Ecological units

(a) Pōhutukawa-pūriri-tōtara forest on gentle hillslope

(b) Pūriri forest on gentle hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

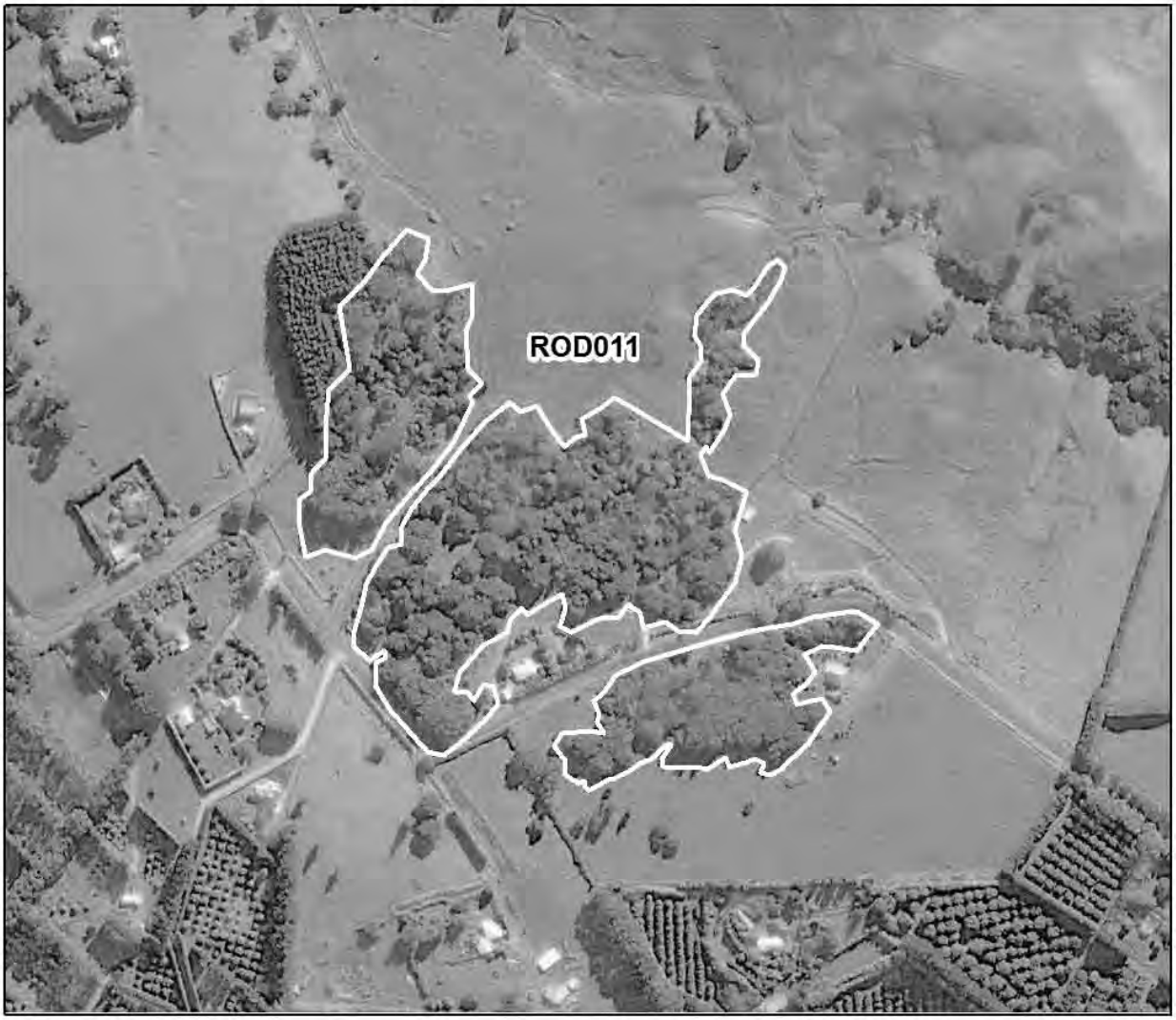
The northern remnant was not surveyed. The middle remnant is defined by type (a) pōhutukawa, pūriri and tōtara that occur commonly with frequent kahikatea. Bamboo sp. and monkey apple are conspicuous in this remnant. Only a limited view of this remnant was obtained. The southern remnant is dominated by abundant type (b) pūriri with occasional, kahikatea, karaka, kawakawa, pōhutukawa, rewarewa, rimu, and tī kōuka. Serious dieback on the pūriri was noted.

Fauna

Kūkupa (regionally significant species) was observed during the survey.

Significance

This site consists of three small forest remnants, the largest of which contains pōhutukawa-dominant forest, which is an unusual feature this far inland. The original PNAP report for Rodney ED (Northland and Auckland) by Mitchell et al. (1992) described the site as the *only pōhutukawa forest on lowland hills in the District* and the *only pōhutukawa forest outside the coastal bioclimatic zone.* A couple of very large pōhutukawa are conspicuous within this site. The site appears to be an old pa site (Mitchell et al. 1992). It supports a regionally significant bird species and is likely to provide important habitat for mobile fauna travelling between larger nearby sites

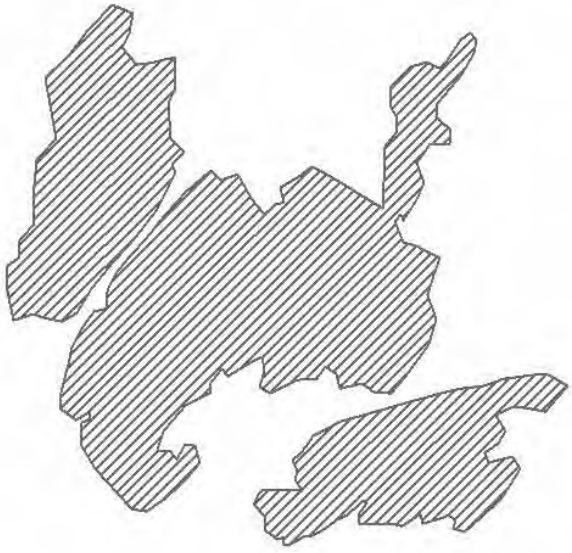


ROD011 Lois Wintle Bush and Pohutukawa Remnant

0 50 100 200 Metres

Habitat type

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



Aerial photography flown in 2008

such as Pukepohatu, Cattlemount and Surrounds (ROD003) and Tara Creek Remnants (ROD012). The ground tier was described as grazed pasture during the 1992 survey. The proximity of the site to residential dwellings and pine plantation, together with the fragmented canopy and degraded understorey, leaves this site vulnerable to further weed incursions. Despite the presence of weeds and the possibility of a grazed undersotrey, both ecological units are considered representative given their rarity within the ED. Approximately 0.8 ha of this site is Tara Road Protected Private Land (administered by Kaipara District Council). Approximately 0.1 ha of this site is within a 'Chronically Threatened' land form environment (A7.1a), 0.4 ha lies within an 'At Risk' land environment (A6.1b), and 7.2 ha is within a 'No Threat Category' land environment (D1.1a) (Walker et al. 2007).

TARA CREEK REMNANTS

Survey no.	ROD012
Survey date	10 November 2010
Grid reference	1738319E 6003211N (AY31)
Area	32.7 ha
Altitude	20–80 m a.s.l.

Ecological units

(a) Kānuka /mānuka-tōtara forest on gentle hillslope

(b) Kānuka/mānuka-kauri forest on gentle hillslope

(c) Tōtara-kānuka/mānuka forest along creek edge

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map:

(1) This remnant was not surveyed.

(2) This remnant comprises co-dominant type (a) kānuka/mānuka and tōtara, with frequent kahikatea, kauri and pūriri and occasional nīkau.

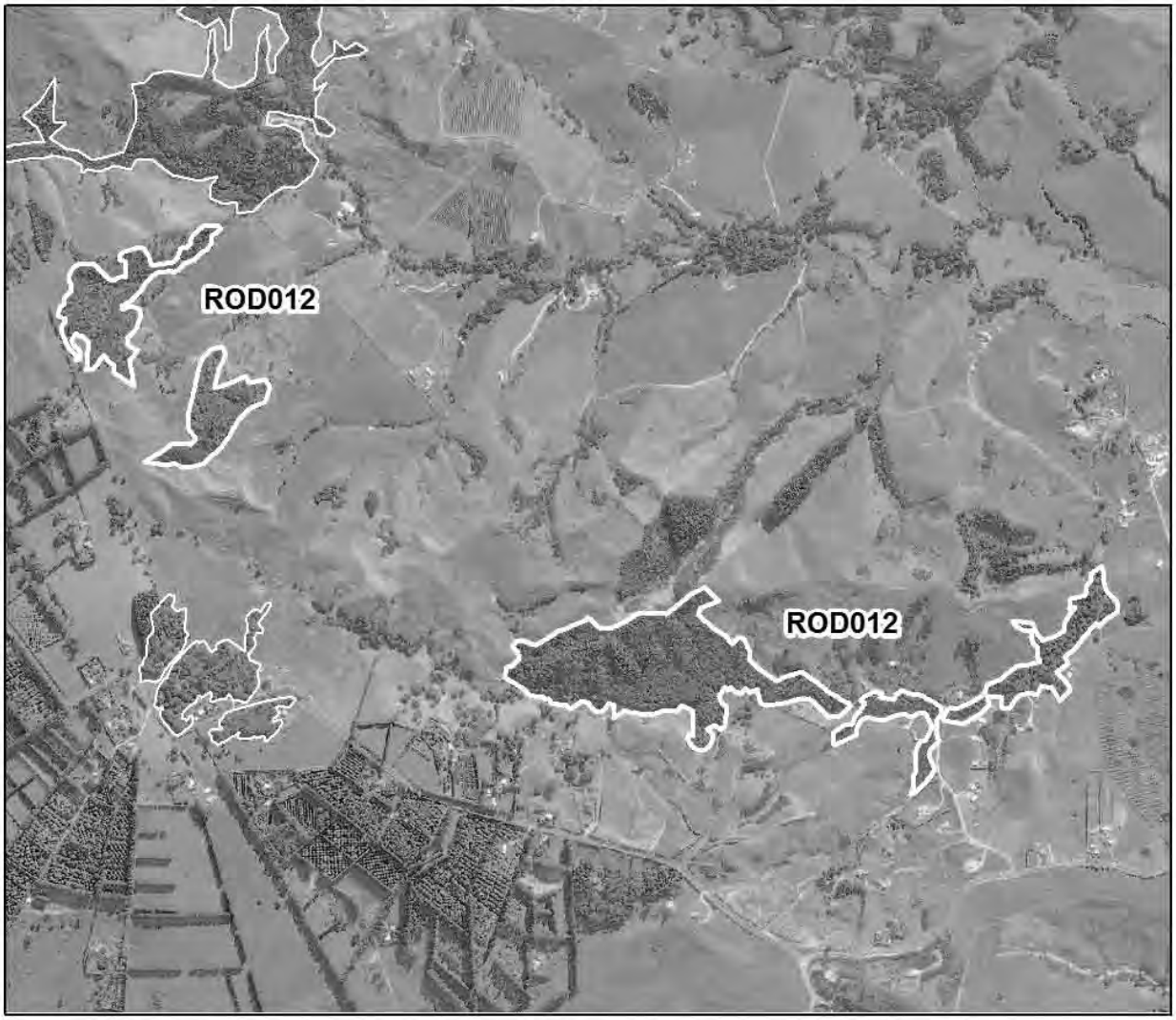
(3) The largest remnant is defined by abundant type (b) kānuka/mānuka with kauri rickers common, frequent pūriri and tōtara (on the top of the hillslope), and occasional kahikatea, mamaku, nīkau, puka, pukatea, rewarewa, rimu, tānekaha and taraire.

Remnant (4) was not surveyed.

(5) This remnant is characterised by abundant type (c) tōtara with kānuka/mānuka common, and occasional kahikatea, pūriri and tītoki.

Significant flora

Black maire (regionally significant) (50–60 cm dbh) and kohia (regionally significant) were recorded from the largest remnant (3) in 1994 (SSBI Q08/H058).



ROD012 Tara Creek Remnants

0 250 500 1,000 Metres

Habitat type

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

Aerial photography flown in 2008 and 2002

Fauna

Shining cuckoos and tūī were heard near the largest remnant (3) during this survey. Kūkupa (regionally significant), NZ kingfishers, grey warblers, NI fantails, silvereyes, tui, and pukeko were recorded in a 1994 SSBI survey (SSBI Q08/H058). Also during this survey, North Island kākā (Nationally Vulnerable) were reported flying over the site.

Significance

The site comprises a number of small, disparate remnants, some of which provide partial buffering to Tara Creek. The largest remnant of this site (remnant (3)) was described, during a 1994 SSBI survey, as having an intact and diverse understorey as stock had been excluded for 'many years'**.** The 1992 PNAP report for Rodney Ecological District (Mitchell et al. 1992) described the largest remnant as *an excellent piece of complex forest on a hillslope/ ridge/gully/creek system. The regeneration in the understorey is very good.* The site supports two regionally significant plant species, one regionally significant bird species, and potentially one 'Threatened' bird species. Site is representative for all ecological units. Approximately 0.9 ha of this site is within a 'Chronically Threatened' land form environment (G3.1b) and 31.8 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

MANGAWHAI NORTH HEAD REMNANTS

Survey no.	ROD013
Survey date	14 April 2011; 19 April 2012
Grid reference	1743197E 6006119N (AY31)
Area	48.5 ha
Altitude	0–107 m a.s.l.

Ecological units

(a) Kānuka/mānuka shrubland on hillslope

(b) Kānuka-mānuka shrubland on alluvium

(c) Open water in artifical pond

(d) Harakeke-karo-pōhutukawa flaxland on headland

(e) Pōhutukawa forest on headland

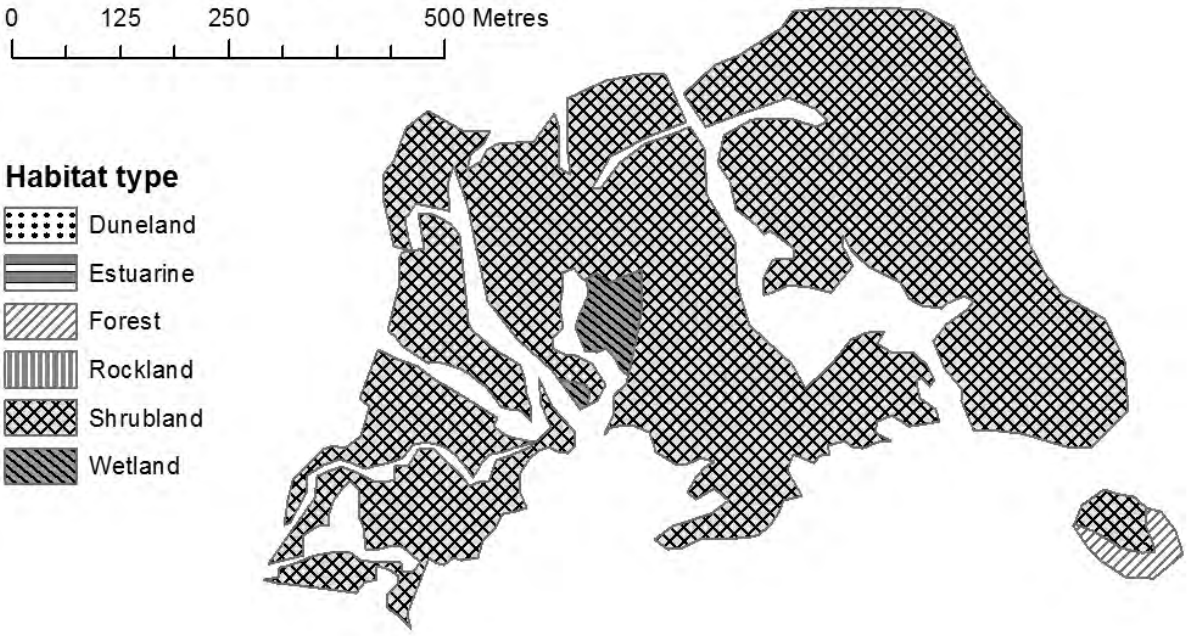
Landform/geology

Intrusions of Late Miocene age Parahaki Volcanics (dacite lava and tuff).

Vegetation

The large shrubland remnant largely comprises abundant type (a) kānuka/ mānuka with frequent mamaku, kūmerahou, sedges, gorse and banksia, and occasional tānekaha, hangehange, tī kōuka, pōhutukawa, pampas, woolly nightshade, prickly hakea, and emergent pine. In 1996, a habitat survey was conducted in the western part of the shrubland area of this site (22.8 ha of what was then called the 'Joyden Estate'), in response to a pending subdivision application, and the area was described as gumland habitat (see SSBI R08/ H002) with the following description: the dominant plant species in the area is type (b) kānuka with patches of mānuka, especially in the damper

ROD013 Mangawhai North Head Remnants



Aerial photography flown in 2008

areas. In the gullies, the cover is taller than 6 m, with occasional mamaku. On the ridges, kānuka is open and shorter (2–3 m), with an understorey of tanglefern, sedges (*Schoenus tendo*, *S. brevifolius* and *Lepidosperma laterale*) and clubmoss (*Lycopodium deuterodensum*). Weed species were noted as invading; these included banksia, cotoneaster, hakea, wild ginger, pines and Dally pine. In 2010, Wildland Consultants Ltd conducted a PNAP-style wetland survey for the Northland Regional Council and described this area as being mānuka shrubland with *Gleichenia microphylla* and *Schoenus tendo* common in the understorey. Climbing asparagus and gorse were noted as being frequent and with occasional tī kōuka, harakeke, *Gahnia* sp., *Lepidosperma laterale*, banksia, arum lily, Dally pine, prickly hakea, boneseed, pampas and agapanthus. An artifical type (c) pond has been constructed in the southwestern part of the site and has a range of species present on its fringe, including *Machaerina teretifolia*, kānuka/mānuka, oioi, tī kōuka, raupō, and boneseed. Harakeke, guava, *Coprosma* sp., *Hebe* sp. and water lily, which appear to be planted, are also present.

Flaxland comprising type (d) harakeke, karo and pōhutukawa is common on the hillslope above the Mangawhai surf club at the southeastern end of the site, occurring with frequent houpara, gorse, buffalo and kikuyu grass, and occasional kawakawa, taupata, oioi, bracken, māhoe, pōhuehue, NZ spinach, mothplant, cape gooseberry, and climbing asparagus. Several species have been planted, including ngaio, Kermadec pōhutukawa, and puka. The remaining vegetation on the headland largely comprises type (e) pōhutukawa forest over a sparse understorey of houpara, karo, kawakawa, rasp fern and hook sedge. Climbing asparagus is the most common weed species.

Significant flora

The following orchids were recorded in 1996 (SSBI R08/H002) from the gumland area in the west as described in type (a) above: *Petalochilus alatus* (Naturally Uncommon), *Molloybas cryptanthus* (Naturally Uncommon) (AK 239456, collected in 1996), and *Drosera peltata* (Coloniser).

Fauna

Birds

A 1987 survey by the Wildlife Service in the gumland area (in SSBI R08/H002) recorded the following species: NI fernbird (Declining), grey warbler, NI fantail, silvereye, and welcome swallow.

Lizards

2002 record of *Oligosoma smithii* (DOC Bioweb database, viewed 2011).

Significance

The site contains one of two examples of coastal shrubland in Rodney ED (Northland). The gumland area identified within this site is a relatively good example and is also one of only two gumland areas identified in Rodney ED (Northland). Gumland is a threatened and uncommon wetland type throughout Northland. The site supports at least three 'At Risk' plant species and two 'At Risk' fauna species. Within the ED, this site is the closest natural area to offshore islands such as Hen and Chickens, and is thus likely to act as a coastal–inland stepping stone for mobile fauna. Environmental weeds and further subdivision development threaten the ecological integrity of the site.

Weeds of particular concern are pampas (mainly coastal slopes), wild ginger and climbing asparagus (mainly in the forest and shrubland understorey). The site is representative for types (a), (b), (d) and (e). Approximately 22.7 ha of this site is within an 'At Risk' land environment (A6.1b, G1.1a) and 25.7 ha is within a 'No Threat Category' land environment (D1.1a, D1.1b) (Walker et al. 2007).

MANGAWHAI HARBOUR, SANDSPIT AND SURROUNDS

Survey no.	ROD014
Survey date	10 November 2010; 7 January, 14 April and 17 June 2011; 19 April 2012
Grid reference	1744270E 6003568N (AY31)
Area	914.9 ha (2.2 ha forest, 28 ha wetland, 19.5 ha shrubland, 270.3 dunefield/sandfield, 597.6 ha estuarine)
Altitude	0–20 m a.s.l.

Ecological units

(a) Pōhutukawa forest on estuary margin

(b) Oioi-saltmarsh ribbonwood rushland in estuary

(c) Oioi-sea rush rushland in estuary

(d) Mangrove-sea rush-oioi-*Austrostipa stipoides*-glasswort mosaic in estuary

(e) Mangrove forest in estuary

(f) Kānuka/mānuka forest on hillslope

(g) Mānuka shrubland on alluvium

(h) Tī kōuka forest on alluvium

(i) *Machaerina juncea*-tangle fern-harakeke-bracken sedgeland on alluvium

(j) Sandfield on sandspit

(k) Pīngao tussockland on dunes

(l) Spinifex tussockland on dunes

(m) *Poa billardierei* tussockland on dunes

(n) *Carex pumila* sedgeland in duneslack

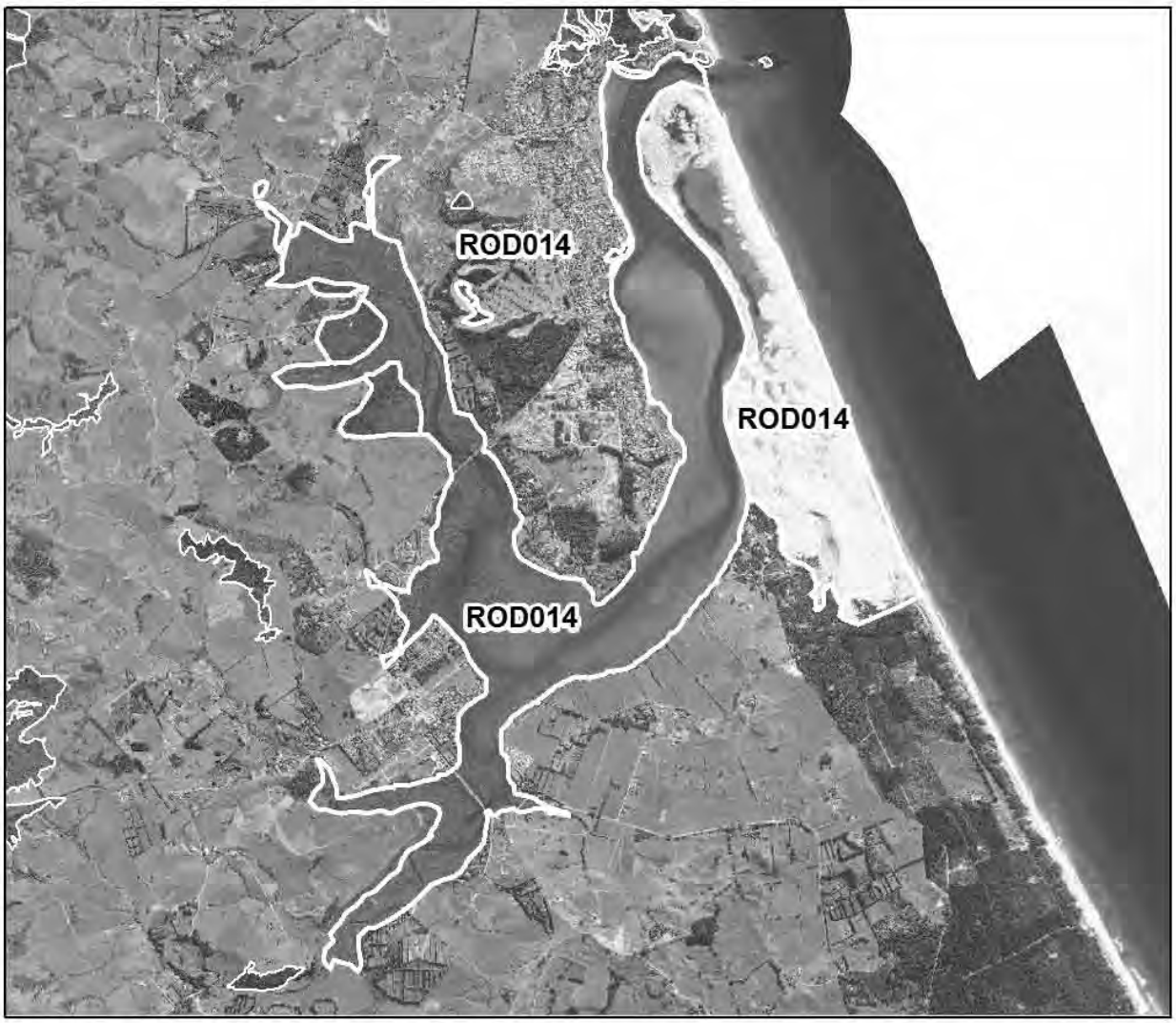
(o) Wīwī-oioi sedgeland in duneslack

Landform/geology

Holocene coastal dunefield and beach sands with Late Quaternary alluvium located at low elevations around the estuary and in the stream valleys. The sands form active dunes around the ocean beach and fixed dunes and terraces further inland (i.e. Mangawhai Heads). The Pleistocene terrace deposits are poorly consolidated silty sands, muds and gravels with minor vegetative remains (plant fragments and peat). A hard iron pan often caps these deposits (Massey 1987). Further inland, the geology is characterised by Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

In the northern part of the site near the harbour entrance, type (a) pōhutukawa forest occurs along the estuary margin with frequent houpara and occasional rewarewa, kānuka/mānuka, wild ginger and pampas. Within the Molesworth Conservation Area at the King Road – Cove Road intersection, type (b) oioi and saltmarsh ribbonwood are co-dominant, with occasional tī kōuka, harakeke, mānuka, māpou and *Olearia solandri*. The saltmarsh out from Cove Road is characterised by type (c) oioi and sea rush (co-dominant) with occasional mangrove, saltmarsh ribbonwood, *Olearia solandri* and māpou. Pampas,



ROD014 Mangawhai Harbour, Sandspit and Surrounds

0 750 1,500 3,000 Metres

Habitat type

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

Aerial photography flown in 2008

gorse, Sydney golden wattle and boneseed (all pest plants) occur on the fringe. Along the southern margin of the harbour, mangroves grade into sea rush, oioi, saltmarsh ribbonwood, and glasswort, with local *Austrostipa stipoides*, saltwater paspalum and exotic iceplant. Salt-resistant herbs such as remuremu and sea primrose occur frequently throughout this part of the site. Several drains with tide gates on them have been installed through the stop-bank and the top has been planted with pōhutukawa. Further towards the harbour mouth, pampas and Sydney golden wattle become dominant on the stop-bank and raised estuarine margins.

In the harbour, type (e) mangroves are abundant (and include a mangrove island). On the northern side of Atkin Road adjacent to the harbour, abundant type (f) kānuka/mānuka occurs with frequent *Acacia* sp. and occasional tōtara, kōwhai, tī kōuka and pine on the ridge. The shrubland area adjacent to Atkin Road on its southern boundary is dominated by abundant type (g) mānuka gumland with frequent willow-leaved hakea and occasional māpou, mamaku, māhoe, kūmarahou, gorse, pampas, and *Gahnia* sp. Swamp umbrella fern is evident as a groundcover and Sydney golden wattle occurs on the edges. On the harbour edge is a broken ribbon of saltmarsh ribbonwood, *Coprosma tenuicaulis*, *C. propinqua* var. *propinqua*, *Machaerina articulata*, harakeke, pōhuehue, willow-leaved hakea and ponga. Extending from this area of type (g) is an area of abundant type (h) tī kōuka with frequent kānuka/mānuka, gorse and raupō, and occasional pampas. Adjacent to this area, extending towards Molesworth Road, (grid ref: 1741531E 6003213N), is an area of type (g) mānuka gumland on a sandstone/peat pan, as described in a 1995 SSBI survey (SSBI R08/H011). Prickly hakea is frequent and swamp umbrella fern was noted as a common groundcover. Clubmoss, *Machaerina rubiginosa*, tūrutu, swamp kiokio and gorse were also noted. Near the lower reaches of Tara Creek, several small fresh-water wetland flushes occur which are dominated by type (i) *Machaerina juncea*, tangle fern, harakeke, rārahu, and locally common raupō. Several plants of *Dianella haematica* were seen in this vegetation type.

Mangawhai Sandspit is mostly composed of extensive areas of open type (j) sandfield. The two most common dune plant species are type (k) pīngao and type (l) spinifex, the former of which is dominant throughout the entire site. Since the late 1990s, tens of thousands of spinifex and pingao have been planted to help stablise the sandspit, particularly the bund area and sand building along constructed windbreak fences. The threatened sand tussock (type (m)) *Poa billardierei* is locally common on steep exposed foredunes, occurring with occasional pingao. Large ephemeral dune slacks are frequent in the mid-dunes of the sandspit. Sedgeland dominated by abundant type (n) *Carex pumila* occurs in shallow water, with occasional *Juncus articulatus*. The damp margins are characterised by herbaceous species such as *Lobelia anceps*, *Limosella lineata*, *Microtis unifolia*, and *Pseudonaphalium luteoalbum*. The native grass *Lachnagrostis billardierei* is also present. Another large dune slack further to the north contains co-dominant type (o) wīwī and oioi, with *Carex pumila* and *Lobelia anceps* occurring commonly in the understorey. Sea aster is frequent throughout the duneslack, while *Lachnagrostis billardierei* is occasional on the drier margins. Pampas and coastal toetoe are present in small quantities.

Significant flora

A significant population of *Poa billardierei* (Declining) was recorded from steep exposed foredunes in April 2012 (Wildland Consultants 2012). Pīngao (Declining) is the dominant duneland species, and the Sandspit is likely to be a regional stronghold for both these species. *Nertera scapanioides* was recorded from the northern margins of the harbour in 1996 (AK 232629). *Tetragonia tetragonioides* (Naturally Uncommon) was recorded on the estuarine margins in the southern part of site (AK 239847, collected in 1999; and again in 2012). *Dianella haematica* (Declining) was recorded from Back Bay, near the Molesworth Drive causeway, and *Kunzea ericoides* var. *linearis* (Declining) was recorded near Moir Point (Townsend 2012). Parapara (Relict) has been recorded on coastline below the Mangawhai Walkway (AK 184308, collected in 1989). *Olearia solandri*, *Coprosma tenuicaulis* and *C. propinqua* var. *propinqua* (all regionally significant) were recorded during the survey. *Triglochin striata* (regionally significant) was recorded in a drain on the margins of the saltmarsh at Kings Road by Wildland Consultants (2012). *Tetraria capillaris* (Regionally Significant) was recorded in 1996 (AK249161). There is a good population of sand coprosma (Declining) at Te Arai Beach in the Auckland part of Rodney ED (S. Myers, pers. comm.), as well as large areas of *Kunzea ericoides* var. *linearis* that occur on dunes at Pakiri (Wildlands Consultants 2012).

Fauna

Birds

The site is a nationally important area for NZ fairy terns (Nationally Critical), northern NZ dotterels (Nationally Vulnerable), which also roost there in winter at up to 130 birds, and Caspian terns (Nationally Vulnerable). Variable oystercatchers (Recovering), Eastern bar-tailed godwits (Migrant) and lesser knots have been recorded as being present on the spit in summer since the mid-1980s in numbers of up to 500 birds for each species (Sagar et al. 1999; Tony Beauchamp pers. comm. 2011). Wrybills (Nationally Vulnerable), royal spoonbills (Naturally Uncommon) and NZ shovelers (regionally significant) have been recorded from the harbour and estuary (Robertson et al. 2007). NI fernbirds (Declining) were heard calling on the day of survey (10 November 2011) from the saltmarsh at Kings Road and again during a successive survey (Wildland Consultants 2012). NI fernbirds were also recorded in 1995 (SSBI R08/H011) from the gumland area between Atkin Road and Molesworth Drive. Australasian bitterns (Nationally Endangered) have been recorded from saltmarsh near Kedge Drive and Cove Road (Tony Beauchamp pers. comm. 2011). Within the mangrove zone, a 2010 survey by DOC (Tony Beauchamp pers. comm.) recorded Caspian terns, pied shags (Nationally Vulnerable), little black shags (Naturally Uncommon), banded rails (Naturally Uncommon), NI kingfishers, and white-faced herons. In addition, a wetland survey by Wildand Consultants Ltd in 2010 for the Northland Regional Council also recorded black shags (Naturally Uncommon), little shags (Naturally Uncommon) and pied stilts (Declining). A pied shag colony was recorded within type (b) vegetation during the 2011 survey. A subsequent survey by Wildland Consultants Ltd in 2012 recorded 18 northern NZ dotterels, several pied stilts, one banded rail and one NZ pipit (Declining). The following additional bird species were recorded in 1979 during a survey by the

NZ Wildlife Service (SSBI R08/H003): red-billed gull (Nationally Vulnerable), white-fronted tern (Declining), reef heron (Nationally Vulnerable), NZ pied oystercatcher (Declining), southern black-backed gull, NZ kingfisher, grey warbler, skylark, and welcome swallow.

Reptiles

A moko skink was caught on the Mangawhai Sandspit in an invertebrate pitfall trap in 2003 (DOC Bioweb database, viewed 2012).

There are historical records of forest geckos (regionally significant) from the harbour edge near Mangawhai township in 1949 and 1965 (DOC Bioweb database, viewed 2011). There is a 1999 record of a green sea turtle from Mangawhai sandspit (DOC Bioweb database, viewed 2011).

Fish

A search of the freshwater fish database (NIWA Freshwater Fish database, viewed 2012) shows historical records of shortfin eel (recorded in 1965), banded kōkopu (regionally significant) (recorded in 1982), common bully (recorded in 2001), and redfin bully (Declining), kōura (Gradual Decline), inanga (Declining) and longfin eel (Declining) (recorded in 2003).

Significance

The site comprises a highly significant complex of dune, estuarine and coastal habitats that is contiguous with dune systems further south at Te Arai and Pakiri (in the Auckland part of Rodney ED). Collectively, the dunes that extend from Pakiri to Mangawhai are the best and least modified on the east coast of the Auckland Ecological Region and the southeastern part of the Northland Ecological Region. The 1992 PNAP report for Rodney Ecological District (Mitchell et al. 1992) describes the dunelands at Mangawhai as a highly significant feature. Mangawhai Sandspit is thought to have been mostly covered with forest 1000 years ago; remnants of burnt tree stumps are still visible (http://www.mangawhaiharbourrestoration.co.nz). The Mangawhai high dune (42 m a.s.l.), in particular, is the only large dune of its type for many kilometres along the east coast of Northland. Some of the inland dunes have been modified due to 'stabilisation' with lupins and marram, which could ultimately threaten the integrity of the high dune (Mitchell et al. 1992). The area surrounding Mangawhai Harbour and Estuary is highly modified and little indigenous vegetation now remains. However, the harbour contains good areas of mangrove forest and saltmarsh (Mitchell et al. 1992).

In terms of the representativeness of vegetation communities, Mitchell et al. (1992) lists the following as the best or some of the best in the Rodney ED (Northland):

- Coastal pōhutukawa forest on hills (best in the ED)
- Mangrove forests on saline wetlands (some of the best in the ED)
- Oioi sedgeland on coastal saline/freshwater wetland (one of the best in the ED)
- Coastal mānuka shrubland on peaty, boggy alluvium (best in the ED)

Mangrove forest is the dominant vegetation type within the harbour and estuary, although there are good examples of saltmarsh present on the estuarine margins. Saltmarsh is the rarest estuarine habitat type in Northland,

its extent has greatly reduced with less than 15%[15] of its original extent remaining today. This site includes gumland, one of only two sites within the Rodney ED (Northland). Gumland is a threatened and uncommon wetland type throughout Northland. *Dianella haematica* and tangle fern (*Gleichenia dicarpa*) are typical of acidic, peat-based ecosystems rather than saline systems, and their presence at this site indicates that a full range of vegetation assemblages from saline to fresh-water wetland are present (Townsend 2012). A search for the black mudfish (Relictual) was undertaken in a 1995 SSBI survey (SSBI R08/H011), within the gumland habitat; however, none were found and a follow-up surveyed is recommended. The Mangawhai Sandspit and estuary are nationally important breeding areas for 'Threatened' and 'At Risk' shorebirds and waders, and include the most important current breeding site for the NZ fairy tern (Nationally Critical). In the 1940s at Mangawhai there were only 2–3 pairs and a maximum known population of 11 birds (Ferreira et al. 2005). The NZ fairy tern faces a 39% chance of extinction within 50 years (due to a combination of threats and uncontrollable factors such as genetic drift) if the population size is not increased (Ferreira et al. 2005). In the 2011/12 breeding season there were three breeding pairs within the DOC-adminstered Mangawhai Government Purpose Wildlife Refuge Reserve, with four separate birds seen over the entire season (M. Mataira, DOC, pers. comm. 2012). A moko skink (Relict) was recorded in recent years from the sandspit. Moko skink are common on offshore rodent-free islands such as the Hen and Chicken Islands; however, they are extremely rare and in severe decline on the mainland. Collectively, the habitats within Mangawhai Harbour, Sandspit and Surrounds support six 'At Risk' plant species, five regionally significant plant species, eight 'Threatened' bird species, nine 'At Risk' bird species, one regionally significant bird species, three 'At Risk' fish species, one regionally significant fish species, and one 'At Risk' aquatic invertebrate. There are historic records of forest gecko (regionally significant).

Over the past 20 years or so, the terrestrial shrubland habitats for birds in the immediate vicinity of Mangawhai Harbour have diminished substantially in size and quality. Weeds threaten the natural character of the site, both in duneland and estuarine habitats. Invasive weeds include gorse, pampas, marram grass, lupin, giant reed grass, Sydney golden wattle, brush wattle, exotic iceplant, Dally pine, Japanese honeysuckle and buffalo grass, the latter of which is encroaching on the lagoon edge at the northern part of Mangawhai Government Purpose Wildlife Refuge. The Department of Conservation and community volenteers are currently targeting pampas, gorse and buffalo grass (M. Mataira, DOC. pers. comm. 2012). A local group called the Mangawhai Harbour Restoration Society has expended considerable effort on restoring the dunes at Mangawhai Sandspit. This has involved the construction of fences to stabilise the sand, and the planting of many thousands of spinifex and pingao plants.

There is a long history of human disturbance in the estuarine part of the site, which is evident in the tracks cut through the saltmarsh and mangrove shrubland. There is also evidence of mangrove removal and drainage ditches

[15] From DOC Northland Conservancy's Conservation Management Strategy published in 1999 (DOC 1999).

dug at several localities. Such disturbances could significantly alter the natural character of the habitats present in this part of the site. The advance of mangroves at Lincoln Street Reserve appears to be the result of human-induced disturbance. For example, where drains have been dug, or tracks put in, mangroves are able to colonise during high tides that allow the relatively large mangrove seeds to float up these cleared areas and establish in the saltmarsh. Furthermore, the removal of mangroves appears to be accelerating the demise of the saltmarsh, as it facilitates wave action that erodes the habitat (Townsend 2012).

The site is representative for all ecological units present, although the quality and abundance of the pīngao on the Mangawhai Sandspit is largely a result of extensive planting by volunteers. Approximately 243.7 ha of this site are protected within the Mangawhai Government Purpose Wildlife Refuge Reserve (DOC-administered), 0.9 ha of this site is protected within the Molesworth Conservation Area (DOC-adminstered), 1.2 ha lies within the Mangawhai Harbour Marginal Strip No.1 (DOC-administered), and a little over 0.01 ha lies within the Tara Creek Marginal Strip (DOC-adminstered). Approximately 110 ha of this site is within an 'Acutely Threatened' land environment (A5.1a, A7.2a), 3.8 ha is within a 'Chronically Threatened' land environment (A1.1c, A7.30, G3.1b), 261.7 ha are within an 'At Risk' land environment (A6.1b, G1.1a), and 16 ha are within a 'No Threat Category' land environment (A1.1a, D1.1a) (Walker et al. 2007).

GARBOLINO ROAD BUSH

Survey no.	ROD015
Survey date	4 November 2010
Grid reference	1738812E 6000555N (AY31)
Area	41.4 ha
Altitude	38–122 m a.s.l.

Ecological units

(a) Kānuka/mānuka forest on gentle hillslope

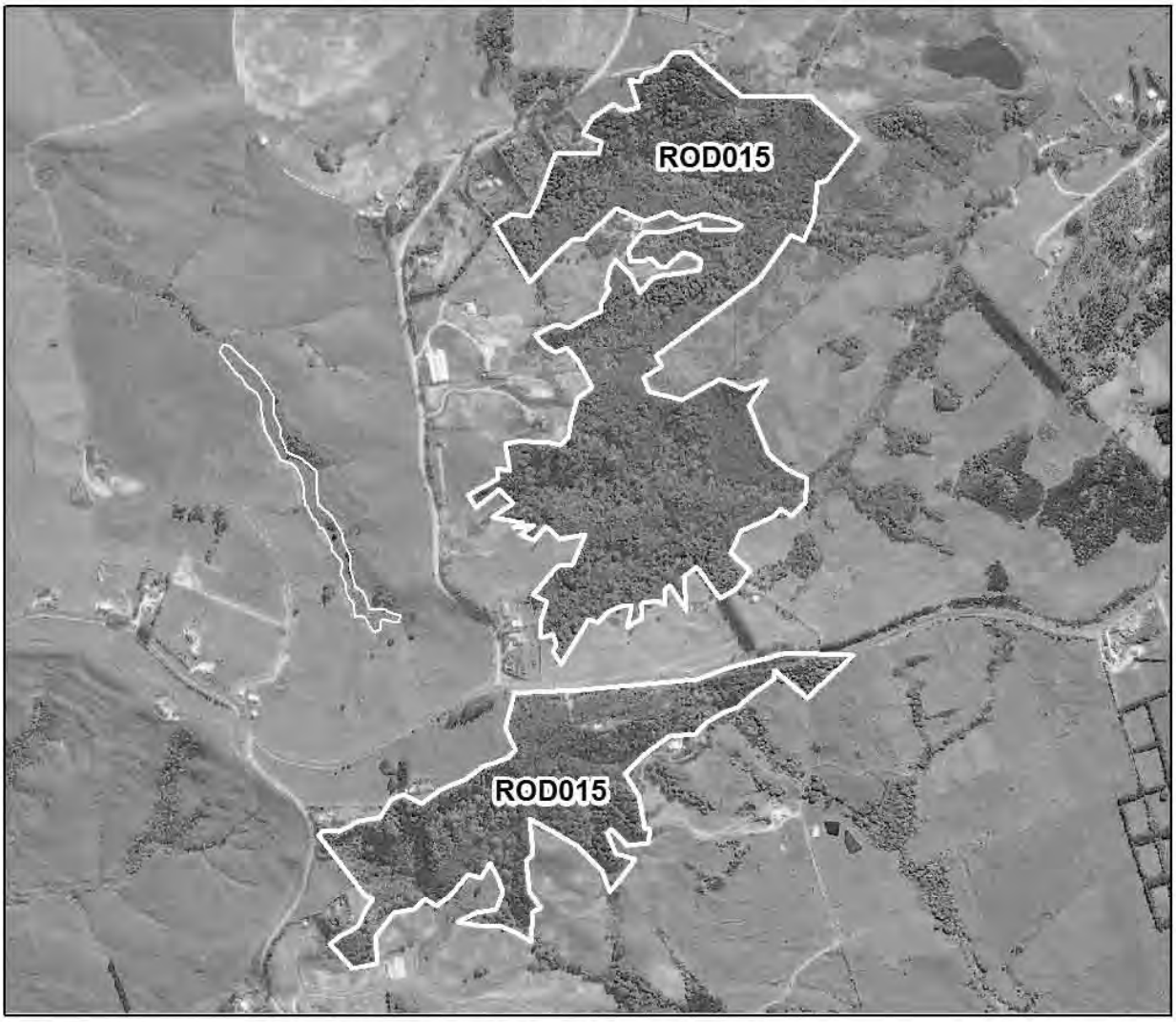
(b) Kānuka/mānuka-tōtara forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

In the northern remnant, type (a) kānuka/mānuka forest is common with frequent kauri, kahikatea and nīkau, and occasional pūriri, rimu, rewarewa, tānekaha and puka. One emergent pine has been observed. Type (b) kānuka/mānuka and tōtara are co-dominant over approximately 90% of the southern remnant, with frequent pūriri, kauri and mamaku, and occasional kohekohe, tānekaha, rewarewa, kahikatea, nīkau, māpou and tī kōuka, and emergent gum, macrocarpa, and Norfolk pine. In the centre of this remnant there are some large pūriri. Tōtara is more dominant in the eastern side of this remnant.

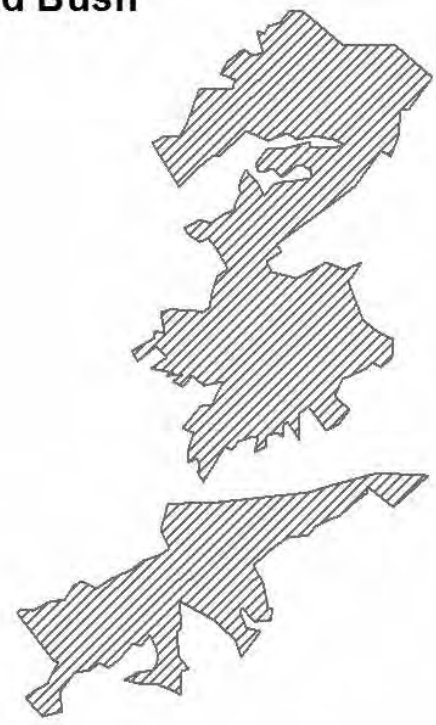


ROD015 Garabolino Road Bush

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2008

Fauna

A pair of kūkupa (regionally significant) was observed at the site in 2010.

Significance

Garbolino Road Bush comprises two small, relatively isolated forest remnants and is one of numerous such sites scattered across the Rodney ED (Northland). Small sites like these can provide stepping stone habitat in a predominantly pastoral landscape and important sources of food for species such as the regionally significant kūkupa. The entire site (41.4 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

KAIWAKA MANGAWHAI ROAD REMNANTS

Survey no.	ROD016
Survey date	18 October 2010
Grid reference	1732249E 5997478N (AY30)
Area	34.1 ha
Altitude	37–100 m a.s.l.

Ecological units

(a) Kānuka/mānuka-tōtara forest on hillslope

(b)Tōtara-kahikatea forest on hillslope

(c) Kahikatea-tōtara forest on hillslope

(d) Kahikatea-kauri-rimu forest on gentle hillslope

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map:

(1) Type (a) kānuka/mānuka and tōtara are co-dominant with occasional tī kōuka, mamaku and pūriri. Hawthorn is present on the edges.

(2) In this remnant, type (b) tōtara is abundant and kahikatea is common, occurring with frequent tītoki and occasional mataī, kauri, māpou, nīkau, and poplar.

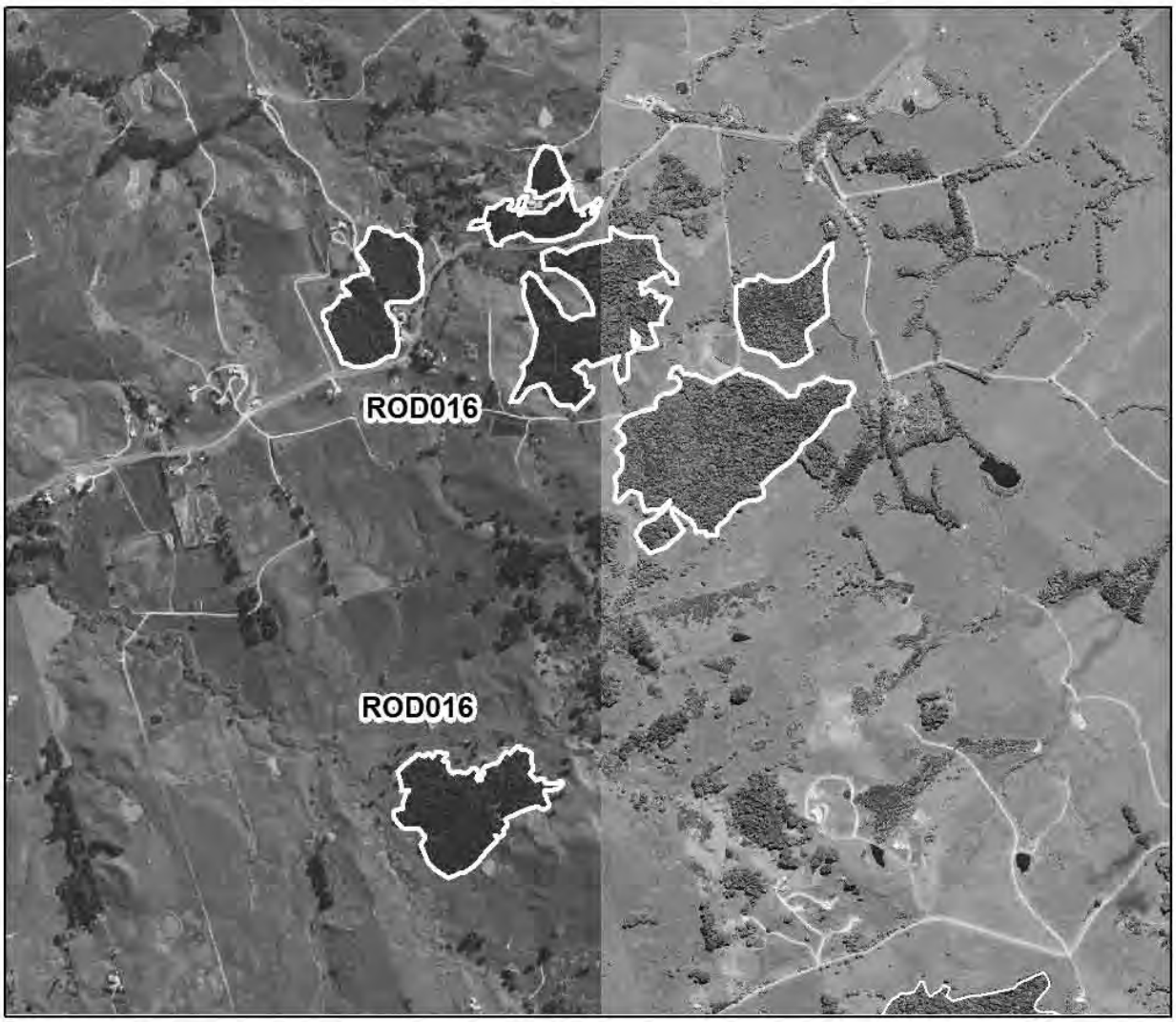
(3) This remnant was not surveyed.

(4) Type (c) kahikatea and tōtara are common with frequent kauri and kānuka/mānuka, and occasional pūriri, rimu, mataī, tītoki, nīkau, willow and poplar.

(5) This remnant is protected under a Queen Elizabeth II Open Space Covenant and is defined by co-dominant type (d) kahikatea, kauri and rimu forest with frequent tōtara.

Fauna

None noted.



ROD016 Kaiwaka Mangawhai Road Remnants

0 250 500 1,000 Metres

Habitat type

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

Aerial photography flown in 2008 and 2002

Significance

The site comprises several small forest remnants that provide important stepping stone habitat within a highly modified ED (Northland). The southernmost site (4.3 ha) is protected within a Queen Elizabeth II Open Space Covenant, which means it is likely to be fenced with active pest control. The site is representative for types (a), (b) and (d). The entire site (34.1 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

KAIWAKA TOWNSHIP BUSH

Survey no.	ROD018
Survey date	21 October 2010
Grid reference	1729880E 5997779N (AY30)
Area	7.1 ha
Altitude	18–21 m a.s.l.

Ecological units

(a) Kahikatea-tōtara forest on gentle hillslope

(b) Kahikatea-kauri-rimu-tōtara forest on gentle hillslope

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

In the western remnant, type (a) kahikatea and tōtara are common with occasional kōwhai, kauri, mānatu, tī kōuka, tānekaha, tarata, māhoe, nīkau and koromiko. The eastern remnant is defined by co-dominant type (b) kahikatea, kauri, rimu and tōtara with occasional rewarewa, miro, matai, tānekaha, nīkau, kohekohe, māhoe, hīnau, tarata, māpou, tī kōuka, lancewood, and whekī. In both remnants, tradescantia was noted as occurring on the forest floor.

Significant flora

Mānatu (regionally significant) has been recorded from the site.

Fauna

Kūkupa (regionally significant), NI fantails and kingfishers were recorded on the day of survey.

Significance

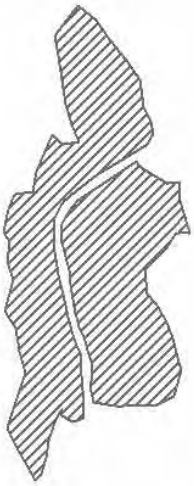
Kaiwaka Township Bush comprises two small remnants bordering the northern fringe of Kaiwaka. It supports one regionally significant plant species and one regionally significant bird species. Such sites provide important stepping stone habitat and a food source for the mobile fauna within a primarily pastoral landscape. Despite its small size, the site is floristically diverse and both ecological units are therefore regarded as representative examples of their type. Approximately 1.4 ha of the site is protected within the Kaiwaka Marginal Strip (DOC-administered) and 3.8 ha are within the Kaiwaka Park Domain Recreation Reserve (DOC-administered). Approximately 3.3 ha of this site are within a 'Chronically Threatened' land form environment (G3.1b) and 3.8 ha lie within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

ROD018 Kaiwaka Township Bush

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2002

OTIORO ROAD FOREST REMNANTS

Survey no.	ROD019
Survey date	18 November 2010
Grid reference	1731607E 5994866N (AY30)
Area	69 ha
Altitude	45–120 m a.s.l.

Ecological units

(a) Tōtara forest on hillslope

(b) Kahikatea-tōtara forest in basin

(c) Kānuka/mānuka-tōtara forest on gentle hillslope

(d) Taraire-tōtara forest on south-facing hill slope

(e) Gorse scrubland on hillslope

(f) Kahikatea forest on hillslope

Landform/geology

Late Miocene chaos-breccia of Tertiary and Cretaceous rocks; areas of Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

The large remnant is characterised by abundant regenerating type (a) tōtara with frequent gorse, especially on the edge, and occasional kahikatea, kānuka/mānuka, kauri, mamaku, nīkau, pūriri and tarata. The north-facing basin of this remnant is type (b), common kahikatea and tōtara with occasional kānuka/mānuka, kauri, mamaku, pūriri and rimu. On the upper slopes on the eastern end of the remnant, type (c) kānuka/mānuka and tōtara is common with occasional kahikatea and mamaku. The lower slopes of the eastern end are characterised by commonly occurring type (a) with frequent kahikatea, and occasional māhoe and mamaku. The western end of the remnant is characterised by type (c), with occasional kahikatea and kauri rickers. On the south-facing hillslope of this remnant, type (d) taraire and tōtara are co-dominant with frequent kānuka/mānuka and kahikatea and occasional kauri rickers, māhoe, mamaku, nīkau, pūriri and rimu. In the northeastern corner of this remnant there is a small area of abundant type (e) gorse with frequent emergent tōtara and occasional māhoe.

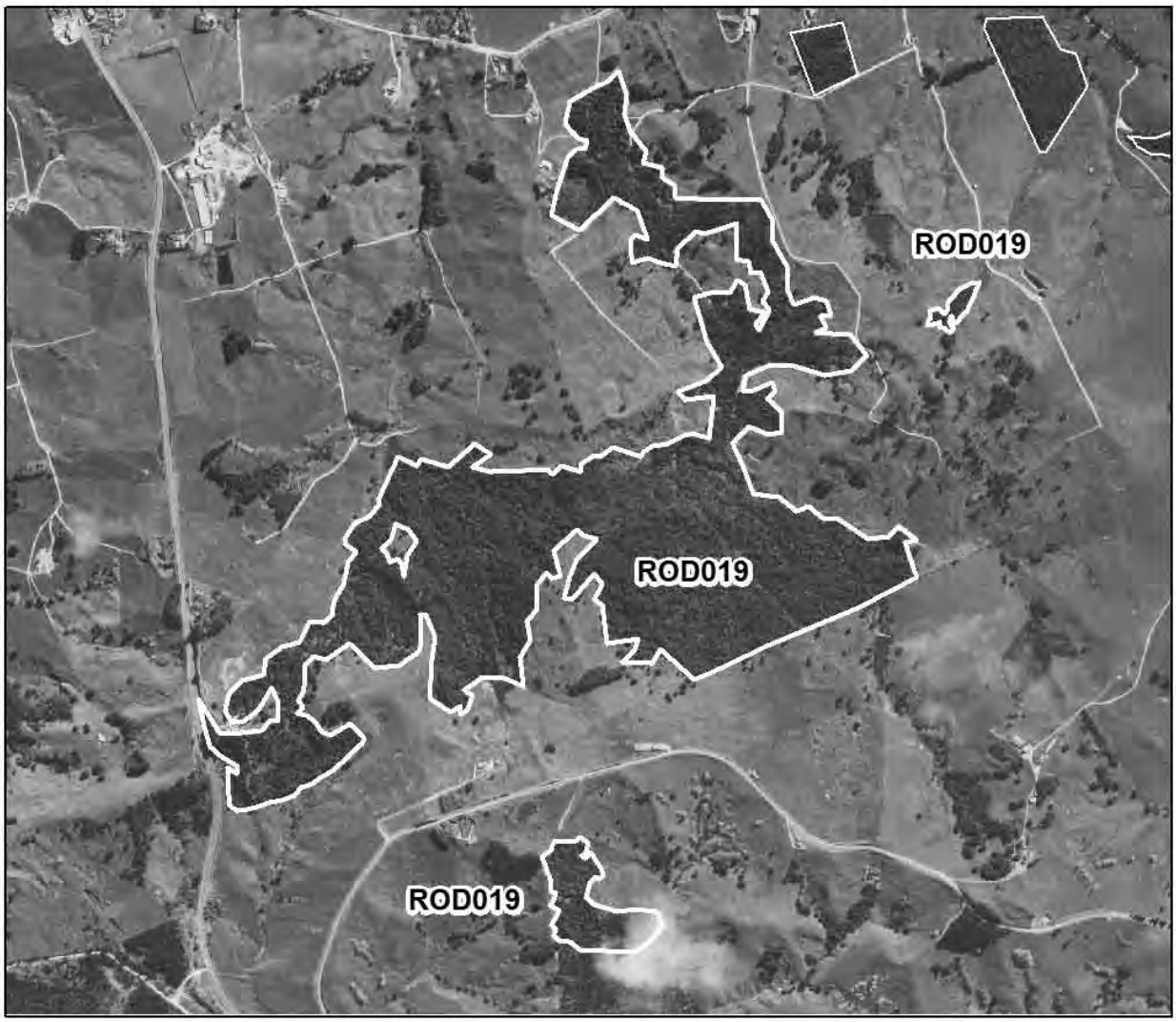
In the smaller southern remnant, type (f) kahikatea is common, with frequent tōtara and occasional kauri, matai, nīkau, pukatea, pūriri, and rewarewa. This remnant is fenced, but appeared to be grazed and adjoins plantation forestry on its southern boundary. The small Queen Elizabeth II Open Space Covenant in the east of this site was not surveyed.

Fauna

None noted.

Significance

The site comprises a relatively large forested site providing important stepping stone habitat within a highly modified ED (Northland). The site has been given Level 1 status because it comprises a large area relative to other

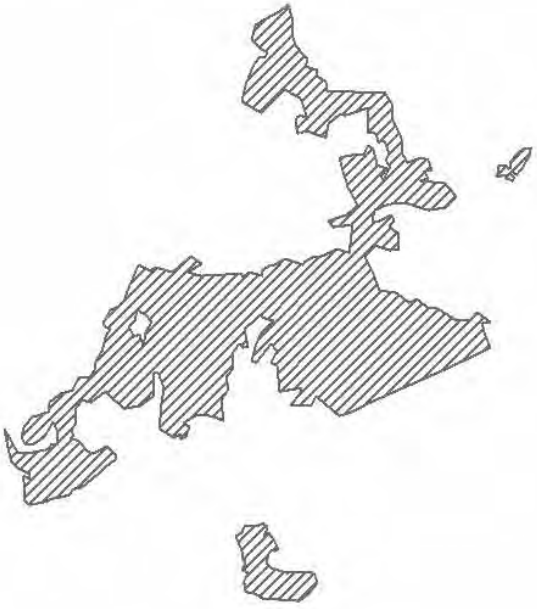


ROD019 Otioro Road Forest Remnants

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2002

similar habitat types, i.e. forest remnants surrounded by pasture. The site is representative for type (d). Approximately 24.7 ha of the site are protected within a Queen Elizabeth II Open Space Covenant. The entire site (69 ha) site lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

SETTLEMENT ROAD FOREST REMNANTS

Survey no.	ROD020
Survey date	18 November 2010
Grid reference	1732645E 5996232N (AY31)
Area	10.3 ha
Altitude	38–120 m a.s.l.

Ecological units

(a) Kahikatea-kānuka/mānuka-tōtara forest on gentle hillslope

(b) Pūriri-tōtara forest on gentle hillslope

(c) Kauri-tōtara forest on hillslope

(d) Tōtara forest on hillslope

(e) Kānuka/mānuka-tōtara forest on gentle hillslope

(f) Raupō reedland on alluvium

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map:

(1) This remnant is defined by co-dominant type (a) kahikatea, kānuka/mānuka and tōtara with occasional kauri, rimu and tī kōuka. Weeds including gorse, privet and pampas were visible on the southwest fringe.

(2) Type (b) pūriri and tōtara are common, with occasional kahikatea, matai, nīkau, tītoki, willow, and poplar.

(3) On the upper slopes of this remnant, type (c) kauri and tōtara are common with frequent pūriri and occasional tī kōuka, rewarewa, willow and macrocarpa. On the lower slopes remnant type (d) tōtara is common, with frequent kahikatea.

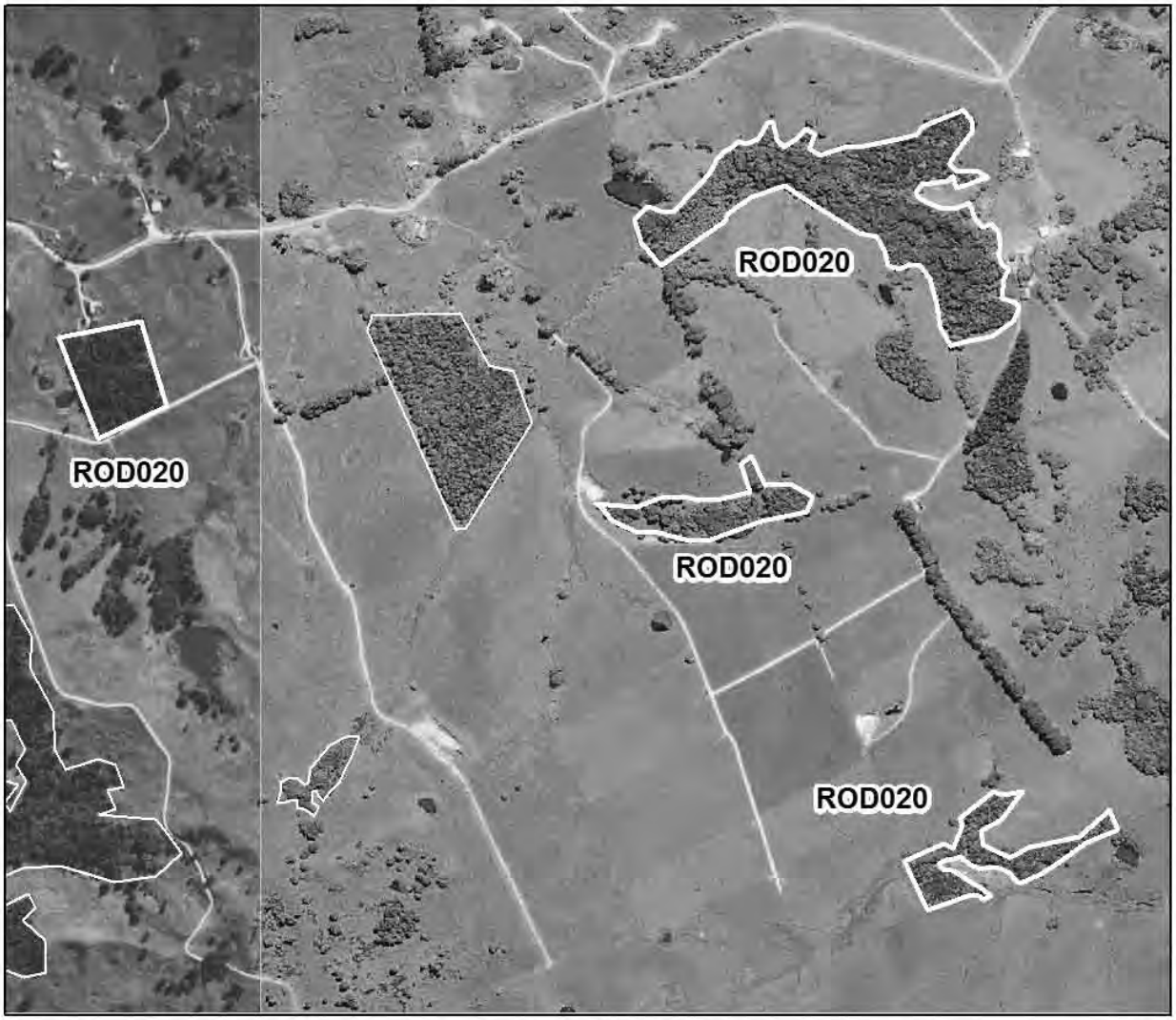
(4) The forest in this remnant comprises co-dominant type (e) kānuka/mānuka and tōtara with occasional kahikatea, kauri, kōwhai and emergent eucalyptus. There is a small strip of frequent type (f) raupō extending through the middle of this remnant (not mapped—identified from 2008 aerial photography).

Fauna

None noted.

Significance

This site comprises a series of small, scattered forest remnants. It contains a freshwater wetland, an ecosystem type that has been significantly reduced from its former extent nationally and regionally. The wetland forms a continuous

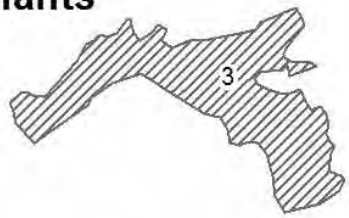


ROD020 Settlement Road Forest Remnants

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2008 and 2002

ecological sequence with the surrounding forest. Although relatively small, these remnants provide important stepping stone habitat for mobile fauna in a predominantly pastoral landscape. The site is representative for types (a) and (b). Approximately 1.4 ha of the site is protected within a Queen Elizabeth II Open Space Covenant, and this part of this site is likely to be fenced, with active pest control. Almost the entire site (10.2 ha) site is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

SETTLEMENT ROAD MATAI REMNANT

Survey no	ROD021
Survey date	4 March 2011
Grid reference	1732262E 5995924N (AY31)
Area	3.7 ha
Altitude	38–51 m a.s.l.

Ecological units

(a) Kahikatea forest on gentle hillslope

(b) Kānuka/mānuka forest on gentle hillslope

(c) Kānuka/mānuka-kahikatea-tōtara forest on gentle hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

In the northern end of this remnant, type (a) kahikatea is abundant with frequent matai and occasional kauri, tī kōuka, tōtara, and rimu. In the southern area, type (b) kānuka/mānuka is common with frequent kahikatea and matai, and occasional kauri, tī kōuka, tōtara, and rimu. On the northwest-facing hillslope, type (c) kānuka/mānuka, kahikatea and tōtara are co-dominant, with occasional matai, kauri, rimu, kōwhai, and willow on the edge.

Fauna

None noted.

Significance

The site comprises a small, compact forest remnant surrounded by pasture. The relative abundance of matai in this site is an uncommon feature in Northland where, although widespread, matai is generally not common at individual sites. Together with surrounding forest remnants, this site forms part of a local habitat network for mobile fauna. The area is representative for all ecological units. The entire site (3.7 ha) lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

ROD021 Settlement Road Matai Remnant

0 125 250 500 Metres

Habitat type

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

Aerial photography flown in 2008

PRITCHARD ROAD FOREST REMNANTS

Survey no.	ROD022
Survey date	4, 18 November 2010
Grid reference	1737246E 5995024N (AY31)
Area	33.3 ha
Altitude	60–120 m a.s.l.

Ecological units

(a) Tōtara forest on moderate hillslope and riparian edge

(b) Kahikatea-tōtara forest in gullies and on moderate hillslope

(c) Mamaku fernland on moderate hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map:

(1) This remnant is dominated by type (a), common tōtara, with frequent kahikatea and occasional kānuka/mānuka, kauri, pukatea, pūriri, and rewarewa. This remnant appears to be fenced.

(2) This remnant is defined by co-dominant type (b) kahikatea and tōtara, with frequent ponga and occasional nīkau, pūriri, rewarewa and rimu.

(3) This remnant is also defined by type (b), kahikatea and totara, with rimu frequent and occasional rewarewa, pūriri, nīkau, māpou, lancewood, and kānuka/mānuka. This remnant adjoins a small block of pine at its northwest corner.

(4) This remnant was not surveyed.

(5) This remnant is defined by type (a) tōtara, which is common along a small watercourse with occasional kahikatea, kauri and rimu.

(6) This remnant is fragmented and does not appear to be fenced. Type (c) mamaku is common with frequent kauri, rimu and nīkau, and occasional kahikatea, kohekohe, rewarewa, taraire, kānuka/mānuka and patē.

Remnants (7) and (8) are both dominated by abundant type (a) tōtara with frequent kahikatea and kānuka/mānuka, and occasional kauri, rimu, nīkau and mamaku.

Remnant (8) is fragmented with pasture gaps.

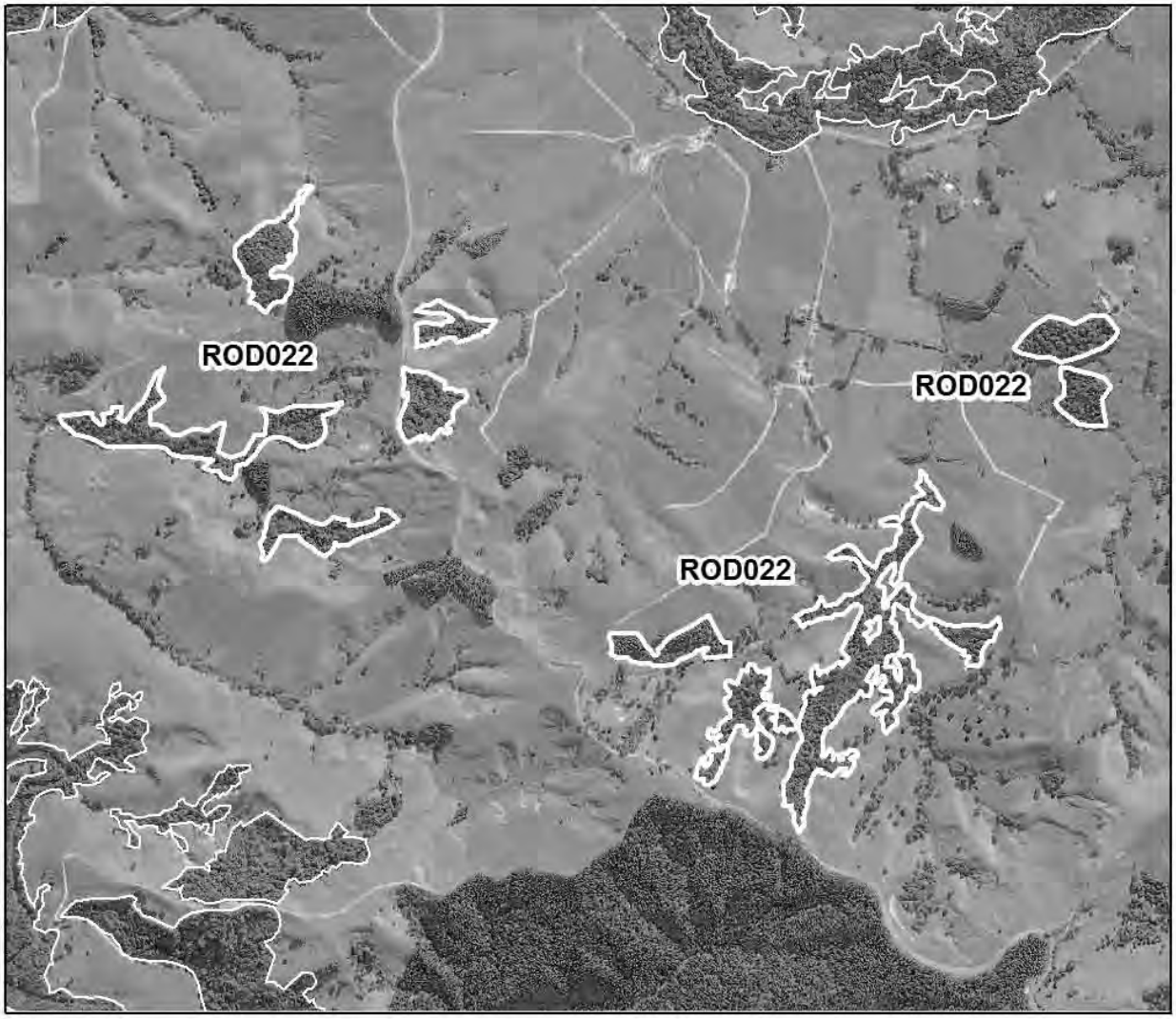
Remnant (9) was not surveyed.

Fauna

Kūkupa (regionally significant) were recorded during this survey (2010).

Significance

The site comprises several small forest remnants that provide important stepping stone habitat for mobile fauna in a predominantly pastoral landscape. The site supports a regionally significant bird species and provides partial riparian buffering to watercourses draining into the Hakaru River. The entire site (33.3 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

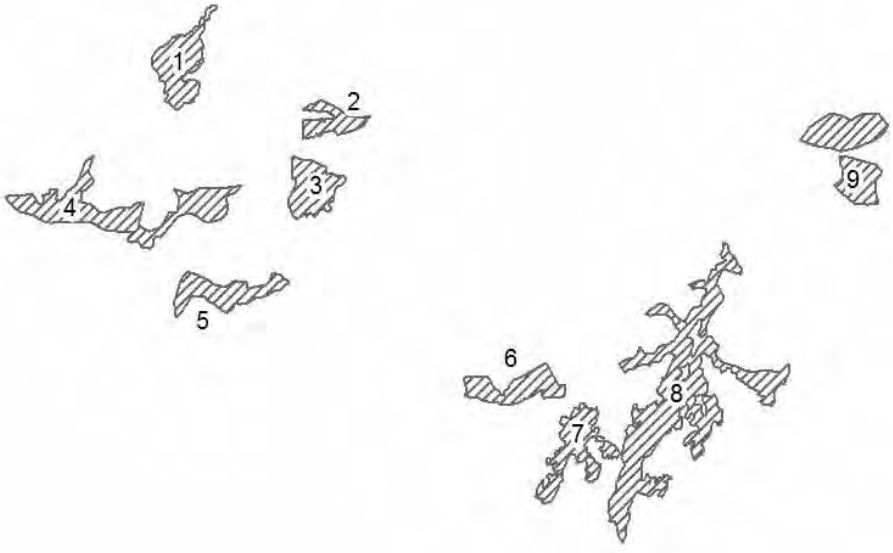


ROD022 Pritchard Road Forest Remnants

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

STANIFORTH PAPER ROAD FOREST REMNANTS

Survey no.	ROD023
Survey date	26 November 2010
Grid reference	1738670E 5995067N (AY31)
Area	20.5 ha
Altitude	70–160 m a.s.l.

Ecological units

(a) Kauri-tōtara forest on moderate hillslope

(b) Kauri-rimu forest on hillslope

(c) Kahikatea-rimu forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

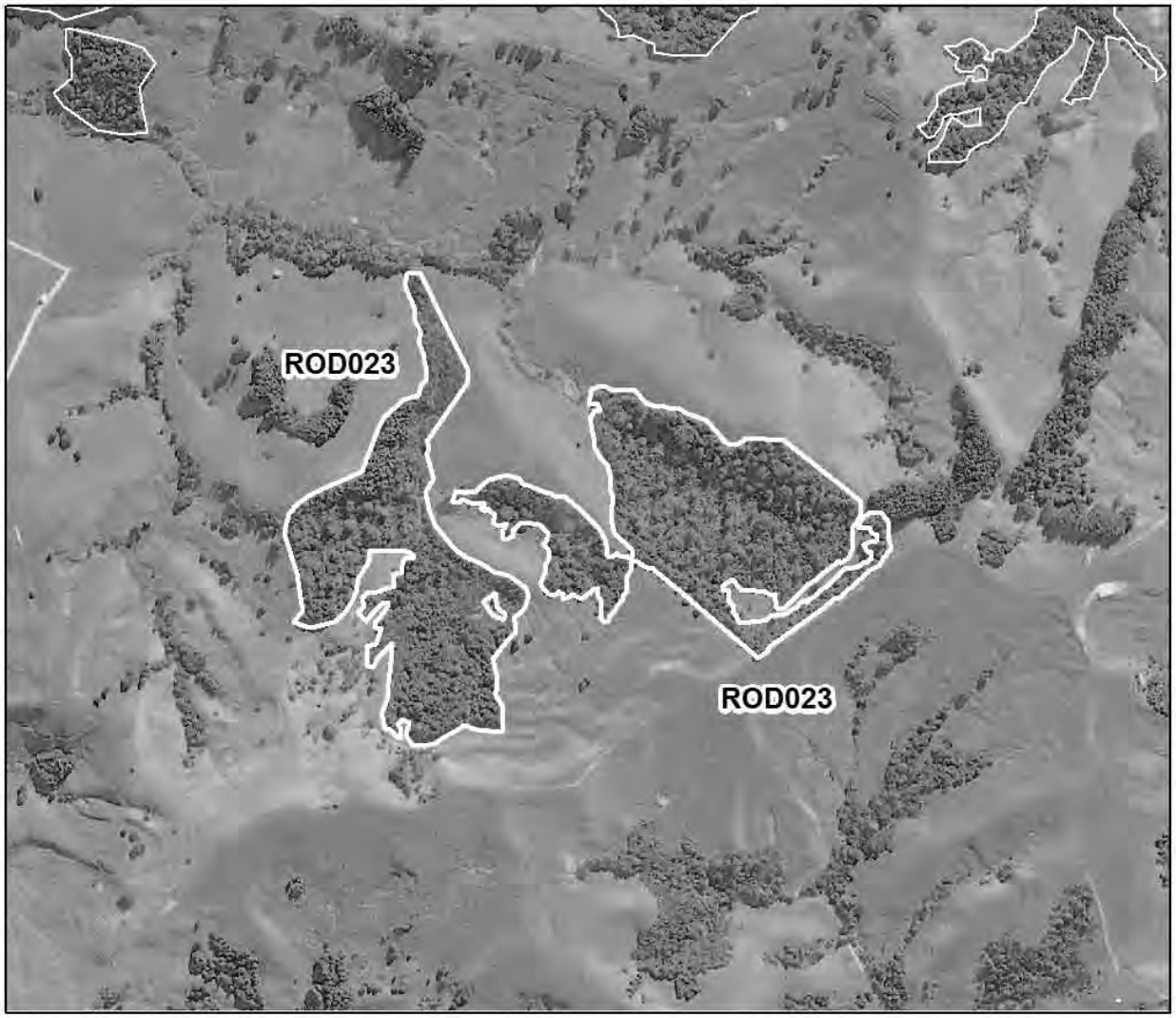
These remnants are largely dominated by kauri and rimu forest. In the eastern remnant, type (a) kauri and tōtara are common, with frequent kahikatea and nīkau, and occasional rimu. Large mature kauri and kahikatea are features of this remnant. Along the western edge of the western remnant, type (b) kauri and rimu are common, with frequent tōtara and nīkau, and occasional mamaku, pūriri, tānekaha, taraire, and rewarewa. The eastern side of the western remnant comprises co-dominant type (c) kahikatea and rimu with frequent nīkau and tōtara, and occasional kauri, mamaku, pūriri, rewarewa, tānekaha, and taraire. This remnant features many large mature kauri and rimu.

Fauna

Kūkupa (regionally significant) were recorded during this survey (2010).

Significance

This site comprises three small forest remants that contain some of the best examples of kauri and kahikatea-dominant forest in the Rodney ED (Northland). Large mature kauri, rimu and kahikatea occur frequently throughout the site. It also supports a regionally significant bird species and provides important stepping stone habitat for other mobile fauna. It is a representative site for all ecological units. The entire site (20.5 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

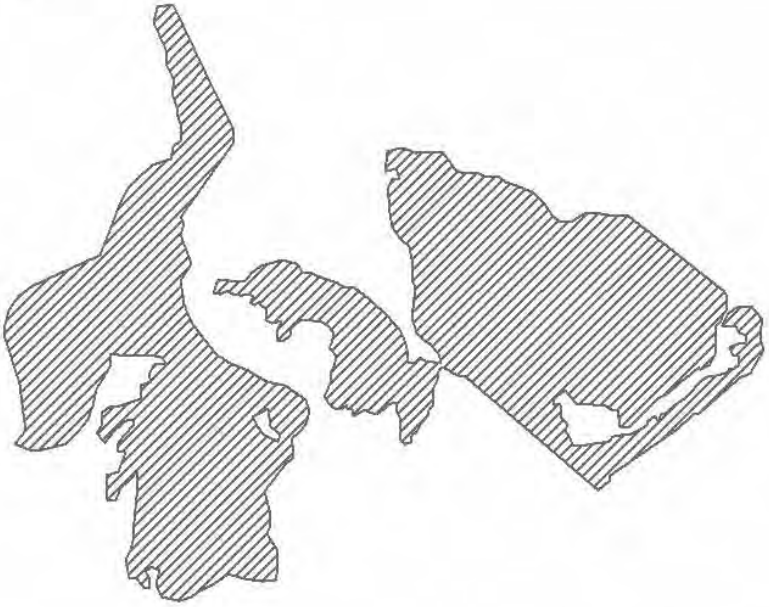


ROD023 Staniforth Paper Road Remnants

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2008

KERERU LANE FOREST REMNANTS

Survey no	ROD024
Survey date	26 November 2010; 13 January 2011
Grid reference	1738931E 5995992N (AY31)
Area	39.5 ha
Altitude	70–130 m a.s.l.

Ecological units

(a) Rimu-tōtara forest on hillslope

(b) Tōtara forest on moderate hillslope

(c) Kānuka/mānuka-tōtara forest on hillslope

(d) Kānuka/mānuka-nīkau forest on hill slope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map:

(1) In this forest remnant, type (a) rimu and tōtara are co-dominant with frequent kānuka/mānuka and occasional tī kōuka, kauri and ponga.

(2) Type (b) tōtara is common, with frequent kauri and kahikatea, and occasional pūriri, rimu and tānekaha.

(3) Type (b) is also common in this remnant, with frequent mature trees of kahikatea, kauri and rimu, and occasional matai, nīkau, pūriri, and rewarewa. This remnant is a fenced Queen Elizabeth II Open Space Covenant.

(4) In this small remnant, type (c) kānuka/mānuka and tōtara are co-dominant, with frequent kauri and occasional rimu.

(5) In this remant, type (d) kānuka/mānuka and nīkau are common, with frequent kahikatea and taraire, and occasional kauri, pūriri and rimu.

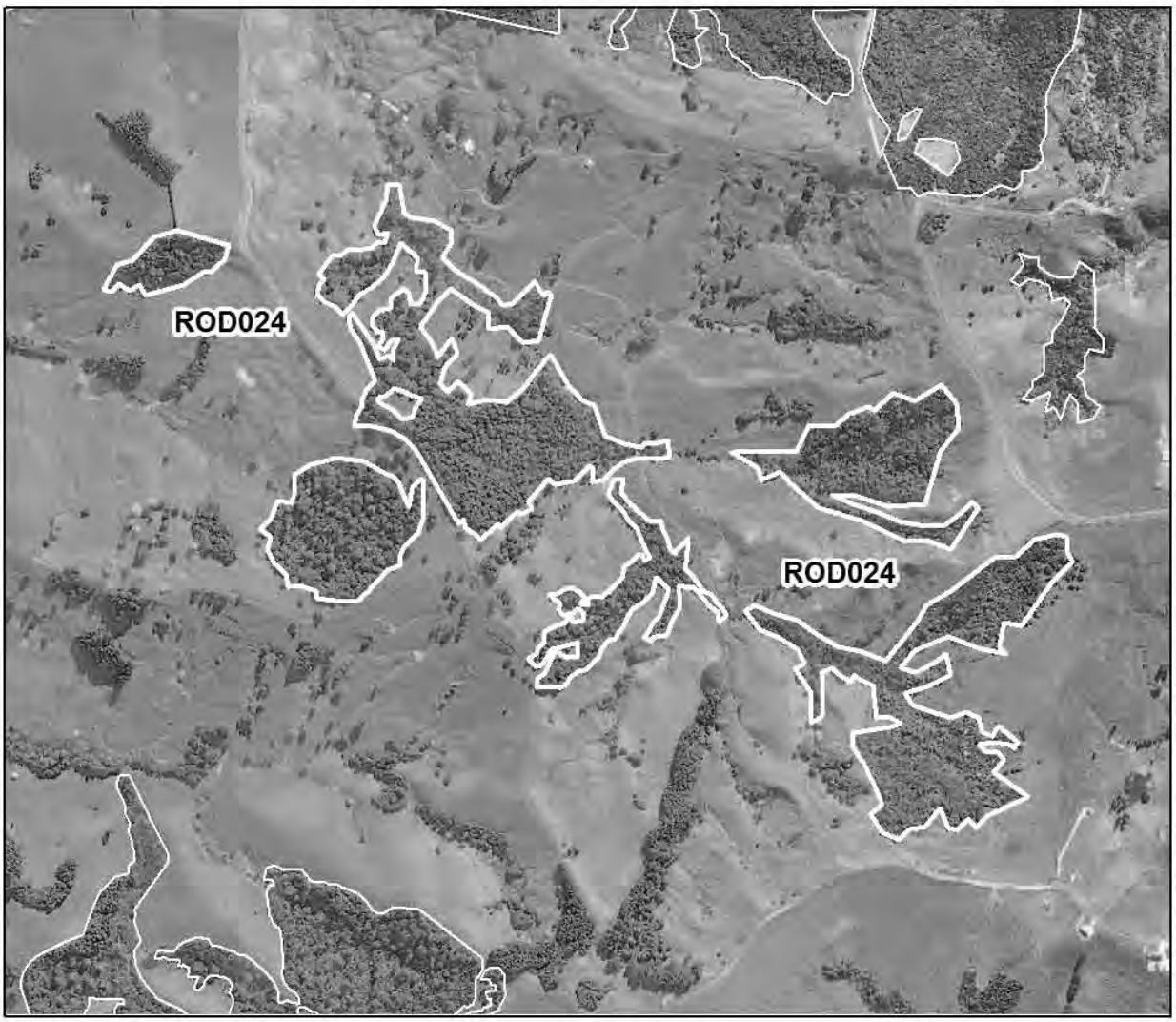
(6) Type (b) is common in this remnant, with frequent kānuka/mānuka and taraire, and occasional rimu and tī kōuka.

Fauna

A search of the freshwater fish database (NIWA Freshwater Fish database, viewed 2012) shows records of common bully, redfin bully (Declining), inanga (Declining), kōura (Gradual Decline) and shortfin eel (all recorded in 2010).

Significance

The site comprises six small forest remnants that support two 'At Risk' fish species and one 'At Risk' aquatic invertebrate species. There are many small sites like this scattered across the Rodney ED (Northland) and, collectively, they form part an important local habitat network for mobile fauna. The site is representative for all ecological units. Approximately 4.6 ha of the site are protected within a Queen Elizabeth II Open Space Covenant. The entire site (39.5 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

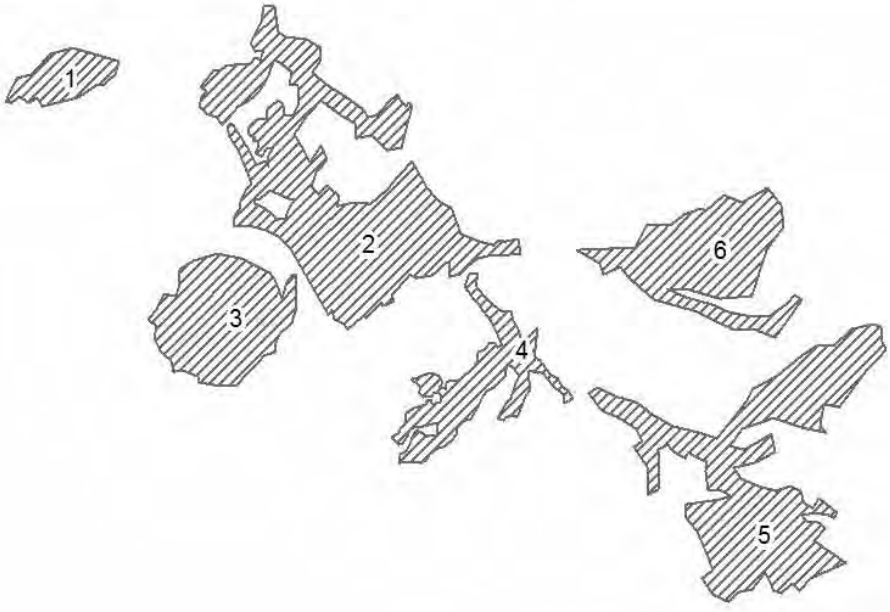


ROD024 Kereru Lane Forest Remnants

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

CAMES ROAD FOREST REMNANTS

Survey no	ROD025
Survey date	4 November 2010; 14 April 2011
Grid reference	1739790E 5996765N (AY31)
Area	86 ha
Altitude	20–144 m a.s.l.

Ecological units

(a) Tōtara forest on hillslope

(b) Kānuka/mānuka-tōtara forest on hillslope

(c) Kauri-tōtara forest on hillslope

(d) Taraire-tōtara forest on moderate hillslope

(e) Kānuka/mānuka-kauri forest on toeslope

(f) Gorse-tōtara shrubland on gentle hillslope

(g) Kahikatea-tōtara forest on hillslope

(h) Kānuka/mānuka forest in gully

(i) Kauri forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned numbers, and these numbers are shown on the site map:

(1) This remnant is dominated by abundant type (a) tōtara with frequent mamaku and occasional kahikatea and pūriri.

(2) This remnant is also dominated by abundant tōtara, type (b), with frequent kānuka-mānuka, kauri and rimu and occasional tānekaha and pūriri.

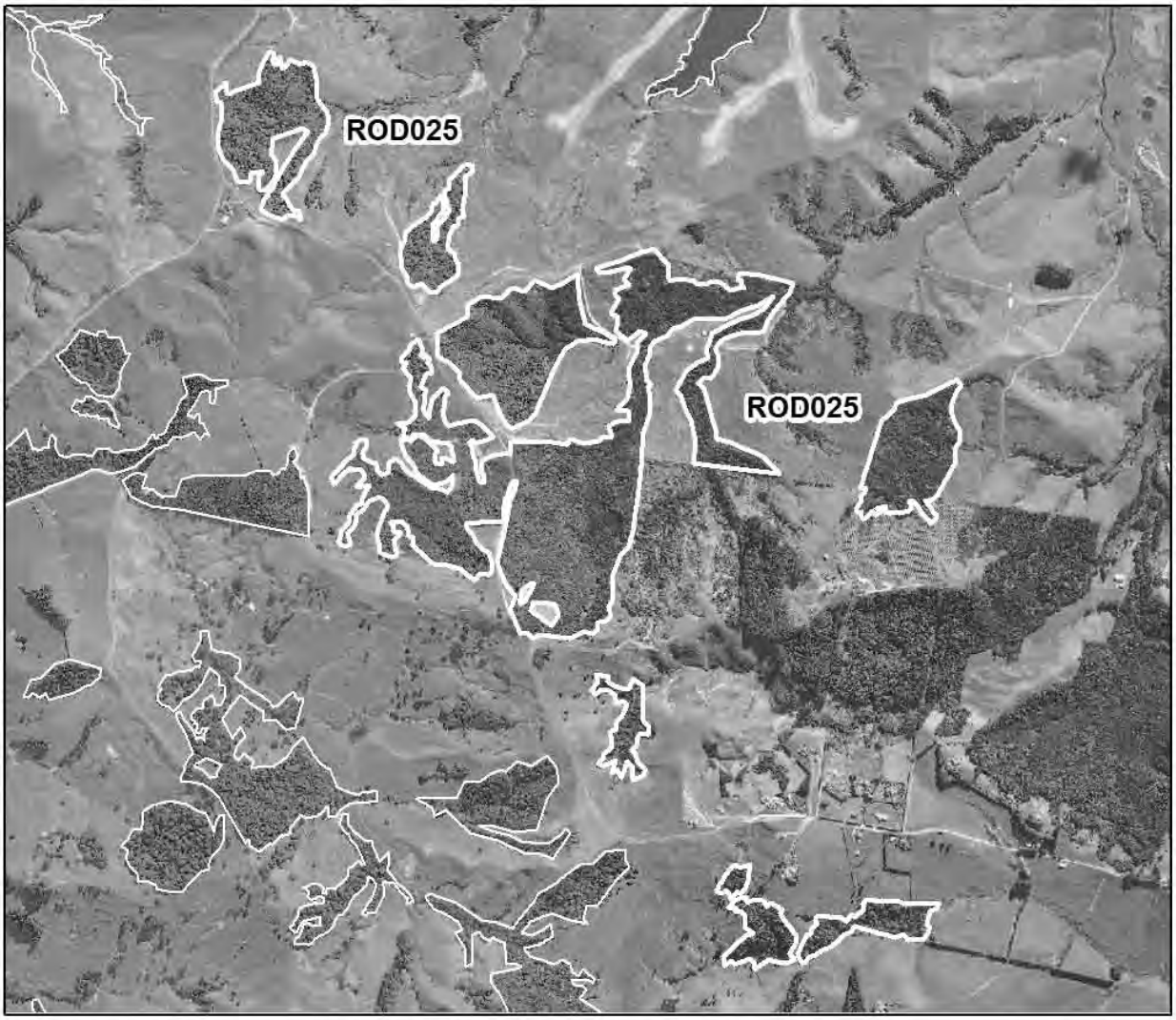
(3) Type (b), kānuka/mānuka and tōtara, is common in this remnant, with frequent mamaku and ponga and occasional kahikatea, māhoe, rimu, and tānekaha.

(4) Several vegetation types occur within this remnant including:

Type (c) kauri and tōtara are common with frequent nīkau and occasional kahikatea, kānuka-mānuka and rimu.

Type (d) taraire and tōtara are common, with frequent pūriri, kahikatea and kauri, and occasional tawa, rimu, nīkau and mamaku. Type (e) kānuka/mānuka is abundant, with commonly occurring kauri. There is also occasional kahikatea, tānekaha and rimu. A small area of abundant type (f) gorse occurs with common tōtara and occasional kahikatea, mamaku and tī kōuka. Type (g) kahikatea and tōtara are common, with frequent kānuka/mānuka and occasional rimu, taraire and pūriri.

(5) This remnant is characterised by abundant type (h) kānuka with frequent tōtara and occasional kahikatea, tī kōuka, mamaku, māhoe, and gorse. An area of raupō was evident here. A pine plantation is present along the northeastern boundary.



ROD025 Cames Road Forest Remnants

0 250 500 1,000 Metres

Habitat type

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

Aerial photography flown in 2008

Remnant (6) was not surveyed.

Remnants (7) and (8) contain commonly occurring type (i) kauri with frequent rimu and kānuka/mānuka and occasional kahikatea.

Fauna

None noted.

Significance

The site comprises several forest remnants, including one relatively large area. Collectively, these remnants provide important stepping stone habitat and food resources for mobile fauna such as kūkupa. The site has been given Level 1 status because it is a large area relative to other similar habitat types within the ED, i.e. forest remnants surrounded by pasture. It is a representative site for vegetation types (a), (b), (c), (d), (e), and (g). The entire site (86 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

TOPUNI SCENIC RESERVE AND SALTMARSH

Survey no.	ROD027
Survey date	13 January 2011
Grid reference	1732032E 5991653N (AY31)
Area	19.2 ha
Altitude	10–110 m a.s.l.

Ecological units

(a) Tōtara-mamaku forest on hillslope

(b) Saltmarsh ribbonwood shrubland in estuary

Landform/geology

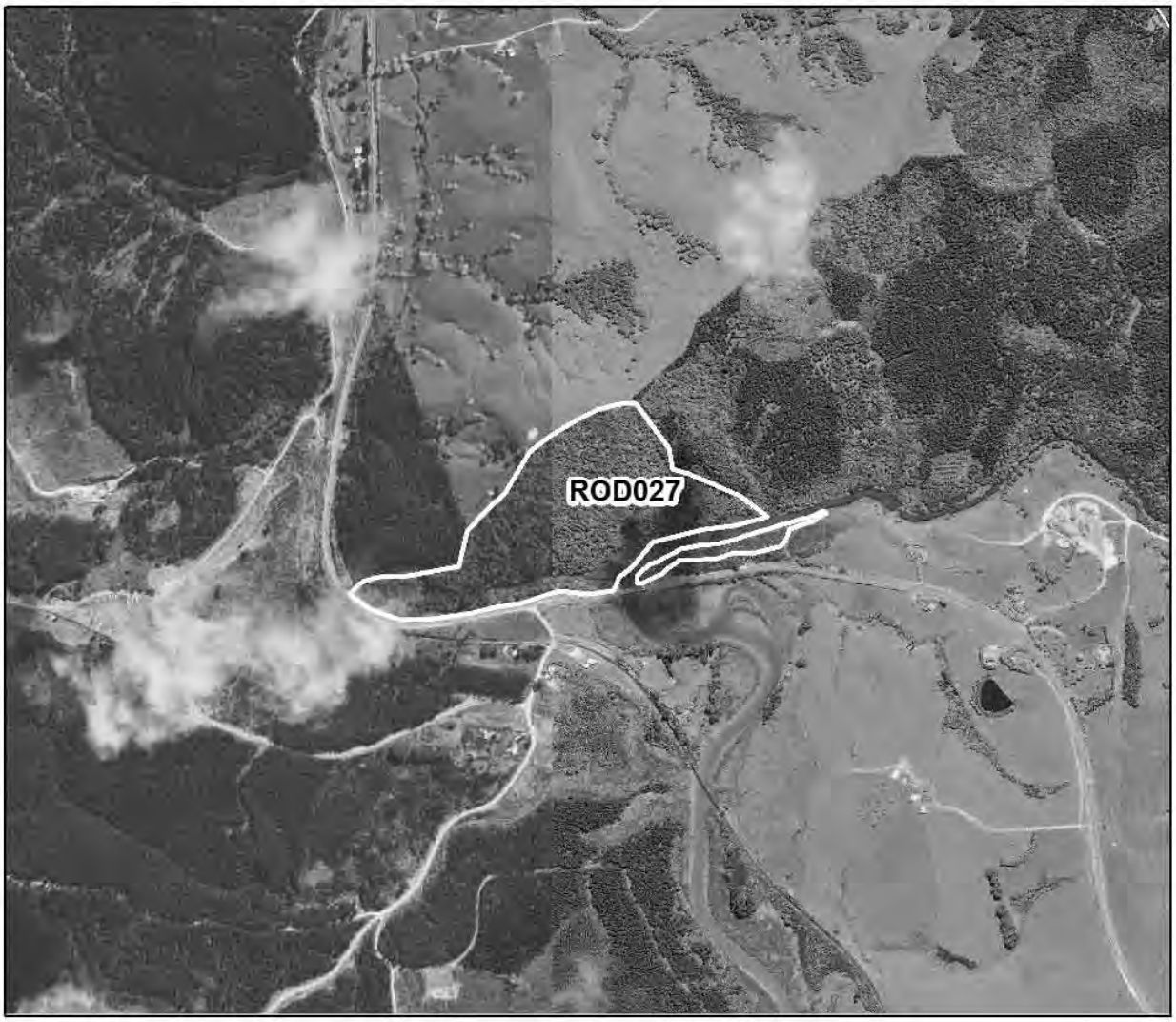
Chaos-breccia of Tertiary and Cretaceous rocks with areas of Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, conglomerate.

Vegetation

Within the Scenic Reserve, type (a) tōtara is abundant with mamaku common and kōwhai frequent, especially along the edges of the creek. There are occasional kahikatea, karaka, māhoe, māpou, mataī, rewarewa, tānekaha, taraire, tī kōuka, tītoki, and pūriri. Plantation pines adjoin the reserve on the eastern and western sides. A 1996 SSBI survey (Q08/H061) noted *Machaerina articulata*, *M. juncea* and saltmarsh ribbonwood present on the flats of the reserve by the Topuni River. Type (b) saltmarsh ribbonwood is common in a small area of saltmarsh along the Topuni River, beside State Highway 1. There are occasional mangroves, pōhuehue and *Olearia solandri*. A narrow fringe of raupō occurs alongside the river.

Significant flora

Olearia solandri (regionally significant) was recorded on the day of survey.

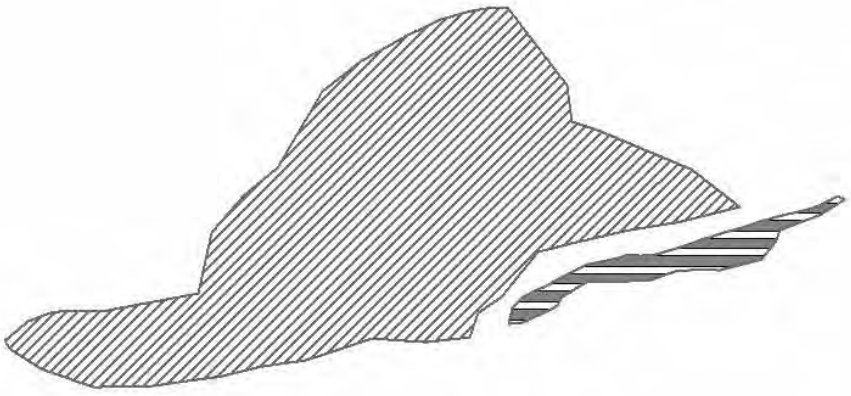


ROD027 Topuni Scenic Reserve and Saltmarsh

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008 and 2002

Fauna

Kukupa (regionally significant) was recorded in a 1996 SSBI survey (SSBI Q08/H061).

Significance

The site comprises a small but floristically diverse area of hillslope forest, adjacent to the Topuni River, which forms part of a regionally uncommon terrestrial forest-saltmarsh ecological sequence. Saltmarsh has been greatly reduced in the Northland Region. The site supports one regionally significant plant species and one regionally significant bird species, and is representative for vegetation types (a) and (b). Approximately 14.4 ha are protected within the Topuni Scenic Reserve, 0.4 ha lies within the Topuni Conservation Area, and 0.3 ha is included in the Hakaru River Marginal Strip No.1, all of which is administered by DOC. Approximately 18.5 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

TOPUNI BUSH FRAGMENTS

Survey no	ROD028
Survey date	27 January 2011
Grid reference	1734017E 5992751N (AY31)
Area	51.9 ha
Altitude	15–126 m a.s.l.

Ecological units

(a) Tōtara forest on hillslope

(b) Tōtara-gorse forest on hillslope

Landform/geology

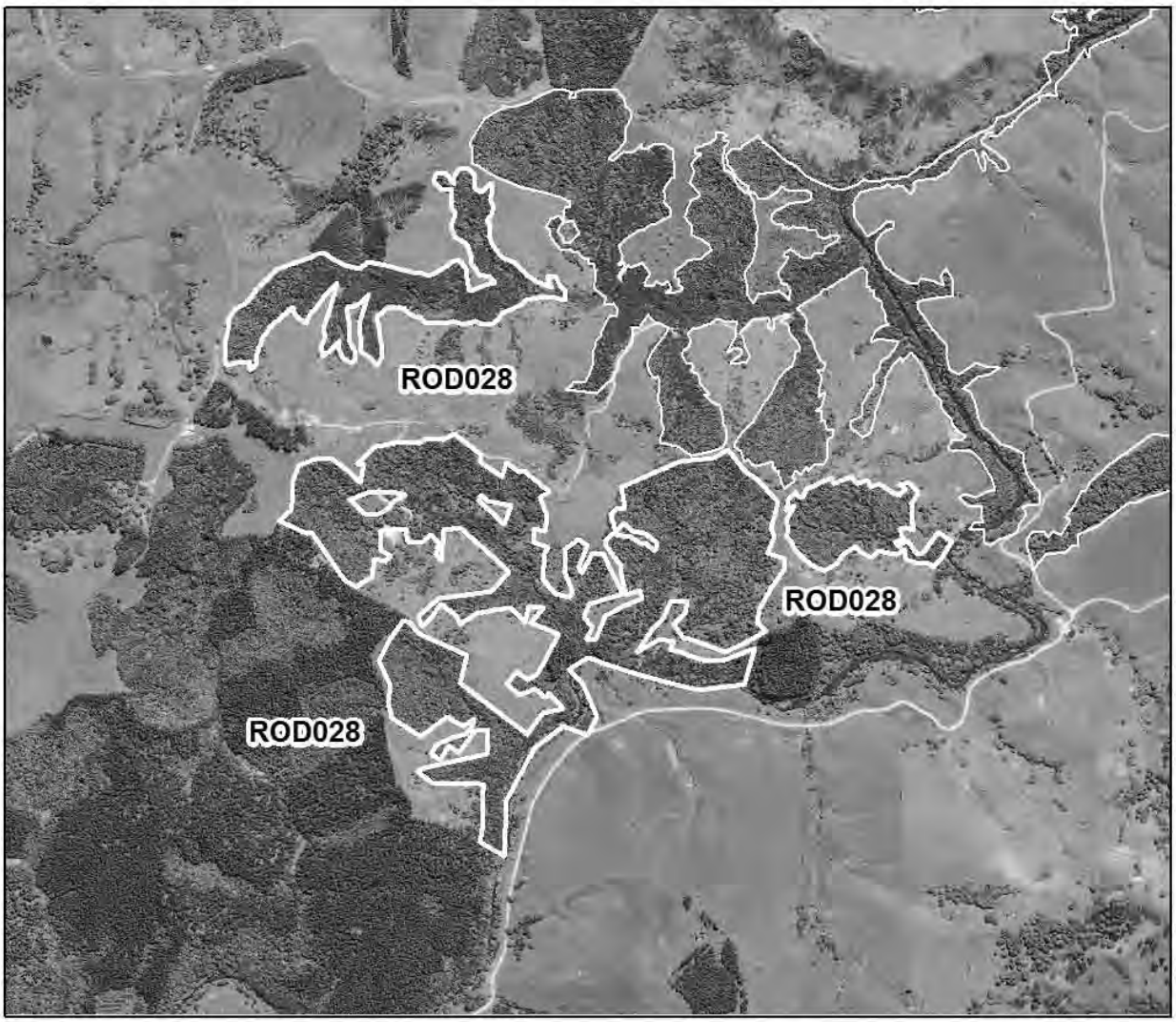
Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone with areas of with areas of Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, conglomerate.

Vegetation

The site consists of three small remnants largely characterised by tōtara forest. In the northeast of the main remnant, abundant type (a) tōtara occurs with frequent kahikatea and occasional nīkau, rewarewa, kauri and mamaku. In the southeast, abundant tōtara occurs with occasional kauri and kahikatea. In the separate western remnant, tōtara occurs with frequent pūriri and kānuka/mānuka, and occasional northern rātā, kahikatea, nīkau, taraire and willow. Abundant type (b) tōtara and common gorse occurs in an area in the southern end of the main remnant. Nīkau and mamaku are frequent, with occasional pūriri, tī kōuka, tānekaha, kānuka/mānuka, kōwhai, māhoe, harakeke, tutu, emergent pine and willow.

Significant flora

Northern rātā (regionally significant) was recorded during this survey.

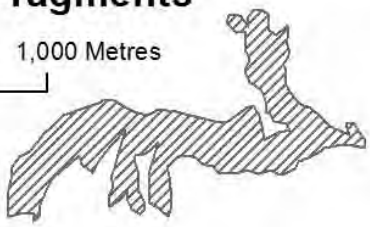


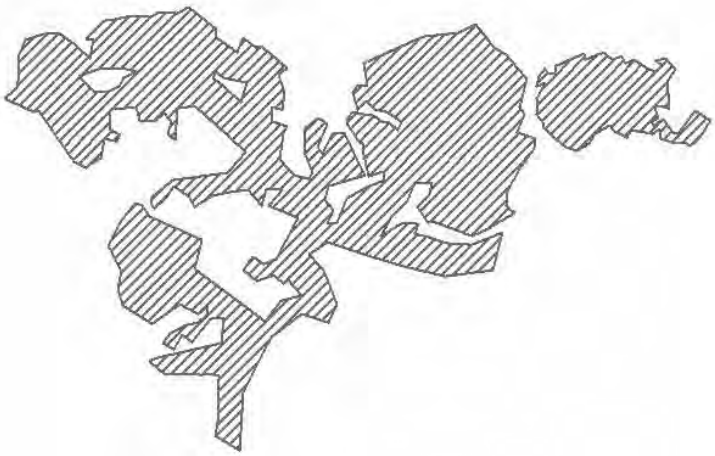
ROD028 Topuni Bush Fragments

0 250 500 1,000 Metres

Habitat type

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





Aerial photography flown in 2008

Fauna

None noted.

Significance

This site comprises one of many groups of small forest remnants that occur across the Rodney ED (Northland). Collectively, they form part of an important local habitat network for mobile fauna travelling between larger tracts of forest. The site supports a regionally significant plant species and is contiguous with Hakaru River Forest Ribbon (ROD008). The site has been given Level 1 status because it covers a large area relative to other similar habitat types within the ED and provides partial buffering to the Topuni River. Approximately 1.9 ha of the site is protected within the Hakaru River Marginal Strip No.1 (DOC-administered). The entire site (51.9 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

TOPUNI FARM BUSH REMNANTS

Survey no.	ROD030
Survey date	27 January 2011
Grid reference	1735590E 5994153N (AY31)
Area	23.9 ha
Altitude	34–100 m a.s.l.

Ecological units

(a) Tōtara forest on hillslope

(b) Kānuka/mānuka-tōtara forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The following ecological unit descriptions have been assigned a number, and these numbers are shown on the site map.

(1) In this remnant (locally known as 'Longview Bush'), type (a) tōtara is abundant with frequent kahikatea, kōwhai and kānuka/mānuka, and occasional kauri, tītoki, kohekohe, nīkau, rewarewa, tī kōuka, miro, pūriri, rimu, and tēnekaha. This remnant is fenced and has a dense understorey.

(2) Type (a) tōtara, is also abundant in this remnant, which is locally known as 'Peacocks Bush'. Kahikatea, nīkau and rimu are frequent, occurring with occasional kauri, northern rātā, rewarewa, pukatea, matai, and kānuka/mānuka. This remnant is fenced.

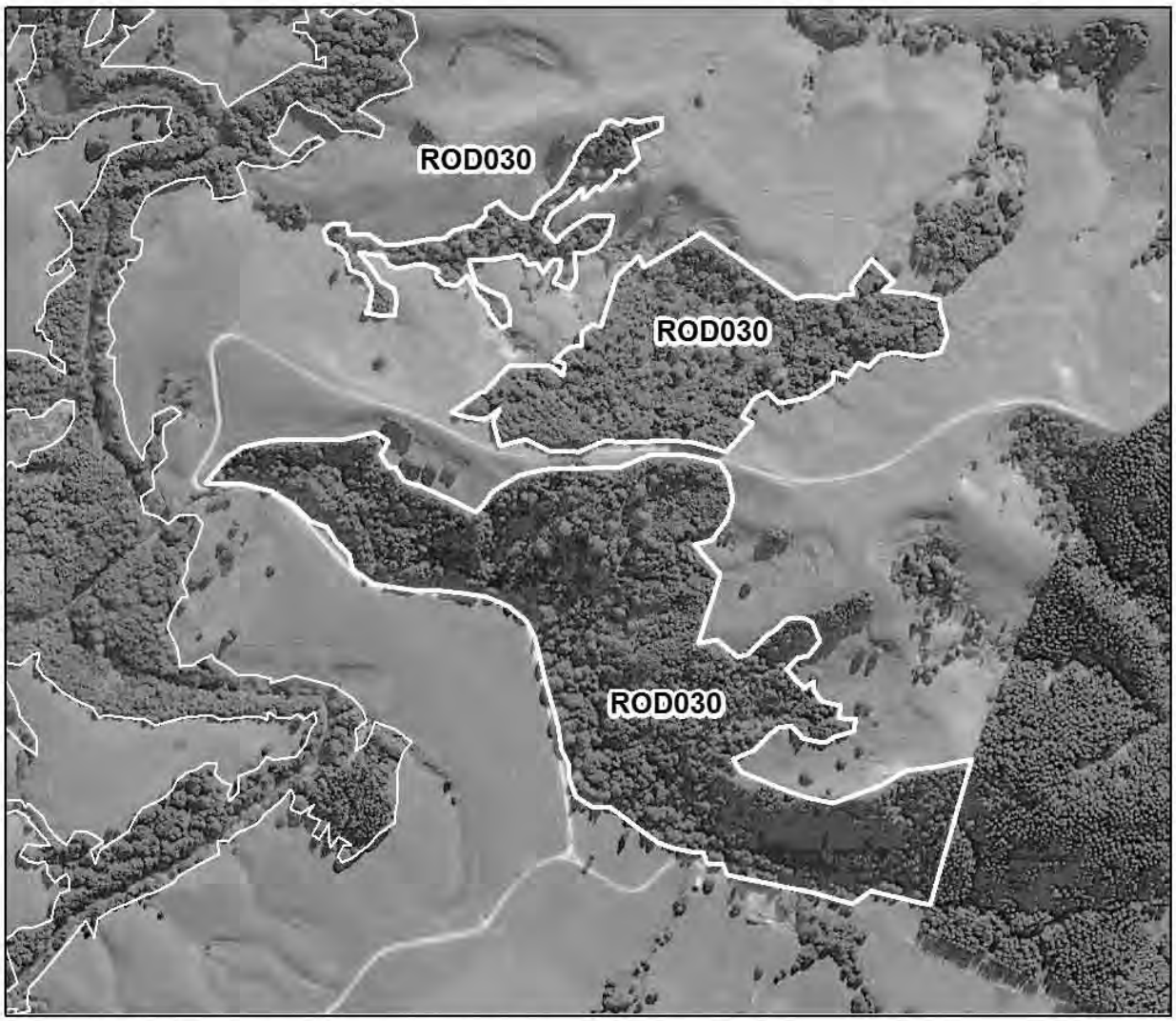
(3) In this remnant, type (b) kānuka/mānuka and tōtara are common with occasional kahikatea and rewarea.

Significant flora

Northern rata (regionally significant) was recorded during this survey.

Fauna

None noted.



ROD030 Topuni Farm Bush Remnants

0 125 250 500 Metres

Habitat type

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

Aerial photography flown in 2008

Significance

The site comprises several small but botanically diverse forest remnants, which are mostly fenced and are likely to be in relatively good condition. It is one of many small forested sites that occur across a highly modified ED (Northland), and together they form an important local habitat network for mobile fauna travelling between larger tracts of forest. The site supports one regionally significant plant species. The site is representative for both ecological units. The entire site (23.9 ha) lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

SENTINEL ROCK

Survey no.	ROD031
Survey date	1 April 1988; 5 March 1991; 8, 19 July 1992 (surveys by E. Cameron and G. Taylor); 3 September 1993 (SSBI survey by Richard Parrish (SSBI R08/H010).
Grid reference	1744333E 6005767N (AY31)
Area	0.4 ha
Altitude	0–21 m a.s.l.

Ecological units

(a) Harakeke-coastal toetoe-wīwī-pōhuehue association on rock island

(b) *Austrostipa stipoides* tussockland on rock island

(c) Native ice plant-glasswort herbfield on rock island

(d) Bare rock on rock island

(e) Mingimingi-kakaha shrubland on rock island

Landform/geology

Deeply weathered pale Pukekaroro Dacites (Miocene).

Vegetation

Sentinel Rock is an exposed inshore stack with low vegetation and bare rock on some of the steep sides. The following description of the vegetation is taken from Cameron & Taylor (1997):

The main vegetation is on this eastern side of the summit ridge, apart from the central eroding area which is bare. The dominant species are type (a) harakeke, coastal toetoe, wīwīand pōhuehue with scattered exotic grass species and giant umbrella sedge. Exposed faces are characterised by commonly occurring type (b) *Austrostipa stipoides*, which is also scattered along the lower margin of the main vegetation. The slope below this zone is mainly bare except for occasional patches of type (c) native ice plant and glasswort. The west side of the islet is nearly vertical and is steeper than the east face, except near the top. Type (b) vegetation is abundant all over this face; clumps of harakeke are present on the higher slopes, and type (c) vegetation is common on the steep faces. Sea primrose occurs by the shoreline. The southern side of the rock features a large area of type (d) bare rock, which supports abundant lichens. Types (b) and (c) are locally common along with *Asplenium haurakiense*. The north side of Sentinel Rock is similar to the south side except there is more type (d) and the northwestern corner is actively eroding.

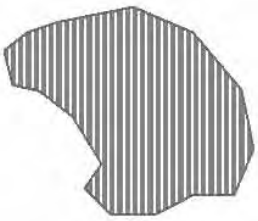
There are cliffs all around the summit ridge except for the north and south portions of the east face (the only climbable parts). The southern part of the summit ridge has exposed rocks with a low vegetation cover of wīwi,

ROD031 Sentinel Rock

0 62.5 125 250 Metres

Habitat type

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



Aerial photography flown in 2008

pōhuehue and adventive grasses. The northern part of the ridge has a dense cover of co-dominant type (a) and exotic grasses, together with locally common type (e) kakaha and mingimingi. The mingimingi forms a windswept 'hedge' 1 m high by 8 m long by up to 3 m wide. Petrel burrows are common here, and *Einadia trigonos* subsp. *trigonos*, chickweed, and a patch of onion weed grows by the bare burrow entrances.

Fauna

In 1993, a breeding colony of grey-faced petrels (50+ burrows) as well as breeding red-billed gulls (Nationally Vulnerable) and white-fronted terns (Declining) (SSBI R08/H010) were recorded. In September 1993, breeding red-billed gulls and white-fronted terns were recorded from the site. In November 1996, white-fronted terns were observed resting on the islet, and red-billed gulls were nesting (three nests) near summit ridge at north end. In December 1996 four pairs of red-billed gulls with chicks just hatching were observed, together with breeding welcome swallow pairs (Cameron & Taylor 1997). In 1997, Cameron & Taylor (1997) recorded red-billed gulls, pied shags (Nationally Vulnerable), little shags (Naturally Uncommon) and black-backed gulls from the site. 'The Knob' is a perching site for shags and white-fronted terns and gulls.

Significance

Sentinel Rock lies 350 m off Mangawhai Heads and is the only inshore islet on this coastline between Whangarei Harbour and Goat Island. Although very small and highly modified, the islet has biological significance, in particular due to the small colony of grey-faced petrels (Cameron & Taylor 1997). It provides an important breeding habitat for at least six seabird species, including two 'Threatened' and two 'At Risk' species. The artificial groyne has aided the access of pests to the islet, although the only pest animal species to be recorded to date is the Norway rat. Weeds are also spread to the island by birds, wind and footwear. The access to the top of the islet is quite steep and this restricts people (and dogs and cats) visiting the upper, sensitive, burrowed area. The vegetation is slowly recovering naturally from a fire in 1954, evident by the recent establishment of pōhutukawa, karo and coastal karamū (Cameron & Taylor 1997). Regular rat control would benefit breeding seabirds on Sentinel Rock. The site is representative for all ecological units.

GARBOLINO ROAD SWAMP

Survey no.	ROD033
Survey date	6 September 2010 (survey conducted by Wildland Consultants Ltd for the Northland Regional Council)
Grid reference	1738240E 6000571N (AY31)
Area	1.2 ha
Altitude	76–85 m a.s.l.

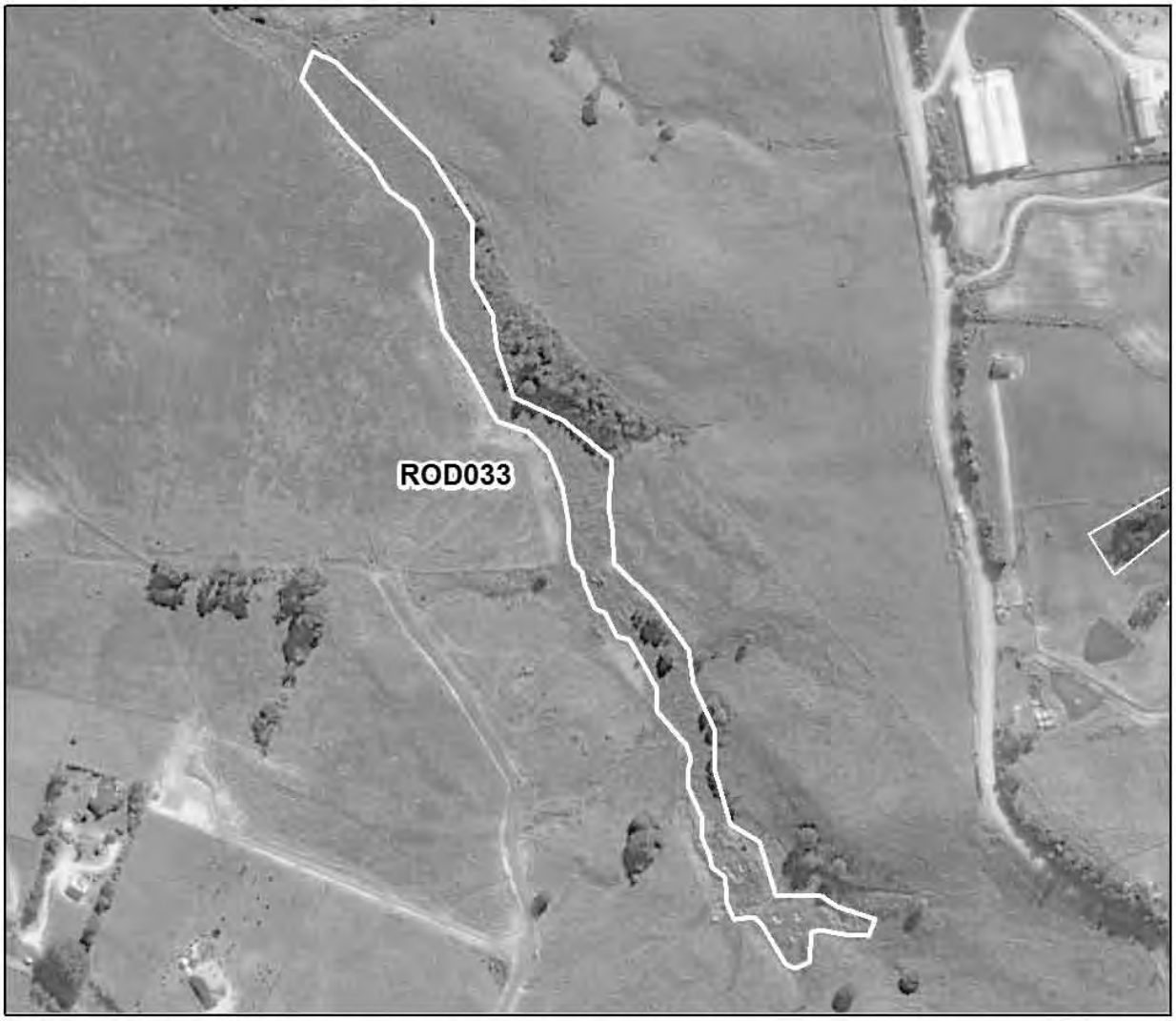
Ecological units

(a) Swamp millet-reed sweetgrass grassland in swamp (40%)

(b) Reed sweetgrass grassland in swamp (40%)

(c) Raupō reedland in swamp (10%)

(d) *Machaerina rubignosa-M. teretifolia* in swamp (10%)

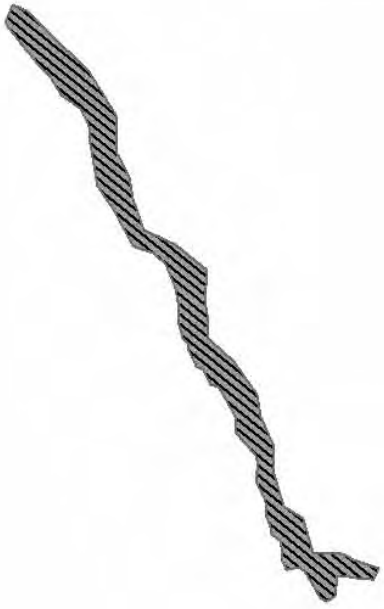


ROD033 Garbolino Road Swamp

0 50 100 200 Metres

Habitat type

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



Aerial photography flown in 2008

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The site comprises a small wetland situated within a narrow gully, featuring a mosaic of vegetation types. Abundant type (a) swamp millet occurs with commonly occurring reed sweetgrass, frequent *Eleocharis acuta* and occasional harakeke and mānuka. In the mid-section of the site, type (b) reed sweetgrass is abundant. Near the head of the gully, type (c) raupō is abundant with common kikuyu and frequent gorse. Type (d) *Machaerina rubignosa* and *M. teretifolia* are common in the middle of the site.

Fauna

None noted.

Significance

Freshwater wetlands are very rare within Rodney ED (Northland), and are also regionally and nationally uncommon. This wetland is adversely impacted by the wetland weed reed sweetgrass; however, there are still good areas of vegetation dominated by native wetland species. The site provides potential habitat for 'At Risk' wetland birds such as NI fernbird and spotless crake. The wetland is fenced and some enhancement planting has been carried out with species such as harakeke, mānuka and tī kōuka. The entire site (1.2 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

STATE HIGHWAY 1 REMNANT

Survey no.	ROD034
Survey date	17 June 2011
Grid reference	1728848E 5999395N (AY30)
Area	16.9 ha
Altitude	20–62 m a.s.l.

Ecological units

(a) Kānuka/mānuka forest on hillslope

(b) Mataī-tōtara forest on gentle hillslope

Landform/geology

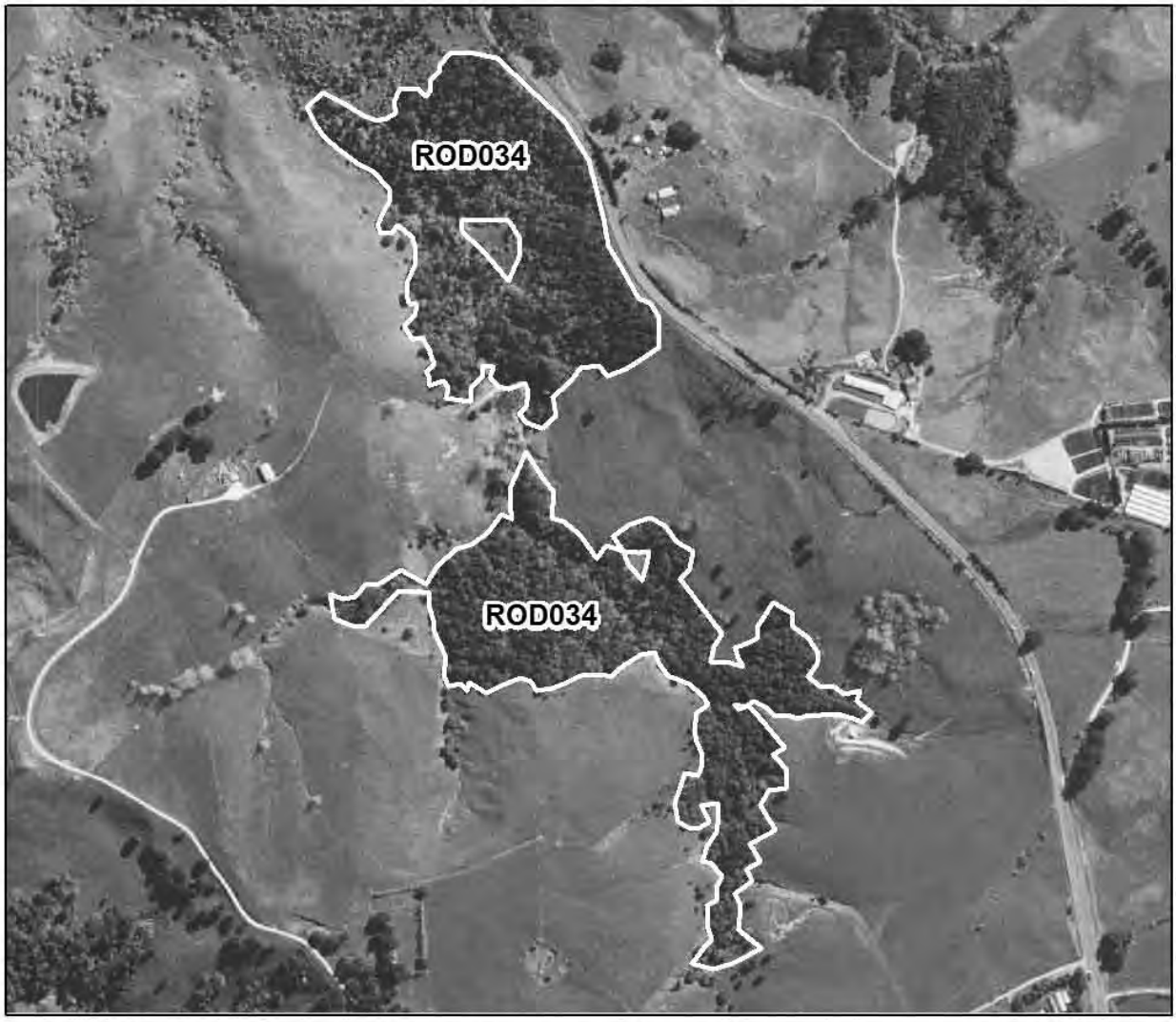
Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

Beside the road in the northern remnant, type (a) kānuka/mānuka is common with frequent tōtara and kahikatea, and occasional taraire and kauri. Alongside the stream in the southern part, type (b) mataī and tōtara are common with frequent kahikatea and poplar. Kauri, kōwhai, tī kōuka, pūriri, nīkau and kānuka/mānuka are occasional.

Fauna

None noted.



ROD034 State Highway 1 Remnant

0 125 250 500 Metres

Habitat type

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

Aerial photography flown in 2002

Significance

This site comprises two small forest remnants adjacent to State Highway 1. It contains a very rare forest type in Northland (mataī-tōtara forest), albeit a very small area. Mataī-dominant forest has only been recorded from two sites in Rodney ED (Northland). Today, although the occurrence of mataī in Northland is widespread, it is very unusual for it to be the dominant canopy component. This site is one of many small forested remnants scattered across the ED that provide stepping stone habitat and botanical diversity within a predominantly pastoral landscape. Site is representative for type (b). Inspection of aerial photography indicates a fragmented canopy in some parts of the site, and it is likely that stock have access to the understorey. Approximately 14.6 ha of the site is within a 'Chronically Threatened' land environment (A6.1d) and 2.3 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

OLD WAIPU ROAD REMNANT

Survey no.	ROD035
Survey date	26 January 2011
Grid reference	1740145E 6002136N (AY31)
Area	14.7 ha
Altitude	26–81 m a.s.l.

Ecological units

(a) Kānuka/mānuka forest on moderate hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

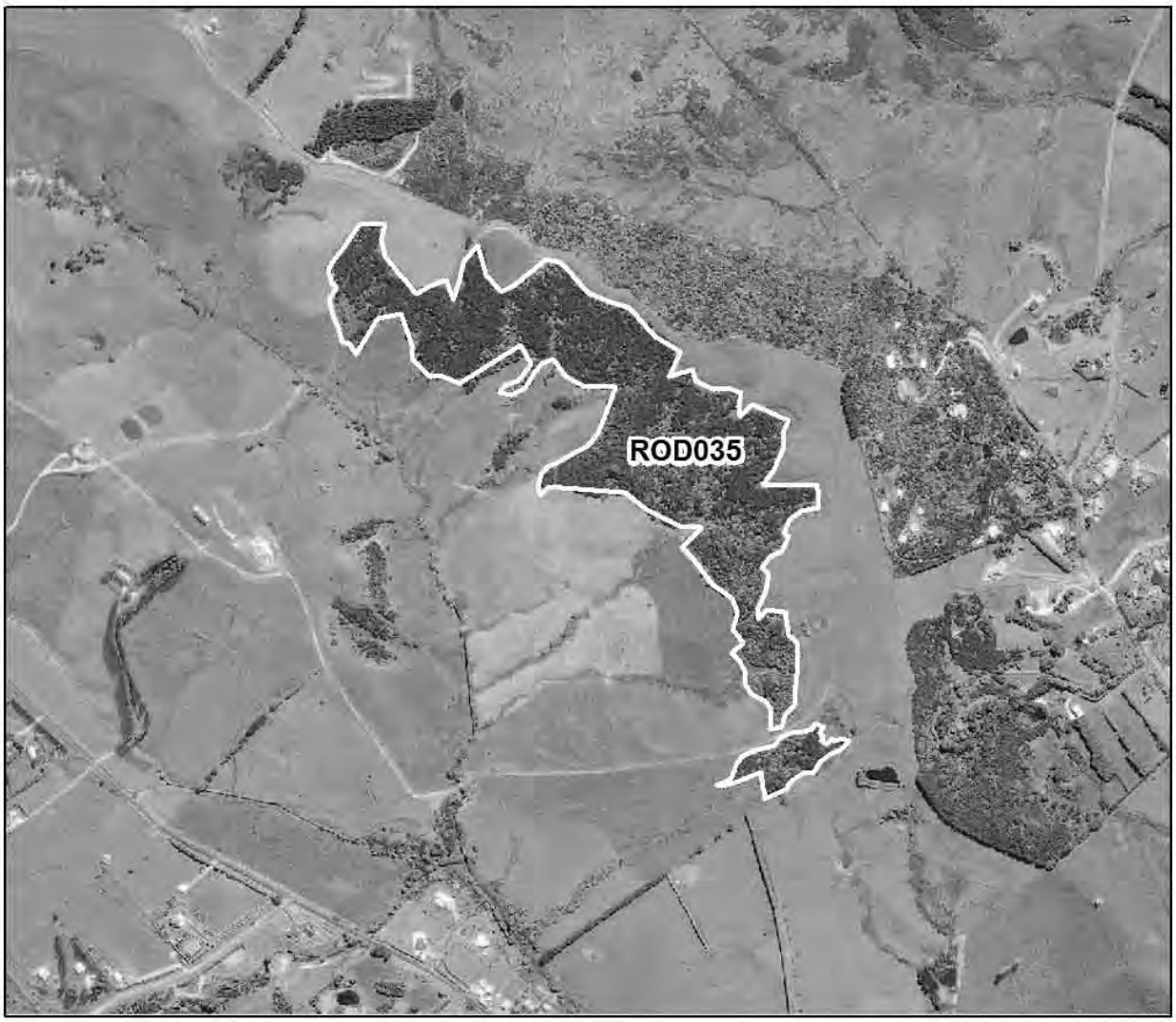
The site comprises two small remnants characterised by abundant (a) kānuka/mānuka with frequent *Acacia* sp. and occasional mamaku, tī kōuka, tōtara, tānekaha, pūriri, and one large emergent pine tree.

Fauna

None noted.

Significance

This small site is one of only three examples of coastal forest recorded in Rodney ED (Northland), which is why it has been assigned Level 1 status. Little is known about the flora and fauna values of the site, although it is also likely to provide stepping stone habitat for mobile fauna travelling to and from offshore islands and larger tracts of inland forest. This is a representative site. Approximately 11.6 ha of the site lies within an 'At Risk' land environment (A6.1b) and 3.2 ha is within a 'No Threat Category' land environment (D1.1b) (Walker et al. 2007).



ROD035 Old Waipu Road Remnant

0 125 250 500 Metres

Habitat type

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

Aerial photography flown in 2008

WALLBANK WAY DAM

Survey no.	ROD036
Survey date	17 June 2011
Grid reference	1740270E 5998290N (AY31)
Area	5.6 ha (5.5 ha wetland, 0.1 ha shrubland)
Altitude	20 m a.s.l.

Ecological units

(a) Open water in artifical lake

(b) Kānuka/mānuka-gorse shrubland lake edge

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

The site comprises a relatively large area of type (a) open water within close proximity to Mangawhai Harbour. At the head of the lake, type (b) kānuka/mānuka and gorse are common with tī kōuka, *Carex* sp., mamaku, māhoe, tōtara, harakeke, pampas, and woolly nightshade. Harakeke, tī kōuka and *Carex* sp. are present around the lake margins with occasional pampas.

Fauna

A pair of Australasian little grebes (Coloniser) and a pair of black swans were recorded on the day of survey.

Significance

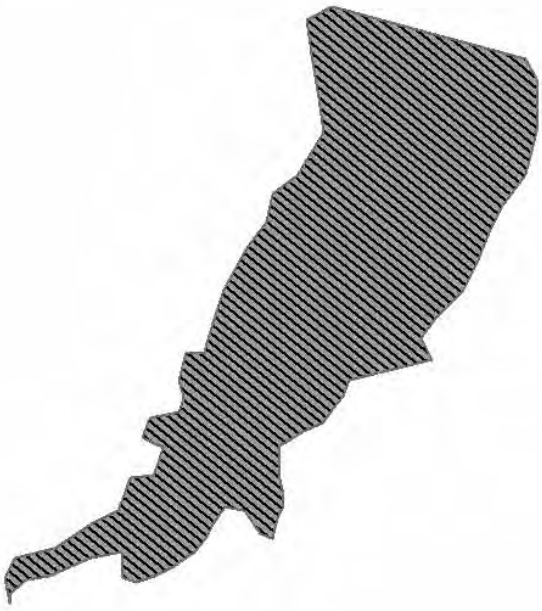
Given the scarcity of wetlands in Rodney ED (Northland), artificial lakes such as Wallbank Way Dam play an important role in providing supplementary habitat for waterbirds. The site currently supports one 'At Risk' bird species, although it is likely that other species utilise the site, including other 'At Risk' and 'Threatened' species. The entire site (5.6 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

ROD036 Wallbank Way Lake

0 62.5 125 250 Metres

Habitat type

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



Aerial photography flown in 2008

CARTER ROAD REMNANTS

Survey no.	ROD038
Survey date	August 2006
Grid reference	1741750E 5996861N (AY31)
Area	39 ha
Altitude	20–74 m a.s.l.

Ecological units

(a) Kauri forest on hillslope

(b) Kānuka-tōtara forest on hillslope

(c) Kānuka-kahikatea forest on hillslope

(d) Kānuka forest on hillslope

(e) Tōtara-rimu-kahikatea-kauri forest on hillslope

(f) Raupō reedland in swamp

(g) Willow treeland in swamp

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

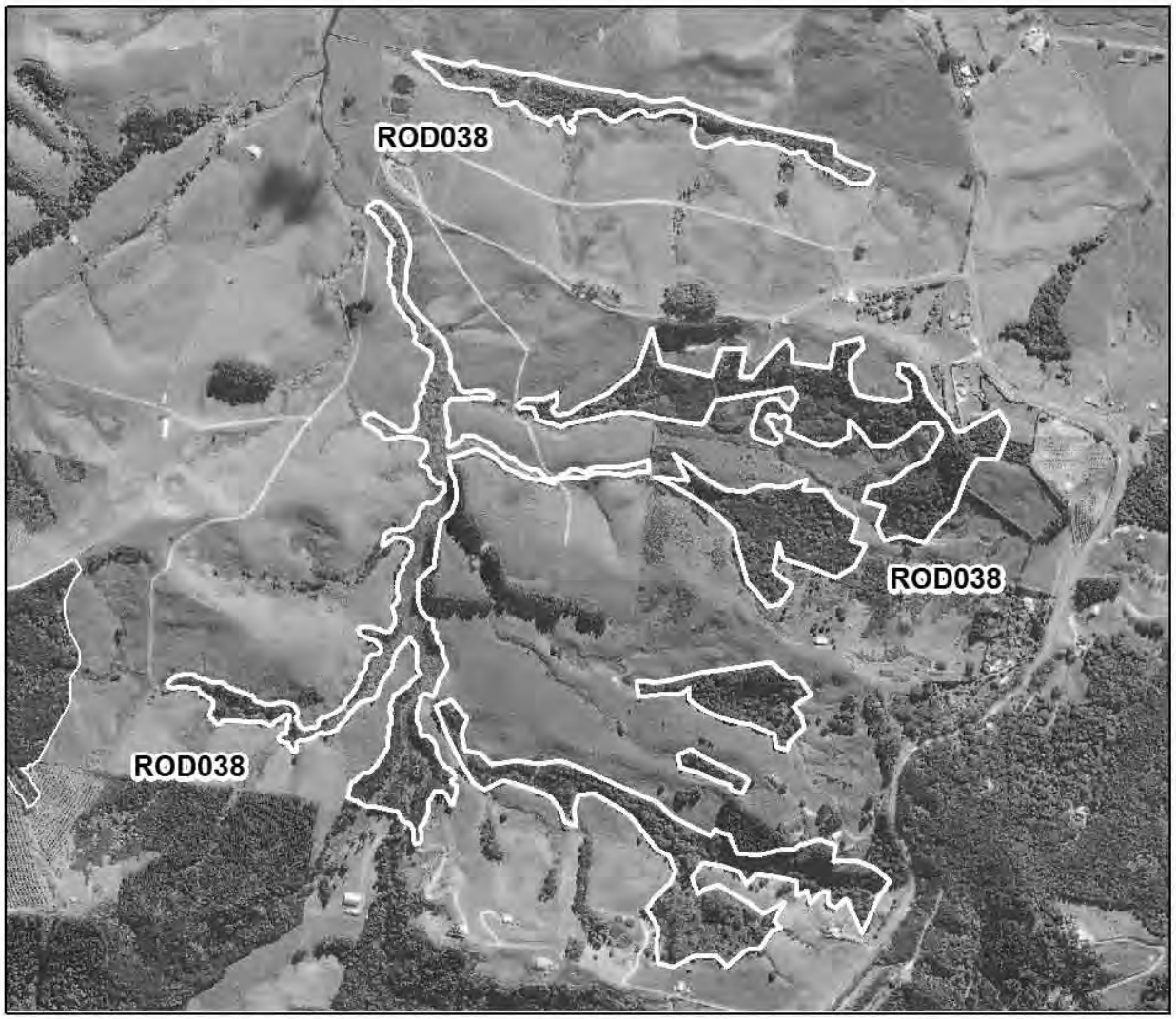
This site comprises five small, convoluted forest remnants on rolling hills in the southeastern corner of the Rodney ED (Northland), together with two narrow wetlands. Part of the southern remnant is characterised by abundant young type (a) kauri, which occurs with occasional nīkau, with ponga, kiekie, hangehange and kanono occurring frequently in the understorey. Gorse occurs occasionally on the exposed margins. To the north, two forest remnants comprise type (b) kānuka-tōtara forest with occasional tānekaha. The understorey is grazed in parts. The northernmost forest remnants contain areas of abundant type (c) kānuka with commonly occurring kahikatea and occasional tōtara, tānekaha and mamaku; abundant type (d) kānuka with occasional tōtara; and co-dominant type (e) tōtara-rimu-kahikatea-kauri forest. In the wetland to the west and north of the forest remnants, type (f) raupō is common with occasional harakeke and emergent tī kōuka. The northern half of the main wetland is dominated by abundant type (f) willow, which forms a fragmented canopy over an understorey comprising *Carex secta*, pūrei, giant umbrella sedge, harakeke and soft rush. The wetlands are fenced and partially buffered by kānuka and pine plantation.

Fauna

Kūkupa (regionally significant) are present at the site (D. Olsson, landowner, pers. comm. 2012).

Significance

The site comprises a group of small forest remnants that contain a relatively diverse range of forest types, including kauri. The site contains the largest freshwater wetland identified in the Rodney ED (Northland), which provides potential habitat for threatened bird species such as Australasian bittern

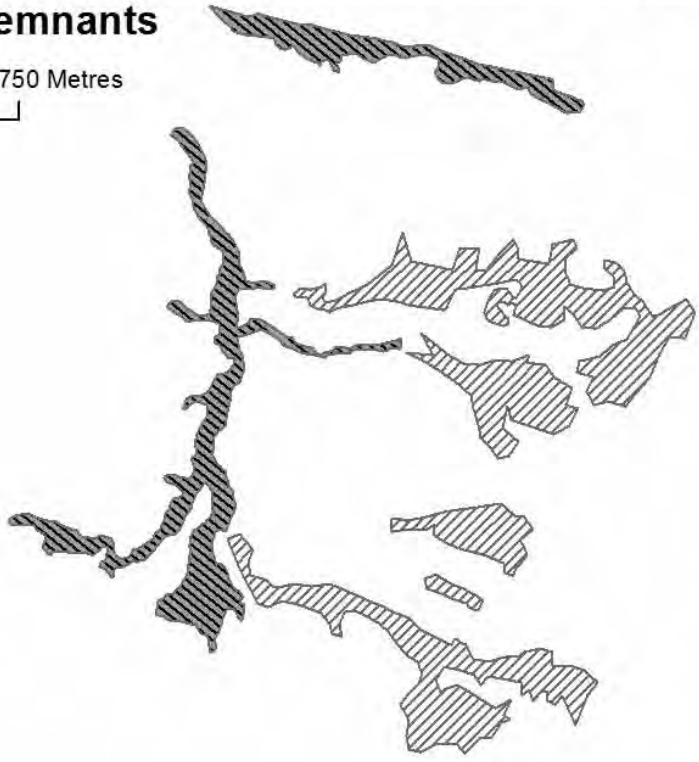


ROD038 Carter Road Remnants

0 187.5 375 750 Metres

Habitat type

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



Aerial photography flown in 2008

(Nationally Endangered), NI fernbird (Declining) and spotless crake (Relict). Inspection of site photographs indicates that the wetland is largely fenced. Although willow is common in the wetland, much of the understorey comprises indigenous plant species. The wetland is contiguous with indigenous forest and shrubland, forming a nationally and regionally rare example of a freshwater-terrestrial ecological sequence. The wetland currently provides a buffer to tributaries feeding into the Mangawhai Estuary and also provides a valuable habitat linkage to the estuary and forest remnants to the west. The site supports at least one regionally significant bird species. Some of the forest remnants are fenced (including the area protected under QEII covenant), but others are undergrazed by stock. The owner has applied for funding to fence remaining areas (D. Olsson, landowner, pers. comm. 2012). The site is representative for ecological units (a) to (f).

The area in which this site is located is dominated by lifestyle blocks and an increasing number of farms with similar remnants are being divided and sold (D. Olsson, landowner, pers. comm. 2012). Therefore, the legal protection of these remaining sites is of upmost importance. The size and shape of the remnants leave them vulnerable to edge effects and weed invasion. Wilding pines are likely to be issue at this site. Approximately 2.3 ha of the site are protected within a Queen Elizabeth II Open Space Covenant. The entire site (20.5 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

MANGAWHAI HEADS DUNE LAKE AND WETLAND

Survey no.	ROD039
Survey date	7 August 2007; April 2008
Grid reference	1742074E 6004726N (AY31)
Area	1.3 ha
Altitude	18 m a.s.l.

Ecological units

(a) Open water

(b) *Utricularia gibba* herbfield in dune lake

(c) *Machaerina articulata-Eleocharis sphacelata* reedland in swamp

(d) *Machaerina rubiginosa* sedgeland in swamp

(e) Gorse-mānuka-pampas-wattle shrubland on wetland edge

Landform/geology

Late Quaternary dune sands.

Vegetation

Source: 2007 survey by Northland Regional Council (NRC) and DOC (Forester et al. 2007) and an April 2008 survey by NIWA (Wells & Champion 2010).

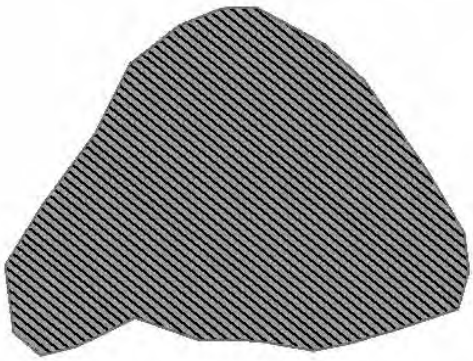
At the time of survey, the area of type (a) open water was estimated to be about 1 ha with a maximum depth of 1.6 m. The water clarity was good and the water peat-stained, which indicates that the lake possibly formed over a former bog wetland. The lake bed was fully vegetated and was dominated by *Chara fibrosa* (a native algal charophyte) with surface-reaching *Potamogeton*

ROD039 Mangawhai Heads Dunelake and Wetland

0 37.5 75 150 Metres

Habitat type

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



Aerial photography flown in 2008

cheesemanii common. A sprawling mat of type (b) exotic bladderwort *Utricularia gibba* is common throughout. Type (c) *Machaerina articulata* and *Eleocharis sphacelata* form a fringe around the lake about 10 m wide. More than 1 ha of wetland vegetation on the eastern side of the lake is characterised by abundant type (d) *Machaerina rubiginosa* sedgeland. A small area of peat bog is characterised by *Machaerina rubiginosa* sedgeland. Exotic species such as type (e) gorse, mānuka, pampas and coastal wattle are common on the drier margins of the wetland along with pockets of mānuka.

Significant flora
Dianella haematica (Declining) (Forester et al 2007; DOC Bioweb, viewed 2011) and *Myriophyllum votschii* (Naturally Uncommon) (Internal Northland Regional Council report by Lisa Forester and Emma Simpson).

Fauna

There is a 2007 record of Australasian bittern (Nationally Endangered) and paradise shelduck (Forester et al 2007). No fish were recorded during the dive survey, although there were abundant diving beetles (L. Forester, Northland Regional Council, pers. comm. 2012). A survey for black mudfish (Relictual) was recommended in 2007.

Significance

Mangawhai Heads Dune Lake and Wetland is all that is left of what would have once been an extensive peat bog wetland (Andrew Townsend, DOC, pers. comm. 2011). Although small, the dune lake is in good condition, with indigenous submerged vegetation, clear water and no recorded pest fish species. There are records of two 'At risk' plant species and one 'Threatened' bird species from the site. There is good habitat for black mudfish and these are known to occur 13 km to the south at Lake Tomarata. Common bullies are likely to be present at the site (L. Forester, NRC, pers. comm. 2012). The dune lake was first surveyed by NIWA in 2008 (Wells & Champion 2010), which gave it a ranking of 'Moderate', describing it as *A small lake with mostly native aquatic species.* The peat bog, however, is possibly too reduced and weedy to be viable into the future. Wells & Champion (2010) commented that *there is some debate about the natural status of this lake. A 1995/1996 aerial photograph (Map Toaster 2008) shows no open water and the area surrounded by a pine plantation. Since the removal of pines it may have become wetter and possibly earthworks could have deepened parts of the area.* Historic photography from 1966 shows a heart-shaped boggy depression with no open water. It is likely that some of the site was excavated when it was in forestry in order to create a water supply. The site can therefore be described as a drowned bog, which explains the peat staining and lack of fish (L. Forester, NRC, pers. comm. 2012).

Within the Northland Conservancy, this site contains one of only two dune lakes known on the east coast of southern Northland, the other one of which occurs at Ruakaka. It is therefore a high priority for protection. Further south in the Auckland Conservancy part of Rodney ED, two small dune lakes occur at Te Arai Regional Park (both surrounded by forest and one with intact aquatic macrophyte flora), together with Lakes Tomarata, Slipper and Spectacle (north of Pakiri), all of which are highly modified. The majority of

dune lakes in Northland occur in the northern part of the region. Within the Northland Conservancy the only other dune lake known on the east coast of southern Northland is Ruakaka Racecourse Dune Lake (Q07/129) in the Waipu Ecological District. The site is representative for types (a), (c) and (d). There is the potential for The Sands Development adjacent to the site to create adverse impacts on the wetland and dune lake. For example, run-off that is channelled into the lake from the development will change the water quality and nutrient status. It is also possible that domestic pets and human disturbance could adversely affect local fauna. The entire site (1.3 ha) is within an 'At Risk' land environment (A1.1c) (Walker et al. 2007).

4.2 LEVEL 2 SITES

A list of Level 2 sites identified in Rodney Ecological District (Northland) is provided in Table 5.

TABLE 5. LIST OF LEVEL 2 SITES IDENTIFIED IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND).

SITE	SURVEY NO.	GRID REFERENCE
Baldrock Road Trig Bush	ROD007	1733498E 5999507N
Mountain Road Remnant	ROD017	1727497E 6000070N
Wallbank Way Bush	ROD026	1740464E 5998964N
Topuni Forest Remnants	ROD029	1734797E 5991422N
Wrightmans Lawrence Wetland	ROD032	1737559E 5998727N
Brown Road Remnant	ROD037	1735768E 6001454N

BALDROCK ROAD TRIG BUSH

Survey no. ROD007

Survey date 5 October 2010

Grid reference 1733498E 5999507N (AY31)

Area 4.7 ha

Altitude 62–100 m a.s.l.

Ecological units

(a) Kānuka/mānuka-kauri forest on gentle hillslope (90%)

(b) Kānuka/mānuka forest on gentle hillslope (10%)

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand and conglomerate.

Vegetation

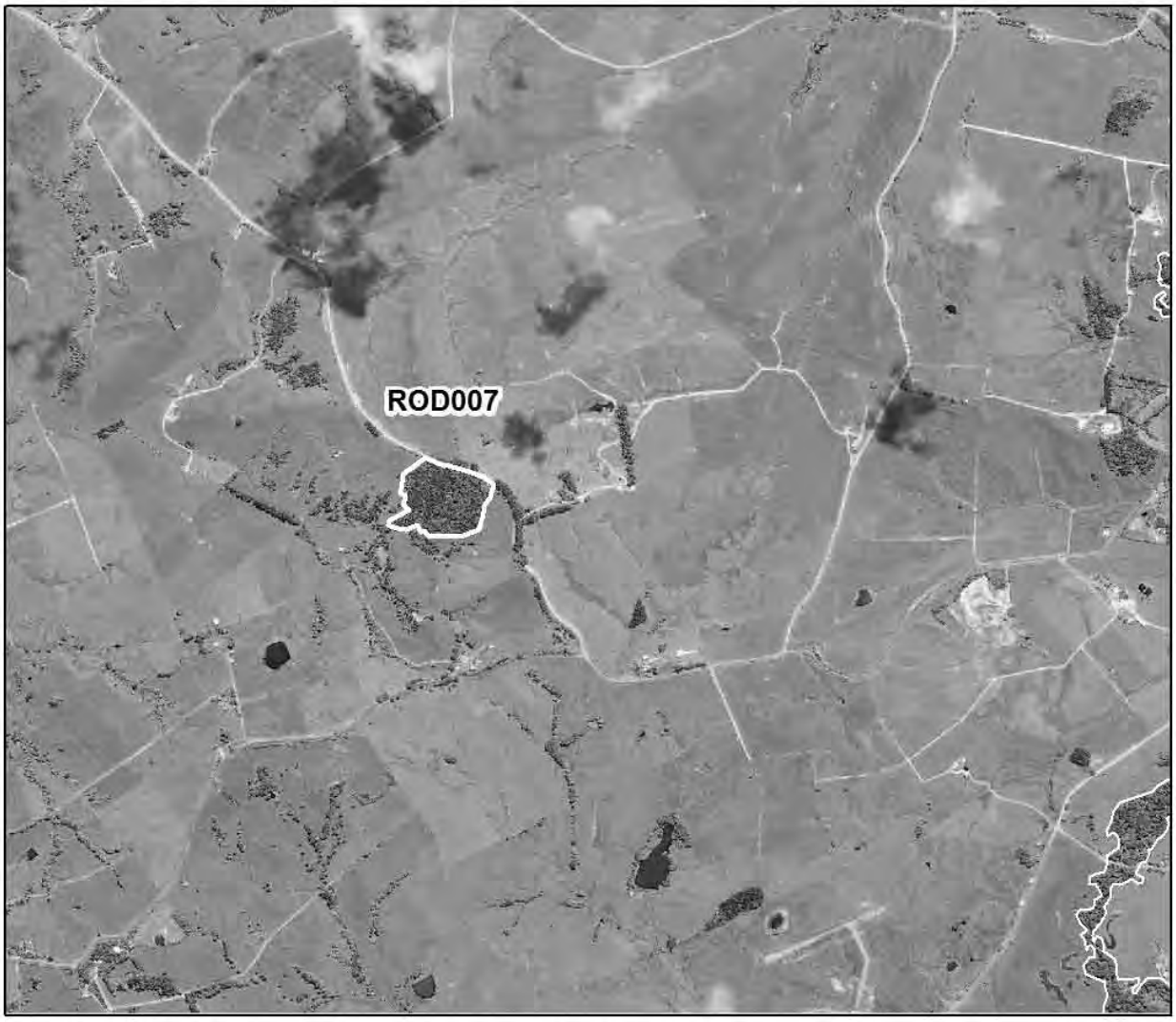
(a) Kānuka/mānuka and kauri (including the occasional mature tree) are co-dominant over most of the site, with occasional tōtara, taraire, pūriri, nīkau, rewarewa, pukatea, mamaku and tī kōuka. Type (b) kānuka/mānuka is common in the western side of the site with some tōtara.

Fauna

None noted.

Significance

The site comprises a small, isolated forest remnant within an extensive pastoral landscape. The subcanopy is relatively open and the understorey may be grazed. The site is likely to provide stepping stone habitat within a highly modified ED. Further information could lead to this site attaining Level 1 status. The entire site (4.7 ha) is within an 'At Risk' land environment (A1.6b) (Walker et al. 2007).

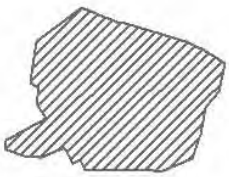


ROD007 Baldrock Road Trig Bush

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

MOUNTAIN ROAD REMNANT

Survey no.	ROD017
Survey date	Not surveyed
Grid reference	1727497E 6000070N (AY30)
Area	11.7 ha
Altitude	8–75 m a.s.l.

Ecological units

(a) Forest on hillslope

Landform/geology

Oligocene calcareous siltstone, sandstone and siltstone (partly alternating with graded sandstone), limestone, greensand, and conglomerate.

Vegetation

The site comprises a small, alluvial forest remnant approximately 1.6 km to the southeast of Pukepohatu, Cattlemount and Surrounds (ROD003). Inspection of aerial photography indicates forest is likely to be dominated by kānuka and tōtara with frequent treeferns (*Cyathea* spp.).

Fauna

None noted.

Significance

This site comprises a small forested remnant located on the margins of the Kaiwaka River. Inspection of aerial photography indicates that the site is characterised by indigenous forest, which forms an ecological sequence with saltmarsh habitat within the Kaiwaka River. Information on the site is insufficient to determine whether it meets the criteria for Level 1 sites. The entire site (11.7 ha) is within a 'Chronically Threatened' land form environment (A6.1d) (Walker et al. 2007).

ROD017 Mountain Road Remnant

0 62.5 125 250 Metres

Habitat type

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

Aerial photography flown in 2008

WALLBANK WAY BUSH

Survey no.	ROD026
Survey date	7 January 2011
Grid reference	1740464E 5998964N (AY31)
Area	5.9 ha
Altitude	20–40 m a.s.l.

Ecological units

(a) Kānuka/mānuka-tōtara forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

This site is dominated by abundant (a) kānuka/mānuka and tōtara, with occasional kahikatea, matai, kauri, tānekaha, rewarewa, tī kōuka, and mamaku. Emergent pines are prevalent on the ridge.

Fauna

None noted.

Significance

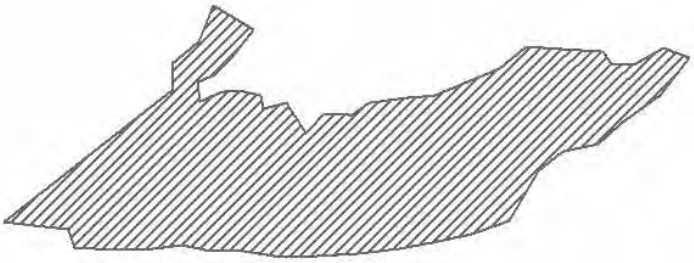
This site comprises a small remnant of indigenous forest beside a tributary of the Mangawhai Estuary. It contains a habitat type that is common throughout the Rodney ED (Northland). Further survey is recommended to determine the full ecological significance of the site. Approximately 0.7 ha of the site is within an 'Acutely Threatened' land environment (A5.1a) and 5.1 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

ROD026 Wallbank Way Bush

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2008

TOPUNI FOREST REMNANTS

Survey no.	ROD029
Survey date	27 January 2011
Grid reference	1734797E 5991422N (AY31)
Area	28 ha
Altitude	20–130 m a.s.l.

Ecological units

(a) Tōtara forest on hillslope

(b) Kānuka/mānuka forest on hillslope

(c) Kauri-tōtara forest on hillslope

(d) Kānuka/mānuka-tōtara forest on hillslope

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

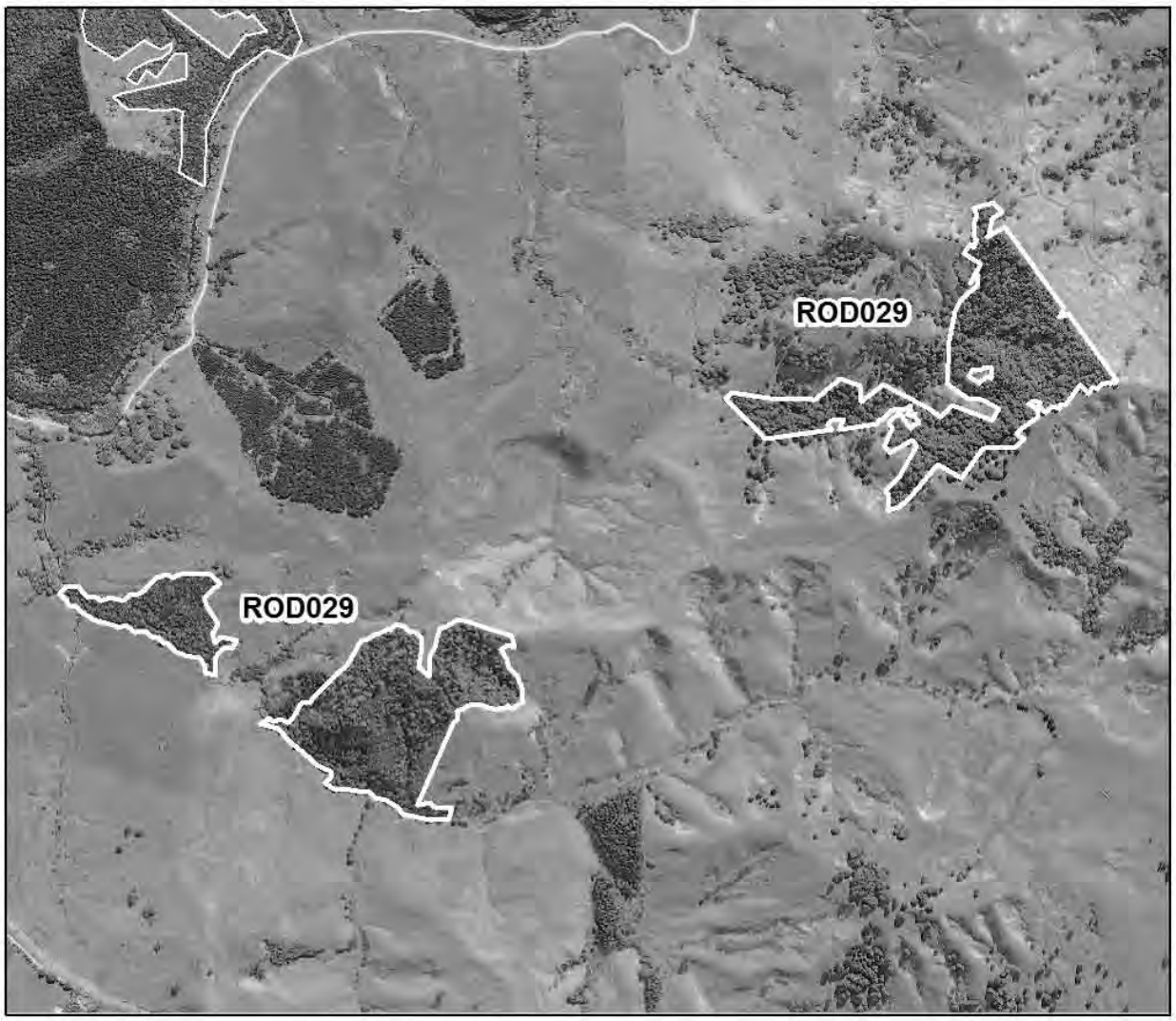
In the eastern remnant, type (a) tōtara is common with frequent pūriri, nīkau and kahikatea. In the middle remnant (locally called 'Clover Bush'), type (b) kānuka/mānuka is common with frequent tānekaha and kauri, and occasional nīkau, rimu and tōtara. On the upper slopes of the middle remnant, type (c) kauri and tōtara are common with frequent kahikatea, nīkau and rimu. In the remaining western remnant (locally called 'Ford Bush'), type (d) kānuka/mānuka and tōtara are common, with frequent kauri and kahikatea, and occasional matai.

Fauna

None noted.

Significance

The site comprises three remnants that are typical of the small areas of forest that occur across low-lying parts of the Rodney ED (Northland). Such sites collectively form part an important local habitat network for mobile fauna travelling between larger tracts of forest. The site provides a degree of riparian buffering for tributaries of the Topuni River. Additional survey is required to determine the full ecological values of this site. The entire site (28 ha) is within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).

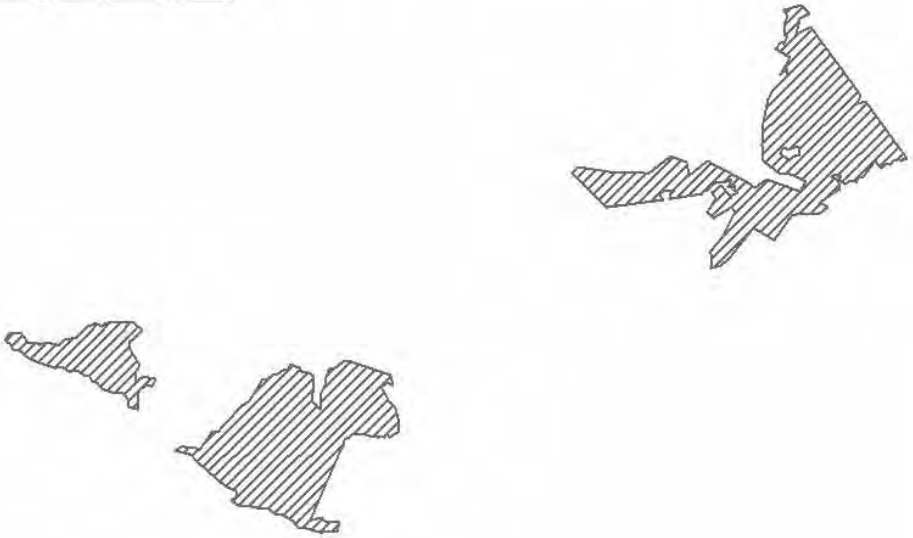


ROD029 Topuni Forest Remnants

0 250 500 1,000 Metres

Habitat type

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



Aerial photography flown in 2008

WRIGHTMANS LAWRENCE WETLAND

Survey no.	ROD032
Survey date	6 September 2010 (survey conducted by Wildland Consultants Ltd for the Northland Regional Council; surveyed from road)
Grid reference	1737559E 5998727N (AY31)
Area	7.6 ha
Altitude	55–77 m a.s.l.

Ecological units

(a) Raupō reedland in swamp (40%)

(b) *Machaerina* sp. reedland in swamp (30%)

(c) Gorse scrubland in swamp and on hillslope (30%)

Landform/geology

Early Miocene calcareous sandstone and siltstone (partly alternating with graded sandstone), pumiceous and andesitic tuff, and limestone.

Vegetation

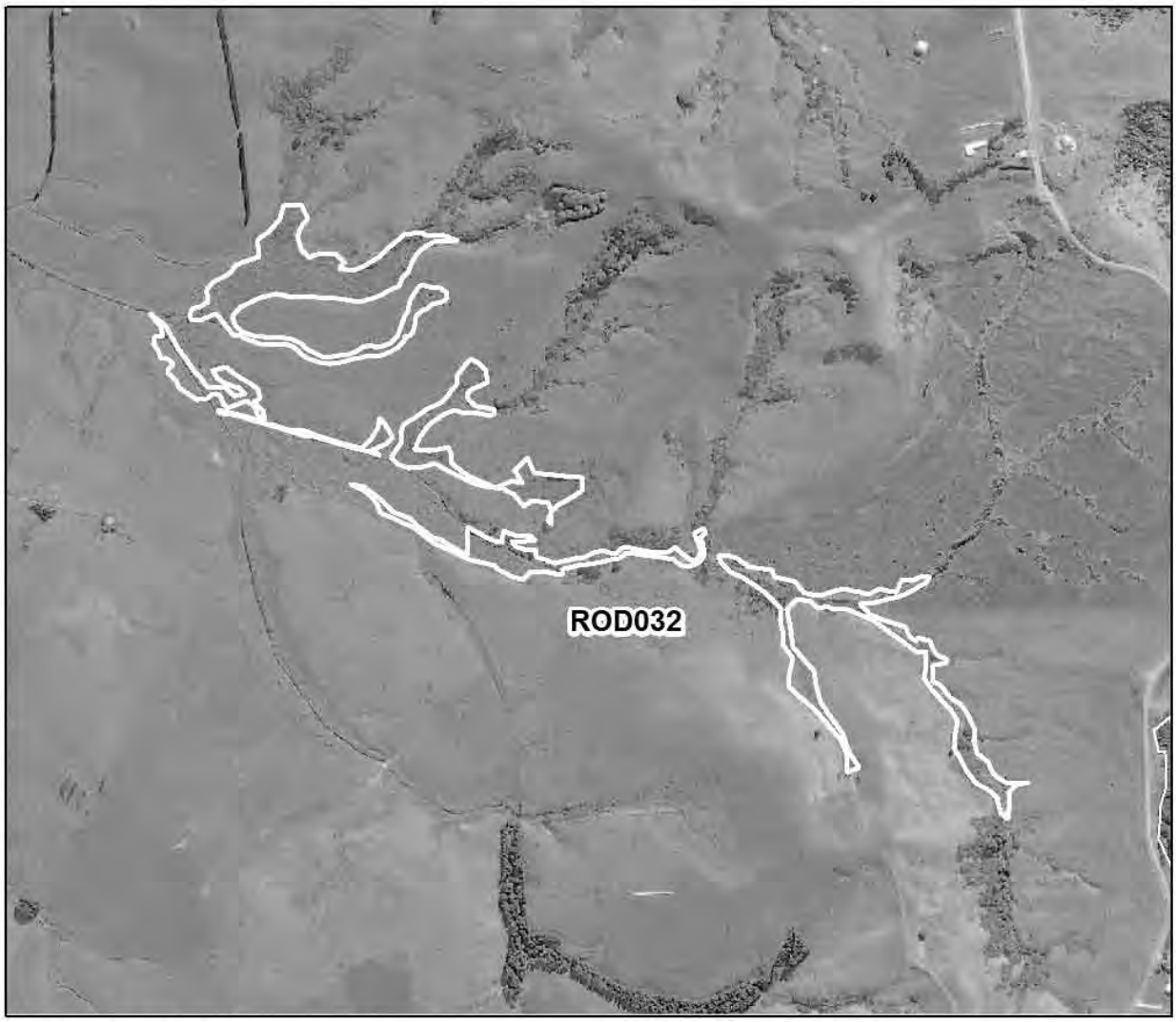
The wetland is long, narrow and discontinuous, and occurs within a gully. The vegetation is characterised by abundant type (a) raupō with occasional *Machaerina* sp. Type (b) *Machaerina* sp. is locally common with frequent soft rush (identification not certain) and occasional harakeke. On the dry margins of the wetland gorse scrubland is locally common.

Fauna

None noted.

Significance

Freshwater wetlands are very rare within the ED (Northland), and are also regionally and nationally uncommon. The site is grazed and unfenced, and gorse is invading the upper part of the wetland and appears to be dominant downstream. The shape of the wetland (long and narrow) and the near complete absence of buffering mean that this site will always be vulnerable to weed invasion and activites on adjacent farmland. For these reasons the site has been assigned Level 2 status. Approximately 3.2 ha of the site lies within an 'Acutely Threatened' land environment (A7.2a), 1.4 ha is within a 'Chronically Threatened' land environment (G3.1b), and 2.7 ha lies within an 'At Risk' land environment (A6.1b) (Walker et al. 2007).



ROD032 Wightmans Lawrence Road Swamp

0 250 500 1,000 Metres

Habitat type

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

Aerial photography flown in 2008

BROWN ROAD REMNANT

Survey no.	ROD037
Survey date	Unsurveyed—could not be viewed from the road
Grid reference	1735768E 6001454N (AY31)
Area	5 ha
Altitude	51–54 m a.s.l.

Ecological units

(a) Forest on alluvial flats

Landform/geology

Late Quaternary alluvium.

Vegetation

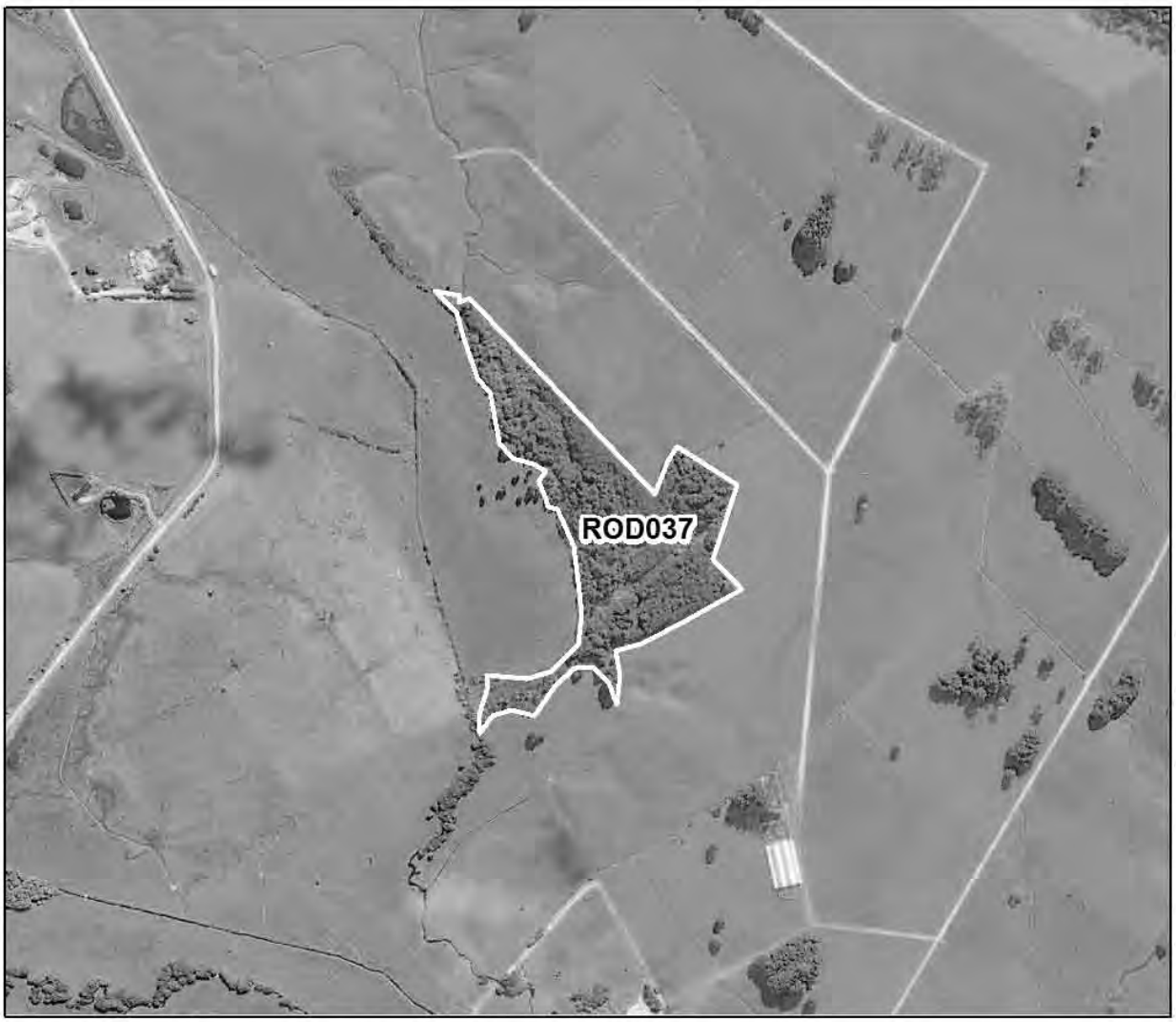
The site comprises a small, alluvial forest remnant approximately 1.6 km to the southeast of Pukepohatu, Cattlemount and Surrounds (ROD003). Inspection of aerial photography indicates that the forest is likely to be dominated by kānuka and tōtara with frequent treeferns (*Cyathea* spp.).

Fauna

None noted.

Significance

Alluvial forest has been significantly reduced in Rodney ED (Northland) and the Northland Region. The site provides partial buffering for a small stream and is likely to provide stepping stone habitat for birds travelling to and from large forested sites such as Pukepohatu, Cattlement and Surrounds (ROD003). It is not known if the forest is fenced. Further information could lead to the site attaining Level 1 status. Approximately 2.9 ha of the site lies within a 'Chronically Threatened' land environment (A5.1a) and 2.1 ha is within a 'No Threat Category' land environment (G3.1b) (Walker et al. 2007).

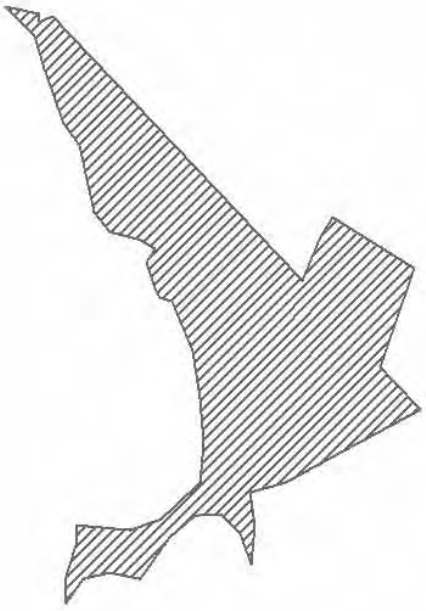


ROD037 Brown Road Remnant

0 125 250 500 Metres

Habitat type

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



Aerial photography flown in 2008

5. Summary and conclusions

A total of 38 significant natural areas covering 4694 ha (22.3% of Rodney ED (Northland); 87.3% terrestrial and 12.7% harbour and estuary) were identified during a reconnaissance field survey undertaken between 2010 and 2012. Existing databases and reports were also used to provide information on natural areas. These natural areas comprise forest (3750.8 ha; 80%), estuarine habitat (597.6 ha; 12.7%), duneland/sandfield (249.7 ha; 5.3%), shrubland (48.4 ha; 1%), freshwater wetland (46.8 ha; 1%, 32.8 ha of which is open water), and rockland (0.4 ha; <0.01%). It should be noted that shrubland is significantly more common in the ED than the survey indicates. Data from LCDB2 shows that there are approximately 448 ha of kānuka/mānuka remaining in the ED. It is likely that a large proportion of this was either missed during the survey and/or classified as 'kānuka/mānuka forest' rather than 'kānuka/mānuka shrubland'.

The majority of 'Threatened', 'At Risk' and regionally significant biota are known from the four largest sites in Rodney ED (Northland): Pukeareinga Scenic Reserve and Surrounds (ROD001), Pukepohatu, Cattlemount and Surrounds (ROD003), Pukekaroro Scenic Reserve and Surrounds (ROD004), and Mangawhai Harbour, Sandspit and Surrounds (ROD014), although a few smaller sites such as Mangawhai North Head Remnants (ROD013), Sentinel Rock (ROD031) and Mangawhai Heads Dune Lake and Wetland (ROD039) support a high number of threatened species relative to their size. Naturally, the size, ownership and accessibility of these sites is commensurate with the scale of survey that has been undertaken, i.e. the survey effort that has taken place in large, publicly owned natural areas far outweighs that carried out in the many privately owned remnants that are scattered across the rolling hills and alluvial plains of the ED. Two sites could not be viewed from vantage points during the 2010–11 survey.

The four largest sites are all legally protected to varying degrees, although active pest animal and weed management by both DOC and volunteers is focused on the Marunui Conservation Area within site ROD003 and Mangawhai Sandspit within site ROD014. Meanwhile, large areas of inland forests are falling increasingly silent as they are subjected to the deleterious presence of animal and plant pests that are able to wreak havoc, unchecked by management.

Key features of Rodney ED (Northland Conservancy) are outlined below:

- Mangawhai Harbour and Sandspit contains a diverse range of ecosystem types, including coastal forest, saltmarsh shrublands and sedgelands, herbfields, mangroves, dunelands, and ephemeral dune slacks. Mangawhai Sandspit and Mangawhai Estuary are a nationally important breeding area for 'Threatened' and 'At Risk' shorebirds and waders, including the most important current breeding site for the NZ fairy tern. The Mangawhai high dune (42 m a.s.l.) is the only large dune of its type for many kilometres along the east coast of Northland and Auckland.

- The number of 'Threatened' and 'At Risk' bird species present in the ED is high.
- The ED contains examples of gumland habitat, a rare habitat type that is unique to Northland, Auckland and Coromandel. Gumlands are particularly rare in southern Northland.
- There are extensive areas of dunelands, which are poorly represented in the existing protected areas network.
- There is high floristic diversity, with a total of 324 indigenous vascular species identified.
- Sentinel Rock is the only island (or islet) present in the ED and supports a high number of 'Threatened', 'At Risk' and regionally uncommon species.

Most of the biodiversity values within Rodney ED (Northland) are formally protected; however, priorities for protection are:

- Habitats for nationally 'Threatened', 'At Risk', and regionally significant species.
- Freshwater wetlands.
- Uncommon terrestrial habitat types.
- Buffers and linkages, with emphasis on extensive riparian corridors and linkages between upland and alluvial forested (Level 1) sites.
- Forest and shrubland adjacent to estuaries.

An effective strategy to create an integrated protected natural areas network in Rodney ED (Northland) would need to consider protection of priority natural areas and ecological restoration of remaining wetlands (including gumlands), ecological corridors, linkages, and buffers to promote better connectivity between inland hill country, alluvial plains, estuarine systems and dunelands. Freshwater wetlands, in particular, are very rare in the ED, with most having been drained or developed.

6. Protected Natural Areas Network

6.1 ANALYSIS OF EXISTING PROTECTED AREAS

6.1.1 Overview

The entire Rodney ED (Northland and Auckland Conservancies) covers a total area of approximately 178,934 ha. Rodney ED (Northland) comprises c. 21,022 ha of this (11.7%). Natural areas cover 4694 ha (22.3%) of the ED; 97% being terrestrial and 3% harbour and estuary. Approximately 876.3 ha (18.6%) of the natural areas are formally protected within reserves and covenants. This is about 4% of the total area of the ED. The various types of protection status within natural areas are summarised in Table 4.

Areas protected per habitat type are as follows: forest—557.7 ha, shrubland—84.1 ha, dunelands—232.5 ha, estuarine—7 ha, and freshwater wetland—1 ha.

A list of ecological units recorded in Rodney ED (Northland) and their current protection status is set out in Table 6, and a summary of the site evaluations is provided 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

Cooks Creek Lakes (ROD006)

Baldrock Road Trig Bush (ROD007)

Tara Creek Remnants (ROD012)

Mangawhai North Head Remnants (ROD013)

Garbolino Road Bush (ROD015)

Settlement Road Matai Remnant (ROD021)

Pritchard Road Forest Remnants (ROD022)

Staniforth Paper Road Forest Remnants (ROD023)

Cames Road Forest Remnants (ROD025)

Wallbank Way Bush (ROD026)

Topuni Forest Remnants (ROD029)

Topuni Farm Bush Remnants (ROD030)

Sentinel Rock (ROD031)

Wrightmans Lawrence Road Wetland (ROD032)

Garbolino Road Swamp (ROD033)

State Highway 1 Remnant (ROD034)

Old Waipu Road Remnant (ROD035)

Wallbank Way Dam (ROD036)

Brown Road Remnant (ROD037)

Mangawahi Heads Dune Lake and Wetland (ROD039)

Sites mostly unprotected

Pukepohatu, Cattlemount and Surrounds (ROD003); 13.6% protected

Hakaru River Forest Ribbon (ROD008); 8% protected

Valley Road Remnant (ROD009); 17.3% protected

Lois Wintles Bush and Pohutukawa Remnant (ROD011); 10.2% protected

Kaiwaka Mangawhai Road Remnants (ROD016); 12.6% protected

Otioro Road Forest Remnants (ROD019); 35.8% protected

Settlement Road Forest Remnants (ROD020; 13.6 % protected

Kereru Lane Forest Remnants (ROD024); 11.6% protected

Topuni Bush Fragments (ROD028); 3.7% protected

Carter Road Remnants (ROD038); 11.2% protected

Sites with large parts unprotected

Pukeareinga Scenic Reserve and Surrounds (ROD001); 45% protected

Mangawhai Harbour, Sandspit and Surrounds (ROD014); 26.5% protected

The remaining sites have over 45% of their area within reserves or covenants; however, some ecological units within them may not be protected—ROD002, ROD004, ROD005, ROD008, ROD018, ROD027.

6.1.3 Threatened land environments of Rodney Ecological District (Northland Conservancy)

Most of Rodney ED (Northland) is classified as a threatened land environment (Fig. 1). Natural areas within Rodney ED (Northland) contain 16 land environments (A1.1a, A1.1c, A5.1a, A6.1a, A6.1b, A6.1c, A6.1d, A7.1a, A7.2a, A7.3a, D1.1a, D1.1b, D1.2a, D1.2b, G1.1a, and G3.1b), totalling 4201 ha. Approximately 126.6 ha (3%) falls into the 'Acutely Threatened' category, 220.9 ha (c. 5.3%) into the 'Chronically Threatened' category, and 1243.3 ha (c. 29.6%) into the 'At Risk' category, 50.3 ha into the 'Critically Underprotected' category (c. 1%), 1994.5 ha (c. 47%) into the 'Underprotected' category, and 564.9 ha (c. 13%) falls into the 'No Threat' category. Approximately 561 ha of the ED ocurs in the Mangawhai Harbour and Estuary (i.e. non-terrestrial natural areas) and is therefore not included in the LENZ analysis.

TABLE 6. PROTECTED NATURAL AREAS NETWORK IN RODNEY (NORTHLAND) ECOLOGICAL DISTRICT (AREA IN Ha).

SITE	SURVEY NO.	STATUS (Ha)						SUB-TOTAL AREA PROTECTED (EXCLUDING RR) (Ha)	RR (Ha)	TOTAL AREA PROTECTED (INCLUDING RR) (Ha)	TOTAL SITE AREA (Ha)	PROPORTION SITE PROTECTED (%)
		CA	MS	QEII	SCER	GPR	PPL					
Pukeareinga Scenic Reserve and Surrounds	ROD001			1.5	80		0.6	82.1		82.1	473.7	17.3
Pretty Bush	ROD002			10.6				10.6		10.6	17.3	61.3
Pukepohatu, Cattlemount and Surrounds	ROD003		1.1	248.0	65.8			314.9		314.9	2138.9	14.7
Pukekararo Scenic Reserve and Surrounds	ROD004				133.4		12.2	133.4		145.6	235.6	61.7
Cooks Stream Scenic Reserve	ROD005				8.3			8.3		8.3	12.3	67.5
Hakuru River Forest Ribbon	ROD008		16.1					16.1		16.1	199.8	8.1
Valley Road Remnant	ROD009			12.4				12.4		12.4	71.8	70.4
Lois Wintles Bush and Pohutukawa Remnant	ROD011						0.8	0.8		0.8	7.8	10.3
Mangawhai Harbour, Sandspit and Surrounds	ROD014	0.9	1.2			240.7		242.8		242.8	914.9	26.5
Kaiwaka Mangawhai Road Remnants	ROD016		4.3				4.3		4.3	34.1	12.6	
Kaiwaka Township Bush	ROD018		1.4					1.4	3.6	5.0	7.1	70.4
Otioro Road Forest Remnants	ROD019			24.7				24.7		24.7	69.0	35.8
Settlement Road Forest Remnants	ROD020			1.4				1.4		1.4	10.3	13.6
Kereru Lane Forest Remnants	ROD024			4.6				4.6		4.6	39.5	11.6
Topuni Scenic Reserve and Saltmarsh	ROD027	0.4	0.3		14.4			15.1		15.1	19.2	78.6
Topuni Bush Fragments	ROD028	1.9					1.9		1.9	51.9	3.7	
Carter Road Remnants	ROD038			2.3				2.3		2.3	20.5	11.2
TOTAL			**1.3**	**22.0**	**309.8**	**299.9**	**240.7**	**13.6**	**877.1**	**3.6**	**892.9**	**4323.7**

TABLE 7. AREA (Ha) OF LENZ LEVEL IV ENVIRONMENTS WITHIN RODNEY ED (NORTHLAND) PNA SITES AND THEIR RESPECTIVE THREAT CATEGORIES.

SITE NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
ROD001	10–20% left	Chronically Threatened	A6.1d	3.3
	20–30% left	At Risk	A6.1b	9.3
	>30% left, <10% protected	Critically Underprotected	A6.1c	3.8
	>30% left, >20% protected	Underprotected	D1.2b	84.2
	>30% left,and >10–20% protected	No Threat Category	D1.1a	328.0
			D1.1b	45.0
		Subtotal		373.0
Total LENZ				**473.6**
ROD002	10–20% left	Chronically Threatened	A7.1a	1.2
			A6.1d	7.7
		Subtotal		8.9
	>30% left, >20% protected	No Threat Category	D1.1b	8.2
Total LENZ				**17.1**
ROD003	<10% left	Acutely Threatened	A5.1a	1.8
	10–20% left	Chronically Threatened	G3.1b	17.6
			A6.1d	4.3
		Subtotal		23.7
	20–30% left	At Risk	A6.1b	176.8
	>30% left and <10% protected	Critically Underprotected	A6.1a	4.1
			A6.1c	40.0
		Subtotal		44.1
	>30% left, >20% protected	Underprotected	D1.2b	1785.3
	>30% left, >20% protected	No Threat Category	D1.1a	5.7
			D1.2a	0.2
			D1.1b	86.3
			D1.2c	16.7
		Subtotal		108.9
Total LENZ				**2138.8**
ROD004	10–20% left	Chronically Threatened	G3.1b	20.2
			A6.1c	33.1
		Subtotal		53.3
	20–30% left	At Risk	A6.1b	33.4
	>30% left and <10%	Critically Underprotected	A6.1c	2.2
	>30% left and 10–20% protected	Underprotected	D1.2b	124.2
	>30% left, >20% protected	No Threat Category	D1.1b	22.5
Total LENZ				**235.6**
ROD005	20–30% left	At Risk	A6.1b	12.3
Total LENZ				**12.3**
ROD006	10–20% left	Chronically Threatened	G3.1b	<0.01
	20–30% left	At Risk	A6.1b	7.7
	>30% left and <10%	Critically Underprotected	A6.1c	0.2
	>30% left and 10–20% protected	Underprotected	D1.2b	0.8
	>30% left, >20% protected	No Threat Category	D1.1b	0.2
Total LENZ				**8.9**
ROD007	20–30% left	At Risk	A1.6b	4.7
Total LENZ				**4.7**
ROD008	<10% left	Acutely Threatened	A5.1a	0.9
			A7.2a	5.2
		Subtotal		6.1
	10–20% left	Chronically Threatened	G3.1b	68.7
	20–30% left	At Risk	A6.1b	125.1
Total LENZ				**199.9**

Continued on next page.

Table 7 continued from previous page.

SITE NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
ROD009	<10% left	Acutely Threatened	A5.1a	<0.01
			A7.2a	1.8
		Subtotal		1.8
	10–20% left	Chronically Threatened	G3.1b	25.4
	20–30% left	At Risk	A6.1b	44.6
Total LENZ				**71.8**
ROD011	10–20% left	Chronically Threatened	A7.1a	0.1
	20–30% left	At Risk	A6.1b	0.4
	>30% left, >20% protected	No Threat Category	D1.1a	7.2
Total LENZ				**7.7**
ROD012	10–20% left	Chronically Threatened	G3.1b	0.9
	20–30% left	At Risk	A6.1b	31.8
Total LENZ				**32.7**
ROD013	20–30% left	At Risk	G1.1a	1.4
			A6.1b	21.4
		Subtotal		22.8
	>30% left, >20% protected	No Threat Category	D1.1a	1.3
			D1.1b	24.5
		Subtotal		25.8
Total LENZ				**48.6**
ROD014	<10% left	Acutely Threatened	A5.1a	71.1
			A7.2a	39.0
		Subtotal		110.1
	10–20% left	Chronically Threatened	A1.1c	0.8
			G3.1b	1.2
			A7.3a	1.9
		Subtotal		3.9
	20–30% left	At Risk	G1.1a	249.7
			A6.1b	12.0
		Subtotal		261.7
	>30% left, >20% protected	No Threat Category	A1.1a	13.9
			D1.1a	2.1
		Subtotal		16.0
Total LENZ				**391.7**
ROD015	20–30% left	At Risk	A6.1b	41.4
Total LENZ				**41.4**
ROD016	20–30% left	At Risk	A6.1b	34.1
Total LENZ				**34.1**
ROD017	10–20% left	Chronically Threatened	A6.1d	11.7
Total LENZ				**11.7**
ROD018	10–20% left	Chronically Threatened	G3.1b	3.3
	20–30% left	**At Risk**	**A6.1b**	**3.8**
Total LENZ				**7.1**
ROD019	20–30% left	At Risk	A6.1b	69.0
Total LENZ				**69.0**
ROD020	20–30% left	At Risk	A6.1b	10.2
Total LENZ				**10.2**
ROD021	20–30% left	At Risk	A6.1b	3.7
Total LENZ				**3.7**

Continued on next page.

Table 7 continued from previous page.

SITE NUMBER	CRITERIA	THREATENED ENVIRONMENT	LENZ LEVEL 4	TOTAL (ha)
ROD022	20–30% left	At Risk	A6.1b	33.3
Total LENZ				**33.3**
ROD023	20–30% left	At Risk	A6.1b	20.5
Total LENZ				**20.5**
ROD024	20–30% left	At Risk	A6.1b	39.5
Total LENZ				**39.5**
ROD025	20–30% left	At Risk	A6.1b	86.0
Total LENZ				**86.0**
ROD026	<10% left	Acutely Threatened	A5.1a	0.7
	20–30% left	At Risk	A6.1b	5.1
Total LENZ				**5.8**
ROD027	20–30% left	At Risk	A6.1b	18.5
Total LENZ				**18.5**
ROD028	20–30% left	At Risk	A6.1b	51.9
Total LENZ				**51.9**
ROD029	20–30% left	At Risk	A6.1b	28.0
Total LENZ				**28.0**
ROD030	20–30% left	At Risk	A6.1b	23.9
Total LENZ				**23.9**
ROD031		n/a		n/a
Total LENZ				
ROD032	<10% left	Acutely Threatened	A7.2a	3.2
	10–20% left	Chronically Threatened	G3.1b	1.4
	20–30% left	At Risk	A6.1b	2.7
Total LENZ				**7.3**
ROD033	20–30% left	At Risk	A6.1b	1.2
Total LENZ				**1.2**
ROD034	10–20% left	Chronically Threatened	A6.1d	14.6
	20–30% left	At Risk	A6.1b	2.3
Total LENZ				**16.9**
ROD035	20–30% left	At Risk	A6.1b	11.6
	30% left, >20% protected	No Threat Category	D1.1b	3.2
Total LENZ				**14.8**
ROD036	10–20% left	Chronically Threatened	A1.1b	5.6
Total LENZ				**5.6**
ROD037	10–20% left	Chronically Threatened	A5.1a	2.9
	30% left, >20% protected	No Threat Category	G3.1b	2.1
Total LENZ				**5.0**
ROD038	20–30% left	At Risk	A6.1b	20.5
Total LENZ				**20.5**
ROD039	20–30% left	At Risk	A1.1c	1.3
Total LENZ				**1.3**
GRAND LENZ TOTAL				**4204.5**

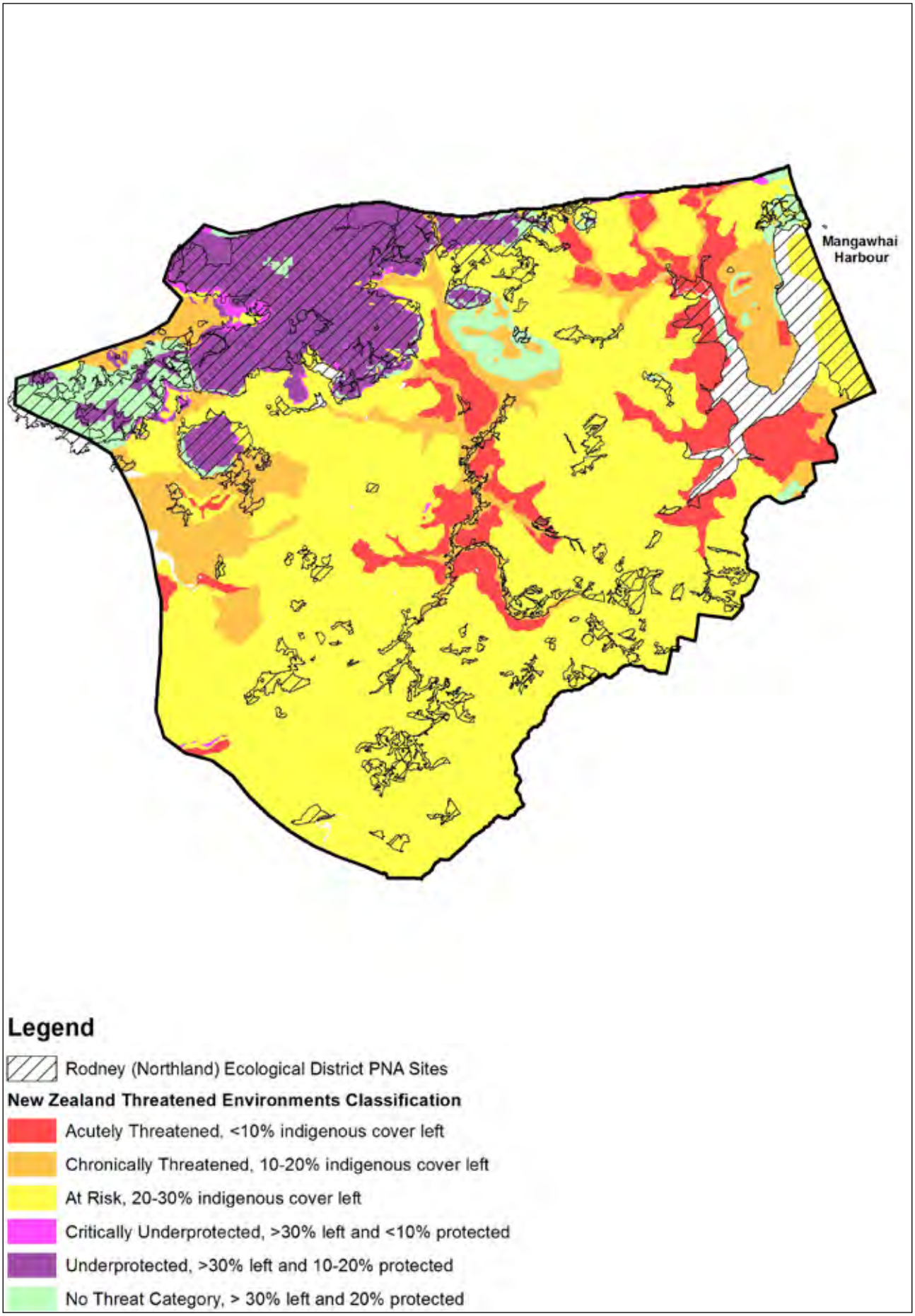


Figure 3. Threatened Land Environments of Rodney Ecological District (Northland Conservancy)

6.2 PRIORITY NATURAL AREAS FOR PROTECTION IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY)

The purpose of this section is to identify the unprotected natural areas documented in this report that best supplement the existing protected natural areas network, to make it more fully representative of the diversity and character of Rodney ED (Northland).

Only a small proportion of the diversity and pattern of ecosystem types in Rodney ED (Northland) is represented within protected areas. Relatively speaking, forests and dunelands are highly represented within these protected areas, while other habitat types such as freshwater wetlands and saltmarsh currently receive no protection. Taking these factors into account, the priorities for protection in Rodney ED (Northland) include:

1. Protection of habitats for nationally threatened and regionally significant species

Rodney ED (Northland) 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 8 birds; 'At Risk' species include 12 plants, 11 birds, 2 land snail species, 1 lizard, 1 frog, 3 fishes, and 1 aquatic invertebrate. There are also a further 29 regionally significant species, which are considered rare or threatened in Northland (22 plant, 5 bird, 1 reptile, and 1 fish species).

Large areas which are not protected or are underprotected, and contain threatened and regionally significant species, include Pukepohatu, Cattlemount and Surrounds (ROD003) and Mangawhai Harbour, Sandspit and Surrounds (ROD014).

2. Protection of freshwater wetlands

While forested habitats are relatively well-protected in Rodney ED (Northland), no freshwater wetlands are formally protected. This is particularly salient given the fact that freshwater wetlands have been so greatly reduced in extent in the ED. Only seven sites were identified during the PNAP survey as containing freshwater habitat, with a total of 46.8 ha within their boundaries. These were: Mangawhai Harbour, Sandspit and Surrounds (ROD014), Wrightmans Lawrence Wetland (ROD032), Garbolino Road Swamp (ROD033), Carter Road Remnants (ROD038) and Mangawhai Heads Dune Lake and Wetland (ROD039). Man-made lakes are also included; these are present at Cooks Creek Lakes (ROD006) and Wallbank Way Dam (ROD036). It is likely that several small swamps are present on rural land across the ED, most of which could only be identified through careful inspection of aerial photography (e.g. 1738880E 6003990N; 1741340E 6005290N).

Freshwater wetlands provide habitat for at least five 'At Risk' plant species, and at least one 'Threatened' and one regionally significant fauna species in Rodney ED (Northland). Gumland is a type of wetland that is rare in Northland, with only two examples recorded in the ED: Mangawhai North Head Remnants (ROD013) and Mangawhai Harbour, Sandspit and Surrounds (ROD014).

The full protection of site Mangawhai Heads Dune Lake and Wetland (ROD039) is particularly important, given it is the only example of a dune lake system in Rodney ED (Northland) and one of only a few dune lakes present in the entire ED (Northland and Auckland).

3. Protection of uncommon terrestrial habitat types that have been reduced significantly from their former extent

While inland forested habitats are generally relatively well-protected in Rodney ED (Northland), no areas of indigenous coastal forest are currently protected. Coastal forest only occurs at three sites: Mangawhai North Head Remnant (ROD013), Mangawhai Harbour, Sandspit and Surrounds (ROD014), and Old Waipu Road Remnant (ROD035).

4. Protection of islets

Sentinel Rock (ROD031) is the only islet that occurs in Rodney ED (Northland) and is only one of a few to occur in the entire Rodney ED (Northland and Auckland). Despite its small size, the island supports a disproportionate number of 'Threatened', 'At Risk' and regionally significant species, including a significant breeding colony of grey-faced petrels. Given the high biological importance of the site, Sentinel Rock should be afforded full protection and subjected to appropriate management to ensure its values are sustained.

5. Protection of buffers and linkages

Emphasis should be on protecting extensive riparian corridors along the Hakaru River and its tributaries at sites Hakaru River Forest Ribbon (ROD008) and Valley Road Remnant (ROD009). In addition, protection should be afforded to Level 1 forest remnants that provide linkages between upland indigenous forest and lowland alluvial habitats, e.g. Cooks Stream Scenic Reserve (ROD005) and Tara Creek Remnants (ROD012).

6. Forest and shrubland adjacent to estuaries

Forest and shrubland adjacent to estuaries within Mangawhai Harbour, Sandspit and Surrounds (ROD014), especially pōhutukawa forest on the estuary margin, mānuka shrubland near Atkin Road and saltmarsh ribbonwood shrubland adjacent to King Road are priorities for protection.

Table 8 shows ecological units recorded in Rodney Ecological District (Northland Conservancy) and their protection status. Table 9 provides a summary of site evaluations.

TABLE 8. ECOLOGICAL UNITS RECORDED IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY) AND PROTECTION STATUS.

Key: CA = Conservation Area; MS = Marginal Strip; RR = Recreation Reserve; GPR = Government Purpose Reserve; QEII = QEII Open Space Covenant; SCER = Scenic Reserve; PPL = Protected Private Land; 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.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
FRESHWATER WETLANDS									
Baumea articulata-							**ROD039**		
Eleocharis sphacelata							**ROD039**		
Baumea rubiginosa									
Baumea sp.			ROD032*						
Baumea rubignosa-*B. teretifolia*			ROD033						
Glyceria maxima			ROD033						
Gorse			ROD032*						
Gorse-mānuka-pampas-Sydney golden wattle							ROD039		
Open water	ROD006		ROD036		ROD013		**ROD039**		
Raupō			ROD020 ptQEII ROD032* ROD033 **ROD038** **ptQEII**						
Swamp millet-*Glyceria maxima*			ROD033						
Willow treeland			ROD038 ptQEII						
SALTMARSH									
Mangrove			**ROD014** **ptGPR ptCA** **ptMS (part of)**			**ROD014** **ptGPR ptCA** **ptMS (part of)**		**ROD014** **ptGPR ptCA** **ptMS (part of)**	

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	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Oioi-saltmarsh ribbonwood			**ROD014 ptGPR ptCA ptMS (part of)**			**ROD014 ptGPR ptCA ptMS (part of)**		**ROD014 ptGPR ptCA ptMS (part of)**	
Oioi-searush			**ROD014 ptGPR ptCA ptMS (part of)**			**ROD014 ptGPR ptCA ptMS (part of)**		**ROD014 ptGPR ptCA ptMS (part of)**	
Saltmarsh ribbonwood	**ROD027 ptSCER ptCA ptMS (part of)**			**ROD027 PtSCER ptCA ptMS (part of)**					
SANDFIELDS/ COASTAL ASSOCIATIONS									
Carex pumila									**ROD014 ptGPR ptCA ptMS (part of)**
Ficinia nodosa-oioi									**ROD014 ptGPR ptCA ptMS (part of)**
Pingao									**ROD014 ptGPR ptCA ptMS (part of)**
ROCKLAND									
Austrostipa stipoides		**ROD031**							
Bare rock		**ROD031**							
Harakeke-coastal toetoe-wiwi-pōhuehue		**ROD031**							
Native iceplant-glasswort		**ROD031**							
Mingimingi-kakaha		**ROD031**							

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	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
COASTAL SHRUBLANDS									
Harakeke-karo-pōhutukawa					**ROD013**				
Kānuka/mānuka					**ROD013**				
Mānuka			**ROD014 ptGPR ptCA ptMS (part of)**			**ROD014 ptGPR ptCA ptMS (part of)**		**ROD014 ptGPR ptCA ptMS (part of)**	
INLAND SHRUBLANDS									
Gorse	ROD003 ptSCER ptMS (part of) ROD019 ptQEII (part of)	ROD003 ptSCER ptMS (part of)	ROD025	ROD019 ptQEII (part of)		ROD003 ptSCER ptMS (part of),			
Gorse-tōtara			ROD025						
Kānuka/mānuka-gorse			ROD036						
COASTAL FOREST									
Kānuka/mānuka			**ROD014 ptGPR ptCA ptMS (part of)** ROD035			**ROD014 ptGPR ptCA ptMS (part of)**		**ROD014 ptGPR ptCA ptMS (part of)**	
Pōhutukawa					**ROD013**				
Tī kōuka			**ROD014 ptGPR ptCA ptMS (part of)**			**ROD014 ptGPR ptCA ptMS (part of)**		**ROD014 ptGPR ptCA ptMS (part of)**	
INLAND FOREST									
Kahikatea	**ROD002 ptQEII ROD019 ptQEII (part of)**		**ROD021**	**ROD019 ptQEII (part of)**					

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Table 8 continued from previous page.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Kahikatea-kānuka/mānuka-tōtara			ROD020 ptQEII						
Kahikatea-kauri-rimu	**ROD016 ptQEII** **ROD018 ptMS ptRR**								
Kahikatea-kauri-tōtara			**ROD009 ptQEII**						
Kahikatea-kōwhai-tōtara	**ROD004 ptSCER ptPPL (part of)**	**ROD004 ptSCER ptPPL (part of)**							
Kahikatea-rimu			**ROD023**						
Kahikatea-taraire	**ROD004 ptSCER ptPPL (part of)**	**ROD004 ptSCER ptPPL (part of)**							
Kahikatea-tōtara	**ROD016 ptQEII** **ROD018 ptMS ptRR** ROD019 ptQEII (part of)		ROD022 **ROD025**	ROD019 ptQEII (part of)					
Kānuka			**ROD038 ptQEII**						
Kānuka-kahikatea			**ROD038 ptQEII**						
Kānuka/mānuka-kauri	ROD003 ptSCER ptMS (part of) ROD007*	ROD003 ptSCER ptMS (part of)				ROD003 ptSCER ptMS (part of)			

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Table 8 continued from previous page.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Kānuka/mānuka-tānekaha	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD003 ptSCER ptMS ptLCR (part of)**				**ROD003 ptSCER ptMS ptLCR (part of)**			
Kānuka/mānuka	**ROD001 ptSCER ptQEII ptPPL**		ROD015 **ROD021** ROD025						
	ROD003 ptSCER ptMS ptLCR (part of)	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD029***			**ROD003 ptSCER ptMS ptLCR (part of)**			
	ROD004 ptSCER ptPPL (part of)	**ROD004 ptSCER ptPPL (part of)**							
	ROD007* ROD034								
Kānuka/mānuka-kahikatea-tōtara			**ROD021**						
Kānuka/mānuka-kauri	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD025** **ROD012**			**ROD003 ptSCER ptMS ptLCR (part of)**			
Kānuka/mānuka-kauri-tānekaha	**ROD004 ptSCER ptPPL (part of)**	**ROD004 ptSCER ptPPL (part of)**							
Kānuka/mānuka-mamaku	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD003 ptSCER ptMS ptLCR (part of)**				**ROD003 ptSCER ptMS ptLCR (part of)**			
Kānuka/mānuka-nīkau			ROD024 ptQEII						

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Table 8 continued from previous page.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Kānuka/mānuka-pine	ROD003 ptSCER ptMS (part of)	ROD003 ptSCER ptMS (part of)				ROD003 ptSCER ptMS (part of)			
Kānuka/mānuka-tōtara	**ROD001 ptSCER ptQEII ptPPL**		**ROD012** ROD015 ROD020						
	ROD003 ptSCER ptMS ptLCR (part of)	**ROD003 ptSCER ptMS ptLCR (part of)**	ptQEII **ROD024 ptQEII ROD025**			**ROD003 ptSCER ptMS ptLCR (part of)**			
	ROD016 ptQEII		ROF026* ROD029*						
	ROD019 ptQEII (part of)		**ROD030**	ROD019 ptQEII (part of)					
Kānuka-tōtara			**ROD038 ptQEII**						
Kauri	**ROD001 ptSCER ptQEII ptPPL**		ROD025 **ROD038 ptQEII**						
	ROD003 ptSCER ptMS ptLCR (part of)	**ROD003 ptSCER ptMS ptLCR (part of)**				**ROD003 ptSCER ptMS ptLCR (part of)**			
	ROD004 ptSCER ptPPL (part of)	**ROD004 ptSCER ptPPL (part of)**							
	ROD005 ptSCER								
Kauri-rimu			**ROD023**						

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Table 8 continued from previous page.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Kauri-tānekaha	**ROD004 ptSCER ptPPL (part of)**	**ROD004 ptSCER ptPPL (part of)**							
Kauri-tānekaha-tōtara			**ROD009 ptQEII**						
Kauri-tōtara			ROD020 ptQEII **ROD023** **ROD025** ROD029*						
Mamaku			ROD022						
Mamaku-māpou-rewarewa	**ROD001 ptSCER ptQEII ptPPL**								
Mamaku-tōtara	ROD001 ptSCER ptQEII ptPPL								
Mānuka	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD003 ptSCER ptMS ptLCR (part of)**				**ROD003 ptSCER ptMS ptLCR (part of)**			
Mataī-tōtara	**ROD034**								
Pōhutukawa-pūriri-tōtara			**ROD011 ptPPL**						
Pūriri	ROD001 ptSCER ptQEII ptPPL		ROD011 PtPPL						
Pūriri-tōtara			**ROD020 ptQEII**						

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	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Rimu-tōtara			**ROD024 ptQEII**						
Tānekaha	**ROD003 ptSCER ptMS ptLCR (part of)**	**ROD003 ptSCER ptMS ptLCR (part of)**				**ROD003 ptSCER ptMS ptLCR (part of)**			
Taraire	**ROD001 ptSCER ptQEII ptPPL**								
	ROD004 ptSCER ptPPL (part of)	**ROD004 ptSCER ptPPL (part of)**							
Taraire-tōtara	**ROD019 ptQEII (part of)**		**ROD025**	**ROD019 ptQEII (part of)**					
Tōtara	ROD001 ptSCER ptQEII		**ROD008 ptMS (part of)**			**ROD008 ptMS (part of)**			
	ROD019 ptQEII (part of)		**ROD009 ptQEII**	ROD019 ptQEII (part of)					
	ROD028 ptQEII (part of)		ROD020 ptQEII (part of)						
			ROD022						
			ROD024 ptQEII						
			ROD028 ptQEII (part of)						
			ROD029*						
			ROD030						
Tōtara-gorse			ROD008 ptMS (part of)			ROD008 ptMS (part of)			
	ROD028 ptQEII (part of)		ROD028 ptQEII (part of)						

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Table 8 continued from previous page.

	OLIGOCENE CALCAREOUS SILTSTONE, SANDSTONE, LIMESTONE, GREENSAND AND CONGLOMERATE	MIOCENE DEEPLY WEATHERED FLOW DACITE	EARLY MIOCENE CALCAREOUS SANDSTONE, SILTSTONE, PUMECEOUS AND ANDESITIC TUFF, AND LIMESTONE	LATE MIOCENE CHAOS-BRECCIA OF TERTIARY AND CRETACEOUS ROCKS	LATE MIOCENE PARAHAKI VOLCANICS	LATE QUATERNARY ALLUVIUM	LATE QUATERNARY DUNE SANDS	PLEISTOCENE TERRACE DEPOSITS	HOLOCENE DUNEFIELD
Tōtara-kahikatea	**ROD016 ptQEII**								
Tōtara-kānuka/mānuka			**ROD008 ptMS (part of) ROD012**			**ROD008 ptMS (part of)**			
Tōtara-mamaku	**ROD027 ptSCER ptCA ptMS (part of)**			**ROD027 ptSCER ptCA ptMS (part of)**					
Tōtara-rimu-kahikatea-kauri			**ROD038 ptQEII**						
Tōwai	**ROD004 ptSCER ptPPL (part of)**	**ROD004 ptSCER ptPPL (part of)**							
Unidentified indigenous forest	ROD017* ptPPL					ROD037*			

TABLE 9. SUMMARY OF SITE EVALUATIONS

Note: reg. significant = regionally significant; e.u. = ecological unit;e.us. = ecological units

SITE	SITE NO.	REPRESENT-ATIVENESS	RARITY/ SPECIAL FEATURES	DIVERSITY & PATTERN	NATURAL-NESS	BUFFER/ LINKAGE	SIZE AND SHAPE
LEVEL 1							
Pukeareinga Scenic Reserve and Surrounds	ROD001	6 e.us.	Contains good examples of regionally uncommon Parakiore soils. Fauna: 2 threatened, 2 reg. significant.	8 e.us. Forest.	Weed free but likely to be adversely impacted by ungulates and possums.	Contiguous with ROD003 to the east and 9 small peripheral parts.	473.7 ha. 1 large area
Pretty Bush	ROD002	1 e.u.		1 e.u. Forest.	Over half of the site is protected under a QEII covenant, thus stock are likely to be excluded and pests and weeds may be controlled.	Semi-contiguous with ROD003. compact parts.	17.3 ha. 2 small,
Pukepohatu, Cattlemount and Surrounds	ROD003	9 e.us.	Flora: 2 reg. significant. Fauna: 3 threatened, 2 reg. significant.	11 e.us. Forest.	Contains small areas of gorse.	Part of a larger tract of forest (Brynderwyn Range) that extends across to Waipu ED.	2138.9 ha. 1 large area and 2 small peripheral parts.
Pukekaroro Scenic Reserve and Surrounds	ROD004	8 e.us.	Extensive area of regenerating kauri and small areas of old growth kauri forest. Flora: 1 threatened, 2 reg. significant. Fauna: 3 threatened, 2 reg. significant.	8 e.us. Forest.	Weed free. Some of the site is protected by a deer fence.	Adjacent to two large sites: ROD001 and ROD002. parts.	253.6 ha. 1 large area and 2 small peripheral
Cooks Stream Scenic Reserve	ROD005	1 e.u .	Flora: 1 reg. significant. Fauna: 2 reg. significant.	1 e.u. Forest.	Weeds unlikely to be present, although possum browse is impacting ecological integrity.	Semi-contiguous with ROD006. parts.	12.3 ha. 3 small
Cooks Creek Lakes	ROD006	1 e.u.	Fauna: 4 threatened.	1 e.u. Artificial lake.		Semi-contiguous with ROD005.	27.3 ha
Hakuru River Forest	ROD008	2 e.us.	Alluvial forest.	3 e.us. Forest	Some exotic trees present, including willow and. poplar Contains gorse.	Provides extensive riparian buffering to the Hakaru River, and wildlife corridor through a pastoral landscape. Links ROD009, ROD028 and ROD030.	199.8 ha. 4 narrow parts.

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Table 9 continued from previous page.

SITE	SITE NO.	REPRESENT-ATIVENESS	RARITY/ SPECIAL FEATURES	DIVERSITY & PATTERN	NATURAL-NESS	BUFFER/ LINKAGE	SIZE AND SHAPE
LEVEL 1							
Valley Road Remnant	ROD009	3 e.us.	Riparian kauri forest Flora: 1 reg. significant.	3 e.u.s. Forest	Some privet present.	Provides riparian buffering and links ROD008 and ROD025.	71.8 ha. 1 large area and 5 small.
Lois Wintles Bush and Pōhutukawa Remnant	ROD011	3 e.us.	Contains the only example of inland pōhutukawa forest in the entire Rodney ED. Fauna: 1 reg. significant.	2 e.us. Forest.	Understorey grazed. Some weeds present.	Stepping stone habitat between ROD003 and ROD12.	7.8 ha. 3 small parts.
Tara Creek Remnants	ROD012	3 e.us.	Flora: 2 reg. significant. Fauna: 1 reg. significant.	3 e.us. Forest.	Largest remnant is fenced and has healthy undertorey.	Provides buffering to Tara Creek. Links ROD014 and ROD003.	32.7 ha. 5 small parts.
Mangawhai North Head Remnants	ROD013	4 e.us.	Coastal forest and shrubland, gumland. Flora: 3 threatened. Fauna: 2 threatened.	5 e.us. Forest/ shrubland.	High densities of weeds, e.g. climbing asparagus, wild ginger and pampas. Threatened by ongoing residential development.	Coastal-inland corridor.	48.5 ha. 2 large and 4 small parts.
Mangawhai Harbour, Sandspit and Surrounds	ROD014	14 e.us.	Large area that contains a complex ecological sequence linking terrestrial, freshwater, estuarine and duneland habitats. Flora: 4 threatened, 5 reg. significant. Fauna: 21 threatened, 3 reg. significant.	14 e.us. Forest/ rushland/ shrubland/ duneland/ tussockland/ sedgeland.	Small amounts of weeds present, e.g. marram grass, saltwater paspalum and exotic iceplant	Provides important buffering to Mangawhai Harbour. Coastal–inland corridor.	914.9 ha. 1 large part and 2 small peripheral parts.
Garbolino Road Bush Forest.	ROD015		Fauna: 1 reg. significant.	2 e.us.			41.4 ha. 2 small parts.
Kaiwaka Mangawhai Road Remnants	ROD016	3 e.us.		4 e.us. Forest.			34.1 ha. 6 small parts.
Kaiwaka Township Bush	ROD018	2 e.u.s.	Flora: 1 reg. significant. Fauna: 1 reg. significant.	2 e.us. Forest.		Relatively isolated.	7.1 ha

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Table 9 continued from previous page.

SITE	SITE NO.	REPRESENT-ATIVENESS	RARITY/ SPECIAL FEATURES	DIVERSITY & PATTERN	NATURAL-NESS	BUFFER/ LINKAGE	SIZE & SHAPE
LEVEL 1							
Otioro Road Forest Remnants	ROD019	1 e.u.		7 e.us. Forest/ shrubland.	Large areas likely to be fenced due to QEII covenant. Contains gorse	Forms part of a local habitat network with ROD008, ROD020 and ROD021.	69 ha. 1 large part and 2 peripheral parts.
Settlement Road Forest Remnants	ROD020	2 e.us.		6 e.us. Forest/ reedland.	1 remnant likely to be fenced due to QEII covenant.	Forms part of a local habitat network with ROD008, ROD019 and ROD021.	10.3 ha. 4 small parts.
Settlement Road Matai Remnant	ROD021	3 e.us.		3 e.us. Forest.		Forms part of a local habitat network with ROD008, ROD019 and ROD020.	3.7 ha. 1 small, compact part.
Pritchard Road Forest Remnants	ROD022		Fauna: 1 reg. significant.	3 e.us. Forest.		Forms part of a local habitat network with ROD009, ROD023, ROD024 and ROD025.	33.3 ha. 5 small parts.
Staniforth Paper Road Forest Remnants	ROD023	3 e.us.	Contains large, mature kauri, rimu and kahikatea. Fauna: 1 reg. significant.	3 e.us. Forest.	Smallest remnant has open canopy and is likely to be grazed.	Forms part of a local habitat network with ROD009, ROD022, ROD024 and ROD025.	20.5 ha. 3 small parts.
Kereru Lane Forest Remnants	ROD024	4 e.us.	Fauna: 3 threatened species .	4 e.us. Forest.	1 remnant likely to be fenced due to QEII covenant. Other remnants unlikely to be fenced.		39.5 ha. 6 small parts.
Cames Road Forest Remnants	ROD025	6 e.us. .		9 e.us. Forest/ shrubland.	Contains gorse	Forms part of a local habitat network with ROD009 and ROD024.	86 ha. 1 large part and 4 small parts.
Topuni Scenic Reserve and Saltmarsh	ROD027	2 e.us.	Contains saltmarsh. Flora: 1 reg. significant. Fauna: 1 reg. significant.	2 e.us. Forest/ shrubland.		Linked by pine plantation to ROD028. Provide partial buffering to the Topuni River.	19.2 ha. 1 compact part.

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Table 9 continued from previous page.

SITE	SITE NO.	REPRESENT-ATIVENESS	RARITY/ SPECIAL FEATURES	DIVERSITY & PATTERN	NATURAL-NESS	BUFFER/ LINKAGE	SIZE & SHAPE
LEVEL 1							
Topuni Bush Fragments	ROD028		Flora: 1 reg. significant.	2 e.us. Forest.	Contains gorse.	Linked by pine plantation to ROD027. Semi-contiguous with ROD008. Provides partial buffering to the Topuni River.	51.9 ha. 1 large part 2 smaller parts.
Topuni Farm Bush Remnants	ROD030	2 e.us.	Flora: 1 reg. significant.	2 e.us. Forest.	Fenced with understorey intact.	Semi-contiguous with ROD008.	23.9 ha. 3 small parts.
Sentinel Rock	ROD031	5 e.us.	Coastal rock islet. Fauna: 4 threatened.	5 e.us. Tussockland/ herbfield/ shrubland.	Localised patches of exotic grasses.	Coastal association with ROD013.	0.4 ha. 1 small part.
Garbolino Road Swamp	ROD033		Wetland.	4 e.us. Grassland/ reedland/ sedgeland.	Impacted by infestation of reed sweetgrass	Isolated from other wetlands.	1.2 ha. 1 small, narrow, part.
State Highway 1 Remnant	ROD034	1 e.u. Forest.	Contains mataī-dominant forest.	2 e.us.	Understorey likely to be grazed in parts.		16.9 ha. 2 small parts.
Old Waipu Road Remnant	ROD035	1 e.u.	Coastal forest.	1 e.u. Forest.	Weeds present.	Coastal-inland linkage.	14.7 ha. 1 large part and one peripheral part.
Wallbank Way Dam	ROD036		Fauna: 1 threatened.	2 e.us. Shrubland and open water.	Contains gorse.	Coastal-inland linkage.	5.6 ha. 1 small part.
Carter Road Remnants	ROD038	6 e.us.	Contains kauri forest and freshwater wetlands.	7 e.us. Forest/ treeland/ reedland.	Willow locally common in wetland.	Relatively isolated.	39 ha. 7 small parts.
Mangawhai Heads Lake Dunelake and Wetland	ROD039	3 e.us.	Dune lake. Flora: 2 threatened. Fauna: 1 threatened.	4 e.us. Reedland/ sedgeland/ shrubland/ open water	Pampas present in wetland. Gorse and Sydney golden wattle occur on margins	Isolated from other wetlands	1.3 ha. 1 small part.
Subtotal Level 1 Sites							**4631.1 ha**

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Table 8 continued from previous page.

SITE	SITE NO.	REPRESENT-ATIVENESS	RARITY/ SPECIAL FEATURES	DIVERSITY & PATTERN	NATURAL-NESS	BUFFER/ LINKAGE	SIZE & SHAPE
LEVEL 2							
Baldrock Road Trig Bush	ROD007			2 e.us. Forest.	Understorey may be grazed	Isolated.	4.7 ha. 1 small part.
Mountain Road Remnant	ROD017			1 e.u. Forest.		Stepping stone to ROD001, ROD003 and ROD004.	11.7 ha. 1 small part.
Wallbank Way Bush	ROD026			1 e.u. Forest.	Pines present	Coastal-inland stepping stone.	5.9 ha. 1 small part.
Topuni Forest Remnants	ROD029			4 e.us. Forest.		Forms part of a local habitat network with ROD008, ROD027 and ROD028. Provides partial buffering to Topuni River.	28 ha. 2 small parts.
Wrightmans Lawrence Wetland	ROD032		Freshwater wetland.	3 e.us. Reedland/ shrubland.	Gorse present	Isolated from other wetlands.	7.6 ha. 6 small, narrow parts.
Brown Road Remnant	ROD037			1 e.us. Forest.		Relatively isolated.	5 ha. 1 small part.
Subtotal Level 2 Sites							**62.9 ha**
Total area							**4694.0 ha**

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8. Bibliography

Allan, H.H. 1982: Flora of New Zealand (Volume I). Government Printer, Wellington. 1085 p.

Allibone, R.; David, B.; Hitchmough, R.; Jellyman, D.; Ling, N.; Ravenscroft, P.; Waters, J. 2010: Conservation status of New Zealand freshwater fish, 2009. *New Zealand Journal of Marine and Freshwater Research 44(4)*: 1–17.

Arand, J.; Basher, L.; Wardle, R.; Wardle, K. 1993: Inventory of New Zealand soil sites of international, national and regional importance. Part Two—North Island and northern offshore islands (1st edition). New Zealand Society of Soil Science, Occasional Publication 2. Lincoln University, Lincoln.

Atkinson, I.A.E. 1962: Semi-quantitative measurements of canopy composition as a basis for mapping. *Proceedings of the New Zealand Ecological Society 9*: 1–8.

Atkinson, I.A.E. 1985: Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23*: 361–178.

Baker, C.; Chilvers, B.; Constantine, R.; DuFresne, S.; Mattlin, R.; van Helden, A.; Hitchmough, R. 2010: Conservation status of New Zealand marine mammals (suborders Cetacea and Pinnipedia), 2009. *New Zealand Journal of Marine and Freshwater Research, 44(2)*: 101–115

Beever, R. 1986: A plant list for Pukekaroro Scenic Reserve Kaiwaka North Auckland. *Auckland Botanical Society Journal 41*: 43–45.

Brook, F.J. 1996: Classification of the ecological districts of Northland. Unpublished report. Northland Conservancy, Department of Conservation, Whangarei.

Brook, F.J. 1999: Distribution and conservation status of the dune snail *Succinea archeyi* Powell (Stylommatophora: Succineidae) in northern New Zealand. *Science for Conservation 129.* Department of Conservation, Wellington.

Brook, F.J. 2002: Uncommon and rare land snails in the Northland region of New Zealand, and an assessment of conservation management priorities. Northland Conservancy, Department of Conservation, Whangarei.

Brownsey, P.J.; Smith-Dodsworth, J.C. 2000: New Zealand ferns and allied plants. David Bateman, Auckland.

Bull, P.C.; Gaze, P.D.; Robertson, C.J.R. 1985: The atlas of bird distribution in New Zealand. Ornithological Society of New Zealand, Wellington.

Cameron, E.K.; Taylor, G.A. 1997: Flora and fauna of Sentinel Rock, Mangawhai Heads, Northern New Zealand. *Tane 36*: 15–25.

Clarkson, B.R.; Smale M.C.; Williams P.A.; Wiser S.K.; Buxton, R.P. 2011: Drainage, soil fertility and fire frequency determine composition and structure of gumland heaths in northern New Zealand. *New Zealand Journal of Ecology 35*: 96–113.

Clunie, N.M.U.; Esler, A.E. 1982: Checklist of plants from Pukekaroro Scenic Reserve. *Auckland Botanical Society Journal 49(1)*: 41–42.

Cowan, P.E. 2001: Advances in New Zealand mammalogy 1990–2000: Brushtail possum. *Journal of the Royal Society of New Zealand 31*: 15–29.

Crawley, M.J. 1997: The structure of plant communities. In Crawley, M.J. (Ed.): Plant ecology. Blackwell Science, Oxford.

de Lange, P.J.; Norton, D.A.; Heenan, P.B.; Courtney, S.P.; Molloy, B.P.J.; Ogle, C.C.; Rance, B.D.; Johnson, P.N.; Hitchmough, R. 2009: Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany 47*: 61–96.

DOC (Department of Conservation) 1999: Conservation Management Strategy, Northland Conservancy 1999–2009, Vols 1 and 2. Northland Conservancy, Department of Conservation, Whangarei.

DOC (Department of Conservation) 2011: Rainbow skinks: a threat to our native fauna (DOC fact sheet). Department of Conservation, Wellington.

Dowding, J.E.; Davis, A.M. 2007: New Zealand dotterel (*Charadrius obscurus*) recovery plan, 2004–14. *Threatened Species Recovery Plan 58*. Science & Technical Publishing, Department of Conservation, Wellington.

Dowding, J.; Moore, S. 1996: Habitat networks of indigenous shorebirds in New Zealand. *Science for Conservation 261*. Department of Conservation, Wellington.

Ferreira, S.M.; Hansen, K.M.; Parrish, G.R.; Pierce, R.J.; Pulham, G.A.; Taylor, S. 2005. Conservation of the endangered New Zealand fairy tern. *Biological Conservation 125*: 345–354.

Forester, L.; Simpson, E.; Townsend, A. 2007: Biodiversity report for Dune Lake and Wetland—The Sands, Mangawhai Heads, Northcoast Developments Ltd. Prepared by Northland Regional Council.

Freeman, D.; Marshall, B.; Ahyong, S.; Wing, S.; Hitchmough, R. 2010: Conservation status of New Zealand marine invertebrates, 2009. *New Zealand Journal of Marine and Freshwater Research 44(3)*: 129–148.

Geo Atlas 2012: Geological Map of New Zealand. Created by the Institute of Geological and Nuclear Sciences. http://maps.gns.cri.nz/website/geoatlas/viewer.htm. Accessed May 2012.

Gill, B.; Whitaker, T. 1996: New Zealand frogs and reptiles. David Bateman, Auckland.

Glenny, D.; Fife, A.; Brownsey, P.; Renner, M.; Braggins, A.; Beever, J.; Hitchmough, R. 2011: Threatened and uncommon bryophytes of New Zealand (2010 revision). *New Zealand Journal of Botany 49(2)*: 305–327.

Goldwater, N.; Beadel, S. 2010: Natural areas of Manaia Ecological District: reconnaissance survey report for the Protected Natural Areas Programme. Wildland Consultants Ltd Contract Report No. 2275 prepared for Northland Conservancy, Department of Conservation, Whangarei.

Graeme, M.; Kendal, H. 2001: Saltwater paspalum (*Paspalum vaginatum*)—a weed review. Unpublished report prepared for Environment Waikato.

Greene, T.C.; Powlesland, R.G.; Dilks, P.J.; Moran, L. 2004: Research summary and options for conservation of kaka (*Nestor meridionalis*). *DOC Science Internal Series 178*. Department of Conservation, Wellington.

Hansen, K. 2006: New Zealand fairy tern (*Sterna nereis davisae*) recovery plan, 2005–15. *Threatened Species Recovery Plan 57*. Department of Conservation, Wellington.

Healy, A.J.; Edgar, E. 1980: Flora of New Zealand Vol III. Government Printer, Wellington,

Heather, B.D.; Robertson, H.A. 2005: The field guide to the birds of New Zealand. Revised edition. Viking, Penguin Books, Auckland.

Hitchmough, R.; Bull, L.; Cromarty, P. (comps) 2007: New Zealand Threat Classification System lists 2005. Department of Conservation, Wellington.

Hitchmough, R.A.; Hoare, J.M.; Jamieson, H.; Newman, D.; Tocher, M.D.; Anderson, P.J.; Lettink, M.; Whitaker, A.H. 2010: Conservation status of New Zealand reptiles, 2009. *New Zealand Journal of Zoology 37(3)*: 203–224.

Johnson, P.J.; Gerbeaux, P. 2004: Wetland types in New Zealand. Department of Conservation, Wellington. 184 p.

Kelly, G.C.; Park, G.N. (Eds) 1986: The New Zealand Protected Natural Areas Programme: a scientific focus: a review in the light of pilot studies and a format for future action. Department of Scientific and Industrial Research, Wellington.

Kenny, J.A.; Hayward, B.W. 1996: Inventory and maps of important geological sites and landforms in the Northland Region. *Geological Society of New Zealand Miscellaneous Publication 83*.

Kershaw, K.A.; Looney, J.H.H. 1985: Quantitative and dynamic ecology. 3rd ed. Edward Arnold, London.

Leathwick, J.R.; Rogers, G.M. 1996: Modelling relationships between environment and canopy composition in secondary vegetation in central North Island, New Zealand. *New Zealand Journal of Ecology 20*: 147–162.

Lindsay, H.; Wild, C.; Byers, S. 2009: Auckland protection strategy; a report to the Nature Heritage Fund Committee. Wellington.

Lux, J.; Beadel, S.; Martin, T. 2007: Natural areas of Waipu Ecological District: reconnaissance survey report for the Protected Natural Areas Programme. *Wildland Consultants Ltd Contract Report No. 1450*. Prepared for Northland Conservancy, Department of Conservation, Whangarei.

MacArthur, A.; Jones, S. 1993: Trip to Pukekaroro Scenic Reserve. *Auckland Botanical Society Journal 49(1)*: 41–42.

MHRS (Mangawhai Harbour Restoration Society) 2012: www.mangawhaiharbourrestoration.co.nz. Accessed April 2012.

Mangawhai Historical Society Inc. 2012: www.mangawhai-museum.org.nz/. Accessed April 2012.

Massey, S.G.A. 1987: A study of aquifers at Mangawhai and Tara using geophysical methods. Unpublished M.Sc thesis, University of Auckland, Auckland.

McDowall, R.M. 2000: The Reed field guide to New Zealand freshwater fishes. Reed Books, Auckland.

McEwen, W.M. 1987: Ecological regions and districts of New Zealand. *Biological Resources Centre Publication No. 5*. Department of Scientific and Industrial Research, Wellington.

Miskelly, M.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, A.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2008: Conservation status of New Zealand birds 2008. *Notornis 55*: 117–135.

MfE (Ministry for the Environment) 2004: New Zealand Land Cover Database 2 (LCDB2).

MfE (Ministry for the Environment) 2007: Protecting our places: information about the statement of national priorities for protecting rare and threatened native biodiversity on private land. Wellington, New Zealand.

Mitchell, N.D.; Campbell, G.H.; Cutting, M.L.; Ayres, B.D.; Hilton, M.; Slaven, D. 1992: Rodney Ecological District survey report for the Protected Natural Areas Programme (1983–1984). Department of Conservation, Auckland.

Moir, R.W.; Collen, B.; Thompson, C.S. 1986: The climate and weather of Northland, New Zealand. *Meteorological Service Miscellaneous Publication 115(2)*. 2nd Ed. Ministry of Transport, Wellington.

Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.; Smith, N.; Stephens, T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication 22*. Department of Conservation, Wellington. 26 p.

Moore, L.B.; Edgar, E. 1976: Flora of New Zealand, Volume 2. Government Printer, Wellington.

Mueller-Dombois, D.; Ellenberg, H. 1974: Aims and methods of vegetation ecology. John Wiley & Sons, New York.

Myers, S.; Park G., Overmars, F. 1987: A book for the rapid ecological survey of natural areas. *Biological Resources Centre Publication No. 6*. Department of Scientific and Industrial Research, Wellington.

Myers, S.; Jamieson, A. 2003: Ecological report on Hubbard's Bush, Tawharanui Peninsula. Report prepared by Natural Heritage, Auckland Regional Council, Auckland.

Newman, D.G.; Bell, B.D.; Bishop, P.J.; Burns, R.; Haigh, A.; Hitchmough, R.A.; Tocher, M. 2010: Conservation status of New Zealand frogs, 2009. *New Zealand Journal of Zoology 37*: 121-130.

NZPCN (New Zealand Plant Conservation Network) 2012: Website: www.nzpcn.org.nz/. Accessed February 2012 – May 2012.

O'Donnell, C.F.J.; Christie, J.E.; Hitchmough, R.A.; Lloyd, B.; Parsons, S. 2010: The conservation status of bats, 2009. *New Zealand Journal of Zoology 37(4)*: 297–311.

Park, G.N.; Walls, G.Y. 1978: Inventory of tall forest stands on plains and terraces in Nelson and Marlborough land districts. Botany Division, Department of Scientific and Industrial Research, Christchurch. 127 p.

Pierce, R.J.; Atkinson, R.; Smith, E. 1993: Changes in bird numbers in six Northland forests 1979–93. *Notornis 40*: 285–293.

Pierce, R.J.; Gardiner, C.; Moodie, H.; Robertson, H.A.; Sporle, W. 2006: Sustainable management of brown kiwi and other threatened birds in Northland. Wildland Consultants Ltd Contract Report No. 1193.

Pierce, R.J.; Marunui Conservation Ltd. 2010: Brynderwyns – Bream Tail: opportunities for ecological restoration. Report prepared for the Biodiversity Condition Fund, December 2010.

Poole, A.L.; Adams, N.M. 1994: Trees and shrubs of New Zealand. Revised edition. Manaaki Whenua Press, Landcare Research, Lincoln.

Robertson, C.J.R.; Hyvonen, P.; Fraser, M.J.; Pickard C.R. 2007: Atlas of bird distribution in New Zealand 1999–2004. Published by the Ornithological Society of New Zealand, Inc. Wellington. 533 p.

Ryburn, W. 1999: Tall spars, steamers & gum: history of the Kaipara from early European settlement 1854–1947. Published by Kaipara Publications. 248 p.

Sagar, P.M.; Shanker, U.; Brown, S. 1999: Distribution and numbers of waders in New Zealand. *Notornis 46*: 1–43.

Shaw, W.B.; Allen, R.B. 2003: Ecological impacts of sea couch and saltwater paspalum in Bay of Plenty Estuaries. *DOC Science Internal Series 113*. Department of Conservation, Wellington. 18 p.

Sullivan, J.J.; Timmins, S.M.; Williams, P.A. 2005: Movement of exotic plants into coastal native forests from gardens in northern New Zealand. *New Zealand Journal of Ecology 29(1)*: 1–10.

Technical Advisory Group 1986: The New Zealand Protected Natural Areas Programme. A scientific focus. *New Zealand Biological Resources Centre Publication No. 4*. Department of Scientific and Industrial Research, Wellington.

Thompson, B.N. 1961: Sheet 2A—Whangarei. Geological map of New Zealand 1:250 000. Department of Scientific and Industrial Research, Wellington.

Townsend, A. J.; de Lange, P. J.; Norton, D. A.; Molloy, J.; Miskelly, C.; Duffy, C. 2008: The New Zealand Threat Classification System Manual. Department of Conservation, Wellington. 30 p.

Townsend, A.J. 2012: Appendix 1: Ecological assessment of areas proposed for mangrove removal in Mangawhai Harbour. Unpublished report DOCDM-906555. Northland Conservancy, Department of Conservation, Whangarei. 48 p.

Walker, S.; Cieraad, E.; Grove, P.; Lloyd, K.; Park, T.; Porteous, T. 2007: Guide for users of the Threatened Environments Classification. Ver 1.1, August 2007. Landcare Research Manaaki Whenua, New Zealand Ltd.

Wardle, P. 1991: Vegetation of New Zealand. Cambridge University Press.

Wells, R.; Champion, P. 2010: Survey of Mangawhai Dune Lake and Wetland. NIWA client report HAM2010-058 prepared for Northland Regional Council.

Wildland Consultants Ltd 2010: Ranking of top wetlands in the Northland Region (Stage 2). Contract Report No.2398 prepared for Northland Regional Council.

Wildland Consultants Ltd 2012: Ecological assessment and management plan for Middle Pakiri Beach Farm. Contract Report No. 2806 prepared for Middle Pakiri Beach Farm Ltd.

Williams, P.A.; Wiser, S.; Clarkson, B.; Stanley, M.C. 2007: New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology 31*: 119–128.

Young, M. 1986: Auckland Botanical Society Newsletter 42(1). Cited in *Auckland Botanical Society Journal 49(1)*: 41–42.

Appendix 1

FIELD SURVEY FORM

PROTECTED NATURAL AREAS PROGRAMME

Department of Conservation
Te Papa Atawhai

TOKATOKA ECOLOGICAL DISTRICT **(Northland Conservancy)**

NATURAL AREA NAME:	**PNA NO.:**
RECORDER:	**SURVEY DATE:**
GRID REF.:	**SSBI NO.:**
HABITAT TYPE(S):	
GEOMORPHOLOGICAL TYPE(S):	

ECOLOGICAL UNIT(S):

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.:			
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 LANDOWNERS

September 2010

Dear Landowner

I would like to advise you that Department of Conservation will soon be undertaking an updated survey of natural features such as forest, wetlands, and sandfields within northern part of the Rodney ecological District (area between the Southern Brynderwyns and Topuni down SH1 and East from Topuni to Mangawhai). The natural features have been identified from recent aerial photography and are viewed from roadsides or (with the permission of landowners) from other viewpoints, recording information on their vegetation type and general condition. This survey is a continuation of work first undertaken by the Department in 1994.

In some cases, where areas we would like to survey are not visible from the road we will contact you to request permission to enter your land to enable a quick survey of the natural features to gain information on the vegetation type and key plant species present.

Why are we doing this survey? Northland's natural features make a significant contribution to the character and quality of the region. Many of these areas are habitat for some of our increasingly rare plants and animals. The Department of Conservation and Kaipara District Council have existing information on many of the natural features in the District. However some of this information is now out of date, and therefore may no longer be accurate. This survey is purely an information gathering process to update the data that was first collected 16 yrs ago and is an important reference point for assessing habitat changes over time and to assist landowners with management of their natural features.

The information gathered in this survey will be made available to people interested in natural features such as landowners, iwi, environmental groups, local bodies, and professionals.

The Kaipara District Council will be provided with the results of the survey upon completion.

With an increasing awareness in the value of natural features many residents and future residents to the District will have updated information describing the native plants and animals in the District. Information collected during this survey may be used to support cases made by private landowners to increase protection of forest or wetland on their land. These cases can be made to the Governments Biodiversity Condition and Advice Fund and the Northland Regional Council's Environment Fund. The Funds were set up to support landowners for the management and protection of natural areas, the information provided in this survey is an important tool in achieving these aims.

If you have any questions about the survey, please contact the Department of Conservation, (attention Pete Graham or Wendy Holland) at Northland Conservancy Office in Whangarei, telephone (09) 470 3300; or email pgraham@doc.govt.nz

Thank you for your assistance

Chris Jenkins

CONSERVATOR NORTHLAND

Department of Conservation

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 3 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, plus the structure diagram and Sections 8, 9 and 10 from Townsend et al. (2008) to explain the refined classification system.

Classification structure—Molloy et al. 2002

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.

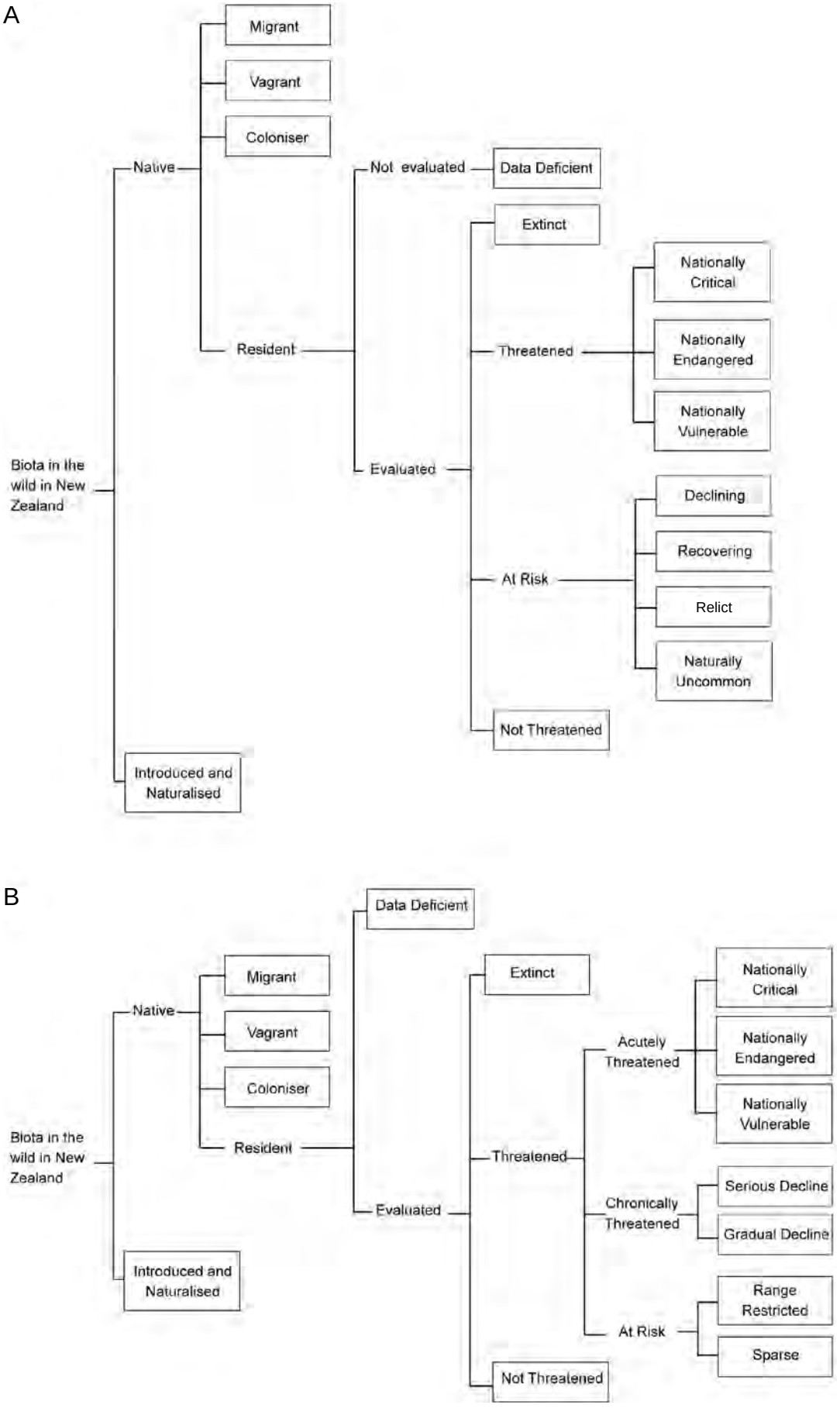

Fig. A3.1. A. revised (2007) and B. original (2002) structure of the New Zealand Threat Classification System (Figure 1 from Townsend et al. 2008).

Coloniser

Colonisers are taxa that have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild for less than 50 years. Three examples are the Nankeen night heron (*Nycticorax caledonicus*), the scoliid wasp *Radumeris tasmaniensis* and the orchid *Cryptostylis subulata*. The IUCN Red List category and source of the listing is included where this exists.

Migrant

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle, but do not breed here are included in the category Migrant. Examples include the Arctic skua (*Stercorarius parasiticus*) and striped marlin (*Tetrapturus audax*). In contrast, taxa that either breed here and migrate beyond New Zealand during their life cycle, e.g. Chatham Island albatross (*Thalassarche eremita*), or taxa that are resident in New Zealand for most of their lives, such as longfinned eels (*Anguilla dieffenbachii*), are not included in this category. The IUCN Red List category and source of the listing is included where this exists.

Data Deficient

The amount of information available for assessing the threat of extinction is highly variable between taxa and groups of taxa. At one extreme there are taxa such as kakapo, *Gunnera hamiltonii* and *Tecomanthe speciosa* where every wild individual is known, while at the other extreme there are taxa whose ecology and biology is virtually unknown (e.g. *Koeleria riguorum*, a recently described grass). Certain criteria and/or definitions must be met for a taxon to be listed in a category. Where information is so lacking that an assessment is not possible, the taxon is assigned to the Data Deficient category. If a taxon is listed in a category other than Data Deficient but confidence in the listing is low due to poor quality data, then the listing can be qualified with the letters DP (Data Poor) to indicate this.

Extinct

A taxon is listed as Extinct when there is no reasonable doubt, after repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon's historic range, that the last individual has died. Examples include huia (*Heteralocha acutirostris*) and Adams's mistletoe (*Trilepidea adamsii*). Only taxa that have become extinct since 1840 are included in the list. Taxa that are extinct in the wild but occur in captivity or cultivation are not listed in this category. These are listed as Critically Endangered and are qualified with the letters EW (Extinct in the Wild).

Threatened

The threatened categories are grouped into three major divisions: 'Acutely Threatened', 'Chronically Threatened' and 'At Risk'.

Acutely Threatened

The categories in the 'Acutely Threatened' division—Nationally Critical, Nationally Endangered and Nationally Vulnerable—equate with the IUCN categories of Critically Endangered, Endangered and Vulnerable. Taxa in these three categories are facing a very high risk of extinction in the wild, as defined by criteria that quantify:

- Total population size
- Area of occupancy
- Fragmentation of populations
- Declines in total population
- Declines in habitat area
- Predicted declines due to existing threats

Although the criteria (described in Section 6) measure similar population features as those in the IUCN Red List criteria, numerical limits and timeframes are tailored to suit New Zealand circumstances. These were set through a process of testing and refinement by the project team and as a result of feedback from New Zealand species experts. Criteria that attempt to predict declines due to possible future threats are not included because of the highly speculative nature of this type of assessment.

Chronically Threatened

Taxa listed in either of the two categories in the 'Chronically Threatened' grouping (Serious Decline and Gradual Decline) also face extinction, but are buffered slightly by either a large total population, or a slow decline rate (see Section 6).

At Risk

Taxa that do not meet the criteria for Acutely Threatened or Chronically Threatened, but have either restricted ranges or small scattered sub-populations, are listed in one of two categories (Range Restricted and Sparse) that fall under the division 'At Risk'. Although these taxa are not currently in decline, their population characteristics mean a new threat could rapidly deplete their population(s). Range Restricted taxa either occur in a small geographic area (e.g. Three Kings Islands), are restricted to a particular habitat (e.g. geothermal areas), or require very specific substrates (e.g. ultramafic rock), and for colonial breeders, have fewer than 10 sub-populations. 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 km^2).

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 listed in Gradual Decline when available scientific evidence indicates that it fits at least one Status criterion and the Trend criterion:

Status criteria

1. The total population size is >5000 mature individuals.
2. There are >15 sub-populations and either:
   a. >500 mature individuals in the largest sub-population, or
   b. the total area of occupancy is >100 ha (1 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, and the decline is predicted to continue beyond 10 years.

Threatened and At Risk categories—Townsend et al. 2008

'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 susceptable 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 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. (See definition of sub-population, Appendix 1.)

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 $Naturalised_{SO}$, 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*) Coloniser$_{TO}$ 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 & 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:

1. **International**—site of international scientific importance.
2. **National**—site of national scientific, educational or aesthetic importance.
3. **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 example of a soil (generally soil group) or soil-vegetation or soil-landform association that is unique to New Zealand (or these latitudes)
- Contains a soil that is naturally uncommon or greatly reduced in extent in other parts of the world
- Contains a wide range of extensive soils with a relatively unmodified vegetation cover
- has been studied in detail and is known internationally

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 AND LICHEN SPECIES IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND)

Vascular plant records are based on field surveys (2010–12), herbarium records and published species lists. All lichen species were recorded by Andrew Townsend (Northland Conservancy, DOC) in Jan–Feb 2012.

Key

Source

1. DOC PNAP field survey of Rodney ED (Northland) (undertaken in 2010–11)
2. Auckland Herbarium (AK)
3. Species recorded by Wildland Consultants in April 2012
4. Clunie & Esler 1982
5. Beever (1986)
6. Maureen Young (1986)
7. MacArthur & Jones 1993
8. Forester et al. 2007
9. SSBI data
10. Townsend 2012
11. Cameron & Taylor 1997

Threat Classification

Current threat classifications (de Lange et al. 2009) are listed in upper case.

Regionally significant status (DOC Northland conservancy, unpubl. data.) is listed in lower case.

Qualifiers

From Molloy et al. 2002 and 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 species ranked as 'Recovering'.
RR = Range Restricted	Species confined to specific substrates, habitats or geographic areas of less than 1000 km^2 (100 000 ha).
Sp = Sparse	Species that occur within typically small and widely scattered populations.

TABLE A5.1. LIST OF VASCULAR PLANT AND LICHEN SPECIES IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY).

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
GYMNOSPERMS			
Indigenous			
Agathis australis[1,3]	kauri		
Dacrycarpus dacrydioides[1,3]	kahikatea		
Dacrydium cupressinum[1,3]	rimu		
Libocedrus plumosa[5]	kawaka	Naturally Uncommon	Sp
Halocarpus kirkii[1]	monoao	Naturally Uncommon	
Phyllocladus toatoa[2,3]	toatoa	regionally significant	RF
Phyllocladus trichomanoides[3,5]	tānekaha		
*Podocarpus hallii*4	Hall's tōtara		
Podocarpus totara var. *totara*[1,3]	tōtara		
Prumnopitys ferruginea[1,3]	miro		
*Prumnopitys taxifolia*1	matai		
Adventive			
Cryptomeria japonica[3]	Japanese cedar		
Pinus patula[3]	patula pine		
Pinus pinaster[3,8]	maritime pine		
Pinus radiata[1,3]	radiata pine		
DICOTS			
Indigenous			
Acaena anserinifolia[3]	piripiri		
Acaena novae-zelandiae[3]	piripiri		
Ackama rosifolia[3]	makamaka		
Alectryon excelsus subsp. *excelsus*[4]	tītoki		
Alseuosmia banksii[5]			
Alseuosmia quercifolia[3]			
Alternanthera nahui[3]	nahui		
Apium prostratum subsp. *prostratum* var. *filiforme*[3]	tūtae kōau, New Zealand celery		
*Aristotelia serrata*3,5	makomako, wineberry		
Beilschmiedia tarairi[1,3]	taraire		
Beilschmiedia tawa (incl. *B. tawaroa*)[3,4]	tawa (tawaroa)	regionally significant	
Brachyglottis repanda[3,5]	rangiora		
Callitriche muelleri[3,4]			
Callitriche stagnalis[3]	starwort		
Calystegia sepium subsp. *roseata*[3]	pōohue		
Calystegia sepium × *C. soldanella*[3]			
Calystegia soldanella[3]	panahi, shore bindweed		
Carmichaelia australis[3,7]	māakaka, maukoro		
Carpodetus serratus[3]	putaputawētā		
Centella uniflora[3,8]			
Clematis paniculata[3,5]	puawānanga		
Coprosma arborea[3]	māmāngi, tree coprosma		
Coprosma areolata[5]			
Coprosma ×*cunninghamii*[3] (*Coprosma propinqua* × *C. robusta*)			
Coprosma grandifolia[3,5]	kanono		
Coprosma lucida[3,5]	karamū, glossy karamū		
Coprosma macrocarpa subsp. *minor*[2,3]	karamū		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Coprosma propinqua var. *propinqua*[2,3]	mingimingi	regionally significant	
Coprosma rhamnoides[3,5]			
Coprosma rigida[2]			
Coprosma robusta[1,3]	karamū		
Coprosma spathulata subsp. *spathulata*[5]			
Coprosma tenuicaulis[8]	hukihuki, swamp coprosma	regionally significant	
Coriaria arborea var. *arborea*[3]	tutu		
Corynocarpus laevigatus[1,3]	karaka		
Cotula coronopifolia[3]	bachelor's button		
Dichondra repens[3]	Mercury Bay weed		
Disphyma australe subsp. *australe*[3]	horokaka		
Dracophyllum latifolium[5]	neinei		
Drosera peltata[9]	sundew		
Dysoxylum spectabile[1,3]	kohekohe	Coloniser	DP, EF, SO
Einadia triogonos subsp. *trigonos*[11]	pigweed		
Elaeocarpus dentatus[5]	hīnau		
Elatostema rugosum[5]	parataniwha		
Entelea arborescens[3] (planted)	whau		
Epilobium rotundifolium[7]			
Euchiton collinus[3]			
Euchiton involucratus[3]			
Euchiton japonicus[3,4]			
Euchiton sphaericus[3]			
Fuchsia excorticata[4]	kōtukutuku	regionally significant	
Gaultheria antipoda[3]	tāwiniwini		
Geniostoma ligustrifolium var. *ligustrifolium*[1,3]	hangehange		
Geranium homeanum[3,4]	pinakitere		
Glossostigma elatinoides[3]			
Gonocarpus incanus[3,4]	piripiri		
Griselinia lucida[1,3]	puka		
Haloragis erecta subsp. *erecta*[3,8]	toatoa		
Hebe macrocarpa[2,3]	kōkōmuka	regionally significant	
Hebe stricta var. *stricta*[3,5]	koromiko		
Hedycarya arborea[3,5]	porokaiwhiri; pigeonwood		
Hydrocotyle heteromeria[3]			
Hydrocotyle moschata[3]			
Hydrocotyle novae-zeelandiae var. *novae-zeelandiae*[3]			
Hypericum pusillum[3]			
Knightia excelsa[1,3]	rewarewa		
Kunzea ericoides[2,3]	kānuka		
Kunzea ericoides var. *linearis*[10]		Declining	
Lagenifera pumila[3]	papataniwhaniwha		
Laurelia novae-zelandiae[4]	pukatea		
Leptospermum scoparium agg.[1,3]	mānuka		
Leucopogon fasciculatus[2,3]	mingimingi		
Lilaeopsis novae-zelandiae[3]			
Limosella lineata[3]	mudwort		
Litsea calicaris[7]	mangeao		
Lobelia anceps[3,8]	punakuru		
Lobelia angulata[3]	pānakenake		
Lophomyrtus bullata[4]	ramarama		
Macropiper excelsum subsp. *excelsum*[1,3]	kawakawa		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Melicytus macrophyllus[3,5]	large-leaved māhoe		
Melicytus micranthus[5]	māhoe-wao		
Melicytus ramiflorus subsp. *ramiflorus*[1,3]	māhoe		
Metrosideros albiflora[2]			
Metrosideros diffusa[3,5]	rātā		
Metrosideros excelsa[1,3]	pōhutukawa		
Metrosideros fulgens[3,5]	rātā		
Metrosideros perforata[3,5]	aka		
Metrosideros robusta[4]	northern rātā	regionally significant	
Mida salicifolia[5]	mida		
Muehlenbeckia australis[3,4]			
Muehlenbeckia australis × *M. complexa*[3]			
Muehlenbeckia complexa[3]	pōhuehue		
Myriophyllum votschii[8]			
Myrsine australis[2,3]	māpou		
Nertera dichondrifolia[3]			
Nertera scapanioides[2]		regionally significant	
Nestegis cunninghamii[3]	black maire	regionally significant	
Nestegis lanceolata[3]	white maire		
Olearia furfuracea[2,3]	akepiro		
Olearia rani var. *colorata*[3,4]	heketara		
Olearia solandri[1,3]		regionally significant	
Oxalis exilis[3]			
Oxalis rubens[3]	sand oxalis		
Parsonsia capsularis[2,3]	akakiore		
Passiflora tetrandra[9]	kohia	regionally significant	
Pelargonium inodorum[3]	kōpata	regionally significant	
Peperomia urvilleana[3]			
Persicaria decipiens[3]	tutunawai		
Pisonia brunoniana[2]	parapara	Naturally Uncommon	TO
Pittosporum cornifolium[7]	tawhirikao		
Pittosporum crassifolium[1,3]	karo		
Pittosporum eugenioides[1,3]	tarata; lemonwood		
Pittosporum tenuifolium[2,3]	kōhūhū		
Plagianthus divaricatus[3]	saltmarsh ribbonwood, mākaka		
Plagianthus regius subsp. *regius*[1]	mānatu, ribbonwood mānatu	regionally significant	
Pomaderris amoena[3,5]	tauhinu		
Pomaderris kumerahou[3,8]	kūmarahou		
Pseudognaphalium luteoalbum agg.[3]	pukatea		
Pseudopanax arboreus[3,5]	whauwhaupaku, five finger		
Pseudopanax crassifolius[3,5]	horoeka, lancewood		
Pseudopanax crassifolius × *P. lessoni* (several cultivars, planted)[3]			
Pseudopanax lessonii[3]	houpara		
Quintinia serrata[5]	tāwheowheo		
Ranunculus reflexus[3,4]	maruru		
Rubus australis[5]	tātarāmoa		
Rubus cissoides agg.[3,5]	tātarāmoa, bush lawyer		
Samolus repens var. *repens*[3]	sea primrose		
Sarcocornia quinqueflora[3]	ureure, glasswort		
Schefflera digitata[3,5]	patē		
Selliera radicans[3]	remuremu		
Senecio biserratus[3]			
Senecio diaschides[10]			

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Senecio esleri[3]			
Senecio glomeratus[3]	pukatea		
Senecio hispidulus[3]			
Senecio lautus var. *lautus*[3]			
Senecio minimus[3,4]			
Solanum americanum[3]	raupeti		
Sophora chathamica[2]	kōwhai		
Streblus heterophyllus[4]	tūrepo		
Tetragonia implexicoma[3]			
Tetragonia tetragonioides[2,3]	kōkihi		
Toronia toru[3,5]	toru		
Vitex lucens[3,4]	pūriri		
Wahlenbergia littoricola subsp. *vernicosa*[2,3]			
Weinmannia silvicola[2,3]	tōwai		
Adventive			
*Acacia mearnsii*3	black wattle		
Acacia melanoxylon[3]	Tasmanian blackwood		
Acacia sophorae[3,8]	coastal wattle		
Achillea millefolium[3]	yarrow		
Ageratina adenophora[3]	Mexican devil		
Agonis flexuosa[4]	peppermint tree		
Alternanthera philoxeroides[3]	alligator weed		
Anagallis arvensis[2,3]	scarlet pimpernel		
Araujia hortorum[3]	moth plant		
Arctotheca calendula[3]	cape weed		
Arctotis stoechadifolia[3]	arctotis		
Aster subulatus[3]	sea aster		
Atriplex prostrata[3]	orache		
Banksia integrifolia[2,3]	banksia		
Bellis perennis[3]	lawn daisy		
Blackstonia perfoliata[3]			
Brassica rapa subsp. *sylvestris*[3]	wild turnip		
Buddleja davidii[3]	buddleia		
Cakile edentula[3]	sea rocket		
Cakile maritima[3]	sea rocket		
Calystegia silvatica[2,3]	greater bindweed		
Cardamine flexuosa[3]	wavy bitter cress		
Cardamine hirsuta[3]	bitter cress		
Carpobrotus edulis[3]	exotic ice plant		
Carthamus lanatus4	woolly safflower		
Casuarina sp.[3]	sheoak		
Centaurium erythraea[2,3]	centaury		
Cerastium fontanum subsp. *vulgare*[3]	mouse-ear chickweed		
Chenopodium album[2,3]	fathen		
Chenopodium ambrosioides[3]	Mexican tea		
Chrysanthemoides monilifera[1,3]	boneseed		
Cirsium vulgare[3,8]	Scotch thistle		
Conyza sumatrensis[3]	broad-leaved fleabane		
Cotoneaster glaucophyllus[3]	cotoneaster		
Cotoneaster lacteus[10]	cotoneaster		
Crassula multicava[3]	fairy crassula		
Crataegus monogyna[3]	hawthorn		
Crepis capillaris[3]	hawksbeard		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Dahlia sp.[3]	dahlia		
Datura stramonium[3]	thorn apple		
Daucus carota[3]	wild carrot		
Digitalis purpurea[3]	foxglove		
Dipsacus fullonum[2,3]	wild teasel		
Echium plantagineum[2]	Paterson's curse		
Elaeagnus ×reflexa[3]	elaeagnus		
Epilobium ciliatum[3]	tall willow herb		
Epilobium tetragonum[2]	tall willow herb		
Erechtites hieraciifolia[3]	American fireweed		
*Erechtites valerianifolia*3	Brazilian fireweed		
Erica baccans[10]	berry heath		
Erigeron karvinskianus[3]	Mexican daisy		
Eriobotrya japonica[3]	loquat		
Erythrina ×sykesii[1,3]	coral tree		
Escallonia ×exoniensis[2]	escallonia		
Euphorbia lathyris[3]	caper spurge		
Euphorbia maculata[3]	spotted spurge		
Euphorbia peplus[3]	milkweed		
Facelis retusa[3]	trampweed		
Foeniculum vulgare[3]	fennel		
Fragaria vesca[3]	wild strawberry		
Fumaria muralis[3]	scrambling fumitory		
Galium aparine[3]	cleavers		
Galium divaricatum[3]	slender bedstraw		
Gamochaeta calviceps[3]	silky cudweed		
Gamochaeta coarctata[3]	purple cudweed		
Geranium robertianum[3]	herb Robert		
Hakea salicifolia[1]	willow-leaved hakea		
Hakea sericea[8]	prickly hakea		
Hedera helix[3]	ivy		
Helminthotheca echioides[10]	oxtongue		
Hydrangea macrophylla[3]	hydrangea		
Hypericum humifusum[3]	trailing St John's wort		
Hypericum perforatum[3]	St John's wort		
Hypochaeris radicata[3,8]	catsear		
Ipomoea indica[3]	blue morning glory		
Jacobaea vulgaris[3]	ragwort		
Jasminum polyanthum[3]	jasmine		
Lantana camara var. *aculeata*[3,4]	lantana		
Leontodon taraxacoides[3]	hawkbit		
Ligustrum lucidum[3]	tree privet		
Ligustrum sinense[3]	Chinese privet		
Linum trigynum[3]	yellow flax		
Lonicera japonica[3]	Japanese honeysuckle		
Lotus angustissimus[3]	slender birdsfoot treefoil		
Lotus pedunculatus[3,8]	lotus		
Lotus suaveolens[3]	hairy birdsfoot trefoil		
Lupinus arboreus[3]	lupin		
Lythrum hyssopifolia[3]	hyssop loosestrife		
Melilotus indica[3]			
Mentha pulegium[3]	penny royal		
Metrosideros kermadecensis[2] (planted)			

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Modiola caroliniana[3]	creeping mallow		
Mycelis muralis[3]	wall lettuce		
Myosotis laxa subsp. *caespitosa*[3]	water forget-me-not		
Nasturtium officinale[3]	watercress		
Nerium oleander[3]	oleander		
Oenothera drummondii[2,3]	evening primose		
Ornithopus pinnatus[2,3]	yellow serradella		
Orobanche minor[3]	broomrape		
Osteospermum fruticosum[3]	rain daisy, dimorphotheca		
Oxalis incarnata[3]	lilac oxalis		
Paraserianthes lophantha[3,8]	brush wattle		
Parentucellia viscosa[3]	tarweed		
Passiflora caerulea[2]	blue-crown passion flower		
Passiflora tripartite var. *mollissima*[10]	banana passionfruit		
Pelargonium sp.[3]	geranium		
Pelargonium ?*tomentosum*[10]	peppermint geranium		
Persicaria maculosa[3,8]	willow weed		
Physalis peruviana[3]	cape gooseberry		
Phytolacca octandra[3]	inkweed		
Plantago australis[3]	swamp plantain		
Plantago coronopus[3]	buck's-horn plantain		
Plantago lanceolata[3]	narrow-leaved plantain		
Plantago major[3]	broad-leaved plantain		
Plectranthus ornatus[2]			
Polycarpon tetraphyllum[3]	allseed		
Polygala myrtifolia[10]	sweet pea shrub		
Populus daltoides[3]			
Populus nigra 'Italica'[3]	Lombardy poplar		
Portulaca oleracea[3]	wild portulaca		
Prunella vulgaris[3]	selfheal		
Prunus persica[3]	peach tree, nectarine		
Psoralea pinnata[3]	Dally pine		
Ranunculus repens[3]	creeping buttercup		
Roldana petasitis[3]	velvet groundsel		
Rosa sp.[3]	climbing rose		
Rosa multiflora[10]	rose		
Rubus sp. (*R. fruticosus* agg.)[3,8]	blackberry		
Rumex acetosella[3]	sheep's sorrel		
Rumex obtusifolius[3]	broad-leaved dock		
Rumex sagittatus[3]	climbing dock		
Sagina procumbens[3]	pearlwort		
Salix chilensis[3]			
Salix fragilis[3]	crack willow		
Senecio angulatus[3]	cape ivy		
Senecio bipinnatisectus[3,8]	Australian fireweed		
Senecio elegans[3]	purple groundsel		
Silene gallica[3]	catchfly		
Solanum linnaeanum[3]	Apple of Sodom		
Solanum mauritianum[3]	woolly nightshade		
Solanum nigrum[3]	black nightshade		
Sonchus apser[10]	prickly sow thistle		
Sonchus oleraceus[3]	puha, sow thistle		
Stellaria media[3]	chickweed		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Syzygium smithii[3]	lillypilly, monkey apple		
Tecomaria capensis[3]	Cape honeysuckle		
Tibouchina grandiflora[3]	large-leaf princess flower		
Trifolium pratense[3]	red clover		
Trifolium repens[3]	white clover		
Tropaeolum majus[3]	garden nasturtium		
Ulex europaeus[3,8]	gorse		
Utricularia gibba[3,8]	bladderwort		
Vellereophyton dealbatum[10]	white cudweed		
Verbascum thapsus[10]	woolly mullein		
Verbena bonariensis[3]	purple-top		
Veronica arvensis[3]	field speedwell		
Veronica persica[3]	scrambling speedwell		
Vicia sativa[3]	vetch		
Vicia villosa subsp. *varia*[3]	winter vetch		
Vinca major[3]	periwinkle		
Vitis vinifera[3]	grape		
PTERIDOPHYTES			
Indigenous			
Adiantum cunninghamii[3,5]	huruhuru tapairu, maidenhair fern		
Adiantum diaphanum[2]	huruhuru tapairu, maidenhair fern		
Adiantum fulvum[2]	huruhuru tapairu, maidenhair fern		
Adiantum hispidulum[3]	huruhuru tapairu, maidenhair fern		
Asplenium bulbiferum[3,5]	mouku, hen and chicken fern		
Asplenium flaccidum[3,5]	makawe		
Asplenium haurakiense[3]			
Asplenium oblongifolium[3,5]	huruhuruwhenua		
Asplenium polyodon[3,5]	petako		
Blechnum chambersii[3,5]	rereti		
Blechnum discolor[5]	petipeti, crown fern		
Blechnum filiforme[3,5]	pūnako		
Blechnum fluviatile[5]	kiwikiwi		
Blechnum fraseri[3,5]			
Blechnum membranaceum[5]			
Blechnum minus[3,8]	swamp kiokio		
Blechnum novae-zelandiae[3,8]	kiokio		
Cardiomanes reniforme[3,5]	kidney fern, konehu		
Ctenopteris heterophylla[3,5]			
Cyathea dealbata[1,3]	ponga, silver fern		
Cyathea medullaris[1,3]	mamaku		
Deparia petersenii subsp. *congrua*[3,4]			
Dicksonia squarrosa[3,5]	whekī		
Diplazium australe[3,4]			
Doodia australis[3,4]	pukupuku		
Gleichenia dicarpa[5,10]	tangle fern		
Gleichenia microphylla[3,4]	waewaekākā, swamp umbrella fern		
Grammitis ciliata[2]		regionally significant	
Grammitis pseudociliata[3]			
Histiopteris incisa[3,8]	mātātā, water fern		
Huperzia varia[3,5]	Whiri-o-Raukatauri		
Hymenophyllum demissum[3,5]	irirangi, filmy fern		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Hymenophyllum dilatatum[3,5]	matua mauku, filmy fern		
Hymenophyllum revolutum[6]	mauku, filmy fern		
Hymenophyllum sanguinolentum[3,5]	piripiri, filmy fern		
Hypolepis ambigua[3]			
Hypolepis dicksonioides[5]		Naturally Uncommon	SO, EF
Hypolepis distans[8]			
Lastreopsis hispida[5]			
Lindsaea linearis[3,5]			
Lindsaea trichomanoides[3,5]			
Loxogramme dictyopteris[5]			
Lycopodiella cernua[3,4]	mātukutuku		
Lycopodium deuterodensum[3,5]	puakarimu		
Lycopodium volubile[3]	waewaekoukou		
Lygodium articulatum[3,5]	mangemange		
Microsorum pustulatum[3,5]	kōwaowao, hound's tongue fern		
Microsorum scandens[3,5]	mokimoki		
Paesia scaberula[3,4]	mātātā		
Pneumatopteris pennigera[3,5]	pākau		
Pteridium esculentum[3,5]	rārahu, bracken		
Pteris macilenta[3]	sweet fern		
Pteris saxatilis[3]			
Pteris tremula[3,4]	turawera, shaking brake		
Pyrrosia eleagnifolia[3,5]	leather-leaf fern		
Schizaea dichotoma[3,5]	fan fern	Naturally Uncommon	SO
Schizaea fistulosa[3,5]			
Sticherus cunninghamii[3,6]	waekura		
Tmesipteris elongata[3,5]			
Tmesipteris sigmatifolia[5]			
Tmesipteris tannensis[3,6]			
Trichomanes elongatum[5]			
Trichomanes endlicherianum[5]			
Trichomanes venosum[5]			
Adventive			
Azolla pinnata[3]	ferny azolla		
Nephrolepis cordifolia[3]	tuber ladder fern		
Osmunda regalis[5]	royal fern		
GRASSES			
Indigenous			
Austroderia splendens[3]	toetoe		
Austrostipa stipoides[3]			
Deyeuxia avenoides[3]			
Deyeuxia quadriseta[3]			
Dichelachne crinita[3]	pātiti, plume grass		
Isachne globosa[3,8]	swamp millet		
Lachnagrostis billardierei[3]	perehia; sand wind grass		
Lachnagrostis filiformis[2,3]	perehia		
Microlaena avenacea[3,5]	bush rice grass		
Microlaena stipoides[3,5]	pātiti, meadow rice grass		
Oplismenus hirtellus subsp. *imbecillis*[3,5]			
Poa anceps agg.[3]			
Poa billardierei[3]	sand tussock, hinarepe	Declining	SO

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUSQUALIFIER(S)
Poa imbecilla[3]		
Poa pusilla[3]		
Rytidosperma clavatum[3]		
Rytidosperma gracile[3,4]		
Spinifex sericeus[3]	kōwhangatara, spinifex	
Zoysia pauciflora[3]		
Adventive		
Agrostis capillaris[3]	browntop	
Agrostis stolonifera[3]	creeping bent	
Ammophila arenaria[3]	marram	
Anthoxanthum odoratum[3]	sweet vernal	
Arundo donax[3]	giant reed	
Axonopus fissifolius[3]	narrow-leaved carpet grass	
Briza minor[3]	shivery grass	
Bromus willdenowii[3]	prairie grass	
Cenchrus clandestinus[3]	kikuyu grass	
Cortaderia selloana[3,5]	pampas	
Cynodon dactylon[3]	Indian doab	
Cynosurus cristatus[3]	crested dogstail	
Dactylis glomerata[3]	cocksfoot	
Digitaria sanguinalis[3]	summer grass	
Echinochloa crus-galli[3]	barnyard grass	
Ehrharta erecta[3]	veldt grass	
Eleusine indica[2,3]	crowfoot grass	
Entolasia marginata[2]	bordered panic grass	
Eragrostis amabilis[2]	Japanese love grass	
Glyceria maxima[3]	reed sweetgrass	
Holcus lanatus[3,8]	Yorkshire fog	
Lagurus ovatus[3]	harestail	
Lolium perenne[3]	rye grass	
Panicum dichotomiflorum[3]	smooth witchgrass	
Paspalum dilatatum[3,8]	paspalum	
Paspalum distichum[3]	Mercer grass	
Paspalum urvillei[3]	Vasey grass	
Paspalum vaginatum[3]	saltwater paspalum	
Phyllostachys aurea[3]	walking stick bamboo	
Poa annua[3]	annual poa	
Poa pratensis[3]	Kentucky bluegrass	
Schedonorus arundinaceus[3]	tall fescue	
Setaria gracilis[2,3]	knot-root bristle grass	
Sporobolus africanus[3,5]	ratstail	
Stenotaphrum secundatum[3]	buffalo grass	
SEDGES		
Indigenous		
Bolboschoenus fluviatilis[3]	purua grass	
Carex breviculmis[3]		
Carex dissita[3,7]		
Carex flagellifera[3]	manaia	
Carex ochrosacus[2]		
Carex pumila[2,3]		
Carex solandri[3]		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Carex testacea[3]			
Carex virgata[3,4]	pūrei		
Cyperus ustulatus f. *ustulatus*[3]	toetoe, upokotangata		
Eleocharis acuta[3,8]	spike sedge		
Eleocharis sphacelata[2]	giant spike sedge, ngāwhā		
Ficinia nodosa[3]	wīwī, knobby clubrush		
Ficinia spiralis[3]	pīngao	Naturally Uncommon	CD, Inc, Sp
Gahnia lacera[3,5]	tarangārara		
Gahnia pauciflora[4]	takahikahi		
Gahnia procera[5]			
Gahnia setifolia[3,5]	māpere		
Gahnia xanthocarpa[3,5]	tūpari-maunga		
Isolepis cernua[3]			
Isolepis distigmatosa[3]			
Isolepis habra[3,8]			
Isolepis prolifera[3,8]			
Isolepis reticularis[3,4]			
Lepidosperma australe[3,5]			
Lepidosperma laterale[3,8]			
Machaerina arthrophylla[3,10]			
Machaerina articulata[2,3]			
Machaerina juncea[3,8]			
Machaerina rubiginosa[3,8]			
Machaerina tenax[2,3]			
Machaerina teretifolia[2,3]			
Morelotia affinis[3]			
Schoenoplectus tabernaemontani[3]	kāpūngāwhā		
Schoenus apogon[3]			
Schoenus brevifolius[8]			
Schoenus maschalinus[3,8]			
Schoenus nitens[8]			
Schoenus tendo[3,4]	wīwī		
Tetraria capillaris[2]		regionally significant	
Uncinia banksii[3,6]	matau		
Uncinia filiformis[3]	matau		
Uncinia uncinata[3,5]	kamu matau a Maui		
Uncinia zotovii[4]	matau		
Adventive			
Carex flacca[2,3]	carnation sedge		
Carex scoparia	broom sedge		
Cyperus brevifolius[2,3]	globe sedge		
Cyperus congestus[3,8]	purple umbrella sedge		
Cyperus eragrostis[3]	umbrella sedge		
Cyperus sanguinolentus[3]	purpleglume flatsedge		
Isolepis sepulcralis[3]			
RUSHES			
Indigenous			
Apodasmia similis[3]	oioi		
Empodisma minus[2]	wire rush	regionally significant	
Juncus edgariae[3]	wi		
Juncus kraussii var. *australiensis*[3]	wi sea rush		

Continued on next page.

Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Juncus pallidus[3]	wi		
Juncus planifolius[2,3]			
Juncus sarophorus[3]	wi		
Adventive			
Juncus acuminatus[3]	sharp-fruited rush		
Juncus articulatus[3]	jointed rush		
Juncus bufonius var. *bufonius*[3]	toad rush		
Juncus effusus var. *effusus*[3,8]	soft rush, leafless rush		
Juncus microcephalus[3]	South American rush		
Juncus tenuis var. *tenuis*[3]	track rush		
ORCHIDS			
Indigenous			
Diplodium alobulum[3]			
Diplodium trullifolium[7]			
Drymoanthus adversus[7]			
Earina mucronata[3,5]	peka-a-waka		
Ichthyostomum pygmaeum[3,5]	piripiri		
Microtis unifolia agg.[3]	māikaika		
Molloybas cryptanthus[2]	hidden spider orchid	Naturally Uncommon	
Nematoceras macranthum[7]			
Orthoceras novae-zeelandiae[3]	māikaika		
Petalochilus alatus[9]			
Petalochilus chlorostylus[2,3]		Naturally Uncommon	
Pterostylis agathicola[2,3]			
Pterostylis banksii[7]	tutukiwi		
Pterostylis graminea[3]			
Singularybas oblongus[5]			
Thelymitra aemula[2]		regionally significant	
Thelymitra longifolia[3,7]	māikuku		
Winika cunninghamii[3,5]			
Adventive			
Epidendrum igabguense[10]	Crucifex orchid		
MONOCOTS (OTHER THAN GRASSES, SEDGES, RUSHES AND ORCHIDS)			
Indigenous			
Astelia banksii[3]	kakaha		
Astelia fragrans[3]	kakaha	regionally significant	
Astelia solandri[3,4]	kōwharawhara		
Astelia trinervia[3,5]	mauri		
Collospermum hastatum[3,5]	kahakaha		
Cordyline australis[1,3]	tī kōuka		
Cordyline banksii[3,5]	tī ngahere		
Cordyline pumilio[3,5]	tī rauriki		
Dianella haematica[8]			
Dianella nigra[3,5]	tūrutu		
Freycinetia banksii[3,5]	kiekie		
Phormium cookianum subsp. *hookeri*[3]	whaririki, mountain flax	regionally significant	
Phormium tenax[3,5]	harakeke, flax		
Potamogeton ochreatus[4]		regionally significant	
Rhopalostylis sapida[1,3]	nīkau		

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Table A5.1 continued from previous page.

SCIENTIFIC NAME	COMMON NAME	STATUS	QUALIFIER(S)
Ripogonum scandens[3,5]	supplejack, kareao		
Triglochin striata[3]	arrow grass	regionally significant	
Typha orientalis[3,8]	raupō		
Zostera muelleri subsp. *novozelandica*[10]	zostera		
Adventive			
Agapanthus praecox[3]	agapanthus		
Alisma plantago-aquatica[3]	water plantain		
Aristea ecklonii[3]	aristea		
Asparagus scandens[2,3]	climbing asparagus		
*Canna indica*3	canna lily, Indian shoot		
Chlorophytum comosum[2]	spider plant		
Colocasia esculenta[3]	taro		
Crocosmia ×crocosmiiflora[3]	montbretia		
Furcraea foetida[10]	Mauritius hemp		
Hedychium gardnerianum[2,3]	kahili ginger, wild ginger		
Kniphofia praecox[3]	red hot poker		
Lilium formosanum[2,3]	Formosan lily		
Ottelia ovalifolia[3]	swamp lily		
Phoenix canariensis[3] (planted)	Phoenix palm		
Potamogeton crispus[3]	curly pondweed		
Tradescantia fluminensis[3]	tradescantia		
Watsonia bulbillifera[3]	watsonia		
Watsonia meriana var. *bulbillifera*[10]	bulbil watsonia		
Zantedeschia aethiopica[3]	arum lily		
LICHENS			
Indigenous			
Dirinaria sp.			
Parmotrema reticulatum			
Physcia sp.			
Pseudocyphellaria aurata			
Ramalina celastri			
Ramalina pacifica		Nationally Endangered	
Ramalina peruviana			
Usnea sp.			
Usnea rubicunda			
*Xanthoria parietina**			
Adventive			
Teleoschistes chrysophthalmus			

* This assessment of this lichen is currently data-poor; it is possible that it may be an introduced species.

Appendix 6

COMMON PLANT NAMES USED IN TEXT

* = exotic species

*	Agapanthus	*Agapanthus praecox* subsp. *orientalis*
*	Arum lily	*Zantedeschia aethiopica*
	Arrow grass	*Triglochin striata*
*	Bamboo	*Bambusa* sp. or *Phyllostachys* sp.
*	Banksia	*Banksia integrifolia*
	Black maire	*Nestigis cunninghamii*
*	Blackberry	*Rubus fruticosus* agg.
*	Boneseed	*Chrysanthemoides monilifera* subsp. *monilifera*
	Bracken	*Pteridium esculentum*
*	Brush wattle	*Paraserienthes lophantha*
*	Buffalo grass	*Stenotaphrum secundatum*
*	Cape gooseberry	*Physalis peruviana*
	Carmine rātā	*Metrosideros carminea*
*	Chickweed	*Stellaria media* subsp. *media*
*	Climbing asparagus	*Asparagus scandens*
	Coastal toetoe	*Austroderia splendens*
*	coastal wattle	*Acacia sophorae*
	Clubmoss	*Lycopedium* and/or *Lycopediella* spp.
	Coastal maire	*Nestegis apetala*
	Coastal toetoe	*Cortaderia splendens*
*	Cotoneaster	*Cotoneaster glaucophyllus*
*	Dally pine	*Psoralea pinnata*
*	Evening primrose	*Oenothera drummondii*
*	Eucalyptus	*Eucalyptus* sp.
*	Exotic bladderwort	*Utricularia gibba*
*	Exotic iceplant	*Carpobrotus edulis*
	Five-finger	*Pseudopanax arboreus*
*	Guava	*Psidium* sp.
	Glasswort	*Sarcocornia qinqueflora*
*	Gorse	*Ulex europaeus*
*	Gum	*Eucalyptus* sp
	Gully tree fern	*Cyathea cunninghamii*
	Hangehange	*Geniostoma ligustrifolium* var. *ligustrifolium*
*	Harakeke, flax	*Phormium tenax*
	Hīnau	*Elaeocarpus dentatus*
	Hook sedge	*Uncinia unicinata*
	Houpara	*Pseudopanax lessonii*
*	Japanese honeysuckle	*Lonicera japonica*
	Kahikatea	*Dacrycarpus dacrydioides*
	Kakaha	*Astelia banksii*
	Kānuka	*Kunzea ericoides*
	Karaka	*Corynocarpus laevigatus*
	Karo	Pittosporum crassifolium
	Kauri	*Agathis australis*
	Kawaka	*Libocedrus plumosa*
	Kawakawa	*Macropiper excelsum* subsp. *excelsum* f. *excelsum*
*	Kikuyu	*Pennisetum clandestinum*
	kohekohe	*Dysoxylum spectabile*

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	Kohia	*Passiflora tetrandra*
	Koromiko	*Hebe stricta* var. *stricta*
	Kōtukutuku	*Fuchsia excorticata*
	Kōwhai	*Sophora microphylla*
	kūmarehou	*Pomaderris kumerahou*
	Lancewood, horoeka	*Pseudopanax crassifolius*
*	Lupin	*Lupinus arboreus*
*	Macrocarpa	*Cupressus macrocarpa*
	Māhoe	*Melicytus ramiflorus* subsp. *ramiflorus*
	Mamaku	*Cyathea medullaris*
	Mānatu	*Plagianthus regius*
	Mangrove	*Avicennia marina* subsp. *australasica*
	Mānuka	*Leptospermum scoparium*
	Māpou	*Myrsine australis*
*	Marram grass	*Ammophila arenaria*
	Matai	*Prumnopitys taxifolia*
	Milk tree	*Streblus banksii*
	Mingimingi	*Leucopogon fasciculatus*
	Miro	*Prumnopitys ferruginea*
*	Monkey apple	*Syzygium smithii*
*	Moth plant	*Araujia sericifera*
	Native iceplant	*Disphyma australe* subsp. *australe*
	Ngaio	*Myoporum laetum*
	Nīkau	*Rhopalostylis sapida*
*	Norfolk pine	*Araucaria heterophylla*
	Northern rātā	*Metrosideros robusta*
	NZ spinach	*Tetragonia* sp.
	Oioi	*Apodasmia similis*
*	Onion weed	*Allium triquetrum*
*	Pampas	*Cortaderia selloana* and *C. jubata*
	Parapara	*Pisonia brunoniana*
	Patē	*Schefflera digitata*
	Pōhuehue	*Muehlenbeckia complexa*
	Pīngao	*Desmoschoenus spiralis*
	Pōhutukawa	*Metrosideros excelsa*
	Ponga, silver fern	*Cyathea dealbata*
*	Poplar	*Populus* sp.
*	Prickly hakea	*Hakea sericea*
*	Privet	*Ligustrum lucida* and *L. sinense*
	Puawānanga	*Clematis paniculata*
	Pukatea	*Laurelia novae-zelandiae*
	Pūrei	*Carex virgata*
	Pūriri	*Vitex lucens*
*	Radiata pine, pine (incl. wilding pine)	*Pinus radiata*
	Rasp fern	*Doodia australis*
	Raupō	*Typha orientalis*
*	Reed sweetgrass	*Glyceria maxima*
	Remuremu	*Selliera radicans*
	Rewarewa	*Knightia excelsa*
	Rimu	*Dacrydium cupressinum*
	Saltmarsh ribbonwood	*Plagianthus divaricatus*
*	Saltwater paspalum	*Paspalum vaginatum*
*	Sea aster	*Aster aubulatus*
	Sea primrose	*Samolus repens* var. *repens*
	Sea rush	*Juncus kraussii* var. *australiensis*
	Shore bindweed	*Calystegia soldanella*

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	Shore spurge	*Euphorbia glauca*
*	Soft rush	Juncus effusus
	Spinifex	*Spinifex sericeus*
	Swamp coprosma	*Coprosma tenuicaulis*
	Swamp kiokio	*Blechnum minus*
	Swamp millet	*Isachne globosa*
	Umbrella fern	*Gleichenia microphylla*
*	Sydney golden wattle	*Acacia longifolia*
	Tānekaha	*Phyllocladus trichomanoides* var. *trichomanoides*
	Tanglefern	*Gleichenia* sp.
	Taraire	*Beilschmiedia tarairi*
	Tarata	*Pittosporum eugenioides*
	Taupata	*Coprosma repens*
	Tawa	*Beilschmiedia tawa*
	Tawāpou	*Pouteria costata*
	Tawaroa	*Beilschmiedia tawa* (incl. *B. tawaroa*)
	Tī kōuka	*Cordyline australis*
	Ti ngahere	*Cordyline banksii*
	Tītoki	*Alectryon excelsus* var. *excelsus*
	Toatoa	*Phyllocladus toatoa*
	Toru	*Toronia toru*
	Tōtara	*Podocarpus totara*
	Tōwai	*Weinmannia silvicola*
*	Tradescantia	*Tradescantia fluminensis*
	Tūrutu	*Dianella nigra*
	Tutu	*Coriaria arboria*
*	Water lily	*Nymphaea* sp.
*	Willow	*Salix* sp.
*	Willow-leaved hakea	*Hakea salicifolia*
*	Willow weed	*Persicaria* sp.
	Whaririki, mountain flax	*Phormium cookianum* subsp. *hookeri*
	Whekī	*Dicksonia squarrosa*
*	Wild ginger	*Hedychium gardnerianum*
*	Woolly nightshade	*Solanum mauritianum*

Appendix 7

CHECKLIST OF FAUNA SPECIES IN RODNEY ECOLOGICAL DISTRICT (NORTHLAND)

Bird data from surveys by DOC (2010–11) and Wildland Consultants (2010 and 2012); Tony Beauchamp; SSBI data; and the Atlas of Bird Distribution in New Zealand: 1999–2004 (Robertson et al. 2007). Herpetofauna records from DOC Herpetofauna database and SSBI data. Fish records from NIWA's New Zealand Freshwater Fish Database (accessed in 2012). Land snail records from SSBI data.

Mammals

SCIENTIFIC NAME	COMMON NAME	STATUS
Indigenous		
Chalinolobus tuberculatus	Long-tailed bat	Unconfirmed
Introduced (feral)		
Canis familiaris	Feral dog	
Capra hircus	Feral goat	
Dama dama dama	Fallow deer	
Erinaceus europaeus occidentalis	European hedgehog	
Felis catus	House cat	
Lepus europaeus	Brown hare	
Mus musculus	House mouse	
Mustela erminea	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

SCIENTIFIC NAME	COMMON NAME	STATUS
Indigenous		
Anarhynchos frontalis	Wrybill	
Anas rhnchotis variegata	New Zealand shoveler	
Anas superciliosa	Grey duck, pārera	Unconfirmed
Anthornis melanura	North Island bellbird, korimako	
Anthus n. *novaeseelandiae*	NZ pipit, pīhoihoi	
Ardea novaehollandiae	White-faced heron	
Botaurus poiciloptilus	Australasian bittern, matuku	
Bowdleria punctata vealeae	North Island fernbird, mātātā	
Calidris canutus	Lesser knot, huahou	
Charadrius obscurus aquilonius	Northern NZ dotterel, tūturiwhatu	
Chrysococcyx lucidus	Shining cuckoo, pīpīwharauroa	

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SCIENTIFIC NAME	COMMON NAME	STATUS
Circus approximans	Australasian harrier, kāhu	
Cyanoramphus novaeseelandiae	Red-crowned kākāriki	Unconfirmed
Egretta sacra	Reef heron, matuku moana	Last recorded in 1979
Eudynamis taitensis	Long-tailed cuckoo, koekoeā	Unconfirmed
Falco novaeseelandiae	Bush falcon	Unconfirmed
Gerygone igata	Grey warbler, riroriro	
Haematopus finschi	NZ pied oystercatcher, tōrea	
Haematopus unicolor	Variable oystercatcher, tōrea	
Hemiphaga novaeseelandiae	Kūkupa, NZ pigeon	
Himantopus himantopus	Pied stilt, poaka	
Hirundo tahitica neoxena	Welcome swallow	
Hydroprogne caspia	Caspian tern, taranui	
Larus dominicanus	Black-backed gull, karoro	
Larus novaehollandiae	Red-billed gull, tarāpunga	
Limosa lapponica	Bar-tailed godwit	
Morus serrator	Australasian gannet, tākapu	
Nestor meridionalis septentrionalis	North Island kākā	
Ninox novaeseelandiae	Ruru, morepork	
Petroica macrocephala toitoi	North Island tomtit	
Phalacrocorax carbo	Black shag, kawau	
Phalacrocorax melanoleucos	Little shag, kawau paka	
Phalacrocorax sulcirostris	Little black shag	
Phalacrocorax varius	Pied shag, kāruhiruhi	
Platalea regia	Royal spoonbill	
Porphyrio melanotus melanotus	Pūkeko	
Porzana tabuensis	Spotless crake, pūweto	Unconfirmed
Prosthemadera novaeseelandiae	Tūī	
Pterodroma macroptera	Grey-faced petrel, ōi	
Rallus philippensis	Banded rail, moho pererū	
Rhipidura fuliginosa placabilis	North Island fantail, pīwakawaka	
Sterna nereis davisae	New Zealand fairy tern	
Sterna striata striata	White-fronted tern, tara	
Tadorna variegata	Paradise shelduck, pūtangitangi	
Tachybaptus novaehollandiae	Australian little grebe	
Todiramphus sanctus vagans	NZ kingfisher, kōtare	
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	
Gymnorhina tibicen	Australian magpie	
Meleagris gallopavo	Feral turkey	
Passer domesticus	House sparrow	
Phasianus colchicus	Ring-necked pheasant	

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SCIENTIFIC NAME	COMMON NAME	STATUS
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	

Herpetofauna

SCIENTIFIC NAME	COMMON NAME	STATUS
Indigenous		
Chelonia mydas	Green turtle	
Cyclodina aenea	Copper skink	Unconfirmed (likely to be present)
Oligosoma moco	Moko skink	
Hoplodactylus granulatus	Forest gecko	Last recorded in 1965
Leiopelma hochstetteri	Hochstetter's frog	
Naultinus elegans elegans	Auckland green gecko	Unconfirmed (likely to be present)
Introduced		
Lampropholis delicata	Rainbow skink	
Litoria aurea	Green and golden bell frog	

Fish

SCIENTIFIC NAME	COMMON NAME	STATUS
Indigenous		
Anguilla dieffenbachii	Longfin eel	
Anguilla australis	Shortfin eel	
Galaxias fasciatus	Banded kōkopu	Last recorded in 1982, but likely to be common throughout ED (Northland)
Galaxias maculatus	Inanga	
Gobiomorphus cotidianus	Common bully	
Gobiomorphus huttoni	Redfinned bully	

Land snails

SCIENTIFIC NAME	COMMON NAME	STATUS
Indigenous		
Amborhytida dunniae (Gray)		
Paryphanta busbyi		
Introduced		
Helix aspersa	Common garden snail	

Aquatic invertebrates

Indigenous		
Paranephrops planifrons	Kōura	

Appendix 8

GLOSSARY OF TERMS

Allochthonous
Geologic units that have formed elsewhere and then been transported through some geological process 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% 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 through human actions, 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 Rodney ED (Northland), 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 that 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.

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 a measure of what natural values are retained despite these factors; e.g. 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 had 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 1–2 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, e.g. granite, diorite, 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. raupō, *Machaerina articulata* and lake clubrush (Johnson & Gerbeaux 2004, adapted from Atkinson 1985).

Regionally significant
Assessed by DOC (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, shrubland, and mangrove shrubland or low forest (Johnson & 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 that 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
Shrubland is defined in this report as vegetation dominated by shrubs with a closed canopy, and, in more advanced stages, containing an understorey of indigenous species.

In Rodney ED (Northland), there are two main types of shrubland:

- Successional vegetation dominated by seral species such as mānuka, kānuka and māhoe, or shrubs such as hangehange, bracken, and kūmarahou.
- Seral vegetation where the rate of further succession is extremely slow, being limited by abiotic factors such as soil structure and fertility and wind shear, e.g. gumland mānuka shrubland, pōhuehue 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. A site's 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.

Stepping stone remnants
See linkages/corridors.

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
Swamps usually have a combination of mineral and peat substrates. They are wetlands that receive a relatively rich supply of nutrients and often also sediment via surface runoff and groundwater from adjacent lands. Leads of standing water or surface channels are often present in swamps, 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 & Gerbeaux 2004). In Rodney ED (Northland), swamps are usually dominated by raupō, *Carex*, *Machaerina articulata*, harakeke, and tī kōuka.

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. 'tōtara treeland' refers to a common vegetation type in Otamatea ED in which sparse tōtara 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 high in iron and magnesium and very low 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-pūriri-kahikatea) and the structure of the vegetation e.g forest, treeland, shrubland, reedland.

Viability

The ability of an area's natural communities to maintain themselves in the long term without particular management efforts aimed at achieving 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 (as defined in the Resource Management Act 1991). Wetlands are areas of swamp, 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 6 m (Ramsar Convention on Wetlands 1971).

Appendix 9

INDEX OF SITES

New Zealand Government