

Natural areas of Tangihua Ecological District

Reconnaissance survey report for the Protected Natural Areas Programme

2009



Department of Conservation
Te Papa Atawhai

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Nick Goldwater, Sarah Beadel, Tim Martin

Report prepared by Wildland Consultants Ltd for:

Department of Conservation
Northland Conservancy
PO Box 842
149-151 Bank Street
Whangarei 0140
New Zealand

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Foreword

The Tangihua Ecological District PNAP survey report was prepared by Wildland Consultants Ltd under contract to the Department of Conservation. This report forms part of a series of reconnaissance survey reports for the Protected Natural Areas Programme (PNAP) in the Northland Conservancy of the Department of Conservation. It describes the significant natural areas of the Tangihua Ecological District (ED). The natural areas were surveyed by the Department of Conservation from 1994 to 2000, and subsequently by Wildland Consultants in 2004 and February 2009. There has been no previous comprehensive survey and review of ecological information of this geographical area.

Tangihua ED comprises a complex matrix of natural areas, pastoral land and exotic plantation, with extensive areas of indigenous habitat having been cleared and modified since human settlement. The District, however, still retains several large, very diverse forest tracts, together with several large, relatively unmodified and regionally significant freshwater wetlands. It also contains numerous scattered remnants of floodplain and riverine forest, and extensive areas of shrubland. While lowland forested areas enjoy a relatively high level of protection, wetlands are critically under-protected in the District. Wetlands in Tangihua ED provide habitat for a range of threatened fauna and flora, and unless they are placed under formal protection they remain at risk of being drained and converted into pastoral land or gradually degraded by stock incursions and weed invasions.

Tangihua ED contains more exotic plantation (predominantly radiata pine) than any other ED in the Northland Region (c.43,350 ha), and many natural areas lie within or are adjacent to extensive areas of plantation. These natural areas provide valuable refugia for mobile fauna during harvesting, while the plantation forest itself can form linkages or corridors between indigenous remnants as well as provide buffering against 'edge' effects.

Northland is the country's stronghold for NI brown kiwi, which have been recorded from many sites in Tangihua ED. Reserves have been established in the District specifically to enhance kiwi survival, involving intensive predator control and regular bird monitoring. One of the major threats to kiwi in the District is stray or wandering dogs.

This report contains a significant amount of information on the ecological values of Tangihua ED, which can be used to effectively guide conservation priorities within the District. Above all, it will help conserve natural areas by providing an important information resource to stake-holders such as landowners, iwi, the Department of Conservation, local bodies, resource management planners, scientists, conservation groups, and the general public.

It rests with the stake-holders to build upon past successes and work collaboratively to ensure the protection and viability of these natural areas.



Chris Jenkins

Conservator Northland

CONTENTS

Foreword	iii
Abstract	vii
1. Introduction	3
1.1 The Protected Natural Areas Programme	3
1.2 Ecological regions and districts	4
1.3 Contents of this report	4
1.4 Tangihua Ecological District	5
2. Methods	6
2.1 General approach	6
2.2 Consultation with landowners	7
2.3 Data acquisition and analysis	7
2.4 Criteria for assessment of habitat significance	8
2.4.1 Level 1 sites	9
2.4.2 Level 2 sites	9
2.5 Updating of data	10
3. Ecological character	12
3.1 Topography/geology	12
3.2 Climate	12
3.3 Vegetation	13
3.3.1 Historical	13
3.3.2 Current vegetation pattern	15
3.3.3 Main vegetation types	16
3.3.4 Species of botanical interest	20
3.3.5 Threatened plant species	20
3.3.6 Regionally significant plant species	25
3.3.7 Threatened and regionally significant plant species not recorded for some time in Tangihua Ecological District	36
3.4 Fauna	37
3.4.1 Overview of indigenous fauna	37
3.4.2 Threatened bird species	39
3.4.3 Threatened mammal species	43
3.4.4 Threatened land snail species	43
3.4.5 Threatened lizard species	44
3.4.6 Threatened fish species	45
3.4.7 Threatened freshwater invertebrate species	46
3.4.8 Other threatened terrestrial invertebrate species	47
3.5 Threats	47
3.5.1 Invasive plants	47
3.5.2 Pest animals	48
3.5.3 Effects of agriculture on natural areas	49
3.5.4 Effects of residential developments on natural areas	50
3.5.5 Ongoing effects of former land clearance	51

3.5.6	Present-day land clearance	51
3.5.7	Poaching of kukupa	52
3.5.8	Legal protection vs conservation management action	52
4.	Site descriptions	54
4.1	Level 1 sites	56
4.2	Level 2 sites	308
5.	Summary and conclusions	
5.1	Analysis of existing protected areas	402
5.1.1	Overview	402
5.1.2	Ecological units protected	402
5.2	Priority natural areas for protection in Tangihua Ecological District	408
6.	Acknowledgments	459
7.	References	460
8.	Appendices	465
8.1	Field survey form	465
8.2	Letter to ratepayers and news media items	467
8.3	Categories of threat	468
8.4	Categories of importance for geological and soil sites	482
8.5	Checklist of plant species in Tangihua Ecological District	483
8.6	Common plant names used in the text	499
8.7	Checklist of fauna in Tangihua Ecological District	502
8.8	Glossary of terms	507
8.9	Index of sites	511

Maps

Map 1.	Location map: Tangihua Ecological District	1
Map 2.	Map of surveyed sites: Tangihua Ecological District	2

Tables

Table A:	Links between the PNAP criteria and Levels 1 and 2	10
Table B:	Level 1 sites	56
Table C:	Level 2 sites	308
Table 1:	Protected natural areas network in Tangihua Ecological District	404
Table 1A:	List of vegetation/habitat types within protected areas in Tangihua Ecological District	406
Table 2:	Ecological units recorded in Tangihua Ecological District and their protection status	409
Table 3:	Summary of site evaluations	443

ABSTRACT

Tangihua Ecological District (c.167,024 ha) is located in the Western Northland Ecological Region. It adjoins eight other Ecological Districts: Hokianga to the north-west, Kaikohe and Kerikeri to the north, Tutamoe to the west, Kaipara to the south-west, Tokatoka to the south, Whangarei to the east, and Whangaruru to the north-east.

Natural areas of ecological significance in Tangihua Ecological District (ED) were identified using information from reconnaissance surveys undertaken from 1994 to April 2009, together with information from a range of ecological reports, databases and unpublished information. A total of 151 natural areas covering 32,214 ha were identified. Of these, 105 are considered to be of particular ecological significance (Level 1 sites).

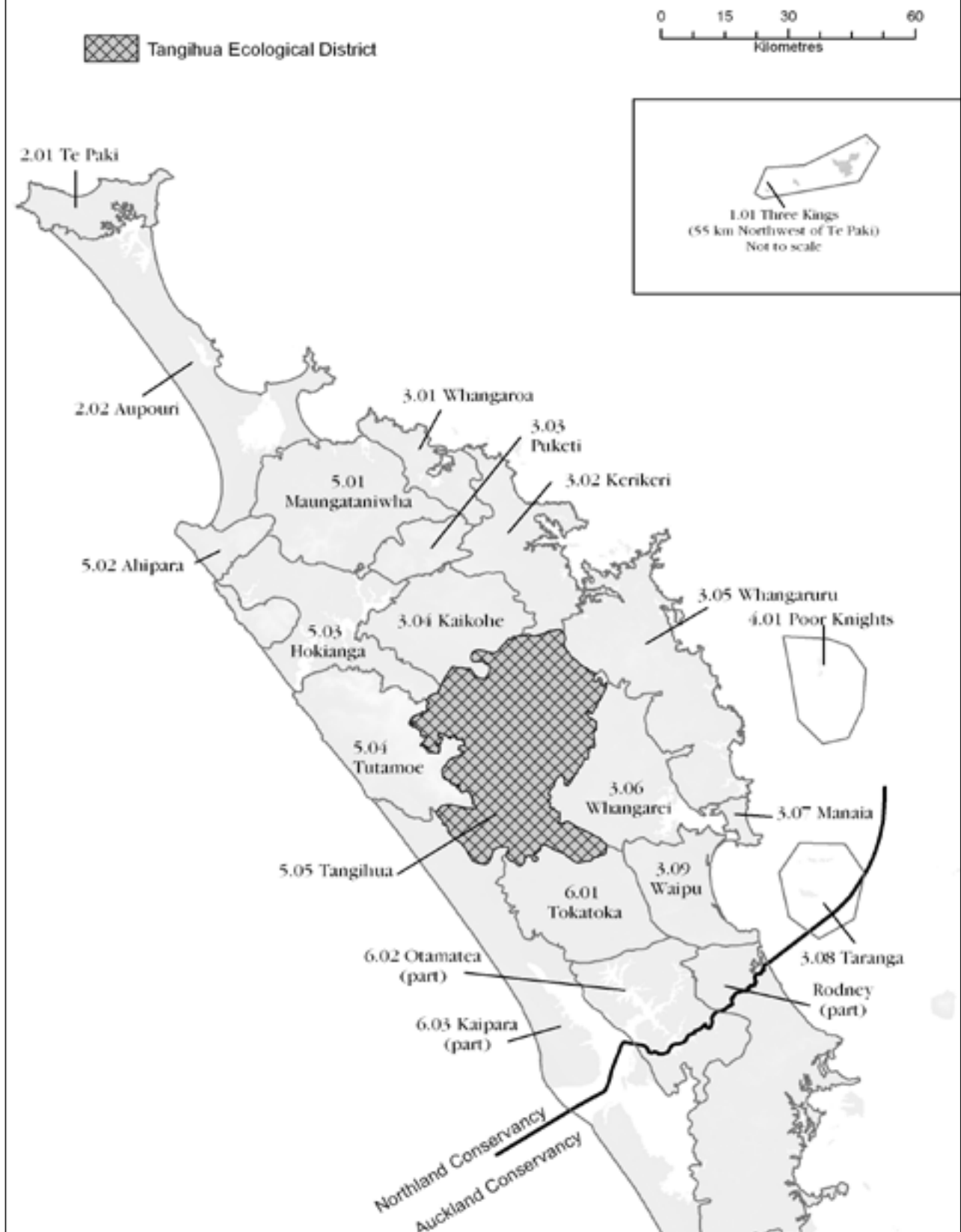
Tangihua Ecological District comprises several moderately large north-west to south-east trending ranges (e.g. Hikurangi Forest and Tokawhero Forest, Mangakahia Forest and Te Tarahiorahiri and Tangihua Forest), small remnants of alluvial floodplain forest and treeland, several large and relatively unmodified freshwater wetlands, and many smaller wetlands at various stages of degradation.

Many facets of the former indigenous biodiversity of Tangihua ED have been lost. The ranges, however, remain mostly forested while the lower hills have a mix of indigenous and exotic forest as well as large areas of indigenous shrubland. Extensive riverine freshwater wetlands and swamp forests in this District include some of the best flood-plain wetland complexes remaining in the North Island. The alluvial riverine forest remnants in this district are also notable. Currently, c.24% of the Tangihua ED has an indigenous vegetation cover, with c.19% forest, c.4.8% shrubland and less than 1% wetland vegetation (MfE 2004). Results of this study show that, of the natural areas identified, 80% (25,816 ha) are forest or treeland, 16.3% (5,265 ha) are shrubland and 3.1% (994 ha) are freshwater wetland. The total area of sites recorded in this report is 32,214 ha (19.3% of the Ecological District).

Only 30% (9,529 ha) of the identified natural areas are currently legally protected; however, these are largely in areas where most indigenous habitat remains (i.e. hill country). Priority areas for protection therefore include freshwater wetlands and forest and shrubland on alluvial plains.

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

Location of Tangihua Ecological District (Brook 1996)



Map 1. Location map of Tangihua Ecological District. Brook 1996

1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

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

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

The goal of the programme is:

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

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

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

This report differs from many PNAP reports in that:

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

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

The purpose and principles of the RMA are set out in Part II of that Act and include:

- safe-guarding the life-supporting capacity of air, water, soil and ecosystems;

- the preservation of natural character of the coastal environment, wetlands and lakes and rivers and their margins;
- the protection of outstanding natural features and landscapes;
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- intrinsic values of ecosystems;
- maintenance and enhancement of the quality of the environment.

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

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

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

1.2 ECOLOGICAL REGIONS AND DISTRICTS

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

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

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

The PNAP uses Ecological Districts as a framework for the evaluation of ecological significance, including representativeness.

1.3 CONTENTS OF THIS REPORT

This report presents the findings of the reconnaissance phase of the PNAP survey of the Tangihua Ecological District. The methods and terminology follow those defined and specified in the Waipu Ecological District PNAP report (Lux *et al.* 2007). This report includes maps and brief descriptions of all of the indigenous natural areas within the Ecological District which

were surveyed during from 1994 to 2000 by DOC, and subsequently in 2004 and 2009 by Wildland Consultants Ltd; together with descriptions of the main vegetation types, and information on threatened species and other taxa of scientific and/or conservation interest.

Aerial photography from 1999, 2002 and 2006 was used to prepare the site maps using the 1994/95 survey maps, the 2003/04 survey maps, and maps from the current study. In a few cases, the site boundaries have changed significantly from the site boundaries identified in the earlier studies, and hence the vegetation description presented in the report may not match the current extent of the site. Generally site boundaries changed very little or not at all whilst the site boundary of some sites was improved upon with the benefit of an aerial view compared to the topographical interpretation used for the original survey. Where the site boundary changed significantly, this is indicated at the beginning of the site report in the 'Area' section.

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

1.4 TANGIHUA ECOLOGICAL DISTRICT

Tangihua ED is located inland and covers c.167,024 ha of mainly rolling and dissected, slump-prone hill country. Isolated, steep-sided volcanic hills including the Tangihua, Mangakahia, Motatau and Houto ranges rise up to 700 m asl. Pre-human vegetation would have comprised broadleaved-podocarp forest with local areas of kauri on the hills, and raupo swamps, swamp shrubland, alluvial forests and other wetlands in the fertile valleys. The ranges remain mostly forested while the lower hills have a mix of indigenous and exotic forest as well as large areas of indigenous scrub. Extensive riverine freshwater wetlands and swamp forests in this District include some of the best flood-plain wetland complexes remaining in the North Island. The alluvial riverine forest remnants in this District are also notable. Currently c.24% of the Tangihua ED has an indigenous vegetation cover, with c.19% forest, c.4.8% shrubland and less than 1% wetland vegetation (MfE 2004).

Tangihua ED adjoins eight other Ecological Districts: Hokianga to the north-west, Kaikohe and Kerikeri to the north, Tutamoe to the west, Kaipara to the south-west, Tokatoka to the south, Whangarei to the east, and Whangaruru to the north-east.

Results of this study show that, of the natural areas identified, 80% (25,816 ha) are forest or treeland, 16.3% (5,265 ha) are shrubland and 3.1% (994 ha) are freshwater wetland. The total area of sites recorded in this report is 32,214 ha (19.3% of the Ecological District).

Significant features of Tangihua Ecological District include:

- Several large, botanically diverse forest tracts such as Mangakahia Forest and Te Tarahiorahiri (3,643.3 ha), Hikurangi and Tokawhero Forests (3,481 ha), South Houto Forest and Maungaru Range (783.2 ha), and Tangihua Forest (3,931ha).

- Several large, relatively unmodified wetland systems, particularly those which are part of the Motatau wetland complex (e.g. Taikirau Wetland and Shrublands and Taikirau Swamp), which is probably the largest and most significant mineralised freshwater wetland system remaining in Northland.

2. Methods

2.1 GENERAL APPROACH

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

Natural areas were identified using recent aerial photography (orthophotography flown in 2002 and 2006) and data collected as part of the Sites of Special Biological Interest (SSBI) surveys. Sites were identified irrespective of land tenure. Consequently, all natural areas, including those administered by DOC, as well as other protected areas, were surveyed using the same methods. This provided a consistent approach to determine the representativeness of all natural areas.

Most of the sites in Tangihua ED were surveyed by DOC in 1994, with remaining areas in Carter Holt Harvey forests surveyed in 2003/2004 (Wildland Consultants 2004), and subsequently by Wildland Consultants in 2009. Each site was mapped, allocated a generic number, and described. Following evaluation (see Section 2.4 below), sites were grouped into levels of ecological significance (Level 1 or 2). Scientific names of species for which common names have been used can be found in Appendix 8.6 (Common Plant Names) or Appendix 8.7 (Checklist of Fauna Species).

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

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

2.2 CONSULTATION WITH LANDOWNERS

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

The then Protection Manager, DOC Northland Conservancy, undertook consultation with iwi throughout Tai Tokerau advising of the pending PNAP surveys prior to commencement of the survey programme in 1994.

2.3 DATA ACQUISITION AND ANALYSIS

Methods followed those prescribed by DOC, as described in Booth (2005). A rapid reconnaissance field survey was carried out to record and map the ecological and geomorphological characteristics, broad habitat type and canopy vegetation of each identified natural area. Most of this work was carried out using telescopes and binoculars from vantage points on public roads or farm tracks.

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

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

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

This semi-quantitative method was selected by DOC because it could be implemented over large areas with a small number of field surveyors during a limited time period, and could be applied to all vegetation types irrespective of the canopy height. More detailed, and therefore more time-

consuming and expensive methods, would not necessarily provide more useful information for assessing representativeness. The disadvantage of this survey approach is that it does not provide a great deal of information on the distribution of uncommon or threatened canopy and understorey species, nor does it provide full information on the distribution of bird species or other fauna. Fauna observations were incidental only.

Species present in the 'abundant' and 'common' columns of the field survey forms were used to define the vegetation type of each ecological unit. 'Abundant' species appear first in the vegetation type name, followed by 'common' species in their relative order of cover. The standard technique of identifying emergent features in the canopy was excluded from these specific methods. Details of vegetation types and geological units within each site were entered into an Excel spreadsheet. Geological units were classified into 14 categories and vegetation/habitat types into 341 categories (see Table 2). Some sites had only one vegetation type on one geological unit, while others had multiple of each. Sorting of these ecological units gave information on their frequency and extent in the study area. This information was used to determine the representativeness of each ecological unit recorded in Tangihua Ecological District.

For the purpose of evaluation of representativeness and description, all ecological units within Tangihua ED are considered 'inland'. However, some 'inland' ecological units will also have some coastal influence because of the narrowness of the Northland Peninsula, and the fact that the south-west corner of Tangihua ED is within 12 km of the coast.

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

2.4 CRITERIA FOR ASSESSMENT OF HABITAT SIGNIFICANCE

Assessment criteria follow Booth (2005).

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

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

The conservation values of these areas were assessed using a two-level classification of habitat significance based on the PNAP ecological

criteria of representativeness, rarity and special features, diversity and pattern, naturalness, habitat structure and characteristics important for the maintenance of ecosystems (i.e. buffer, linkage or corridor, size and shape) (see Table 3, p.443).

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

2.4.1 Level 1 sites

A Level 1 site contains significant vegetation and/or significant habitats of indigenous fauna and is defined by the presence of one or more of the following ecological characteristics:

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

2.4.2 Level 2 sites

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

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

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

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness*	Contains the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units (3). Supports good populations of taxa which are endemic to Northland (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 taxa diversity relative to other areas of 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 Level 1 site criteria.

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

2.5 UPDATING OF DATA

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

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

sustained grazing of forest remnants will, in the long term, completely eliminate some habitats.

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

3. Ecological character

3.1 TOPOGRAPHY/GEOLOGY

The geology of Tangihua ED is characterised by the presence of isolated steep-sided and rugged allochthonous Tangihua Complex ophiolitic massifs up to 700 m asl (including the Mangakahia, Motatau, Houto, Maungaru and Tangihua ranges), surrounded by lower (up to 210 m asl) rolling to moderately dissected and slump prone hill country on allochthonous Cretaceous-Paleocene Mangakahia Complex sedimentary rock units. There are also areas of allochthonous Eocene Oligocene Motatau Complex glauconitic sandstone and muddy limestone in the north-east of Tangihua ED, and small areas of allochthonous Eocene-Oligocene Te Kuiti Group calcareous sandstone and bioclastic limestone in the Tangowahine Valley. Alluvial deposits are common along river valleys in the sedimentary hill country, and there are extensive riverine freshwater wetlands in the Taikirau Stream catchment in the north-east (Brook 1996).

3.2 CLIMATE

Northland

Northland's climate is influenced by its northerly location (latitudes 34°S to 36°S), the narrowness of the peninsula (no areas are more than 50 km from the sea), and its generally low topography (most areas are below 150 m asl). Summers are warm and humid, and winters mild. Mean annual air temperatures vary from 14°C to 16°C. Air frosts are infrequent in Northland, but ground frosts ($\leq 1^\circ\text{C}$ at 2.5 cm above ground) are not uncommon, especially inland. Annual sunshine hours vary little across Northland, with 2,000 at low altitudes, decreasing to 1,700 at higher altitude sites.

Rainfall peaks in winter, with the driest seasons being summer and early autumn, and there are usually one or two "dry spells" (periods of fifteen or more consecutive days with less than 1 mm of rain on any one day) between December and March. Mean annual rainfall ranges from 1,200 mm to 2,400 mm. The predominant winds are from the south-west, 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).

Tangihua Ecological District

Tangihua ED has a warm and humid climate, with winds predominantly from the south-west. However, precipitation and temperature vary at a local scale according to altitude, topography, and proximity to the coast.

Altitudes range from sea-level, on the banks of the Wairoa River in the south-west, to 697 m asl, on the summit of Te Tarahiorahiri, within Mangakahia Forest. Climate data used in the following descriptions is derived from weather stations at Dargaville, Tangihua, Kawakawa, and Kaikohe. Of these, only Tangihua lies within Tangihua ED.

At lower altitudes, mean annual precipitation ranges from 1,400 mm in the south-east to nearly 1,800 mm in the north. For example, there is 1,500 mm per year at Dargaville to the south-west, 1,417 mm per year at Tangihua in the south-east, 1,526 mm per year at Kawakawa to the north-east, and 1,766 mm per year at Kaikohe to the north. Rainfall increases with altitude, and is likely to exceed 2,000 mm per year on the high peaks of Tangihua Forest and in Mangakahia Forest. The wettest months are June, July, and August, and the driest months are December, January, and February. However, rainfall is fairly evenly distributed throughout the year, and January, the driest month, has a mean rainfall of 95 mm. Northland also periodically experiences high winds and extreme rainfall events when storms of subtropical or tropical origin, enter the New Zealand region. These events tend to occur in late summer and early autumn and cause widespread flooding, slips and tree fall.

Northland is a relatively narrow land mass, with no part of the Tangihua ED more than 40 km from the coast. Air temperatures on land are therefore moderated by proximity to the sea. At Kaikohe, seven kilometers to the north of Tangihua ED, the mean annual air temperature is 14.7°C. January and February are the warmest months with a mean of 19°C, and July is the coldest month with a mean of 10°C. Winter frosts are uncommon throughout most of Northland, but in low-lying inland areas such as the river valleys of central Tangihua ED, mild frosts occur on the coldest winter nights. Temperatures in Northland rarely exceed 30°C. The Northland District receives approximately 2,000 hours of bright sunshine per year (NIWA 2009b).

3.3 VEGETATION

3.3.1 Historical

Little information is available on the vegetation history of Tangihua ED, but based on landform and current patterns it is assumed that this Ecological District would have comprised a mosaic of broadleaved-podocarp forest, with a few discrete areas of kauri forest. In the fertile valleys, extensive swampy habitats of raupo, swamp shubland, alluvial forest and other wetlands are likely to have occurred (Conning 2001). On a regional scale, mixed lowland kauri-podocarp-broadleaved forest was the most common forest type found in Northland, comprising more than 50% of the original forested area (Conning 2001). It is estimated that there was originally c.200,000 ha of kauri-dominated forest in what is now the Northland Conservancy of the Department of Conservation.

Observations made by early European provide an insight into the sheer grandeur of the kauri-podocarp-broadleaved forests of Northland. In 1827, Earle (an artist) described the forests as “*a wood so thick that the light*

of heaven could not penetrate the trees that composed it. They were so large and close together that in many places we had difficulty to squeeze our way through them..., not a gleam of sky was to be seen: all was a mass of gigantic trees, straight and lofty, their wide-spreading branches mingling overhead, and producing throughout the forest an endless dark and unbroken gloom” (Hutchins 1919). Later, in 1870, an observant writer described one of these forests for the Weekly News when hundreds of square kilometres still remained in primeval splendour: *“...a sea of dense verdure covering the hills and valleys and stretching far away on every side. This vast and boundless landscape of tree and foliage is distinguished for its sylvan sublimity and beauty as well as for that aspect of profound repose which usually prevails in these woodland solitudes; at times so calm that not a leaf is stirring”* (Reed 1956).

Logging of forests on the coast to the east of Tangihua ED began in the 1830s, but it wasn't until the late 1800s that large quantities of timber were extracted from Tangihua ED. In the 1860s, timber mills were established in the 'heavy bush' of the Hikurangi area, and in 1872, Dargaville was founded by Joseph McMullen Dargaville, a timber merchant. Kauri was felled and processed using pit saws, and transported either to Whangarei or Dargaville. The Northern Wairoa River and the Kaipara Harbour formed an important access route, linking Northland's kauri forests and gum fields to Helensville and Auckland. In 1875, construction of a road from Hikurangi to Whangarei facilitated the carting of the timber to the eastern coast of Northland. In the 1890s the government sold 2,360 cubic metres of standing kauri to sawmillers alone, and during the same period acquired, subdivided and sold hundreds of blocks of land to new settlers. In Northland many of these blocks contained areas of indigenous forest, which were mostly felled or burnt to create pasture, or felled and the timber sold to gain income for development (Haigh 1991). Kahikatea timber was also a very important resource, with extensive stands of this species on the low-lying flood plains of the upper Wairoa River. Australia provided a market for kahikatea timber, where the drier climate reduced the susceptibility of this timber to borer damage, and later, it was discovered that kahikatea was ideal for the construction of butter boxes. The felling of the kahikatea forests continued into the 20th century, and in 1913 a barque, the Joseph Craig, departed for Australia bearing 537,206 feet of sawn kahikatea (Northern Advocate 13/4/1913). Despite the proliferation of timber mills and the huge volume of timber exported, the extraction of timber was only one contributing factor in the loss of Northland's forests. Forests were burned to clear land for pasture or to facilitate the extraction of kauri gum, and during dry summers many of these fires burned uncontrolled. *“By 1840, 58% of the forest land had been converted into permanent open plains, rolling downs and uplands”* (Haigh 1991). From the 1840s through to as late as the 1940s, fires swept across large areas of Northland, not only burning large tracts of forest, but also threatening homes. The bush fires of the summer of 1901-2 destroyed hundreds of square miles of standing kauri in the Te Kopuru, Kaipara, and Dargaville areas. Drained swamps also burned, the

fires burning the peat deep down into the ground, only halting when reaching the water table (Mitcalfe 1981).

Although the kauri industry was the economic mainstay of Northland in the late 19th century and early 20th century (Anderson & Moran 1983), kauri timber was soon to be supplanted by radiata pine. The first exotic plantings in Northland occurred in 1904, but it was not until the 1920s and 1930s that the Region, and New Zealand as a whole, experienced the first minor wave of afforestation. Several forestry companies were formed in Northland at this time, and they acquired land and funded planting either by way of bondholding or by offering shares for purchase. The following decades saw the industry grow steadily, with involvement from both the state (New Zealand Forest Service) and the private sector (from Wheeler & Moran 1985). Pine plantation currently occupies c.43,350 ha in Tangihua ED (MfE 2004), the majority of which is owned by private companies such as Carter Holt Harvey.

3.3.2 Current vegetation pattern

As with most other parts of Northland, the current vegetation of Tangihua ED is mostly secondary in origin. The largest areas of indigenous vegetation are on hill country above 100 m asl, while the remaining landforms have small and highly modified examples of their former vegetation.

Extensive forest tracts occur on the steeper massifs, often joined by plantation forests, resulting in a vast mosaic of production and protection forestry (Conning 2001). Kauri, rimu, kahikatea, tanekaha, totara, miro, and northern rata characteristically occur as infrequent emergent trees. Kanuka, manuka, kauri, rimu, tanekaha, rewarewa, and totara associations are prevalent on ridges within these ranges, while upper slopes support forest dominated by totara, kanuka, karaka, kohekohe, puriri, and/or tanekaha. Tawari, tawheowheo, mangeao and *Dracophyllum* species occur at the highest altitudes where sub-montane conditions exist. Tawa is a feature of high altitude forest in Mangakahia Forest, which is unusual in Northland. Lower hillslopes and gullies are characterised by broadleaved forest containing taraire, puriri, totara, tawa, kohekohe, pukatea, and kahikatea. Kohekohe, mamangi, pigeonwood, mahoe, nikau, and ponga are generally the prominent understorey species. Shrubland is relatively common in Tangihua ED, where it is dominated by manuka and/or kanuka. At cooler higher altitudes, from about 550-600 m asl (e.g. Hikurangi Forest, Tokawhero Forest, and Mangakahia Forest), kauri is either sparse or absent (Conning 2001).

Riverine flood and alluvial vegetation is limited to numerous small, scattered forest remnants and shrubland along riparian and wetland margins, and occasionally on floodplains away from main river channels. Although it would have been relatively common in low lying swampy plains and valleys throughout Tangihua ED, it is now one of the rarest, most fragmented and under-represented forest types occurring in Northland (Conning 2001). Kahikatea is the dominant species in this habitat type, occurring with associations of taraire, totara, kanuka, manuka, ti kouka and harakeke.

Shrubland comprises a smaller component of vegetation cover in Tangihua ED and throughout Northland (< 10%). The vast majority of this

comprises manuka-kanuka in successional stages and as corridors, buffers, and ecotones to mature forest and wetlands. Mingimingi, hangehange, mapou, *Coprosma rhamnoides* and lancewood are commonly found in shrubland habitats (Conning 2001).

Gumlands are seasonally waterlogged, infertile and acidic habitats which are characterised by 'heathland' species such as manuka sedges, *Gleichenia* species and *Dracophyllum lessonianum*. This habitat type is unique to Northland, Auckland and Coromandel and is one of the rarest habitat types in Northland. The Department of Conservation has estimated that less than 1% of its original extent remains today. Gumland is known from three sites in Tangihua ED, although it is likely to be more common than the records indicate (L. Forester, pers. comm.).

Tangihua ED contains c.994 ha of freshwater wetlands, which in the Northland Region is second only in extent to Aupouri ED with c.2,734 ha (MfE 2004). While many of the wetlands are small and degraded, there are at least four sites (> 100 ha) which are excellent examples of relatively intact inland freshwater swamps that provide significant habitat for indigenous fauna and flora. Raupo reedland is the most common wetland vegetation type.

In terms of the District's geology, the majority of inland hill broadleaved and podocarp-broadleaved associations occur on Cretaceous-Paleocene ophiolitic volcanics, while shrubland associations are commonly found on Cretaceous siliceous mudstone. Oligocene micritic limestone, Pleistocene consolidated sand dunes, and concretionary micaceous sandstone are the least common geological landforms in the Ecological District.

3.3.3 Main vegetation types

Overview

This study recorded 340 different in Tangihua ED, and these are listed in full in Table 2 (p.409), with representative units shown in bold. The following paragraphs describe the present-day vegetation patterns of Tangihua ED and highlight distinctive ecological units.

For the purposes of PNA studies in Northland, 'inland' ecological units are defined as occurring 1 km or more from the coast (see Table 2). However, this is an arbitrary division, and although Tangihua ED is landlocked some inland ecological units are mildly influenced by coastal features. This is because some areas of Tangihua ED (south-western) are within 12 km of the coast, and because of the narrow width of the Northland peninsula.

Freshwater wetlands

Freshwater wetlands were documented at 34 sites within Tangihua ED covering a total of 994 ha¹. All of these are considered natural or semi-natural in origin (no constructed ponds or dams were surveyed as part of this report). Prior to agricultural clearance, riverine and Holocene wetlands are likely to have been relatively extensive on the alluvial plains

1 This figure is based on the information obtained during the PNAP reconnaissance survey. The amount of wetlands remaining as stated in the NZ Landcover Database (MfE 2004) is c.680 ha.

in Tangihua ED. It has been estimated that in the whole of Northland only about 3.1% of the original freshwater wetlands (excluding lakes, rivers and streams) remain (Waters of National Importance [WONI] analysis; W. Holland, DOC, pers. comm.).

Raupo reedland is the most common wetland vegetation type, and tends to be associated with valley floor alluvium. The presence of raupo is an indicator of moderate to high nutrient status (Johnson & Gerbeaux 2004), and in Tangihua ED agricultural run-off is likely to contribute to this. Gumlands and acidic peat bogs are the least common wetland vegetation types in the ED.

Many freshwater wetlands in Tangihua ED are small, degraded patches of raupo reedland, harakeke flaxland, and *Baumea* species sedgeland. Impacts include trampling, grazing, and nutrient enrichment through animal excrement and mineral fertilizers, and lack of buffering. Many wetlands have altered water tables due to the surrounding land use and drainage or by impoundment of water by willows. An indication of this is the relative weediness of a site. For example, the invasion of gorse, Mexican devil and/or pampas indicates a lowered water table, whilst the presence of *Glyceria maxima* is associated with a rise in water levels (L. Forester pers. comm.). Nonetheless, Tangihua ED still retains several large, relatively unmodified wetland systems, three of which are associated with the Taikirau River system, representing some of the best flood-plain wetland complexes in the North Island (Conning 2001). There are four sites which are of particular significance:

- (i) Taikirau Wetland and Shrublands (P06/072) (376.8 ha) is part of the Motatau wetland complex, which is probably the largest and most significant mineralised freshwater wetland system remaining in Northland. It comprises a diverse assemblage of mostly indigenous wetland, swamp forest, and riverine plants, although willows have caused impoundment of water in parts.
- (ii) Taikirau Swamp (P06/074) (803.8 ha) is part of the same system, and contains a very diverse flora, including some nationally rare vegetation types.
- (iii) Te Whatianga Swamp (P06/066) (391.1 ha) contains representative examples of low altitude swamp forest and marsh, and extensive mineralised wetlands, forming part of a large wetland complex within the Taikirau/Takapau Stream system.
- (iv) Flaxmill and Awakino Swamps (P07/001) (104.9 ha) form a large contiguous eutrophic wetland complex dominated by raupo. The site is an important area for nationally threatened flora and fauna, and nationally rare habitat types. The southern part of the site, comprising Flaxmill Swamp, is currently administered by Fish and Game New Zealand. Flaxmill Swamp, and to some extent Awakino, have had alterations of water levels through excavation activities.

Alluvial Landform Vegetation

Remaining indigenous vegetation on alluvial flats and gullies in Tangihua ED comprises c.828 ha, within 34 different sites. One site often comprises several separate remnants. Alluvial flats make the most productive

agricultural land and were the first to be cleared by early European settlers. These areas were zealously maintained as farmland over time.

The most common vegetation types present on broad alluvial river plains (Holocene alluvium) are forests of secondary kahikatea, totara, taraire, and manuka, as in the following: kahikatea forest, kahikatea-totara forest, kahikatea-taraire forest, totara forest, taraire forest, taraire-totara treeland, kahikatea-manuka forest, and manuka shrubland. The only old growth kahikatea forest remaining on alluvial flats was recorded at P06/062, along the Pipiwai Stream, and at P06/073, just south of Taikirau Swamp.

Kahikatea and totara are hardy podocarp species which are resistant to trampling and grazing, which explains their dominance within grazed riparian forests and treelands along rivers and streams in the Tangihua ED lowlands. Previously, species such as taraire, titoki, kowhai, manatu, puriri, turepo, ti kouka, karaka, mapou, matai, houhere, and pukatea would have formed a greater part of the canopy of alluvial plain forests. Now there are only very tiny remnants of the following habitat types which approximate some of the former vegetation types (albeit in much poorer condition): houhere-nikau-pukatea forest, maire tawake forest, kowhai forest, taraire forest, titoki-totara forest, totara-kahikatea-towai treeland, kahikatea-kowhai-ti kouka forest, puriri-taraire forest, and ti kouka-kahikatea forest.

Inland Hill Vegetation

Most of Tangihua ED is hill country and this is where most indigenous vegetation remains or has been allowed to regenerate since logging and burn-offs in the 1800s and 1900s. A series of north-west to south-east trending moderately dissected ranges still support large forest remnants. These begin with Hikurangi Forest and Tokawhero Forest (P06/003) in the north, then southwards to Mangakahia Forest and Te Tarahiorahiri (P06/001), and southwards again through to South Houto Forest and Maungaru Range (P07/037), ending in the south-east with Tangihua Forest (Q07/111) (the latter being the largest continuous area of indigenous forest in Tangihua ED). Rolling hill country, such as in the south of Tangihua ED near Tangowahine, Avoca, and Waihue, or in the foothills of the previously listed sites, has been more heavily deforested compared with the steeper land at higher altitude.

On the inland hills of Tangihua ED, the following vegetation pattern is typical: ridges and upper hillslopes covered in secondary kanuka forest in association with young emergent kauri, tanekaha, and rimu; ridges where the vegetation cover has been recently disturbed and are now characterised by kanuka and/or manuka shrubland; hillslopes supporting forest dominated by totara, kanuka, taraire, puriri, towai, and/or mamaku; lower hillslopes and gullies with broadleaved forest characterised by taraire, towai, puriri, nikau, and tawa, often containing kahikatea; disturbed gullies or gully heads with shrublands of pate, mahoe, hangehange, and mamaku; totara-dominant forest on pasture margins and in many of the smaller, heavily grazed forest remnants. The main vegetation types on different topographies are summarised below.

Common vegetation units on inland hill country in Tangihua ED:

- Ridges and upper hillslopes
 - On ridges, forests with various combinations of kanuka, kauri, tanekaha, and rimu, and sometimes including rewarewa, taraire, towai, tawa, and/or totara
 - On upper hillslopes, forests with various combinations of puriri, towai, kowhai, kohekohe, kanuka, kauri, and/or tanekaha
- Mainly on hillslopes, but also on ridges
 - Kanuka/manuka-totara forest
 - Taraire-towai forest
 - Towai forest
- Hillslopes
 - Kahikatea-totara forest
 - Kahikatea-taraire forest
 - Kanuka/manuka forest
 - Kanuka/manuka shrubland
 - Kanuka-totara forest
 - Kauri forest
 - Kohekohe-puriri-taraire forest
 - Puriri forest
 - Puriri-taraire-totara forest
 - Puriri-totara forest
 - Tanekaha-totara forest
 - Taraire-totara forest
- Mainly on hillslopes, but also in gullies
 - Kahikatea forest
 - Manuka shrubland
 - Puriri-taraire forest
 - Taraire forest
 - Totara forest
 - Totara-towai forest
- Gullies
 - Taraire forest, including various combinations of pukatea, kahikatea, towai, tawa, towai, and puriri

Ecological units on inland hill country which are considered uncommon in Tangihua ED:

- Akeake-kanuka/manuka-totara shrubland in P06/051
- Akeake-mamangi-manuka-tanekaha shrubland in P06/013
- Akeake-totara-towai forest in P06/012
- *Dracophyllum lessonianum*-manuka-mingimingi shrubland in P06/095
- Hall's totara forest in P07/055
- Kahikatea-kauri-totara forest in P07/041
- Kahikatea-pukatea-maire tawake forest in P06/013

- Kahikatea-rimu forest in P07/045
- Kanuka-kohuhu-mamaku forest in P06/026
- Kanuka-rimu forest in P06/003
- Karaka-kowhai forest in Q06/180
- Kauri-northern rata forest in P06/001
- Kauri-rimu-tanekaha forest in P06/082
- Kauri-taraire-totara forest in P07/043
- Kohekohe forest in P07/038
- Kowhai forest in P07/011
- Makamaka-towai forest in P06/030
- Mamaku-titoki forest in P06/044
- Mamangi-puriri-taraire forest in P06/002
- Manuka-*Gleichenia* sp. shrubland in P06/041
- Manuka-kauri forest in P06/071
- Mapou forest in P07/008
- Miro-towai forest in P06/026
- Rimu forest in P06/005
- Rimu-rewarewa forest in P06/076
- Tawa forest in P06/001
- Tawa-puriri forest in P06/001
- Totara-taraire-puriri-rimu forest in P06/052

3.3.4 Species of botanical interest

The regionally significant tree species *Hoheria angustifolia* and the regionally significant climbing plant *Fuchsia perscandens* reach their northern limits of distribution in the William Upton Hewett Memorial Scenic Reserve (P06/095), whilst *Pittosporum pimeleoides* subsp. *pimeleoides* (Naturally Uncommon) reaches its southern limit in the same site.

3.3.5 Threatened plant species

The conservation status of species listed below follows de Lange *et al.* (2009). Appendix 8.3 describes the New Zealand threat classification system as set out in Townsend *et al.* (2008).

Threatened

Daucus glochidiatus (Nationally Critical_{DP, SO})

This annual or biennial carrot-like herb occurs on dry cliffs, rock talus, dry clay banks, or forest margins in the lowland zone. It has been recorded in the Mamaranui Farm Settlement Scenic Reserve (P07/041) in 2003 (SSBI P07/H027). *Daucus glochidiatus* has undergone a rapid decline over the last 30 years and is now extinct over large parts of its former range. The reason for this is likely to be competition from weeds, most of which are faster growing and taller than *Daucus glochidiatus* (NZPCN 2009).

***Pomaderris phyllicifolia* (Nationally Endangered_{so})**

This shrub was scattered throughout the upper North Island from Te Pahi to the Waikato Basin but is now confined to the Northland Peninsula. It inhabits mainly coastal, nutrient poor, open sites amongst manuka and sedges, and on clay banks and roadsides. It is a naturally short-lived, early coloniser of slips and disturbed areas (NZPCN 2009). It was recorded in 1999 at William Upton Hewett Memorial Reserve (P06/095) (AK 292382), where it was growing in manuka forest and gumland.

***Baumea complanata* (Nationally Vulnerable_{RF})**

This sedge had a local distribution, occurring from Te Pahi to the Waikato Basin but is now confined to Northland. It is occasionally found growing in damp manuka shrubland and gumland, and was recorded from Flaxmill and Awakino Swamps (P07/001) in 1999 and 2006 (SSBI P07/H040).

***Drosera pygmaea* (Nationally Vulnerable_{DP, SO})**

This is a diminutive red, red-purple or green rosette forming herb which usually occurs in gumland and pakihi shrublands and adjoining wetlands, especially peat bogs (NZPCN 2009). Within Tangihua ED, the species has been recorded from Mangaroa Stream Riverine Forest and Gumland (P06/059) (L. Forester pers. comm.).

At Risk

***Brachyglottis kirkii* var. *kirkii* (Declining_{DP})**

This shrub is endemic to the North Island, and is usually an epiphyte in lowland to lower montane forest. It is known from two sites in Tangihua ED: Tangihua Forest (Q07/111) (Cameron 1992), William Upton Hewett Memorial Reserve (P06/095) (recorded in 1998, SSBI P06/H063), and the Mamaranui Farm Settlement Scenic Reserve (P07/041) (recorded in 2003, SSBI P07/H027). *Brachyglottis kirkii* var. *kirkii* is intolerant of browse and is preferentially browsed by possums, goats and deer.

***Dianella baemata* (Declining_{DP})**

This species is an upright, densely tussock-forming evergreen perennial herb which occurs in coastal to lowland wetlands, favouring high moor restiad dominated peat bogs (NZPCN 2009). Within Tangihua ED, the species has been recorded from Mangaroa Stream Riverine Forest and Gumland (P06/059) (L. Forester pers. comm.).

***Juncus pauciflorus* (Declining_{DP, SO, SP})**

This rush occurs throughout the North Island, South Island and Stewart Island (often on northern offshore islands), where it occupies damp ground and hollows under light scrub, in pasture, on swamp margins, in dune swales under scrub or within coastal forest (NZPCN 2009). The species is known only from one site in Tangihua ED: Taikirau Swamp (P06/074) recorded in 1985 (SSBI P06/H014).

***Ptisana salicina* King Fern (Declining_{so})**

This is a large, robust fern with thick, heavy fronds that may be up to 4 m long by up to 1.5 m broad. It is found in wet, shady gullies in dense bush. It was once common in lowland forests of the North Island, but because of browsing by feral pigs and other ungulates, it is now rare. In Tangihua ED, it has been recorded in Huehue Forest and Maungakawakawa Forest (P06/013) in 2001 (SSBI P06/H023).

***Anzybas rotundifolius* Helmet orchid (Naturally Uncommon_{EF, sp})**

This tiny, winter-flowering endemic helmet orchid is found in the upper North Island, but was recently discovered on the Chatham Islands (2007) and Great Barrier Island (2008) (NZPCN 2009). The species occurs in open, though often heavily shaded, sites overlying seasonally waterlogged soils. It is often found in deep drifts of leaf litter, particularly under kanuka or in association with regenerating kauri forest (NZPCN 2009). In Tangihua ED, *Anzybas rotundifolius* was recorded in William Upton Hewett Reserve (P06/095) in 1996 (AK 231699), where it was common in leaf mould under kahikatea forest near Aponga Stream.

***Corunastylis pumila* (Naturally Uncommon_{EF, sp})**

This orchid has a similar distribution to *Anzybas rotundifolius*, but requires open, sparsely vegetated, and usually relatively infertile habitats. Most recent collections are from gumland shrubland, particularly in sites which have been burned frequently (NZPCN 2009). In Tangihua ED, it has been recorded in the William Upton Hewett Memorial Reserve (P06/095) in 1992 (AK 206359) and in 1998 (SSBI P06/H063). *Corunastylis pumila* has undergone a massive range reduction over the last one hundred years, as the open clay pans and gumland shrubland it flourishes in have been reduced to tiny, effectively non-functional units now given over to natural succession to taller vegetation (NZPCN 2009).

***Doodia squarrosa* (Naturally Uncommon_{sp})**

Doodia squarrosa is a small tufted fern with a local, discontinuous distribution. It occurs in coastal and lowland alluvial forests throughout the North Island and tends to occur near water (Allan 1982), usually in dappled light or sunny situations. This species is vulnerable to the spread of aggressive weeds (NZPCN 2009). Within Tangihua ED, it has been recorded in Taikirau Swamp (P06/074) in 1985 (SSBI P06/H014), William Upton Hewett Memorial Reserve (P06/095) in 1998, (SSBI P06/H063) and more recently in Puketurua Bush (P06/094) in 2007 (AK 300807).

***Halocarpus kirkii* Monoao (Naturally Uncommon_{sp})**

Monoao is an uncommon podocarp, endemic to the Northland-Auckland region and associated with kauri forest. In Tangihua ED, it was recorded from the headwaters of Takitu Stream (Coronet Road Bush (P06/044) during a survey in 1994.

***Libocedrus plumosa* Kawaka (Naturally Uncommon_{sp})**

This endemic cypress has a disjunct distribution, being restricted to Northland and northwest Nelson, where it is found in local patches within

coastal to lowland forest. In the north it often occurs in association with kauri, often on ridge lines, spurs, or areas of major wind throw damage. Within Tangihua ED, it has been recorded from Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043), Huehue Forest and Maungakawakawa Forest (P06/013) in 1994 (recorded during survey), Coronet Road Bush (P06/044) in 1994 (recorded during survey), Sharp Road Bush (P07/015) in 2003-04 (Wildland Consultants 2004), Mamaranui Farm Settlement Scenic Reserve (P07/041) in 2003 (SSBI P07/H027), Te Toa Bush (P06/024) in 1994 (recorded during survey), and Tangihua Forest (Q07/111) in 1985 (Willets 1985).

***Myosotis spathulata* (Naturally Uncommon_{DP,EF,SP})**

This perennial herb is endemic to the North, South and Chatham Islands and is usually found on or near rock outcrops, under rock overhangs, on ledges or amongst rubble in forest and shrubland in coastal to subalpine areas (NZPCN 2009). In Tangihua ED, it was recorded in Tangihua Forest (Q07/111) (AK 7514, date unknown).

***Petalochilus alatus* (Naturally Uncommon_{SO,SP})**

This orchid occurs in the North Island from Te Pahi to about Rotorua, and from there is disjunct to the Horowhenua. Its exact distribution is still unknown as it was only recently (1980s) recognised as occurring in New Zealand (NZPCN 2009). It often inhabits dry sites in gumland shrubland or on open clay pans in coastal to lowland zones (NZPCN 2009). In Tangihua ED, *Petalochilus alatus* was recorded from William Upton Hewett Memorial Reserve (P06/095) in 1992 (AK 210013, growing along a track by regenerating manuka on podsolized soils) and again in 1998 (SSBI P06/H063).

***Pittosporum pimeleoides* subsp. *pimeleoides* (Naturally Uncommon_{SP})**

This shrub is endemic to Northland, where it occurs mainly in the east from Karikari Peninsula south to about Whangarei in the east and Waipoua Forest in the west. It is usually associated with kauri forest, often in secondary regrowth, along ridge lines and in shrublands caused by past fires, slips or other natural or human-induced disturbance mechanisms. It is also found in coastal shrubland and gumland scrub (NZPCN 2009). In Tangihua ED, *Pittosporum pimeleoides* subsp. *pimeleoides* is known from Worsp Road Bush (P06/092) (recorded in 2007, SSBI P06/H064) and William Upton Hewett Memorial Reserve (P06/095) where it was recorded in 1993 (AK 215068) and 2007 (M. Young pers. comm.), the latter of which is the southernmost record for this species.

***Stegostyla atradenia* (Naturally Uncommon_{EF,SP})**

This distinctive orchid is endemic to the North Island and northern South Island, and is found in coastal to montane zones where it favours infertile substrates, especially clay podzols and pumice soils. It is also known from pine plantations and from geothermal areas covered in low shrubland (NZPCN 2009). It has only been recorded once in Tangihua ED, in 1996 (AK 231701), under kanuka forest in William Hewett Memorial Reserve (P06/095).

***Thelymitra ixioides* Spotted sun orchid (Naturally Uncommon_{sp})**

This orchid is found throughout the North Island and South Island, favouring open ground, especially clay pans within gumland shrubland but also colonising roadside banks, road gravel, stable dune slacks, and well-lighted but sparsely vegetated ground under taller shrubland and forest (NZPCN 2009). *Thelymitra ixioides* has been recorded from William Upton Hewett Memorial Reserve (P06/095) (recorded in 1996, AK 232573) and Moore Road Mosaic (P06/119) (L. Forester pers. comm.).

***Thelymitra* (c) (“rough leaf”) (Naturally Uncommon_{sp})**

This undescribed orchid species is restricted to Northland where it occurs along lowland sunny track sides and ridge tops. It is known from one site in Tangihua ED: William Upton Hewett Memorial Reserve (P06/095), recorded in 1998 (SSBI P06/H063).

***Colensoa physaloides* (Relict_{pd})**

Colensoa physaloides is a densely branched shrub with blue flowers and hydrangea-like foliage. It is endemic to Northland and some of the Hauraki Gulf islands. It is found in coastal and lowland forest, often along stream sides, tracks, and on talus slopes. In Tangihua ED, it is known from Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1984-85, SSBI P06/H043). This is a highly palatable plant species which is sensitive to browse by possums and goats; however, it remains abundant on islands free of browsing mammals.

***Pellaea falcata* (Relict_{dp, so})**

This small, dark green fern is primarily a species of northern offshore islands, but also occurs infrequently in Northland, Auckland and Coromandel. It is usually found in small patches growing on banks, under light bush and open forest, and on cliff faces. There are two records of *Pellaea falcata* in Tangihua ED, both of which are from the same locality: Houto Cone Forest (P07/034) (recorded in 1997, SSBI P07/H015) and AK 233974 (recorded in 1997, growing amongst grass and over rocks in open karaka-taraire-kohekohe-puriri forest).

***Plectranthus parviflorus* (Coloniser_{so})**

This perennial herb is confined to the North Island, and is known locally from Tangihua and Mimiwhangata in Northland. It mainly occurs on base rich rocks in regenerating or early successional forest (NZPCN 2009). *Plectranthus parviflorus* has been recorded once in Tangihua ED (1984, AK 168181).

Data Deficient

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

This spider orchid occurs in the North Island probably from Taranaki north, on mossy rock banks close to water level or in year-round seepage on mud-flows in indigenous forest (NZPCN 2009). Within Tangihua ED, the species has been recorded at Mangakahia Forest and Te Tarahiorahiri

(P06/001) (recorded in 1984-85, SSBI P06/H043) and the Waihoa Ecological Area within Tangihua Forest (Q07/111) in 1985 (Willets 1985).

3.3.6 Regionally significant plant species

Regionally significant plant species are not nationally threatened or uncommon, but are uncommon within Tangihua ED and/or Northland. Species classified as regionally significant are determined by DOC Northland Conservancy (DOC, in prep.; W. Holland, DOC, pers. comm.).

Asplenium gracillimum

This species is usually found in lowland forest where it can be common in the ground tier, especially in high rainfall areas (NZPCN 2009). In Northland, however, it is uncommon and has only been recorded from Maungaru Trig Forest (P07/038) in 2000 (SSBI P07/H023) and Purua Scenic Reserve (Q06/180) in 2004 (SSBI Q06/H066).

Astelia fragrans

This species is found throughout the country in coastal and lower mountain forests. However, it has been recorded only once from Tangihua ED, on the main ridge of Tangihua Forest (Q07/111) in 1984 (AK 168171).

Astelia grandis

Astelia grandis is a robust, tufted plant with stiffly arching leaves, and occurs from Northland to south Westland (Johnson 1998). It is uncommon in Northland and was recorded from Taikirau Swamp in 2006 (M. Young & L. Forester pers. comm.).

Astelia nervosa

This is a distinctive species of *Astelia* which is found throughout New Zealand in mountain to subalpine forest and tussock grassland. It is restricted to high altitude habitats in Northland (W. Holland, DOC, pers. comm.) and has only been recorded once in Tangihua ED, in Tangihua Forest (Q07/111) in 1985 (AK 174515).

Azolla filiculoides

This aquatic, floating fern occurs on Raoul Island, North Island and South Island, and is widespread throughout the Pacific extending into Asia and India. This fern is most common in shallow eutrophic water bodies, but it can also establish in more acidic wetland systems, where it is often a conspicuous plant of the lagg zone (NZPCN 2009). In Tangihua ED, *Azolla filiculoides* has been recorded from Taikirau Swamp (P06/074) in 1985 (SSBI P06/H014) and Taikirau Railway Wetland (P06/087) in 1995 (recorded during this PNAP survey).

Blechnum fluviatile

This easily recognised fern is found in the North Island, South Island, Stewart Island and Chatham Islands, where it is common in damp lowland to montane forest, usually in shaded areas, often beside streams. It is

uncommon in Northland. Within Tangihua ED it is recorded only from Hikurangi Forest and Tokawhero Forest (P06/003) in 1997 (SSBI P06/H050) and Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043), Boulder Bed Stream Bush (Q06/004) in 1995 (SSBI Q06/R06/H127), and from the Waihoa Ecological Area in Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

Carex forsteri

This sedge is endemic to the North Island and South Island, but is not common north of Auckland. It is usually found in dense forest in high rainfall areas where it grows in wet seepages, depressions and along stream banks (NZPCN 2009). In Tangihua ED, it is known only from Purua Scenic Reserve (Q06/180) (recorded in 2004, AK 291120).

Carex maorica

This is a light green to yellow-green tufted sedge that is found in coastal to lowland wetlands, under willows in gully systems, along river and stream banks, on lake margins, and in clearings within forest (NZPCN 2009). This sedge is widespread but uncommon in Northland (W. Holland, DOC, pers. comm.). In Tangihua ED, it is known from Taikirau Swamp (P06/074) recorded in 1985 (SSBI P06/H014) and Puketurua Bush (P06/094) (recorded in 2007, SSBI P06/H058).

***Carex secta* Pukio**

This tussock-forming sedge is found throughout New Zealand, commonly occurring in coastal to montane wetlands. Due to the significant loss of wetlands throughout Northland, pukio is now regarded as being regionally significant. Pukio has been previously recorded from swamp margins in Tangitaroria (recorded in 1961, AK 155552), and more recently in Taikirau Swamp (P06/074) (recorded in 1985, SSBI P06/H014), in 2006 (M. Young & L. Forester pers. comm.), Flaxmill and Awakino Swamps (P07/001) (recorded in 2006, SSBI P07/H040), and Puketurua Bush (P06/094) (recorded in 2007, SSBI P06/H058).

Collosporum microspermum

A specialised epiphyte with narrow leaves that are dark-brown at the base. It is restricted to the North Island, and is known from four sites in Tangihua ED: Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1984-85, SSBI P06/H043), Maungaru Trig Forest (P07/038) (recorded in 2000, SSBI P07/H023), Mamaranui Scenic Reserve (P07/041) (recorded in 2003, SSBI P07/H027), Maungaru Trig Forest (P07/038) (recorded in 2000 SSBI P07/H023) and Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

Coprosma crassifolia

Coprosma crassifolia is a shrub to small tree up to 4 m tall with stiff, widely spreading branchlets. It is common throughout most of the North Island and South Island, in coastal to lower mountain forests and shrubland, however, in Northland *Coprosma crassifolia* is uncommon. It has been recorded at several sites in Tangihua ED, including Mamaranui

Scenic Reserve (P07/041) in 2003 (SSBI P07/H027), Purua Scenic Reserve (Q06/180) in 1999 (AK 292412), and along a riverine corridor on the Wairua River (L. Forester pers. comm.).

Coprosma rigida

This is an erect, small-leaved, divaricating shrub found throughout both the North Island and South Island, although it is relatively uncommon in Northland. In Tangihua ED, it has been recorded from nine sites.

Coprosma rotundifolia

Coprosma rotundifolia is a shrub with roundish, softly hairy leaves that occupies forests and shrublands on hill slopes and alluvial flats. It is uncommon in Northland due to habitat loss. In Tangihua ED, it has been recorded from nine sites.

Coprosma tenuicaulis

Coprosma tenuicaulis, or swamp coprosma, is a shrub up to 3 m tall with spreading branchlets, occurring in lowland swamp forest and shrubland. Due to habitat loss this species is regarded as being regionally significant. Within the Tangihua ED it is known from 16 sites.

Corokia cotoneaster

This is a variable shrub up to 3 m tall with stiffly zig-zagging branchlets and leathery, spoon-shaped leaves. It is found in lowland and montane shrubland. In Northland *Corokia cotoneaster* is widespread but uncommon. In Tangihua ED, the species is known only from the northern area of North Houto Forest (P07/036) (recorded in 1984, AK 167998).

***Cyathea cunninghamii* Gully tree fern**

This is a very tall, narrow-trunked (when mature) tree fern similar to mamaku (*Cyathea medullaris*) but with thinner stipes and shorter fronds that curl upwards slightly towards the ends. It is usually seen as scattered individuals throughout the North, South and Chatham Islands, and is uncommon in Northland. Within Tangihua ED, gully tree fern was recorded from Matawaia Bush (P06/082) in 1993 (SSBI P06/H019), Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043) and North Houto Forest (P07/036) in 1985 (SSBI P07/H009).

Dicksonia lanata* var. *hispida

This is a diminutive tree fern that is endemic to the northern North Island. It has a very local distribution, largely confined to kauri forest. In Tangihua ED, it was recorded from William Upton Hewett Memorial Reserve (P06/095) (recorded in 1998, SSBI P06/H063), the Waihoa Ecological Area within Tangihua Forest (Q07/111) in 1985 (Willets 1985) and Huehue Forest and Maungakawakawa Forest (P06/013) in 1988 (SSBI H023*1).

Dracophyllum sinclairii

Dracophyllum sinclairii is a shrub reaching 3 m tall, which occurs along forest margins and shrubland throughout the northern half of the North Island. In Tangihua ED, there are three records from Tangihua Forest (Q07/111) (AK 167603 in 1984, Waihoa Ecological Area; AK 170908 in 1985; and AK 200563 in and 1991).

***Dracophyllum traversii* Mountain neinei**

Mountain neinei is a distinctive tree up to 10 m tall with a disjunct distribution. It occurs in montane to subalpine forest and shrubland throughout the northern half of the South Island and in the northern half of the North Island (including Great Barrier Island), where it occupies lowland to montane forest. In Northland, mountain neinei is found on rocky high points in wet upland forest (L. Forester pers. comm.). In Tangihua ED it has been recorded from North Houto Forest (P07/036) in 1984-85 (SSBI P07/H009), Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1990 (SSBI P06/H043) and Tangihua Forest (Q07/111) in 1991 (AK 200572).

Epilobium nerteroides

This herb is found throughout the North Island, South Island and Stewart Island, and also the main Chatham Island and Pitt Island. It occupies mossy banks or rocks along rivers and streams (NZPCN 2009). There are two records of *Epilobium nerteroides* in Tangihua ED: Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1984-85, SSBI P06/H043) and the Waihoa Ecological Area within Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

Epilobium nummulariifolium

This willowherb occurs throughout the North Island, the eastern half of South Island, and the Chatham Islands, favouring well-lit eroding banks and waste places (NZPCN 2009). There is only one record of *Epilobium nummulariifolium* in Tangihua ED, in North Houto Forest (P07/036) recorded in 1985 (AK 168560).

Epilobium pubens

This slender perennial willowherb mainly occurs in the coastal, lowland, and lower montane zones, where it favours dry situations on rock outcrops, cliff faces, clay banks or similar semi-shaded to sunny habitats (NZPCN 2009). Within this Ecological District, it has been recorded once in Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1984-85 (SSBI P06/H043).

***Fuchsia excorticata* Kotukutuku**

The largest member of the *Fuchsia* genus, kotukutuku is found commonly throughout much of New Zealand as far south as the Auckland Islands, but is uncommon in Northland. It grows from sea level up to about 1,000 m asl, particularly alongside creeks and rivers. The species is highly palatable to browsing mammals. In Tangihua ED, kotutukutu is known from the

Waihoa Ecological Area within Tangihua Forest (Q07/111) (Willetts 1985), Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1990, SSBI P06/H043), Worsp Road Bush (P06/092) (recorded in 2007, L. Forester pers. comm.), Maungaru Trig Forest (P07/038) (recorded in 2000, SSBI P07/H023), Ruatoro Bush (P06/068) (Wildland Consultants 2004), and Twin Bridges Riparian Forest (P06/050) (recorded in 2009 by Wildland Consultants during this PNAP survey).

Fuchsia perscandens

This sparingly-branched, climbing species is found from Northland to Southland, although it is often uncommon over large parts of its range (NZPCN 2009) and is very rare within Northland. In Tangihua ED, it was recorded in Mangaroa Stream Riverine Forest and Gumland (P06/059) in 1994 (SSBI P06/H066) and William Upton Hewett Memorial Reserve (P06/095) in 1998 (SSBI P06/H063), the latter of which is the northernmost record for the species.

***Geranium solanderi* “coarse hairs”**

This form of *Geranium solanderi* is restricted to the North Island and the Three Kings Islands. It is characterised by small pale flowers and densely hairy leaves (Gardner 1984). In Tangihua ED, it has been recorded from Mamaranui Farm Settlement Scenic Reserve (P07/041) (recorded in 2003, SSBI P07/H027), Purua Scenic Reserve (Q06/180) in 2004 (SSBI Q06/H066) and Huehue Forest and Maungakawakawa Forest (P06/013) in 2005 (W. Holland, DOC, pers. comm.).

Gonocarpus micranthus

A slender herb up to 10 cm tall, found in boggy and peaty places throughout the North Island, South Island and Stewart Island (Allan 1982). It was recorded once in Tangihua ED, just beyond the western boundary of William Upton Hewett Memorial Reserve (P06/095), adjacent to Wright Road (Wildland Consultants 2009).

***Grammitis billardierei* Common strap fern**

This strap fern has erect to short-creeping rhizomes and hairy, indistinct stipes. It is found throughout New Zealand as a low epiphyte, on rocks or occasionally on the ground, in lowland forest to subalpine shrubland (Brownsey & Smith-Dodsworth 1989). There are four records of *Grammitis billardierei* from Tangihua ED, three of which are from Tangihua Forest (Q07/111) (recorded in 1984, AK170910 and AK 218874; and 1991, AK 200570) and one from Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1984-85 (SSBI P06/H043).

Grammitis pseudociliata

This strap fern is similar to *Grammitis billardierei*, although its stipes and fronds are abundantly hairy. It is epiphytic in montane forest throughout both the North Island and South Island, but is common only in Northland, where it is confined to western areas. There are three records of *Grammitis pseudociliata* in Tangihua ED, two of which are

from Tangihua Forest (Q07/111) (recorded in 1984, AK 168168; and 1991, AK 200569) and one from Hikurangi Forest and Tokawhero Forest (P06/003) (recorded in 1997, SSBI P06/H050).

Hebe flavida

This shrub is endemic to the North Island, ranging from from near Kaitaia south to Maunganui Bluff in the west, but its exact eastern distribution is as yet unclear (NZPCN 2009). It is mostly known from upland areas in the west, including cloud forest. It has been recorded from only one site in Tangihua ED: Maungaru Trig Forest (P07/038) (recorded in 2000, SSBI P07/H023).

Hebe ligustrifolia

This is a small shrub up to 1 m tall with yellowish green leaves. It occurs in open shrubland and forest margins from North Cape to Whangarei. There are only two records of the species in Tangihua ED, on Houto Cone Forest (P07/034) (recorded in 1997, AK 233972) and (SSBI P07/H015) and Tangihua Forest (Q07/111) in 1991 (Cameron 1992).

Helichrysum lanceolatum

Helichrysum lanceolatum is an endemic shrubby daisy species widespread in New Zealand. It is often found at disturbed sites such as road cuttings, track margins, and river banks (NZPCN 2009). In Tangihua ED, it has only been recorded from Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043).

Hoheria angustifolia

This small-leaved species of lacebark is found in lowland and montane forests in the North Island and South Island, although it is very uncommon in Northland. In Tangihua ED, it is only known from William Upton Hewett Memorial Reserve (P06/095) (recorded in 1998, SSBI P06/H063), which is the northernmost record for this species.

Hymenophyllum cupressiforme

This filmy fern has long-creeping, very thin rhizomes, and is usually found in lowland to montane regions, but is uncommon in Northland (Brownsey & Smith-Dodsworth 1989). It has been recorded once in Tangihua ED from along the Wairua River in 1994 (AK 214238), where it was observed on basalt blocks under dense kahikatea-matai forest.

Hymenophyllum lyallii

This filmy fern species is distinguished by its fan-shaped lamina, and is usually epiphytic on tree fern trunks, at the base of other trunks or in moss on rocks outcrops in forest. It is found scattered throughout the North Island, South Island and Stewart Islands (Brownsey & Smith-Dodsworth 1989) but is uncommon in Northland. Within Tangihua ED, it has been recorded at two localities: Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1984-85 (SSBI P06/H043) and in dense towai forest on Mt Hikurangi (P06/003) in 1997 (SSBI P06/H050).

Hypolepis lactea

This fern is endemic to the North Island, South Island and Chatham Islands, but is uncommon north of Auckland. It favours peat or swampy soils in open places or under light shade (Brownsey & Smith-Dodsworth 1989). Within Tangihua ED, it has been recorded from Tangihua Forest (Q07/111) in 1984 (AK 274447) and North Houto Forest (P07/036) in 1985 (SSBI P07/H009).

Hypolepis rufobarbata

Hypolepis rufobarbata can be recognised by its reddish purple stipes and midribs and its sticky fronds. It is rare in Northland, with only two records in Tangihua ED, both of which are from Tangihua Forest (Q07/111) in 1985 (AK 174514 and AK 174553).

Ileostylus micranthus

Ileostylus micranthus is a mistletoe with yellow-green flowers that is found throughout New Zealand and on Norfolk Island (Poole & Adams 1990). In Northland, this species is uncommon despite having once been widespread. In Tangihua ED, it has been recorded from Huehue Stream Riparian Forest and Wetland (P06/017) (during a survey in 1994), Pipiwai Stream Riverine Forest Remnants (P06/062) (recorded during a survey in 1994), and Moore Road near Pipiwai in 1995 (AK 223958) and 2006 (L. Forester pers. comm.).

***Ixerba brexioides* Tawari**

This is a small tree up to c.10 m tall and is confined to the northern North Island, where it is an associate of kauri forest and montane cloud forest (NZPCN 2009). Tawari was recorded from Tangihua Forest (Q07/111) in 1985 (Willets 1985) and North Houto Forest (P07/036) recorded in 2000 (SSBI P07/H009).

Libertia grandiflora

This species of iris is endemic to the North Island, where it occurs in coastal to montane areas, usually in open, lowland forest remnants, forest margins, on steep slopes, ridgelines, bluffs, cliffs, stream banks, and river terraces (NZPCN 2009). In Tangihua ED, it has been recorded from Tangihua Forest in 1985 (Willets 1985). There is an unconfirmed 2003 record of *Libertia grandiflora* from Mamaranui Farm Settlement Scenic Reserve (P07/041) (SSBI P07/H027).

Luzula picta* var. *picta

This indigenous rush occupies lowland to montane seepages, damp forest margins, stream banks, and slips and is uncommon in Northland. It was recorded in Tangihua ED at William Upton Hewett Memorial Reserve (P06/095) in 1998 (SSBI P06/H063) and in 1999 (AK 292343).

***Metrosideros carminea* Carmine rata**

This is a rata vine which produces carmine flowers in late winter/early spring. It is threatened by possum browse and is uncommon in Northland.

In Tangihua ED, it is known from several sites: Hikurangi Forest and Tokawhero Forest (P06/003) (recorded in 1997, SSBI P06/H050), Houto Cone Forest (P07/034) (recorded in 1999, SSBI P07/H075), North Houto Forest (P07/036) (recorded in 1985, SSBI P07/H009), Maungaru Trig Forest (P07/038) (recorded in 2000, SSBI P07/H023) and the Tangihua Forest (Q07/111) (recorded in 1992, AK 200573).

***Metrosideros robusta* Northern rata**

Northern rata is endemic to New Zealand, where it occurs in coastal and lowland forest, occasionally extending to montane forest in some parts of the country. Possum browse has resulted in its decline in many parts of the country. Northern rata has been recorded from several sites within Tangihua ED.

Myriophyllum triphyllum

This aquatic herb is found throughout New Zealand. It roots on the bottom of lowland to montane lakes, rivers, and streams, often in sand or gravel substrates. It has been recorded once in Tangihua ED at North Houto Forest (P07/036) in 1898 (AK 101307).

Myrsine divaricata

Myrsine divaricata is a divaricating shrub with a weeping habit, and is uncommon in Northland. In Tangihua ED, it has been recorded from William Upton Hewett Memorial Reserve (P06/095) in 1998 (SSBI P06/H063).

***Myrsine salicina* Toro**

Toro occurs in coastal to lower mountain forest throughout the North Island and in the north-west of the South Island. In Northland toro is associated with regenerating forest where it has a local distribution, with populations often considerable distances apart (L. Forester pers. comm.). The species has been recorded at five sites in Tangihua ED: Mangaraupo Stream Bush (P06/032) (recorded during a survey in 1994), Tokawhero Forest and Hikurangi Forest (P06/003) (recorded in 1997, SSBI P06/050), Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1997-2004, SSBI P06/H043), William Upton Hewett Memorial Reserve (P06/095) (recorded in 1998, SSBI P06/H063) and Tangowahine Valley Road Remnants (P07/002) (recorded in 2003-04, Wildland Consultants 2004).

***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 Tangihua ED, it is known from Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1984-85, SSBI P06/H043), Pīpīwai Stream Riverine Forest Remnants (P06/062) (recorded during a survey in 1994) and Maungaru Trig Forest (P07/038) (recorded in 2000, SSBI P07/H023).

Olearia albida

Olearia albida is a small tree found in coastal forest from the Bay of Plenty northwards. It was recorded from four sites in Tangihua ED: Tangihua Forest (Q07/111) (recorded in 1985 by Willetts), North Houto Forest (P07/036) (recorded in 1984-85, SSBI P07/H009), Houto Cone Forest (P07/034) (recorded in 1997, SSBI P07/H015) and Mamaranui Farm Settlement Scenic Reserve (P07/041) (recorded in 2003, SSBI P07/H027).

Passiflora tetrandra

This endemic liane grows to c.10 m tall and climbs by means of tendrils which are modified branches rising from leaf axils. It occurs in lowland forest in the North and South Islands. *Passiflora tetrandra* was recorded from six sites in Tangihua ED: Massey Road Remnant (P07/013) in 1994 (recorded during this PNAP survey), Taraire Reserve (P07/054) in 1998 (recorded during this PNAP survey), Houto Cone Forest (P07/034) in 1997 (SSBI P07/H015), North Houto Forest (P07/036) in 1985 (SSBI P07/H009), Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043), Huehue Forest and Maungakawaka Forest (P06/013) in 2005 (W. Holland, DOC, pers. comm.) and Puketurua Bush (P06/094) in 2007 (SSBI P06/H058).

***Pennantia corymbosa* Kaikomako**

Kaikomako is widespread throughout lowland New Zealand but is uncommon in Northland due to habitat loss. This small, slender tree has a divaricating juvenile stage and grows up to 10 m tall. It is known from several sites in Tangihua ED, including: Tangihua Forest (Q07/111) (recorded in 1985 by Willetts), Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1990, SSBI P06/H043), William Upton Hewett Memorial Reserve (P06/095) (recorded in 1998, SSBI P06/H063), Huehue Forest and Maungakawaka Forest (P06/013) (recorded in 2005, W. Holland, DOC, pers. comm.), Purua Scenic Reserve (Q06/180) (recorded in 2004, SSBI Q06/H066) and Puketurua Bush (P06/094) (recorded in 2007, SSBI P06/H058).

***Phormium cookianum* subsp. *bookeri* Wharariki**

Sometimes known as mountain flax, wharariki is smaller than harakeke (*Phormium tenax*) and is characterised by drooping leaves and flower stalks. It is naturally uncommon in Northland, where it is usually found at higher altitudes. In Tangihua ED, wharariki has been recorded in North Houto Forest (P07/036) in 1985 (SSBI P07/H009) and in the Waihoa Ecological Area within Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

***Plagianthus regius* Manatu**

Also known as ribbonwood, this tall tree is found on fertile soils in lowland forest throughout the country. It has become less common due to a significant reduction in riverine floodplain forest. This species was recorded from five sites in Tangihua ED.

Potamogeton suboblongus

This floating pondweed is endemic to New Zealand, occurring in swamps and still pools in the North Island, South Island, and Stewart Islands (Healy & Edgar 1980). It was recorded only from one site in Tangihua ED: Flaxmill and Awakino Swamps (P07/001) in 2006 (SSBI P07/H040).

Lobelia angulata

This is a small, creeping herb with white flowers and purplish-red berries that grows in lowland to subalpine damp places throughout New Zealand, but is uncommon in Northland. In Tangihua ED, it is known from Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 1984-85, SSBI P06/H043), the Waihoa Ecological Area within Tangihua Forest (Q07/111) (Willetts 1985) and Huehue Forest and Maungakawakawa Forest (P06/013) (recorded in 1988 (SSBI P06/H023).

***Pseudowintera axillaris* Horopito**

Horopito is a small tree which is uncommon in Northland where it is usually restricted to higher altitudes. In Tangihua ED, it has been recorded in Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1990 (SSBI P06/H043) and in the Tangihua Forest (Q07/111) in 1984 (AK 168152) and 1985 (SSBI Q07/R07/H020).

***Phyllocladus toatoa* Toatoa**

Toatoa is a small tree (c.15 m tall) which grows from Northland down to the central North Island. It grows at higher altitudes than tanehaka (Dawson & Lucas 2000) and is uncommon in Northland. It has been recorded once in Tangihua ED from William Upton Hewett Memorial Reserve (P06/095) (SSBI P06/H063) in 1998.

Raukaua anomalus

Raukaua anomalus is a shrub with zig-zagging, interlacing branchlets that is endemic to New Zealand, found in lowland to montane forests. It is very uncommon in Northland, and in the Tangihua ED it is known from Mangakahia Forest and Te Tarahiorahiri (P06/001) where it was recorded in 1990 (SSBI P06/H043), and Puketurua Bush (P06/094) (recorded in 2008, L. Forester & M. Young pers. comm.) and Huehue Forest and Maungakawakawa Forest (P06/013) (recorded in 2005, W. Holland, DOC, pers.comm.).

***Raukaua edgerleyi* Raukawa**

Raukawa occurs throughout the country, and is found mostly in moist lowland forests, often on margins, where it often begins life as an epiphyte on tree fern trunks due to its palatability to ungulates and possums. The notable features of this species are its thin, very shiny and strongly aromatic leaves as well as its very distinctive juvenile leaves (Dawson & Lucas 2000). In Tangihua ED, raukawa is known from four sites: Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded most recently in 1990, SSBI P06/H043), Hikurangi Forest and Tokawhero

Forest (P06/003) (recorded in 1997, SSBI P06/H050), North Houto Forest (P07/036) (recorded in 1985, SSBI P07/H009) and Tangihua Forest (Q07/111) (Willetts 1985).

Rubus schmidelioides* subsp. *schmidelioides

Rubus schmidelioides is a prickly climber with rugose, coarsely toothed leaves (Poole & Adams 1994). It is found throughout the country in lowland forest, particularly on alluvial soils. It is uncommon in Northland and has been recorded twice in Tangihua ED: from Mangaroa Stream Riverine Forest and Gumland (P06/059) in 1994 and Puketuru Bush (P06/094) in 2007 (SSBI P06/H058).

Rubus squarrosus

Rubus squarrosus is a yellow-prickled, leafless, scrambling climber with a scattered distribution in Northland. It was recorded in Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1990 (SSBI P06/H043), Taikirau Swamp (P06/074) in 1985 (SSBI P06/H014) and in the Waihoa Ecological Area of Tangihua Forest (Q07/111) (Willetts 1985).

Schizaea bifida

This diminutive, forked comb fern occurs in lowland, gumland, heaths and pakihi on clay and pumice soils in the North Island and north-west and western South Island. It has a restricted distribution in Northland and was recorded in William Upton Hewett Memorial Reserve (P06/095) in 1998 (SSBI P06/H063).

***Stellaria parviflora* New Zealand chickweed**

This diminutive herb has been recorded from three locations in Tangihua ED: Purua Scenic Reserve (Q06/180) in 2004 (AK 291117), Maungaru Trig Forest (P07/038) in 2000 (SSBI P07/H023) and Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

Sticherus flabellatus

This distinctive, fan-shaped fern occurs in the North Island from Te Pahi to the Bay of Plenty and in the South Island from north-west Nelson to northern Westland (Metcalf 2003). It favours stream sides in mixed lowland and coastal forest and scrub, and also kauri forest in the north. In Tangihua ED, it was recorded from William Upton Hewett Memorial Reserve (P06/095) in 1998 (SSBI P06/H063).

***Syzygium maire* Maire tawake**

This tree is found throughout the North Island and the top of the South Island. Maire tawake predominantly grows in wetlands, but also tolerates reasonably dry situations. It is present in 11 sites throughout Tangihua ED.

Uncinia distans

This hooked sedge species occurs in both the North and South Island, and is often sparsely distributed throughout coastal to montane areas,

usually in forest. *Uncinia distans* has been found in North Houto Forest (P07/036) in 1998 (SSBI P07/H009).

***Urtica incisa* Scrub nettle**

This is a small nettle that is uncommon in Northland and has only been recorded at two sites in Tangihua ED: North Houto Forest (P07/036) in 1985 (SSBI P07/H009) and from within the Waihoa Ecological Area in Tangihua Forest (Q07/111) in 1985 (Willetts 1985).

Viola filicaulis

This herb is endemic to the North, South and Stewart Islands. Within Tangihua ED, it was recorded from Taikirau Swamp (P06/074) in 2006 (M. Young & L. Forester pers. comm.).

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

Threatened

***Linguella puberula* (Nationally Critical_{EF, sp})**

This is a very rare, endemic greenhood orchid that is scattered throughout the North Island, northern South Island, and Great Island in the Three Kings Islands. It is a slender orchid up to 200 mm tall, with a pale silvery-green stem and numerous rosette-shaped leaves (NZPCN 2009). There are three very early collections (1898 and 1918) of this species from Purua in Tangihua ED (AK 108480, AK 132435 and AK 247273). Habitat loss and degradation through weed invasion, natural regeneration of shrubland and gumland habitat to forest, and pig rooting are the main threats to this species.

***Plumatichilos tasmanicum* (Nationally Endangered_{EF, PD, SO})**

This delicate orchid is known from the Three Kings Islands, Northland, Waikato, Wellington and Nelson. It favours damp mossy areas and also drier more exposed sites along shrubland and forest margins. It sometimes occurs under gorse or manuka on clay hillsides (NZPCN 2009). *Plumatichilos tasmanicum* is threatened by a lack of fires (which it requires to maintain an open habitat) and competition from weeds such as gorse. The only records of this species from Tangihua ED (AK 108572 and AK 247272) are both over one hundred years old.

Regionally significant

Myosotis forsteri

Myosotis forsteri is a very variable species which can be difficult to distinguish from the much rarer *M. petiolata* var. *pansa* and *M. venosa* (NZPCN 2009). It favours waterways and shaded environments. It has been recorded only once in Tangihua ED in 1902, near Purua (AK 7494).

3.4 FAUNA

3.4.1 Overview of indigenous fauna

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

- Sites of Significant Biological Interest (SSBI) files held at the Northland Conservancy office, Department of Conservation.
- The Bioweb Herpetofauna database (DOC 2009).
- Atlas of Bird Distribution in NZ (OSNZ 2007).
- 'Uncommon and rare land snails in the Northland Region of New Zealand, and an assessment of conservation management priorities' (Brook 2002).
- The New Zealand Freshwater Fish Database (NIWA 2009a).
- Incidental field observations during this PNAP survey by the Department of Conservation and Wildland Consultants Ltd.
- Observations by Dr Ray Pierce between 1990 and 2006.
- Records from unpublished reports, including those by Wildland Consultants Ltd.

A comprehensive checklist and discussion of fauna, particularly invertebrates, is beyond the scope of the present study. The descriptions for each site provide details of any threatened fauna that have been recorded and they also provide some records of non-threatened species. There are very few records of reptiles and invertebrates, irrespective of their prevalence, and it is recognised that they are a significant facet of indigenous ecosystems which are often overlooked. Indigenous New Zealand invertebrates are our most abundant and taxonomically diverse fauna group, and perform a wide range of ecosystem functions. In addition to their consumption of live plant material, they are involved in pollination, breakdown of leaves, litter and logs, soil formation, general scavenging, parasitism and predation, as well comprising the most important food item for many birds and lizards, and most freshwater fish (Watt 1975). Today our endemic invertebrates continue to face a variety of pressures, including reduction of habitat, habitat modification, and increased predation and competition from introduced species (McGuinness 2001). Efforts to conserve threatened invertebrates in New Zealand, however, are too often hampered by lack of knowledge of basic biology, in some cases even of systematics, of the species affected (Cartellieri & Lövei 2000).

Seabirds formerly nested over large areas of mainland New Zealand, including on inland mountain ranges. The former extent of seabird colonies in Tangihua ED is not known, but many elevated areas such as Tangihua Forest, Te Tarahiorahiri, Motatau Forest, and the Maungaru Range possibly supported colonies. Seabirds play a critical role in nutrient cycling, raising fertility of soils through the deposition of guano and fish and other marine animal deposits, and creating soil turnover through burrow excavation. The extinction of colonies will have resulted in long-term effects on ecosystem function.

Despite losing many of its original wetlands to agriculture, Tangihua ED

still retains some of Northland's most significant wetland systems, which provide habitat for a range of indigenous birds. Common indigenous bird species associated with wetlands in Tangihua ED include, white-faced heron, pukeko, paradise shelduck, welcome swallow and NZ kingfisher. Larger, less-modified wetlands, and some of the smaller wetlands located near larger wetlands, support threatened species such as spotless crane, NI fernbird and Australasian bittern. Artificial water bodies can also provide important habitat for these species, particularly where indigenous riparian vegetation (e.g. raupo, shrubland) has become well-established. Constructed water bodies in Tangihua ED can provide habitat for other indigenous waterfowl such as, grey duck, grey teal, New Zealand shoveler, white-faced herons, and cormorants, notably the little shag. Winter flooding of low-lying pasture also provides temporary habitat for these and other waterbirds locally, notably the grey teal which disperses in large numbers to Northland in autumn and winter (R. Pierce pers. comm.). Indigenous birds of forests, shrublands, and/or grasslands, and which are common within Tangihua ED include tui, NI fantail, grey warbler, silvereye, welcome swallow, shining cuckoo, Australasian harrier, morepork, NZ kingfisher, paradise shelduck, pukeko and spur-winged plover.

Terrestrial reptiles recorded from Tangihua ED in the last 45 years include copper skink, ornate skink, forest gecko, Pacific gecko and Auckland green gecko. There are no recent records of endemic frog species in Tangihua ED, and past and recent searches for Hochstetter's frogs in Tangihua Forest (Q07/111) found no sign of the species (Peter Anderson, Tony Beauchamp, DOC, pers. comm.), however, it is possible that Hochstetter's frog occurs in Tangihua ED given that there are numerous records of the species from nearby Waipu ED, particularly in the Brynderwyn Hills and Mareretu Forest (DOC Bioweb 2009).

Ten species of indigenous freshwater fish, and two introduced species, have been recorded from Tangihua ED. With the exception of shortjaw kokopu and longfin eel, they are not threatened, although banded kokopu is considered to be regionally significant as there is a historic decline in this species nationally, due to habitat modification and loss, and there are few records within the Tangihua ED. The marine fish species grey mullet has been recorded in the middle reaches of the Mangakahia River (e.g. Twin Bridges, L. Forester pers. comm.).

Several species of threatened endemic land snail occur in Tangihua ED, and some of these have local distributions. The kauri snail is relatively widespread, being found in forest and shrubland habitats.

Records of invertebrates within Tangihua ED are few. No extensive invertebrate surveys have been undertaken, and most of the records are incidental observations made during ecological surveys, often without full identification. *Peripatus* sp. (Range Restricted) was found in the Mangakahia Forest and Te Tarahiorahiri (P06/001) in 1994 and in the Awakino and Flaxmill Swamps (P07/001) in 2006.

The conservation status for birds is derived from Miskelly *et al.* 2008, which uses the New Zealand threat classification system as set out by Townsend *et al.* 2008 (see Appendix 8.3). The conservation status for all other indigenous fauna species is derived from Hitchmough *et al.*

(2007), which uses the threat classification system of Molloy *et al.* (2002) (see Appendix 8.3). Species classified as 'regionally significant' are determined by DOC Northland Conservancy (DOC, in prep.; Wendy Holland pers. comm.). Nomenclature follows Miskelly *et al.* (2008) for threatened indigenous bird species and Hitchmough *et al.* (2007) for all other threatened indigenous fauna.

A checklist of fauna recorded in Tangihua Ecological District is presented in Appendix 8.7.

3.4.2 Threatened bird species

Tangihua ED has a moderate number of threatened bird species: five species are 'Threatened', and ten species are 'At Risk'.

Threatened

***Anas superciliosa superciliosa* Grey duck (Nationally Critical)**

Indigenous

Grey duck prefer small lakes and slow-flowing rivers surrounded by indigenous forest rather than farmland, and as such they have not adapted to the agricultural landscape (Heather & Robertson 1996). Sites with recent records are relatively few: Awarua Farm Trust Wetland (P06/118) (recorded in 2009, L. Forester pers. comm.), Te Whatianga Bush and Swamps (P06/066) (recorded in 1987, SSBI P06/H017), Mangaroa Stream Riverine Forest and Gumland (P06/059) (recorded in 1994, SSBI P06/H066), Taikirau Wetlands and Shrublands (P06/072) (recorded in 1987, SSBI P06/H010) and Kahuwera Stream Shrubland (P06/010) (recorded in 2003-04, Wildland Consultants 2004). Despite the limited records, grey duck are likely to be more widespread throughout Tangihua ED, particularly along the margins of major rivers such as the Wairoa and Mangakahia Rivers.

***Botaurus poiciloptilus* Australasian bittern (Nationally Endangered_{sp, TO})**

Indigenous

Australasian bittern mainly inhabit freshwater wetlands with tall, dense stands of raupo and reeds (Heather & Robertson 1996). Within Tangihua ED, Australasian bittern have been recorded at Huehue Stream Riparian Forest and Wetland (P06/017) (recorded in 1978, SSBI P06/H027), Te Whatianga Bush and Swamps (P06/066) (recorded in 1987, SSBI P06/H017), Taikirau Wetlands and Shrublands (P06/072) (recorded in 1987, SSBI P06/H010; recorded in 2006, L. Forester & M. Young pers. comm.), Taikirau Swamp (P06/074) (recorded in 1978, SSBI P06/H014) and Flaxmill and Awakino Swamps (P07/001) (recorded in 2006, SSBI P07/H040). The wetland network in the Motatau area is particularly important for bittern in Northland and New Zealand. The species is also present along the Wairoa and Mangakahia River edges (R. Pierce pers. comm.).

***Nestor meridionalis septentrionalis* North Island kaka (Nationally Vulnerable_{CD, PD, RF})**

Endemic

North Island kaka are resident on larger offshore islands off the eastern coast of Northland and Auckland, and birds often wander to mainland areas (Heather & Robertson 1996). In recent years they have become increasingly common and 'resident' in the Whangarei Heads area, particularly Bream Head (R. Pierce pers. comm.). North Island kaka were observed in Kotaretahe Bush and Ngarurunui Shrublands (P06/065) in 1978 (R. Pierce pers. comm.) and in Tangihua Forest (Q07/111) in 1982 (SSBI Q07/R07/H020). There are more recent records of NI kaka from Riponui Reserve in 1997-98 and Aponga Scenic Reserve in 1999 (P. Graham, DOC, pers. comm.).

***Apteryx mantelli* North Island brown kiwi (Nationally Vulnerable_{CD, PD, RF})**

Endemic

North Island brown kiwi originally occurred throughout Northland, including on the Aupouri Peninsula. In the 1970s, they were found throughout most forest and shrubland areas from the Brynderwyn Range to Awanui (Bull *et al.* 1985). However, by the early 1990s, kiwi had all but disappeared from the Brynderwyn, Mareretu, and Tangihua Ranges and most other forest remnants south of a line between Whangarei and Dargaville (Pierce *et al.* 2006). There are currently about six main geographical groupings of kiwi in Northland, and within each there are several local concentrations or clusters. The 'South Central' grouping occurs in Tangihua ED, with clusters in the Purua-Marlow-Motatau and Pipiwai areas (Pierce *et al.* 2006). Kiwi have been recorded from c.30 sites throughout Tangihua ED, although many of these records are over 30 years old. In sites that are being effectively managed for kiwi, call count responses indicate most sub-populations are holding their own (Pierce 2008).

***Larus novaehollandiae scopulinus* Red-billed gull (Nationally Vulnerable)**

A highly gregarious species that is widespread and locally common in New Zealand. A reduction in winter food supplies of offal and sewage discharged into the sea is likely to have impacted upon red-billed gull numbers (Heather & Robertson 1996). Red-billed gulls have been recorded at several locations in Tangihua ED (Robertson *et al.* 2007), mainly on the periphery of the District.

At Risk

***Bowdleria punctata vealeae* North Island fernbird (Declining_{RR, SI})**

Endemic

NI fernbird have been frequently recorded in freshwater wetlands and shrubland throughout Tangihua ED, with the most recent sightings in early January-February 2009 at Horahora Road Gumland (P06/041) (Wildland Consultants) and Awarua Trust Swamp (P06/118) (L. Forester pers. comm.).

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

Endemic

In Northland, red-crowned kakariki are mainly found in heavy forest in the west and bush patches along the eastern coast. This species is particularly susceptible to predators such as stoats, cats and ship rats because they often feed on the ground and nest in hole close to the ground (Heather & Robertson 1996). In Tangihua ED, red-crowned kakariki have been recorded on two occasions in 1991-92 (R. Pierce pers. comm.), and an unidentified kakariki species was recorded from the Tangihua Forest (Q07/111) in 1991 (SSBI Q07/R07/H020).

***Porzana tabuensis plumbea* Spotless crane (Relict_{so})**

Indigenous

Spotless cranes inhabit raupo- and sedge-dominated swamps throughout the North Island, but are sparsely distributed in raupo swamps and reedbeds in the South Island and on Stewart Island (Heather & Robertson 1996). Spotless cranes have been recorded from 16 wetlands in Tangihua ED, with the most recent sighting in 2006 at the Flaxmill and Awakino Swamps (P07/001) (SSBI P07/H040). Tangihua ED still retains relatively large areas of wetlands, which will help sustain local crane populations.

***Eudynamis taitensis* Long-tailed cuckoo (Naturally Uncommon_{DP})**

Breeding endemic

There is one historical sighting of this species in Tangihua ED, which is from Hikurangi Forest and Tokawhero Forest (P06/003) (reported in 1978, SSBI P06/H050). Long-tailed cuckoo breed only in New Zealand, and in the North Island they parasitise primarily the nests of whiteheads (*Moboua albicilla*). Whiteheads are now absent from Northland, and therefore any Northland records are likely to be of birds migrating to their wintering grounds in the tropical Pacific (Heather & Robertson 1996). They typically pass north through Northland in February-early March (R. Pierce pers. comm.).

***Gallirallus philippensis assimilis* Banded rail (Naturally Uncommon_{DP})**

Indigenous

Although banded rails have a preference for areas of mangrove that grade into saltmarsh - they are widespread within Whangarei Harbour (Parrish 1984) - there have been three reported historical sightings of the species in freshwater wetlands in Tangihua ED: Flaxmill and Awakino Swamps (P07/001) (recorded in 1978, SSBI P07/H040), Huehue Stream Riparian Forest and Wetland (P06/017) (recorded in 1978, SSBI P06/H027) and Taikirau Swamp (P06/074) (unconfirmed sighting in 1978, SSBI P06/H014).

***Phalacrocorax carbo novaehollandiae* Black shag (Naturally Uncommon_{so, sp})**

Indigenous

Black shags are common visitors to wetlands and especially streams of Tangihua ED. They regularly use large riparian trees along the lower

Wairoa River for roosting from which they disperse into the surrounding countryside to fish in streams of varying sizes (R. Pierce pers. comm.), although they have been documented at only six sites in Tangihua ED. During this PNAP survey (1999), black shag was recorded from Mapuna Road Remnants (P07/044) and Pukupo Bush (P07/045) (recorded during the 1999 survey). Birds were previously recorded at Taikirau Swamp (P06/074) (recorded in 1978, SSBI P06/H014). One black shag was recorded at the Flaxmill and Awakino Swamps (P07/001) in 2009 during this survey.

Regionally significant

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

***Anas gracilis* Grey teal**

Indigenous

Grey teal are found on lowland lakes and estuaries throughout North Island and South Island (Heather & Robertson 1996). Within Tangihua ED, this species has been recorded at the Taikirau Railway Wetland (P06/087) during this PNAP survey in 1995. It also commonly occurs in flooded pasture in winter (R. Pierce pers. comm.).

***Anas rhynchotis variegata* New Zealand shoveler**

Indigenous

This species is found in wetlands throughout the country, although they are uncommon north of Waikato. In Tangihua ED, NZ shoveler was recorded at the Taikirau Wetland and Shrublands (P06/072) (recorded in 1987, SSBI P06/H010), Taikirau Swamp (P06/074) (recorded in 1978, SSBI P06/H014) and Taikirau Railway Wetland (P06/087) (recorded during the PNAP survey in 1995), although it is more common in the ED than the records indicate (R. Pierce pers. comm.).

***Hemiphaga novaeseelandiae* Kukupa**

Endemic

The survival and productivity of kukupa can be impacted by illegal hunting of birds, competition for fruit from possums, and the predation of eggs and chicks by introduced predators (Heather & Robertson 1996), while the increase in Australasian harrier numbers and habitat fragmentation also contributes to mortality (R. Pierce pers. comm.). This species is likely to be widespread and locally common throughout Tangihua ED where sufficient pest control is implemented. Studies in the Maungatapere area (Pierce & Graham 1995) and Mototau (Innes *et al.* 2004) indicate that kukupa can reside for most of the year in relatively small areas of diverse forest, but they can also disperse longer distances for late-summer-autumn fruiting of podocarps and other tree species, including exotic species, often in very small forest remnants. Kukupa have been recorded from c.40 sites throughout Tangihua ED, although these records greatly underestimates site use.

***Petroica macrocephala toitoi* North Island tomtit**

Endemic

North Island tomtit numbers declined throughout the North Island after lowland forest clearance and the introduction of predatory mammals, but the subspecies was able to adapt in many parts of the North Island and continued to live in forest remnants (Heather & Robertson 2000). Healthy populations occur in the larger forests of the Tangihua ED, e.g. Tangihua Forest (Q07/111) and Motatau Forest (P06/084).

3.4.3 Threatened mammal species

There are no confirmed records of either of New Zealand's endemic bat genera in Tangihua ED. The long-tailed bat (*Chalinolobus tuberculatus*, Nationally Vulnerable) has been recorded from four sites in Whangarei ED (Manning 2001), while the northern short-tailed bat (*Mystacina tuberculata aupaourica*, Nationally Endangered) is now only known from Omahuta, Warawara, Little Barrier Island, and most recently in Waipoua Forest (recorded in early 2009, M. Calder, DOC, pers.comm.). Both the long-tailed bats and short-tailed bats would have occurred in Tangihua ED before mammalian predators became abundant and major anthropogenic habitat loss occurred (Molloy 1995).

3.4.4 Threatened land snail species

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

Chronically Threatened

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

Endemic

This land snail is endemic to Auckland and Northland with a sporadic distribution resulting from extensive habitat destruction. The main threats to the species are predation by mammalian predators and loss or degradation of habitat, especially through browsing and trampling by livestock or land clearance (Brook 2002). Within Tangihua ED, this species has been recorded at two sites: Huehue Forest and Maungakawakawa Forest (P06/013) (recorded in 1987, SSBI P06/H023) and Tangihua Forest (Q07/111) (SSBI Q07/R07/H020).

***Amborhytida forsythi* (Gradual Decline)**

Endemic

This snail is endemic to Northland with a fragmented, relict distribution resulting from extensive habitat destruction caused by anthropogenic land clearance. It is found in indigenous forest and shrubland, generally on the ground in litter and under wood, stones, and ground-layer plants, but also arboreal in epiphytes and trapped litter. 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). *Amborhytida forsythi* has been recorded from six sites within Tangihua ED (Brook 2002).

***Paryphanta busbyi* Kauri snail (Gradual Decline)**

Endemic

The kauri snail is endemic to Northland and North Auckland with a fragmented distribution resulting from the extensive destruction of indigenous vegetation. Predation by pigs, rats, possums, and possibly hedgehogs, and continued loss of habitat are the main threats to the species (Brook 2002). Kauri snails have been recorded from 20 areas of forest or shrubland in Tangihua ED between 1978 and 2008.

At Risk

***Liarea bicarinata* (Range Restricted)**

This land snail is endemic to Northland, with a disjunct distribution in central and eastern Northland. Its preferred habitat comprises indigenous broadleaved forest and kauri-podocarp-broadleaved forest (Brook 2002). *Liarea bicarinata* was recorded at Puhitia Bush (P06/090) (recorded in 1987, SSBI P06/H052) and in Motatau Forest (P06/084) (recorded in 1992, SSBI P06/H054).

***Punctidae* sp. 161 (Range Restricted)**

Endemic

This species of land snail occurs in kauri-podocarp-broadleaved forests in western Northland (Brook 2002). In Tangihua ED, it has been recorded from the Hikurangi Forest and Tokawhero Forest (P06/003) (Brook 2002).

***Punctidae* sp. 159 (Range Restricted)**

Endemic

This land snail is endemic to southern Northland where it is found in kauri podocarp broadleaved forests (Brook 2002). In Tangihua ED, it has been recorded from the Mamaranui Farm Settlement Scenic Reserve (P07/041) and Tangihua Forest (Q07/111) (Brook 2002).

***Punctidae* sp. 225 (Range Restricted)**

Endemic

This species is endemic to central Northland and inhabits kauri-podocarp-broadleaved forests (Brook 2002). In Tangihua ED, it has been recorded from Mangaraupo Stream Bush (P06/032) and Pakotai Scenic Reserve (P07/014) (Brook 2002).

3.4.5 Threatened lizard species

Chronically Threatened

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

Endemic

This is an arboreal species, endemic to Auckland and Northland (north to approximately Hokianga). It is found in forest and shrubland, including kanuka/manuka shrubland. The only record of Auckland green gecko in Tangihua ED is from the William Upton Hewett Memorial Reserve (P06/095) in 1992 (SSBI P06/H063).

***Hoplodactylus pacificus* Pacific gecko (Gradual Decline)**

Endemic

The Pacific gecko occurs in the North Island and many outlying islands, but not in the Three Kings, Poor Knights or Mokohinua Island groups. In inland areas it favours forest and scrubland trees, creviced clay banks and rock bluffs, rock outcrops, and associated scrubby vegetation including flax (DOC Bioweb 2009). There was an unconfirmed sighting of the species in the Pipiwai Stream Old Growth Remnant (P06/061) during this PNAP survey in 1994.

***Cyclodina ornata* Ornate skink (Gradual Decline)**

Endemic

This species of skink is widespread throughout the North Island and on many outlying islands. It inhabits forest or open areas with deep leaf litter, or stable cover such as deep rock piles (DOC Bioweb 2009). Ornate skink was recorded from the Rarewarewa Scenic Reserve (Q06/179) in 2001 (DOC Bioweb 2009).

3.4.6 Threatened fish species

Chronically Threatened

***Anguilla dieffenbachii* Longfin eel (Gradual Decline)**

Indigenous

This species has been recorded from many rivers and streams throughout Tangihua ED (NIWA 2009a). Longfin eels are found throughout New Zealand, but are threatened by over-harvesting (especially of large females) and habitat modification.

At Risk

***Galaxias postvectis* Shortjaw kokopu (Sparse)**

Endemic

This species is very uncommon in Tangihua ED and throughout Northland, with one record from the Pikiwahine Stream in the Tangihua Range (Q07/111) in 2005 (SSBI Q07/R07/H020). Shortjaw kokopu are usually found in small streams flowing through unmodified indigenous forest, and extensive forest clearance is likely to have contributed to its current rarity throughout New Zealand (McDowall 1990).

***Geotria australis* Lamprey (Sparse)**

Indigenous

The lamprey is one of the most widely distributed freshwater fishes in the world. In New Zealand it may be present in rivers and streams in most coastal areas, although its distribution is very sparse in Northland (McDowall 1990). In Tangihua ED, there are several records of lamprey from the Mangakahia River and one from the Waiharakeke Stream (NIWA 2009a).

Regionally significant

***Galaxias brevipinnis* Koaro**

Endemic

Koaro is a very elongate, slender fish which is found in rapidly flowing, tumbling, rocky streams in indigenous forest. Although widespread throughout much of New Zealand, records of koaro in Northland are few (McDowall 1990). It has twice been recorded in the Awakino Stream within Tangihua ED (NIWA 2009a).

***Galaxias fasciatus* Banded kokopu**

Endemic

The banded kokopu is still common in many parts of New Zealand, although records from Tangihua ED are few. There are extensive areas of the country where this species is absent, although, apart from the lack of forest cover, there is no obvious reason why (McDowall 1990). Banded kokopu was recorded in the southern part of Tangihua Forest (Q07/111) in 2005 (SSBI Q07/R07/H020), and is known from the Mangakahia River and the Pikiwahine Stream within Tangihua ED (NIWA 2009a).

3.4.7 Threatened freshwater invertebrate species

Chronically Threatened

***Hyridella menziesii* Freshwater mussel (Gradual Decline)**

Endemic

The freshwater mussel is found in freshwater lakes, streams and rivers throughout New Zealand, and is always coated with a thick, greenish-brown horny epidermis (Te Ara 2009b). This species was recorded from a covenanted property within Mangaroa Stream Riverine Forest and Gumland (P06/059) (SSBI P06/H066).

***Paranephrops planifrons* Koura (Gradual Decline)**

Endemic

This species of freshwater crayfish occurs in streams, lakes, ponds, and swamps in the North Island and in the north-west of the South Island (Te Ara 2009c). Koura populations are decreasing in some areas as they are subject to habitat modification and the effects of agricultural intensification. Koura has been recorded from streams and tributaries near to several sites, and specifically from the southern part of Tangihua Forest (Q07/111) in 2005 (SSBI Q07/R07/H020), Mangakahia Forest and Te Tarahiorahiri (P06/001) in 2004 (SSBI P06/H043), Mangaroa Stream Riverine Forest and Gumland (P06/059) in 1994 (SSBI P06/H066) and Te Opou Stream Forest (P06/004) in 2001 (NIWA 2009a).

3.4.8 Other threatened terrestrial invertebrate species

At Risk

Peripatus sp. (Range Restricted)

Indigenous

This primitive velvet worm typically lives in damp forest, under or inside rotting logs, or in the undergrowth, where it feeds on other invertebrates such as spiders, weta, and beetles (Te Ara 2009d). *Peripatus* sp. has been recorded from three sites in Tangihua ED: Mangakahia Forest and Te Tarahiorahiri (P06/001) (recorded in 2004, SSBI P06/H043), Huehue Forest and Maungakawaka Forest (P06/013) (recorded in 1978, SSBI P06/H023), and Flaxmill and Awakino Swamps (P07/001) (recorded in 2006, SSBI P07/H040).

3.5 THREATS

There are several ongoing and potential threats to the natural areas of Tangihua ED. Some of these threats are shared with all of lowland New Zealand, but the degree of some threats is severe in Tangihua ED.

3.5.1 Invasive plants

Freshwater wetlands and shrublands are the worst affected habitat types in terms of weed infestation. Smaller wetlands which lack indigenous buffering have been severely affected by weed invasion. Falls in water levels caused by water abstraction or diversion also facilitate weed invasion of wetlands, especially smaller sites (L. Forester pers. comm.). Conversely, a rise in the water table caused by impoundment can result in the proliferation of weeds. For example, willows blocking a creek near Taikirau Railway Wetland (P06/087) have contributed to dense swards of *Glyceria maxima* dominating approximately 75% of the site. The wetter margins of raupo-dominant wetlands are often characterised by willow weed and exotic grasses, while the drier margins usually include occasional to common pampas (*Cortaderia* spp.), gorse (*Ulex europaeus*), blackberry (*Rubus fruticosus* agg.), Mexican devil (*Ageratina adenophora*), and woolly nightshade (*Solanum mauritianum*). Small riparian wetlands alongside streams and rivers are often dominated by crack willow (*Salix fragilis*). Invasive plants can affect wetlands by altering nutrient cycling and hydrology, decreasing plant species diversity and degrading fauna habitat (Rea & Storrs 1999). Furthermore, weed species such as alligator weed (*Alternanthera philoxeroides*) can form extensive interwoven mats that limit fishing, swimming, and other recreational uses of wetlands, lakes, rivers and streams (Spencer & Coulson 1976). Weeds are readily spread from site to site, especially after flooding events, which can transport weeds downstream.

Shrublands are more readily invaded by invasive plants than are forests due to relatively higher light levels reaching the ground. In some shrublands, the indigenous species and weeds may have established at the same time following the clearance of former vegetation. On inland hills, gorse, black

wattle (*Acacia mearnsii*), woolly nightshade (*Solanum mauritianum*) and prickly hakea (*Hakea sericea*) are often present. However, most exotic-dominated shrublands on hill country are succeeding to indigenous shrubland, and their future vegetation is likely to be indigenous or mixed indigenous-exotic forest. In coastal and semi-coastal areas, invasive species of shrubland areas include gorse, brush wattle (*Paraserianthes lophantha*), radiata pine, woolly nightshade and pampas. Detrimental impacts of invasive weeds on shrublands include competing with and/or shading out indigenous flora and increased fire risk.

There are several relatively common invasive tree species which attain forest canopy height (e.g. radiata pine, crack willow, black wattle and tree privet). However the main weed threat in forests is in the understorey. Dense carpets of exotic species inhibit the growth of indigenous seedlings, and can prevent forest regeneration even when livestock are excluded. Smothering weeds (e.g. *Tradescantia fluminensis*) are particularly prevalent in riparian forest remnants (e.g. Patutahi River System, P06/037), because periodic flooding and greater light intensities at the edges of the remnant provide suitable habitat (Standish 2002). Water movement, particularly during floods, also helps spreads weeds by dispersing plant fragments and seeds.

3.5.2 Pest animals

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

Mustelids (*Mustela* spp.), cats (*Felis catus*), rats (*Rattus* spp.), and European hedgehogs (*Erinaceus europaeus*) prey on indigenous birds, lizards and invertebrates, and are a major cause of decline for threatened indigenous birds. Stoats (*Mustela erminea*), ferrets (*M. furo*), and weasels (*M. nivalis vulgaris*) are all present in Tangihua ED (King 2005), although ferrets only colonized this area in the last 20-40 years (Miller and Pierce 1995). Ferrets had only spread as far north as the eastern Kaipara by the 1960s (Marshall 1963, King 1990), but by the 1990s had advanced at least 80 km northward to southern Waipoua, east through Mangakahia and Whangaruru, with many scattered records further north (Miller and Pierce 1995). Ferrets are likely to have contributed to the decline of kiwi in Tangihua ED (Miller and Pierce 1995), with documented ferret-kills of kiwi at Aponga Settlement Scenic Reserve (Q06/179) (Robertson *et al.* 1999). Brushtail possums (*Trichosurus vulpecula*) are 'opportunistic herbivores' but also eat meat, including birds, their eggs, and land snails. Until relatively recently, the importance of possums as predators was underestimated in New Zealand. Local studies assigned kukupa nest mortality to possum predation (e.g. Pierce and Graham 1995) and more recent research by Innes *et al.* (2004) has clearly demonstrated significant predation pressure of kukupa by possums. The marked decline of kukupa in Northland during the 1980s (Pierce *et al.* 1993) was likely caused by combinations of illegal hunting and increasing levels of possum predation exacerbated by competition from possums for food resources (R. Pierce pers. comm.).

Within different habitat types possums have distinct preferences, and this often results in canopy dieback and loss for some plant species (Cowan 2005). The full effects of possum browse on the biota of Tangihua ED are yet to be realised; possums were released in the Auckland region in the 1860s and 1870s, and by 1963 had spread as far north as the Bay of Islands and Hokianga Harbour (Cowan 2005). Thus, in the majority of forest remnants the current canopy comprises tree species that established prior to or at the time of the arrival of possums. Brushtail possums have been implicated in the decline of highly palatable species such as mida (*Mida salicifolia*), northern rata, tree fuchsia and kohekohe (*Dysoxylum spectabile*). Highly palatable plant species are now scarce and are likely to comprise a minor proportion of possum diet in Tangihua ED. Less palatable species are now frequently browsed and these species are predicted to decline.

Feral goats (*Capra hircus*) are widespread in Tangihua ED, with numbers particularly high in Tangihua Forest (Q07/111) (P. Davis, DOC, pers. comm.). The browsing of indigenous flora by goats can inhibit forest regeneration, particularly where they coexist with stock, and cause the decline or local extinction of highly palatable species such as mida and tree fuchsia. Goats may also act as a vector for the spread of kauri dieback disease (*Phytophthora* taxon *Agathis*), a microscopic fungus-like plant pathogen that can kill kauri of all ages.

The impacts of feral pigs (*Sus scrofa*) on New Zealand forest vegetation are not well understood, although they may affect plant species composition by consuming fruits, eating, uprooting and barking plants, and also by clearing new substrate for seedling establishment (Wardle 1984; Nugent, G. Parkes, J.P., Dawson, N., Caley, P. unpubl. data). Pigs are also likely to prey on large invertebrates such as land snails and earthworms. Approximately 100 pig-predated kauri snails were recorded on one ridge in Herekino, Ahipara ED, during the mid-1990s (R. Pierce pers. comm.). Pigs occur throughout the larger forest remnants of Tangihua ED, with high numbers recorded in Tangihua Forest (Q07/111) (P. Davis, DOC, pers. comm.). Other recent records are from Mangu Road Wetland (P06/099), Hikurangi Forest and Tokawhero Forest (P06/003) and the Mamaranui Farm Settlement Scenic Reserve (P07/041). Populations may be supplemented by illegal releases for hunting purposes, as occurs in other parts of Northland. As with goats, there is the possibility of pigs spreading the soil-borne kauri dieback pathogen throughout forested areas.

3.5.3 Effects of agriculture on natural areas

Grazing and trampling by livestock in forested areas limits regeneration of most indigenous plant species, causes soil compaction, reduces habitat quality for indigenous fauna (e.g. less food available, fewer and poorer nesting sites), and ultimately alters forest structure (Smale *et al.* 2008). 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 Tangihua ED; many grazed remnants are characterised by a sparse, species-poor understorey, and are degrading on their edges into indigenous treeland with a groundcover of exotic pasture species. Grazing can also render forest ecosystems less resistant to invasive introduced

organisms through, for example, changes in understorey density at edges (Cadenasso & Pickett 2001).

Cattle (*Bos taurus*) are currently free to roam through many wetlands in Tangihua ED, where they graze and trample indigenous vegetation, including the habitat of threatened birds such as Australasian bittern, NI fernbird and spotless crane. Evidence of damage to natural systems was observed in the Flaxmill and Awakino Swamps (P07/001) in 2009, where cattle were browsing and defecating within the raupo reedland. Livestock can also adversely affect water quality, with run-off from pugging and high volumes of urine and faeces causing eutrophication and siltation of waterways. Such activities degrade habitat for indigenous fish and sensitive aquatic macroinvertebrate species (e.g. stoneflies, caddisflies and mayflies), and have negative downstream effects on estuaries. In addition, both sheep and cattle also have the potential to disperse weeds (Stanton 2006), and thus can act as effective vectors for introducing weeds into natural areas, particularly unfenced forest and shrubland remnants.

3.5.4 Effects of residential developments on natural areas

The main threats to natural areas from nearby residential developments are weed invasion through 'garden escapes', dumping of refuse, and predation of indigenous fauna by domestic pets (e.g. dogs and cats). However, Tangihua ED is rural in nature and does not contain any large concentrations of residential dwellings. Compared with coastal areas such as those in Waipu ED, Tangihua ED is undergoing far less intensive residential development, which will help minimize the impact of the above-mentioned factors on local fauna and flora. In saying that, though, some plant species with bird dispersed or windborne seeds are spreading into the District. For instance, several three metre tall bungalow palms (*Archontophoenix cunninghamiana*) were seen in a remote part of Taikirau Swamp (P06/074), more than 2.5 km from the nearest house (L. Forester & M. Young pers. comm.).

Domestic pets, as well as feral animals, can be important factors in the decline of indigenous species. Domestic cats prey on a wide range of indigenous fauna, including birds, lizards, invertebrates, and occasionally frogs (Gillies and Fitzgerald 2005). Domestic, feral/stray, and hunting dogs pose a major threat to populations of Australasian bittern and particularly NI brown kiwi in Tangihua ED. In Northland, between 1990 and June 1995 dogs accounted for 135 (70%) of all reported kiwi deaths, with the greatest numbers attributed to feral or wandering/stray dogs (38 deaths) and pet dogs that are loose during the day or night (29 deaths). Fewer deaths, but still significant numbers, were reported involving farm dogs, pig or goat hunters' dogs, and a duckshooter's dog (Pierce & Sporle 1997). In December 2008 seven marked birds were found dead in Purua Scenic Reserve (Q06/180), and it assumed many more also fell victim to wandering dogs (P. Graham, DOC, pers. comm.).

Close proximity to human dwellings can take a toll on secretive wetland bird species such as Australasian bittern. For example, the piecemeal development of Rodney and Kaipara Ecological Districts is gradually resulting in the disappearance of these birds from this part of the country (R. Pierce pers. comm.).

3.5.5 Ongoing effects of former land clearance

Land clearance has led to severe habitat fragmentation throughout Tangihua ED. Smaller remnants have a greater edge-to-interior ratio than larger areas, and are therefore vulnerable to a wide range of threats (often referred to as 'edge effects'). These include increased light and wind, greater temperature extremes, and lower humidity. The altered microclimate makes the remnant more susceptible to invasion by opportunistic weeds and pest animals. Reduced humidity can also result in the local extinction of indigenous plant species such as filmy ferns (*Hymenophyllum* spp.) from these remnants. Some forest remnants are so small and exposed that the edge effects render them ecologically dysfunctional; they are in effect 'tree museums'. They no longer contain palatable species and regeneration is limited by the combined impacts of stock grazing, trampling, and infestation by pest animals and plants. In addition, the further away they are from other natural areas and seed sources, the less likely it is that regeneration can occur. If regeneration does not occur, then trees will not be replaced in the landscape after they mature and die.

The effects on indigenous fauna of total habitat loss vary, but for less mobile species with special habitat requirements this can mean local extinction, e.g. NI fernbird and land snails. Reduction in habitat size will inevitably lower the carrying capacity of an area for fauna species by diminishing the habitat and food resources available. Land use changes do not usually eliminate local indigenous fauna and flora totally, but create new conditions which are typically less suitable for such species, particularly those already threatened (Anderson *et al.* 1984). Some indigenous species, however, such as NI brown kiwi, kukupa and NI kaka, are quite tolerant of habitat modification/changing forest structure, but the key problem is excessive predation pressure. For example, kiwi adapt very well to pines and other exotic trees because they provide food and shelter, but the rate of predation can be worse in these areas (R. Pierce pers. comm.).

3.5.6 Present-day land clearance

Tangihua ED currently has c.39,750 ha of indigenous forest and scrub and/or shrublands, which accounts for c.24% of the total landcover (MfE 2004). In an assessment of recent loss of indigenous cover, Walker *et al.* (2006) ranked the majority of Tangihua ED's indigenous habitats as 'Critically Underprotected' (>30% indigenous cover remaining and <10% protected), and mapped the ED as having a 0.15-5% loss of indigenous cover for the five year period 1996/97 - 2001/02. Walker *et al.* (2006) concluded that Northland, including Tangihua ED, is losing indigenous habitats at a higher rate than most other areas in New Zealand. Any amount of further clearance could be considered ecologically damaging. In Tangihua ED, farming and pine plantation are probably the two main factors contributing to present-day land clearance.

Intensification of land use can also cause increased isolation of habitat remnants. It is assumed that the clearance of gorse-dominated scrub for agricultural purposes has few negative impacts on indigenous biodiversity,

but the linkages that these habitats may provide can assist the movement of indigenous fauna across pastoral landscapes. Similarly, pine plantations can act as functional yet temporary linkages between forest remnants, and can support considerable indigenous biodiversity themselves, depending on management. In terms of managing NI kiwi populations, there is the need to plan for an integrated landscape approach, which would involve maintaining areas of indigenous vegetation available to kiwi in and adjacent to production forest areas. Following harvesting, these natural areas are likely to provide refugia for kiwi, from which birds can recolonise regenerating indigenous habitat or newly planted exotic trees (Pierce 2003).

Plantation forest cover can be subject to rapid change in response to economic fluctuations, e.g. the current trend of conversion of plantations to agriculture. At present, Tangihua ED contains the most pine plantation (c.43,350 ha) of all Ecological Districts in Northland (MfE 2004).

3.5.7 Poaching of kukupa

It is an offence to kill or harm kukupa, but poaching is likely to occur in Tangihua ED from time to time. Kukupa are likely to benefit from piecemeal subdivision development, as more conservation-minded landowners will undertake local possum control, which may expand into a more integrated control programme covering larger areas (R. Pierce pers. comm.).

3.5.8 Legal protection versus conservation management action

Several large areas in Tangihua ED have some legal protection status and are managed by the Department of Conservation, QEII National Trust, Ngati Hine and Nga Whenua Rahui. However, these areas will continue to lose indigenous biodiversity without active conservation management. Furthermore, all of the larger protected areas are on steeper topography and many other ecological units (particularly those wetlands and forest on alluvium) are absent from or under-represented in the protected area network. As a bare minimum, the following actions need to be undertaken to conserve the immediate, long-term viability of protected natural areas:

- Develop prescriptive management plans that include objectives, strategic approach and action plans, including monitoring (note that without plans the following actions may be wasted or misdirected, e.g. in some instances livestock can be beneficial in managing grazing to help recover some threatened spp., pest management needs to be focussed on clear objectives, etc). Fencing to exclude livestock.
- Targeted control programmes for invasive plants.
- Integrated control of mammalian pests.
- Education of local residents regarding the negative impacts caused by residential developments and how to reduce these impacts, particularly in areas relatively remote from the main urban centres, the aim being to empower residents to the local guardians/managers.
- Targeted Regional funding for protection of priority wetlands.

- Wetland advocacy, which includes educating landowners on how to protect wetlands as per Regional Water and Soil Plan Rules on drainage and other activities which affect wetlands.

A lack of active conservation management, in the face of all the pressures discussed above, is probably the greatest threat to the future viability of natural areas in Tangihua ED. On a positive note, however, there is a ground-swell of community interest emerging in Northland, including in Tangihua ED. The result has seen various groups helping to manage the local environment on small and large scales, with support from agencies such as the Department of Conservation, Northland Regional Council, NZ Landcare Trust and Landcare Research. Large areas of ecologically significant and sensitive land lie within private property, and many landowners of these areas are currently receiving assistance for fencing, pest animal control and weed control from the QEII Trust. Priority areas for protection are described in Section 5.2.

4. Site descriptions

Descriptions for all 113 sites are presented below, including maps, grid references, area, altitude, ecological units, landform/geology, vegetation, notable species, and ecological significance. The percentage cover of ecological units has been included in the site descriptions, and individual ecological units within sites have, with some exceptions, been mapped. Vegetation types within ecological units are defined by 'abundant' species (species forming > 50% of the canopy) where present, otherwise 'common' (species which form 20-50% of the canopy) species, plus overall vegetation structure. If there are no common canopy species, vegetation types are defined by 'frequent' species (which form 10-20% of the canopy). The vegetation types are aggregated into 19 major vegetation types (from the PATN cluster analysis), which are then aggregated into higher level habitat mapping units (forest, forest-shrubland, shrubland, wetland, estuarine, dunes). Appendix 10 presents the concordance of ecological units, the 19 major vegetation types, and the six habitat mapping units, as well as area and level of ecological significance. Faunal records from the SSBI database held at Northland Conservancy, Department of Conservation, are given with site number and date of observation. Records of threatened flora and fauna have been obtained from herbaria and other databases and information systems like the SSBI mentioned in Section 2.1 and 3.6.1, or were made directly during this survey. Unless referenced, the Fauna section of each site description lists indigenous fauna observations made during this survey. The current New Zealand conservation status (e.g., Gradual Decline) which is derived from Hitchmough *et al.* (2007) and unpublished lists of regionally significant flora and fauna. See Appendices 8.5 and 8.7 for lists of flora and fauna respectively present in Kaipara ED (Northland). The Significance section specifies the ecological and conservation values of the site according to Section 2.4 (Criteria for assessment of the significance of ecological units). This includes the presence of any 'representative ecological units', i.e. priority ecological units representing the highest quality examples of ecological units characteristic of the diversity in the ED, or the best examples of depleted and hence underrepresented ecological units. It also includes presence of threatened and regionally significant species, land environments classified as Acutely Threatened, Chronically Threatened or At Risk (MfE 2007), and the existing degree of statutory protection. Recent aerial photography from 2002 and 2006 were used to produce the site maps. In a few cases, site boundaries have changed significantly, and hence the vegetation may have changed from the original survey which was used to prepare the vegetation descriptions presented here. Generally, the extent of each site has changed very little or not at all since 1994/95. The accuracy of many site boundaries was improved with the benefit of the aerial photographs, compared with the topographical interpretation used for the 1994/95 survey. Where maps have been updated, an explanation is made at the beginning of the site report in the 'Area' section.

Midpoint grid references are given for all sites. Where the site comprises

more than one remnant, the number of remnants is given in brackets after the grid reference.

Vegetation types within ecological units are defined by 'abundant' (species which form >50% of the canopy) and 'common' (species which form 20-50% of the canopy) species. If there is more than one canopy species, these are listed in descending order of abundance. The PNAP survey of Tangihua ED was started in 1994 by the Department of Conservation (Northland Conservancy) and was completed in 2009 by Wildland Consultants Ltd. The 1994/95 survey did not always determine the percentage cover of individual ecological units. Broad habitat types, (e.g. 'forest', 'shrubland', 'freshwater wetland') have been mapped according to Section 2.3. Surveys for many sites did not differentiate between manuka and kanuka, possibly because the sites were observed from too great a distance. In such cases, 'kanuka/manuka' has been used to describe the ecological unit.

Records of threatened plant species and fauna have been sourced from herbaria and other databases and information systems mentioned in Section 2.1, or were direct observations during the course of this survey. The threat status of all species was checked prior to inclusion in this report. The fauna section of each site description lists incidental indigenous fauna observations (exotic fauna are not recorded here) and identifies significant fauna with their current New Zealand conservation status in capitals (e.g. Gradual Decline), which is derived from Miskelly *et al.* (2008) for birds and Hitchmough *et al.* (2007) for all other indigenous fauna species. See Appendix 8.7 for a list of fauna present in the Tangihua Ecological District. 'Not surveyed' is stated in the fauna section of the site description if, at the time of publication, the Department of Conservation, Northland Conservancy, did not have any information on indigenous fauna species from that natural area.

4.1 LEVEL 1 SITES

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

TABLE B: LIST OF LEVEL 1 SITES.

SITE NAME	SURVEY NO.	GRID REF.
Te Ahu Ahu Wetlands and Environs	P05/048	P05 962412
Uekehea Habitat Mosaic	P05/049	P05 988429
Davis Road Swamp	P05/106	P05 010405
Mangakahia Forest and Te Tarahiorahiri	P06/001	P06 960170
Kaikou Forest Mosaic	P06/002	P06 970233
Hikurangi Forest and Tokawhero Forest	P06/003	P06 930270
Te Opou Stream Forest	P06/004	P06 890315
Kahuwera Stream Shrubland	P06/010	P06 014250
Rakautao Forest	P06/011	P06 910373
Te Oi Bush	P06/012	P06 873372
Huehue Forest and Maungakawakawa Forest	P06/013	P06 820320
Kaikau Forest	P06/014	P06 027250
Orchid Road Podocarp Forest	P06/015	P06 835284
Huehue Stream Riparian Forest and Wetland	P06/017	P06 787295
Te Toa Bush	P06/024	P06 795274
David Carson Kauri Grove	P06/025	P06 763260
Gammon Road Bush	P06/026	P06 783245
Parker Road Riverine Association	P06/030	P06 750220
Mangaraupo Stream Bush	P06/032	P06 800240
Otiwhero Bush	P06/034	P06 825225
Otaenga Road/Awarua Riverine Forest	P06/035	P06 850236
Otaenga Swamps	P06/036	P06 840273
Patutahi River System	P06/037	P06 015240
Waimatenui Road Riverine Forest	P06/038	P06 773205
Waiokumurau Stream Riverine Forest	P06/039	P06 767190
Horahora Road Gumland	P06/041	P06 070300
Opouteke Stream Reserve and Surrounds	P06/043	P06 850118
Coronet Road Bush	P06/044	P06 855160
Putaka Stream Forest Remnants	P06/046	P06 890125
Pakotai Swamp	P06/047	P06 912116
Taurangakawau Stream Bush	P06/048	P06 890150
Twin Bridges Riparian Forest	P06/050	P06 880188
Te Huia Falls Bush	P06/051	P06 870203
Allan Road Bush	P06/052	P06 902193
Omahu Stream Riverine Forest	P06/053	P06 910200
Omahu Road Bush	P06/054	P06 912193
Mangaroa Stream Riverine Forest and Gumland	P06/059	P07 025130
Mangaroa Wetland	P06/060	P06 010150
Pipiwai Stream Old Growth Forest Remnant	P06/061	P06 004165
Pipiwai Stream Riverine Forest Remnants	P06/062	P06 022161
Kaikou River Bush	P06/063	P06 027210
Kaikou Riverine Bush	P06/064	P06 986245
Koteretahi Bush and Ngarurunui Shrublands	P06/065	P06 991290
Te Whatianga Swamp and Environs	P06/066	P06 000310
Patakorokoro Hill Bush	P06/067	P06 985343
Ruatoro Bush	P06/068	P06 953378
Totara Bush Associations	P06/069	P06 965395
Davis Road Bush	P06/070	P06 014396
Taikirau Wetland and Shrublands	P06/072	P06 013377
Pokere Kahikatea Remnant	P06/073	P06 009352
Taikirau Swamp	P06/074	P06 040340

SITE NAME	SURVEY NO.	GRID REF.
Horahora Stream Swamp Association	P06/075	P06 073325
Tarakihi Wetland and Environs	P06/076	P06 068400
Hurihanga Stream Forest Remnants	P06/077	P06 048282
Rata Tipene Shrubland	P06/078	P06 073285
Rata Tipene Road Harakeke Swamp	P06/079	P06 083294
Kiekie Bush	P06/081	P06 946349
Matawaia Bush	P06/082	P06 966324
James Road Bush	P06/083	P06 970300
Motatau Forest	P06/084	P06 080230
Puhitia Road Bush	P06/090	P06 020300
Worsp Road Bush	P06/092	P06 063195
Kaikou River Forest Remnants	P06/093	P06 046180
Puketurua Bush	P06/094	P06 065151
William Upton Hewett Memorial Reserve	P06/095	P06 061135
Mangu Road Wetland	P06/099	P06 983367
Tokawhero Road Forest Remnants	P06/104	P06 903245
Waioitakanga Stream Wetland	P06/106	P06 741237
Lovatt Road Wetland	P06/117	P06 969244
Awakino Trust Farm Wetland	P06/118	P06 847260
Moore Road Mosaic	P06/119	P06 035170
Awakino and Flaxmill Swamps	P07/001	P07 875905
Kirikopuni Road Remnant	P07/003	P07 980062
Awakino East Bush	P07/005	P07 890925
Nathan Road Shrubland	P07/007	P07 793995
Kaihu Scenic Reserve and Surrounds	P07/008	P07 814010
Okaharau Bush	P07/011	P07 840077
Massey Road Remnant	P07/013	P07 873011
Pakotai Scenic Reserve	P07/014	P07 886094
Sharp Road Bush	P07/015	P07 910097
Boundary Swamp	P07/018	P07 928075
Karaka Road Shrubland	P07/019	P07 930075
Karaka Road Raupo Wetland	P07/021	P07 929088
Mangakahia River Bush	P07/023	P07 044022
Houto Cone Forest	P07/034	P07 995025
North Houto Forest	P07/036	P07 960055
South Houto Forest and Maungaru Range	P07/037	P07 955005
Maungaru Trig Forest	P07/038	P07 985965
Waimata Scenic Reserve and Surrounds	P07/039	P07 890990
Avoca Road Kauri Remnant	P07/040	P07 881954
Mamaranui Farm Settlement Scenic Reserve and Surrounds	P07/041	P07 833955
Pukehuia Road Remnants	P07/042	P07 036936
Wilson Road Forest Remnant	P07/043	P07 030946
Mapuna Road Remnants	P07/044	P07 012889
Waihue Road Shrubland and Forest Remnant	P07/047	P07 857914
Tongariro Forest Remnants	P07/048	P07 853984
Avoca Forest Remnants	P07/050	P07 929977
Taraire Scenic Reserve	P07/054	P07 878986
Paerata Wildlife Management Reserve	P07/055	P07 045000
Atchinson's Bush	Q06/001	Q06 105252
Boulder Bed Stream Bush	Q06/004	Q06 134265
Aponga Settlement Scenic Reserve	Q06/179	Q06 144205
Purua Scenic Reserve	Q06/180	Q06 135177
Marlow Road Bush	Q06/181	Q06 108263
Tangihua Forest	Q07/111	Q07 120920

TE AHU AHU WETLANDS AND ENVIRONS

Survey no.	P05/048
Survey date	22 December 1994 and 2003-04
Grid reference	P05 962412
Area	404.6 ha (104.5 ha forest, 224.5 ha shrubland, 75.6 ha wetland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	80-190 m asl

Ecological units

- (a) Totara-taraire forest on alluvial flats
- (b) Kahikatea forest on alluvial flats
- (c) Taraire-kanuka forest on hillslope
- (d) Totara-tanekaha-manuka forest on hillslope
- (e) Manuka shrubland on hillslope
- (f) Raupo-*Baumea* sp. reedland in swamp
- (g) Raupo-*Carex* sp.-*Baumea* sp. reedland in swamp
- (h) Harakeke-*Baumea* sp. flaxland in swamp
- (i) *Carex* sp. sedgeland in swamp
- (j) *Baumea articulata* sedgeland in swamp
- (k) Open water in small lake
- (l) Manuka-*Coprosma tenuicaulis*-harakeke shrubland in swamp
- (m) Radiata pine-mamaku-pate shrubland on gentle hillslope
- (n) Taraire-totara-tawa-puriri forest on hillslope

Landform/geology

Valley floor wetlands on Holocene alluvium, bounded by steep hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

Te Ahu Ahu Wetlands and environs comprise a complex mosaic of wetland, shrubland, and secondary forest types centred on large swampy tributaries of the Orauta Stream, near the northern boundary of Tangihua ED. The site includes wetland and forested areas surveyed in 2003-04 (Wildland Consultants 2004), which lie within the Ngati Hine Forest pine plantation. Alluvial forest types include riverine totara-taraire forest (a) with frequent kahikatea and occasional titoki, and areas of dominant kahikatea (b). A small area of forest on the eastern boundary of the site contains dominant taraire with common kanuka (c). This unit also includes frequent tanekaha, kahikatea and rimu, and occasional kauri, puriri, mamaku, rewarewa and northern rata. Other hillslope areas are defined by totara-tanekaha-manuka forest (d), and manuka shrubland (e) with frequent *Hakea* sp. and tanekaha and occasional totara. A large, central wetland, which adjoins site P06/069, comprises raupo-*Baumea* sp. reedland (f) with occasional harakeke. Raupo is also co-dominant with *Baumea* sp. and *Carex* sp. (g) in swamp containing emergent species such as frequent kahikatea and maire tawake, and occasional ti kouka

and manuka. Elsewhere, harakeke is dominant with common *Baumea* sp. (h), or *Carex* sp. is dominant (i), or abundant *Baumea articulata* occurs with occasional harakeke and manuka (j). The site includes Lake Kaiwai, which contains a relatively large area of open water (k).

Habitat types within the Ngati Hine Forest pine plantation include wetlands dominated by manuka with common *Coprosma tenuicaulis* and locally common harakeke (l). Occasional species in this unit include mamaku, ponga, wheki, ti kouka, pate, hangehange, toetoe, and koromiko. The drier margins are dominated by frequent pine, mamaku, and pate (m). A small remnant of modified primary kauri-podocarp-broadleaved forest is present in the site's south-western corner. The canopy is dominated by taraire with commonly occurring totara, tawa and puriri (n), and occasional rimu, kauri, tanekaha, rewarewa and kahikatea.

Significant flora

Northern rata (regionally significant) was recorded during this survey. Maire tawake (regionally significant) and *Coprosma tenuicaulis* (regionally significant) were recently recorded (Wildland Consultants 2004).

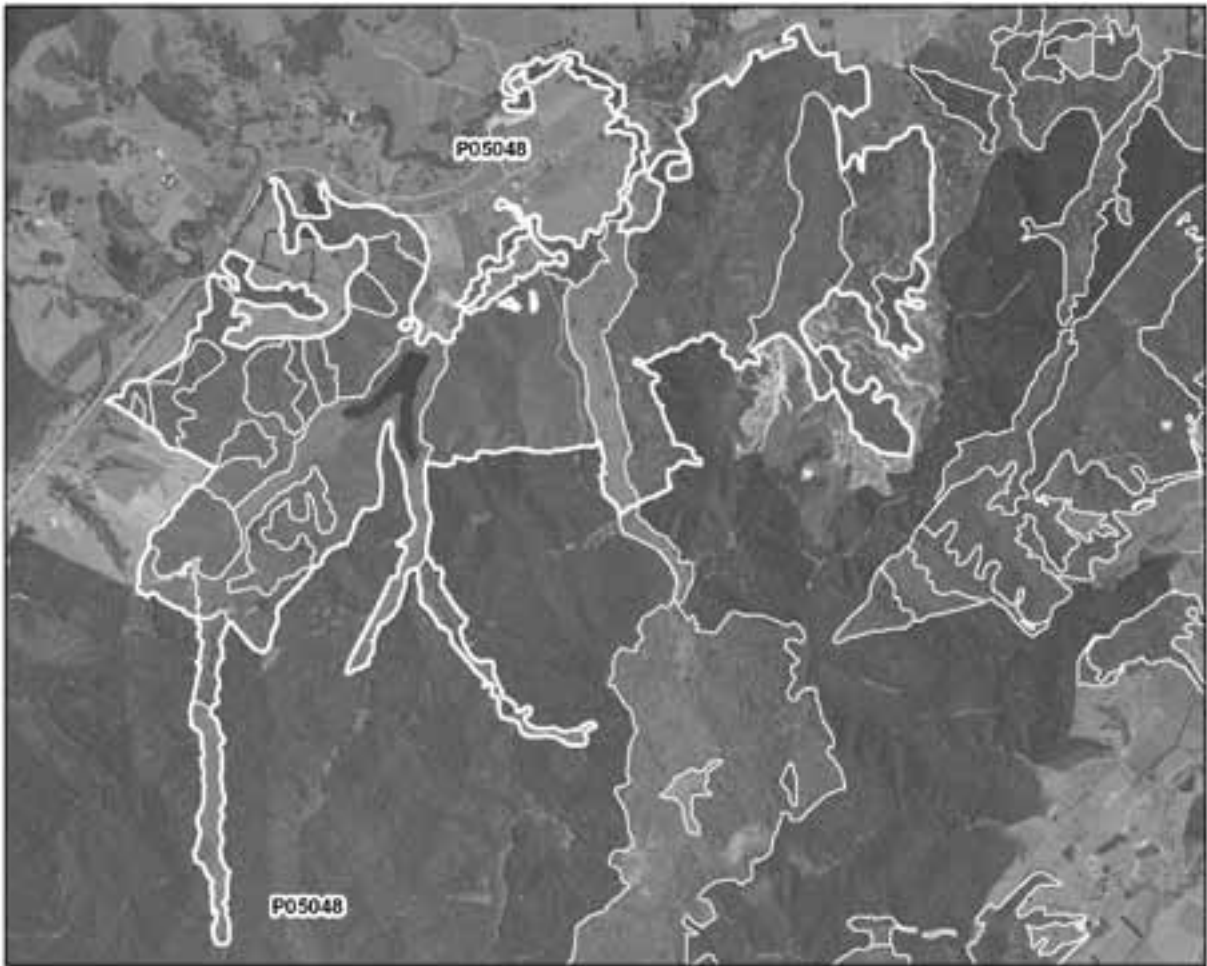
Fauna

NI fernbird (Declining), spotless crane (Relict), grey warbler, silvereye, NI fantail, kingfisher and Australasian harrier were recorded during a 1987 survey (SSBI P05/H087). NI fernbird, spotless crane and NI fantail were recorded in a recent survey (Wildland Consultants 2004). Other threatened fauna are likely to use this site, e.g. Australasian bittern (R.Pierce pers. comm.).

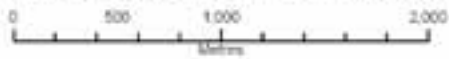
Significance

Te Ahu Ahu Wetlands and its environs display a habitat sequence from open water (Lake Kaiwai), through wetland and swamp forest associations (including a rare maire tawake association), to hillslope shrubland and forest. This altitudinal sequence is rare in Tangihua ED and within Northland. The site contains excellent dense swamp habitat for waterbirds and supports at least two threatened bird species (NI fernbird and spotless crane), and three regionally significant plant species (*Coprosma tenuicaulis*, maire tawake and northern rata). The surrounding terrestrial associations support common forest birds. Waterbirds are hunted on Lake Kaiwai, suggesting at least seasonal usage by duck species.

The site is geographically close to several large wetland complexes within Tangihua ED such as Tarakihi Wetland (P06/074), the Taikirau Wetland complex (P06/072), and Ngawha Springs in Kaikohe ED. All exhibit different characteristics: Tarakihi wetlands being semi-fertile within short catchments, the Taikirau wetland complex being a large fertile ponded floodplain, and Ngawha of geothermal origin. Collectively these wetlands have a far greater potential for sustaining biodiversity than as isolated remnants. The site contains eight representative ecological units: (a), (b), (c), (d), (e), (j), (l) and (n). Units (f)-(i) have not been considered since they lack descriptions at the species level. Pines have been planted sparsely throughout the harakeke wetlands (h), but are not surviving well.



P05/048 Te Ahu Ahu Wetlands and Environs



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

UEKEHEA HABITAT MOSAIC

Survey no.	P05/049
Survey date	10 May 1994
Grid reference	P05 988429 (three remnants)
Area	263.7 ha (129.5 ha forest, 134.2 ha shrubland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	40-200 m asl

Ecological units

- (a) Taraire forest on hillslope
- (b) Manuka-tanekaha-totara forest on hillslope
- (c) Kahikatea forest on alluvial flats
- (d) Manuka shrubland in swamp
- (e) Manuka-*Hakea* sp. shrubland on hillslope
- (f) Kanuka-black wattle forest on hillslope

Landform/geology

Steep hill country of Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

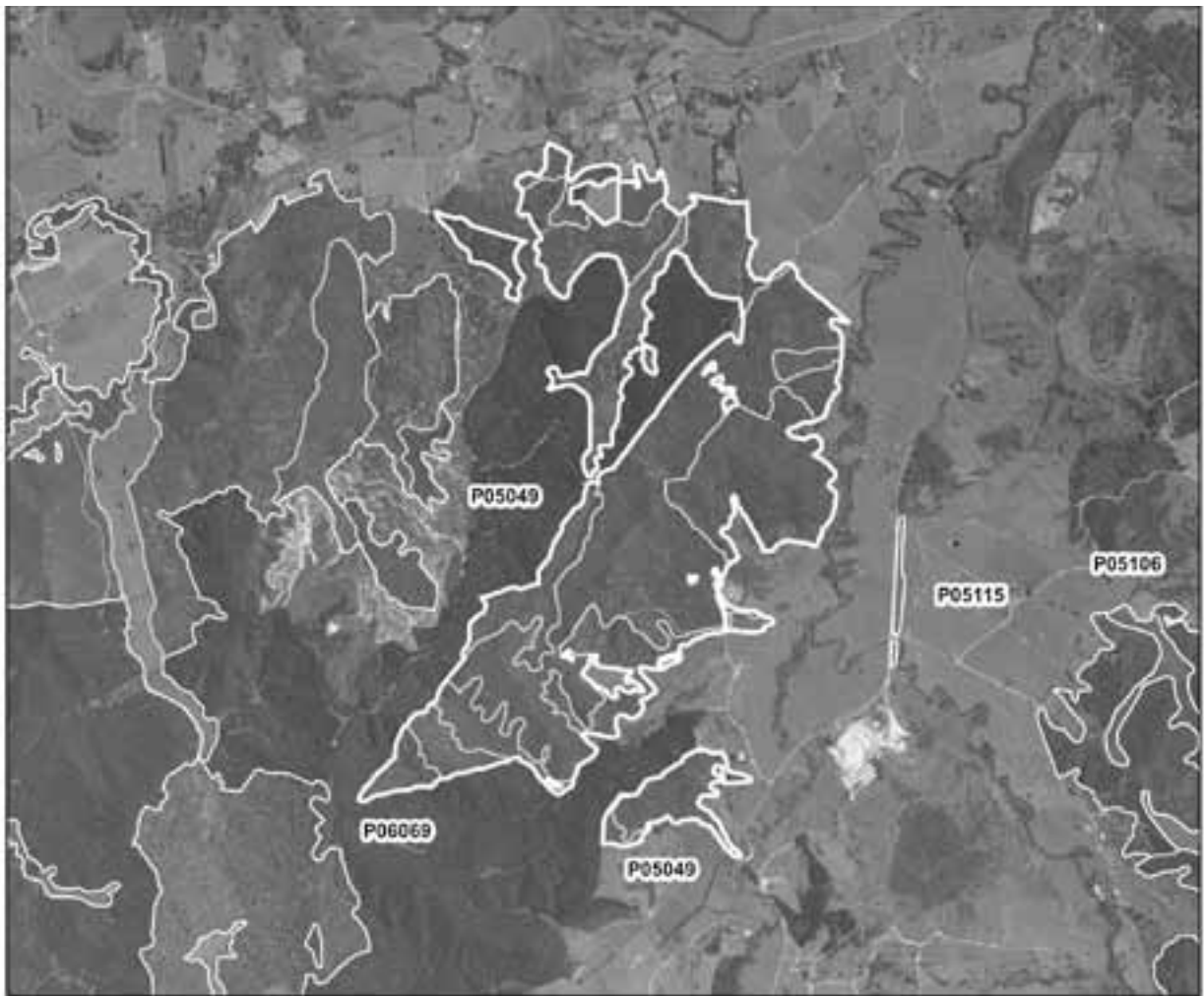
The site comprises a relatively large area of secondary forest, wetland, and shrubland adjoining pine plantation and two smaller areas linked to the former by pine plantation. The north-western remnant of forest includes common taraire (a) with frequent tanekaha and ti kouka, and occasional totara, rimu, rewarewa, towai and mamangi. The northernmost area of indigenous forest is defined by manuka, tanekaha and totara (b). In gullies to the east, kahikatea (c) is dominant with frequent pukatea, while in the south of the northernmost remnant manuka (d) is common with frequent raupo, harakeke and pampas. Ti kouka occurs occasionally. Shrubland areas are predominantly manuka-dominated (e) with common *Hakea* sp. and emergent tanekaha, totara, mamaku and rimu. Black wattle is locally frequent on the ridge. Throughout the site there are small patches of secondary kanuka forest, with black wattle co-dominant in the canopy (f) and scattered emergent kahikatea, rewarewa and tanekaha.

Fauna

NI fernbird (Declining) was recorded during the 1994 survey. Lamprey (Sparse) has been recorded in the Waiharakeke Stream downstream of the site (NIWA 2009a).

Significance

This site includes alluvial forest and a wetland, both of which are under-represented habitat types in Northland, and it is representative for one ecological unit: (b) manuka-tanekaha-totara forest on hillslope. Wetland vegetation, which would have been common on the extensive alluvial



P05/049 Uekehea Habitat Mosaic



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

plains in the Tangihua ED, now comprises only c.0.5% of the ED (MfE 2004). The site supports one threatened bird species and provides potential habitat for other threatened indigenous wetland birds such as Australasian bittern (Nationally Endangered) and spotless crane (Relict). The forested areas provide upper catchment and riparian protection, and would act as a refuge for indigenous fauna during the harvesting of adjacent pine plantation.

DAVIS ROAD SWAMP

Survey no. P05/106
Survey date 26 October 1994
Grid reference P05 010405
Area 9.9 ha
Altitude 50 m asl

Ecological units

- (a) Raupo-*Baumea* sp. reedland in swamp
- (b) Harakeke-*Baumea* sp. flaxland in swamp
- (c) Manuka shrubland in gullies

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

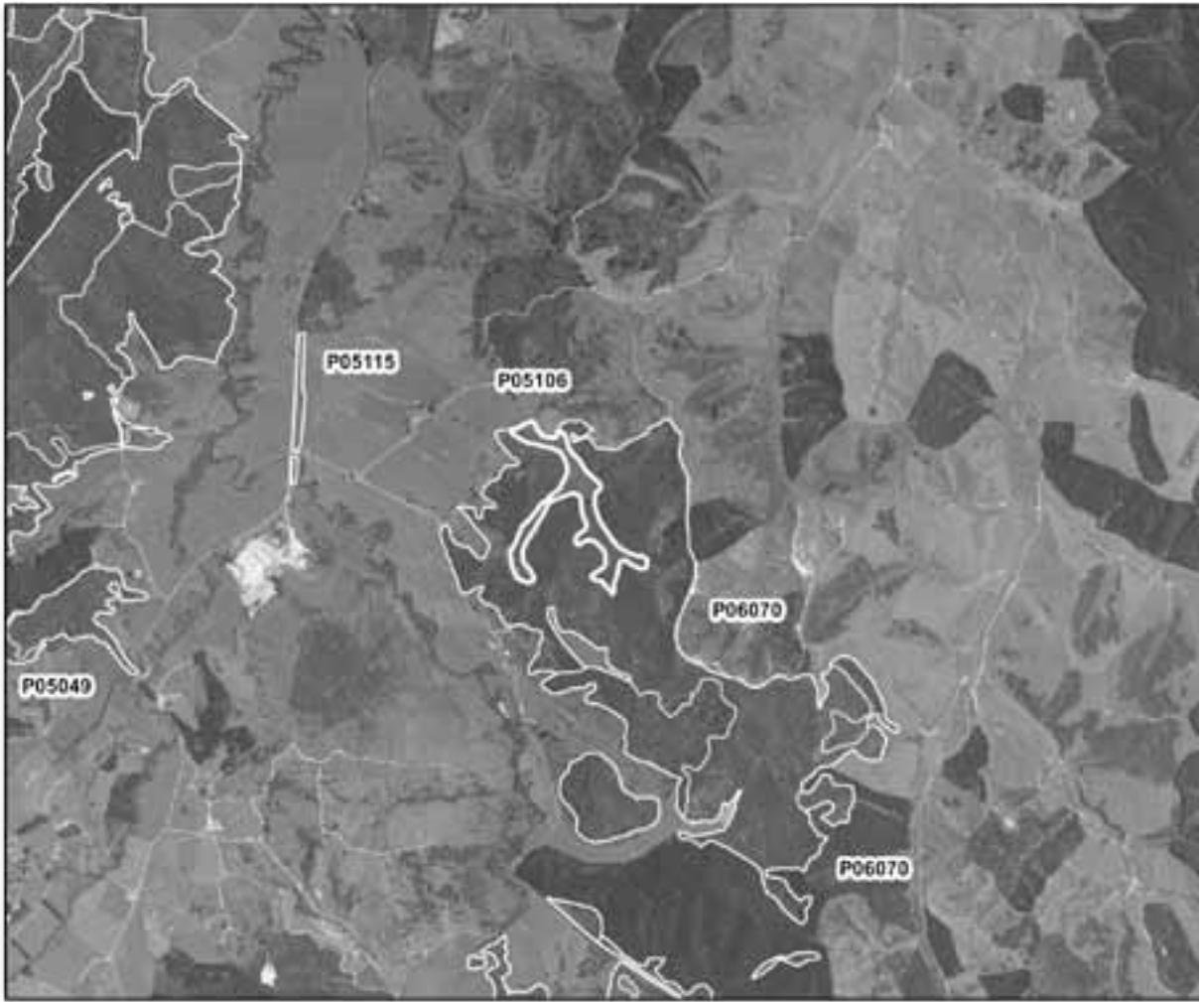
The site consists of a semi-mineralised freshwater wetlands in a small swampy valley, largely buffered by shrubland within Davis Road Bush (P06/070). Wetter areas are dominated by raupo and common *Baumea* sp. (a) with occasional harakeke, or harakeke and common *Baumea* sp. (b) with occasional manuka. Manuka shrubland (c) dominates wetlands in gullies with common kiokio, *Gleichenia* sp., *Baumea arthrophylla* and scattered *Coprosma propinqua*.

Fauna

Not surveyed.

Significance

Wetlands are a rare and diminishing habitat type and are a priority for protection. Wetland vegetation, which would have been common on the extensive alluvial plains in the Tangihua ED, now comprises only c.0.5% of the ED (MfE 2004). The site is significant because of its size, buffering, and the fact that it provides ample habitat for NI fernbird (Declining), spotless crane (Relict) and other indigenous wetland species. This site could only be partially viewed during this survey, thus further information is required to determine its full ecological values.



P05/106 Davis Road Swamp



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

MANGAKAHIA FOREST AND TE TARAHIORAHIRI

Survey no.	P06/001
Survey date	27 July 1994
Grid reference	P06 960170 (two remnants)
Area	3643.3 ha (3,404.3 ha forest, 238.9 ha shrubland)
Altitude	40-697 m asl

Ecological units

- (a) Taraire-towai forest on moderate to steep hillslope
- (b) Towai-rewarewa forest on moderate hillslope
- (c) Mamaku-towai treefernland on moderate hillslope
- (d) Kauri-manuka-tanekaha forest on moderate to steep hillslope
- (e) Towai forest on moderate to steep hillslope
- (f) Kahikatea forest on moderate hillslope
- (g) Taraire-puriri forest on steep hillslope
- (h) Tawa-towai forest on moderate to steep hillslope
- (i) Tawa forest on moderate to steep hillslope
- (j) Tawa-puriri forest on moderate hillslope
- (k) Puriri-totara forest on steep hillslope
- (l) Kanuka-totara shrubland on steep hillslope
- (m) Kanuka-mamaku-mamangi forest on steep hillslope
- (n) Kauri-northern rata forest on moderate hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises an extensive area of primary and modified primary kauri-podocarp-broadleaved forest contiguous with Mangakahia Forest (partly administered by DOC). The lower altitude forest is characterised by emergent northern rata, rimu and kahikatea over a canopy of co-dominant tawa and towai, together with puriri, taraire, hinau, miro, pigeonwood, nikau, tawheowheo and mamaku. The understorey includes *Cyathea smithii*, heketara, kanono, karamu, *Coprosma spathulata*, hangehange, kawakawa, mahoe and *Rhabdotohamnus solandri*. The high altitude forest features miro emergent over tawa, towai, tawheowheo and Hall's totara. *Cyathea smithii*, kiekie, horopito, akepiro, lancewood, crown fern and bush rice grass are the main understorey plants.

Taraire associated with towai (a), frequent kahikatea (emergent), rewarewa, and tawa is a common vegetation type in the far north-western part of the site. In this vegetation type there is occasional kawaka, puriri, matai, puka, kowhai, and emergent rimu, kauri, miro, northern rata and totara. This unit has been cut-over. Towai is abundant (b) with common

emergent rewarewa in an area of secondary forest on the mid-western boundary of the site. Makamaka and areas of bracken are frequent, with occasional mamaku. Abundant mamaku with common towai (c) occurs in the same area as vegetation type (b). Further east, secondary kauri forest (d) is dominant with common manuka and tanekaha. Kowhai is locally common with occasional rewarewa, totara and kohekohe. Towai forest (e) with frequent rewarewa, and emergent kauri and northern rata is dominant on the eastern slopes of the site.

The far south-western corner of the site supports kahikatea forest (f) on moderate hillslopes with frequent puriri, totara, manuka and occasional mamaku. Steep hills in the far south-eastern corner are dominated by cut-over tall taraire-puriri forest (g), with frequent kohekohe and tawa, and occasional karaka, rimu, matai, kahikatea, pukatea and emergent northern rata. South-western areas, around Te Tarahiorahiri, support tawa-towai forest (h) with emergent northern rata, rimu and kahikatea, while tawa forest (i) dominates some areas on moderate to steep hillslope. Puriri, taraire, hinau, miro, pigeonwood, nikau, makamaka, tawheowheo and mamaku are also present.

South-east of Te Tarahiorahiri, tawa-puriri forest (j) occurs with occasional karaka, taraire, rewarewa and towai, while on steep hillslopes on the southern boundary cut-over tall puriri-totara forest (k) occurs with frequent karaka, taraire, kohekohe and tawa, and occasional kowhai and nikau. The steep hillslopes also support advanced kanuka-totara shrubland (l) with occasional mamaku, and kanuka-mamaku-mamangi forest (m) with frequent nikau and occasional houhere, karaka and puriri. One example of kauri-northern rata-totara forest (n) was recorded during a recent survey (Wildland Consultants 2004).

Significant flora

Colensoa physaloides (Relict), kawaka (Naturally Uncommon), *Nematoceras rivulare* (Data Deficient). Regionally significant species: Black maire, *Blechnum fluviatile*, *B. nigrum*, *Collospermum microspermum*, gully tree fern, *Dracophyllum traversii*, *Epilobium nerteroides*, *E. nummulariifolium*, *E. pubens*, kotukutuku, *Grammitis billardierei* (AK 234002), *Helichrysum lanceolatum*, horopito, *Hymenophyllum lyallii*, kaikomako, carmine rata, northern rata, *Passiflora tetrandra*, *Lobelia angulata*, raukawa, *Raukaua anomalus*, *Rubus squarrosus* and toro. All species without herbarium records are listed in SSBI P06/H043.

Fauna

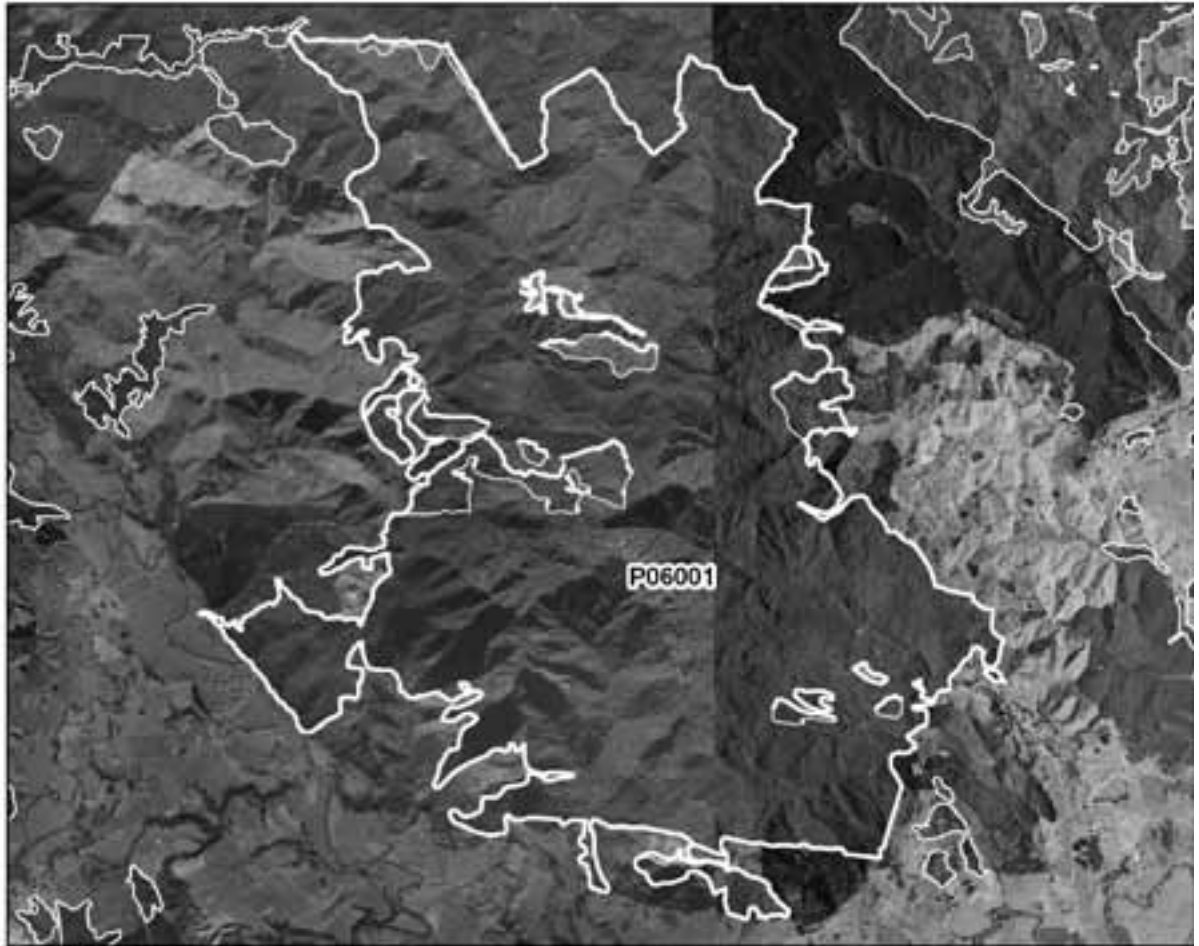
In the early 1990s very high numbers of NI brown kiwi (Nationally Vulnerable) were present in at least the southern part of this site (Miller and Pierce 1995), but in 2004 only low numbers were recorded from the same station and from neighbouring stations within this site (Pierce 2004). Other birds: kukupa (regionally significant), NI tomtit (regionally significant), morepork, kingfisher, grey warbler, NI fantail, silvereye and tui were recorded in 2004 (SSBI P06/H043), and a kakariki sp. was reported in 1980. Freshwater species: longfin eel (Gradual Decline), koura (Gradual Decline) and a *Galaxias* sp. (possibly shortjaw kokopu, further

investigation is needed) were recorded in 2004 (SSBI P06/H043). Kauri snail (Gradual Decline) and *Peripatus* sp. (Range Restricted) were also recorded in 2004 (SSBI P06/H043).

Significance

A large area of hinterland forest supporting many threatened and regionally significant plants and animals and containing high floral diversity and a significant range of altitudinal sequences for Northland (the site contains the Te Tarahiorahiri trig station, which at 697 m asl, is one of the highest points in Northland²). Mangakahia Forest includes areas of unmodified mature kauri and uncommon and unusual high altitude broadleaved forest. It also includes the unusual features of tawa-dominated forest and kauri-northern rata forest (both uncommon in Northland), and tawa-puriri forest (very rare in Northland). The site contains at least nine representative ecological units: (b), (c), (d), (h), (i), (j), (l), (m) and (n). Despite it being heavily logged, the site contains some fine examples of healthy northern rata, a very large kauri (L. Forester pers. comm.), and has good floral diversity and intactness (SSBI P06/H043). The site provides habitat for five threatened fauna species, one regionally significant bird species, two threatened plant species and 24 regionally significant plant species. The upper catchments have moderate to high goat numbers, and predation on kauri snails by pigs was evident. Rats, possums, stoats, and ferrets are also present. 1,397.4 ha lie within the Mangakahia Forest Conservation Area (DOC-administered), while protected land administered by the Whangarei District Council (WDC) includes a 4.2 ha recreational reserve. The forest is bounded by indigenous forest which is either administered by DOC, owned by local Maori or New Forest Products, other private land, and rocky bluffs (all of which form natural boundaries) (SSBI P06/H043). The block provides a potential corridor across Northland between intensively managed sites for kiwi at Purua-Motatau in the east and Opouteke-Trounson-Waipoua in the west (Pierce *et al.* 2006).

2 The highest point in Northland is Te Raupua in the Waima Range at 781 m asl within the Tutamoe Ecological District.



**P06/001 Mangakahia Forest
and Te Tarahiorahiri**



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

KAIKOU FOREST MOSAIC

Survey no.	P06/002
Survey date	13 July 1994
Grid reference	P06 970233 (five remnants)
Area	1542.2 ha (1,096.9 ha forest, 445.3 ha shrubland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	40-380 m asl

Ecological units

- (a) Kanuka/manuka-towai shrubland on hillslope
- (b) Mamangi-puriri-taraire forest on hillslope
- (c) Kanuka/manuka-kahikatea-totara forest on hillslope
- (d) Puriri-taraire forest on hillslope
- (e) Totara forest on hillslope
- (f) Taraire forest on steep hillslope

Landform/geology

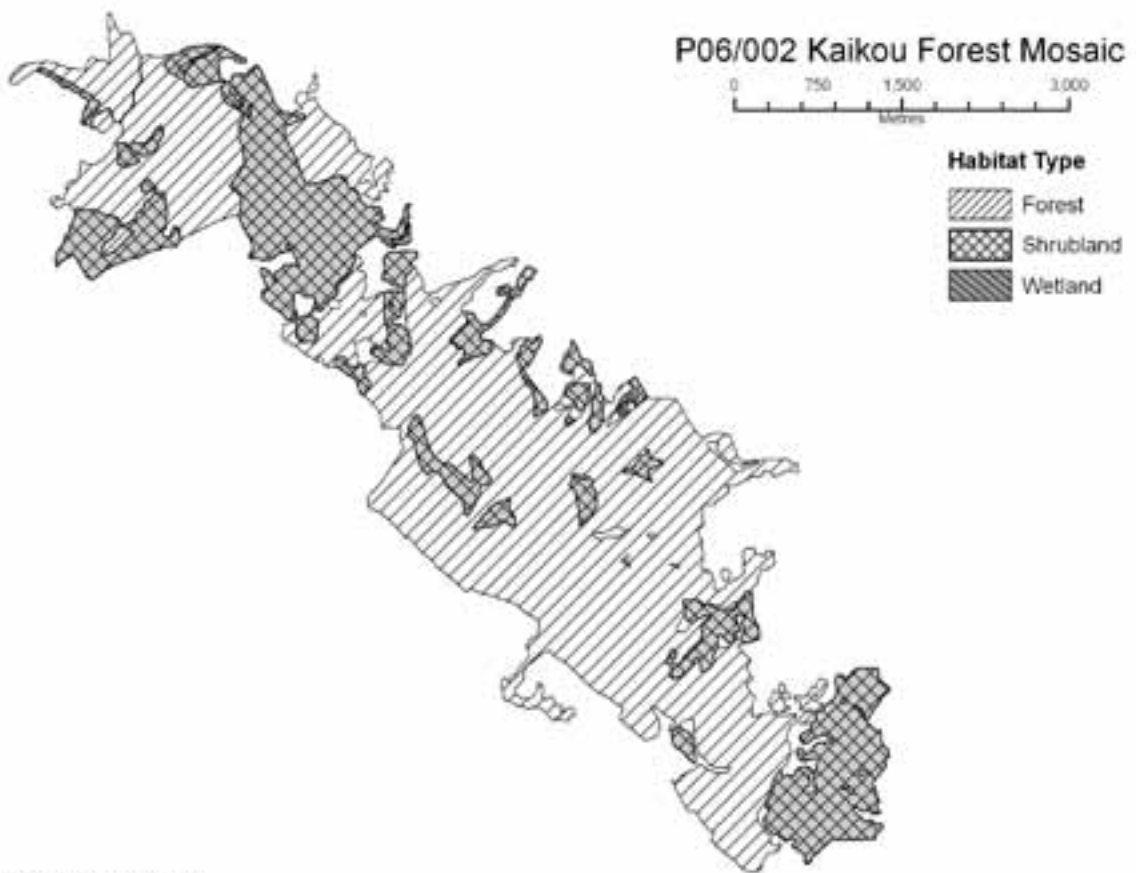
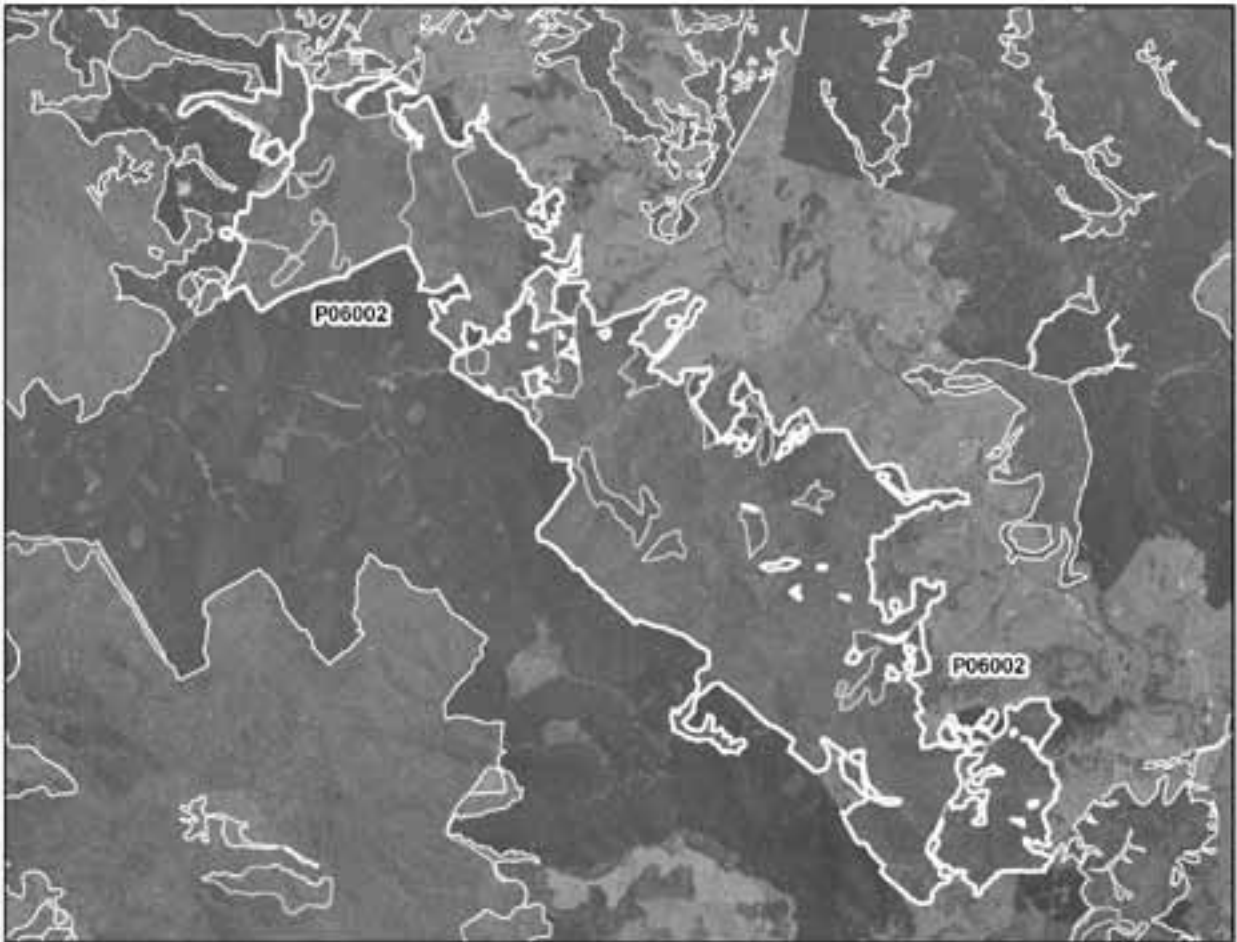
Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site encompasses a mosaic of secondary and cut-over tall forest and shrubland forming the eastern margin of a large indigenous and plantation forest tract which incorporates the Mangakahia and Tokawhero forests. All of the vegetation units occupy moderate to steep hillslope. Kanuka/manuka-towai shrubland (a) covers some of the moderate slopes, occurring with occasional mamaku. Probably the most species rich vegetation unit is mamangi-puriri-taraire forest (b), which also includes frequent totara, towai, kowhai, tanekaha and titoki. A range of occasional species includes pukatea, tawa, nikau, kahikatea, karaka, puriri, and emergent northern rata, kauri and rewarewa. Kanuka/manuka-kahikatea-totara forest (c) also occurs on moderate hillslope, and includes occasional puriri in the canopy. In areas where puriri-taraire forest (d) is dominant, towai and nikau are frequent with occasional matai and tawa. Kauri and northern rata occur occasionally as emergent species. Another common forest type on hillslopes is totara forest (e) with frequent puriri and occasional kowhai, kahikatea and tanekaha. Taraire forest (f) occurs on the steepest slopes with frequent tawa, kohekohe and puriri, and occasional miro, matai, tanekaha, karaka, titoki, and emergent rimu and kahikatea.

Significant flora

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



Aerial photography Bawn 2006

Fauna

Grey warbler, NI fantail, and silvereye were recorded in 1978 (SSBI P06/H057). NI brown kiwi (Nationally Vulnerable) were recorded in surrounding areas during a recent survey (Pierce 2004). NI tomtit (regionally significant) are present (R. Pierce pers. comm.).

Significance

The Kaikou Forest Mosaic is a large integral part of an extensive indigenous/exotic forest tract with a high degree of altitudinal variance and floral diversity. It is representative for at least three ecological units: (a), (b) and (c). The site supports one regionally significant plant species and one regionally significant bird species, while NI brown kiwi have been recorded in the general area.

HIKURANGI FOREST AND TOKAWHERO FOREST

Survey no.	P06/003
Survey date	13 July 1994
Grid reference	P06 930270 (three remnants)
Area	3,481 ha (3,389.9 ha forest, 91.1 ha shrubland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	80-632 m asl

Ecological units

- (a) Towai forest on moderate to steep hillslope
- (b) Taraire forest on moderate hillslope
- (c) Kanuka forest on moderate hillslope
- (d) Totara-tanekaha forest on moderate hillslope
- (e) Puriri forest on moderate hillslope
- (f) Kanuka-rimu forest on moderate hillslope
- (g) Kahikatea forest on moderate hillslope
- (h) Taraire-puriri-towai forest on moderate hillslope
- (i) Kahikatea-totara forest on moderate hillslope
- (j) Totara-towai-taraire forest on moderate hillslope
- (k) Kanuka-tanekaha-towai-taraire forest on moderate hillslope
- (l) Taraire-towai forest on moderate hillslope and in gullies
- (m) Towai-kanuka/manuka shrubland on moderate hillslope

Landform/geology

Hillslopes and gullies are underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex), with a small area of Holocene alluvium bordering the Kaikou River at the south-eastern end of the site.

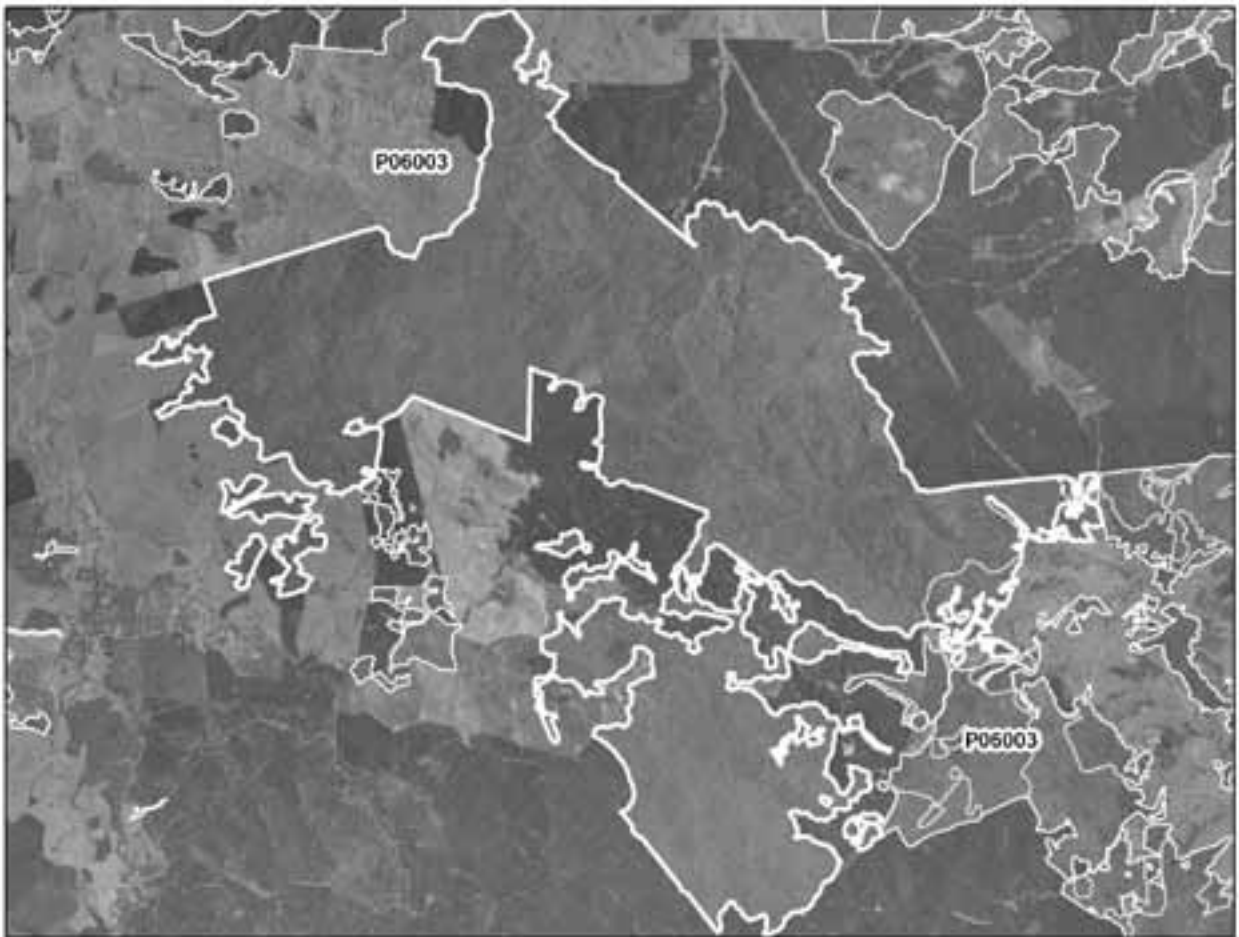
Vegetation

The site comprises a large and convoluted area of cut-over tall forest and secondary kauri-podocarp-broadleaved forest with a canopy dominated by totara and kanuka, but towai and taraire are also common. Kahikatea, rewarewa, rimu, kauri, pukatea, northern rata, tanekaha and miro are all scattered emergents. The site includes advanced shrubland in some peripheral areas. Towai forest (a) occurs on high altitude steep hillslopes and contains frequent makamaka, hinau, miro, taraire and tawa. Occasional species include pukatea, rewarewa, mamaku, puka, and emergent northern rata and rimu. At lower altitudes old growth forests are dominated by taraire forest (b) with frequent towai, tawa and rewarewa, and occasional kohekohe, puka, pukatea, puriri, miro, matai and emergent northern rata and rimu. Towai forest (a) is also common at lower altitudes, with frequent kanuka and rimu, and occasional kawaka, kohuhu, matai, miro, tawa, and emergent rimu and northern rata. Other secondary vegetation includes kanuka forest (c) with frequent towai, mamangi, rimu, totara and lancewood, and occasional kawaka and rewarewa. Secondary totara-tanekaha forest (d) is also a common forest type, occurring with frequent puriri, kanuka and rewarewa, and occasional pukatea and kahikatea, and emergent kauri, rimu and northern rata. Puriri forest (e) is common on the lower slopes, occurring with frequent towai, taraire and totara, and occasional northern rata, rewarewa, kowhai and kohekohe.

Kanuka-rimu forest (f) occurs on moderate hillslopes on the western side of the site with occasional kahikatea and totara. Another common forest type occupying moderate hillslopes is kahikatea forest (g). Other species include frequent puriri, taraire and nikau, and occasional totara, towai, pukatea, houhere, ti kouka, rewarewa, and emergent northern rata. Taraire-puriri-towai forest (h) occurs with frequent mamaku and rewarewa, and occasional tawa, matai, rimu, pukatea and nikau. Kahikatea-totara forest (i) is present on moderate hillslopes with occasional matai, rimu and rewarewa. A survey by Wildland Consultants (2004) identified two additional forest types: totara-towai-taraire forest (j) is a relatively diverse forest type and includes species such as puriri, kanuka, mamaku, pigeonwood, nikau, mamangi and emergent kahikatea, rewarewa, rimu, kauri, pukatea and northern rata. The other forest type to be recorded was kanuka-tanekaha-towai-taraire forest (k), which occurs on moderate hillslopes with mamaku, mapou and emergent rewarewa. In the north-east of the site, there are three gullies containing secondary taraire-towai forest (l) within pine plantation. Occasional species include emergent rewarewa, kahikatea, tanekaha and kauri. The site includes an area of advanced shrubland characterised by abundant towai and kanuka/manuka (m). Toetoe (*Cortaderia fulvida*) is notable along the road edge at higher altitudes (L. Forester pers. comm.).

Significant flora

Kawaka (Naturally Uncommon), *Blechnum fluviatile* (regionally significant), *Coprosma rotundifolia* (regionally significant), *Hymenophyllum lyallii* (regionally significant) carmine rata (regionally significant) and toro (regionally significant) (recorded in 1997, SSBI P06/H050). *Grammitis pseudociliata* (regionally significant) is also known to the site (AK 234003).



**P06/003 Hikurangi Forest
and Tokawhero Forest**



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Fauna

NI brown kiwi (Nationally Vulnerable), long-tailed cuckoo (Naturally Uncommon), NI tomtit (regionally significant), kukupa (regionally significant), tui and silvereye were recorded in 1978 (SSBI P06/H050). NI brown kiwi, morepork, kingfisher, grey warbler, NI fantail, and kauri snail (Gradual Decline) were recorded in 1992 (SSBI P06/H050). The land snails *Amborhytida forsythi* (Gradual Decline) and Punctidae sp. 161 (Range Restricted) have been recorded at the site (Brook 2002). NI brown kiwi were also recorded from all three gullies in the north-east compartment during a kiwi survey in 2004, and this is part of one of the sites recommended for kiwi management (Pierce 2004). Longfin eel (Gradual Decline), koura (Gradual Decline) and Cran's bully have been recorded in local streams (NIWA 2009a). Tui, grey warbler, chaffinch, kingfisher, NI fantail and Australasian harrier were recorded by Wildland Consultants (2004). Black shag (Naturally Uncommon) are known to fish within streams in the site (R. Pierce pers.comm.).

Significance

This site is part of a large and botanically diverse forest tract that is representative for all 13 ecological units, and it exhibits a very definite altitudinal gradient (L. Forester pers. comm.). The site supports threatened and regionally significant species, including one threatened plant species, seven regionally significant plant species, seven threatened fauna species and two regionally significant bird species. The site provides upper catchment protection for three large river systems (Awarua, Kaikou and Punakitere Rivers) and riparian buffering for Waikerei Stream and Te Hoanga Stream, which are tributaries of the Kaikou River. A total of 1,056.8 ha lies within the Hikurangi Scenic Reserve and 739.6 ha lies within the Hilel Korman Scenic Reserve, both of which are administered by DOC. Possum browse and pig tracks were observed in 2004, and there have been past records of goats and cattle within the site (SSBI P06/H050). Control of dogs and mustelids is vital for the maintenance of the current kiwi population (Pierce 2004), although the presence of pigs and pig-hunters are likely to adversely affect kiwi survival rates (R. Pierce pers. comm.).

TE OPOU STREAM FOREST

Survey no.	P06/004
Survey date	18 July 1994
Grid reference	P06 890315 (four remnants)
Area	157 ha
Altitude	130-340 m asl

Ecological units

- (a) Towai forest on steep hillslope (80%)
- (b) Taraire-towai forest on steep hillslope (20%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

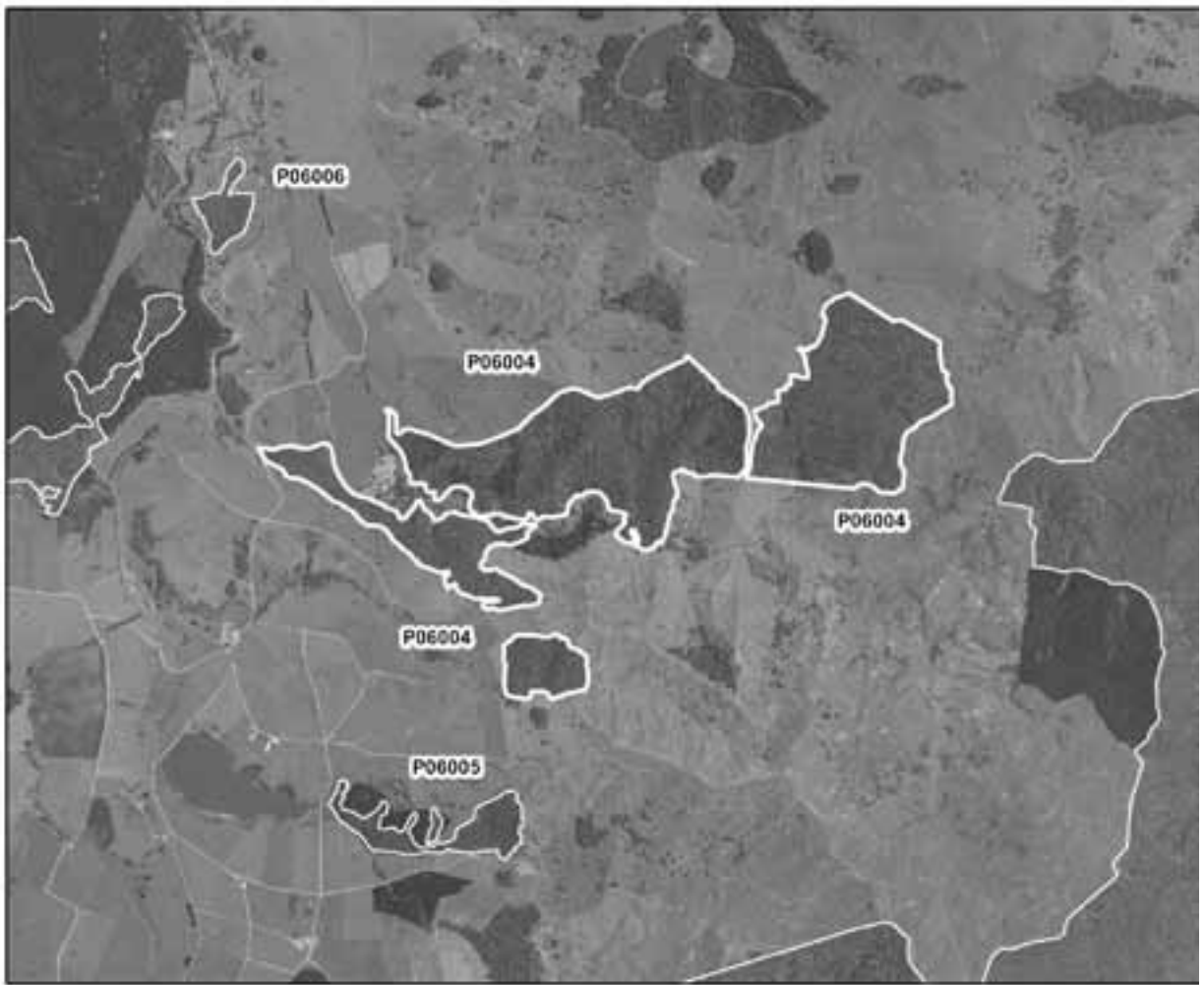
The site comprises four forested remnants on steep south-facing slopes bordering Te Opou Stream. The site is dominated by towai forest (a) with frequent taraire and puriri, and occasional miro, matai and kohekohe, and emergent rimu, kahikatea and northern rata. The other forest type recorded at the site is taraire-towai forest (b) with frequent puriri and nikau, occasional miro, matai and kohekohe, and emergent rimu, kahikatea and northern rata.

Fauna

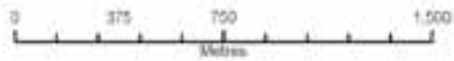
Kukupu (regionally significant), grey warbler, silvereve and tui were recorded in 1976 (SSBI P06/H049). Longfin eel (Gradual Decline), koura (Gradual Decline), shortfin eel, redfin bully and common bully have been recorded from the Te Opou Stream (NIWA 2009a). NI brown kiwi (Nationally vulnerable) are likely to be present (R. Pierce pers. comm.).

Significance

This forest provides a linking function to the nearby large forests of Huehue (P06/013), Hikurangi (P06/003), and the Hilel Korman Scenic Reserve (also within P06/003). The site provides some upper catchment protection and riparian cover for the upper Te Opou Stream, which supports at least two threatened species. NI brown kiwi is likely to be present. Habitat values will increase significantly if stock and goats are removed. 0.3 ha is within a local purpose reserve administered by the Far North District Council (FNDC).



P06/004 Te Opou Stream Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

KAHUWERA STREAM SHRUBLAND

Survey no.	P06/010
Survey date	2003-04
Grid reference	P06 014250 (six remnants)
Area	14.9 ha
Altitude	70-80 m asl

Ecological units³

- (a) Manuka-mamaku-*Baumea* sp. shrubland on moderate hillslope
- (b) Manuka shrubland on moderate hillslope
- (c) Mamaku-pate-*Gabnia* sp. treefernland on hillslope
- (d) Raupo-wheki reedland in ephemeral gully
- (e) Manuka-mamaku shrubland on moderate slope in ephemeral gully
- (f) Kanuka-totara-kahikatea forest on stream terrace
- (g) Raupo reedland in swamp

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site is located along the Kahuwera Stream, within the boundary of the Kaikau Forest pine plantation. It comprises a small area of secondary forest, shrubland, and wetlands containing kanuka and manuka with varying amounts of mamaku, and emergent totara and kahikatea in some units. Hillslope vegetation bordering the stream is characterised by manuka-mamaku-*Baumea* sp. shrubland (a), locally abundant manuka shrubland (b), and mamaku-pate-*Gabnia* sp.-treefernland (c), while ephemeral gullies are occupied by common raupo and wheki (d) and manuka-amaku shrubland (e). Kanuka, totara, and kahikatea (f) are co-dominant on stream terraces and raupo (g) dominates a small wetland.

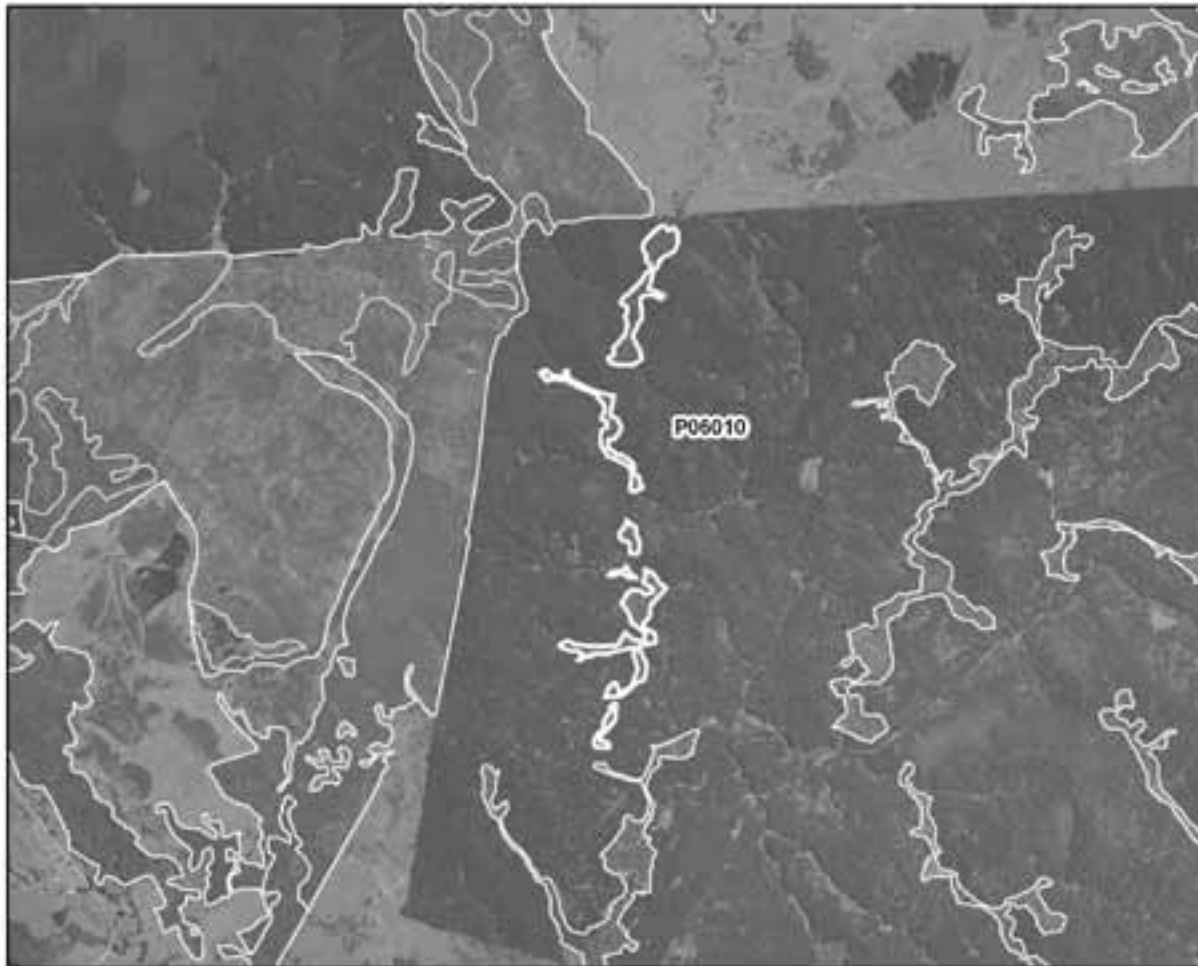
Fauna

Grey duck (Nationally Critical), NI fernbird (Declining), tomtit (regionally significant), grey warbler, NI fantail, and Australasian harrier were recorded during this survey (Wildland Consultants 2004). NI brown kiwi (Nationally Vulnerable) are present at low densities in the surrounding area (Wildland Consultants 2004).

Significance

The site provides habitat for two threatened bird species, one regionally significant bird species, and it is representative for two ecological units: (d) and (f). The site may provide a refuge for indigenous fauna during the logging of surrounding pine forest. It also provides partial riparian buffering for the Kahuwera Stream. DOC Whangarei Area (pers. comm.)




³ Habitat maps were not produced for this site due to a lack of available information at the time of survey.



P06/010 Kahuwera Stream Shrubland



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Unclassified habitat type



Aerial photography flown 2006

indicates that someone may be trapping predators in the forest as part of their kiwi recovery programme, and private individuals are poisoning possums in the forest. Pigs are common throughout the site, and hunters with dogs use the forest.

RAKAUTAO FOREST

Survey no.	P06/011
Survey date	10 May 1994
Grid reference	P06 910373
Area	336.9 ha (311.4 ha forest, 25.5 ha wetland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	130-260 m asl

Ecological units

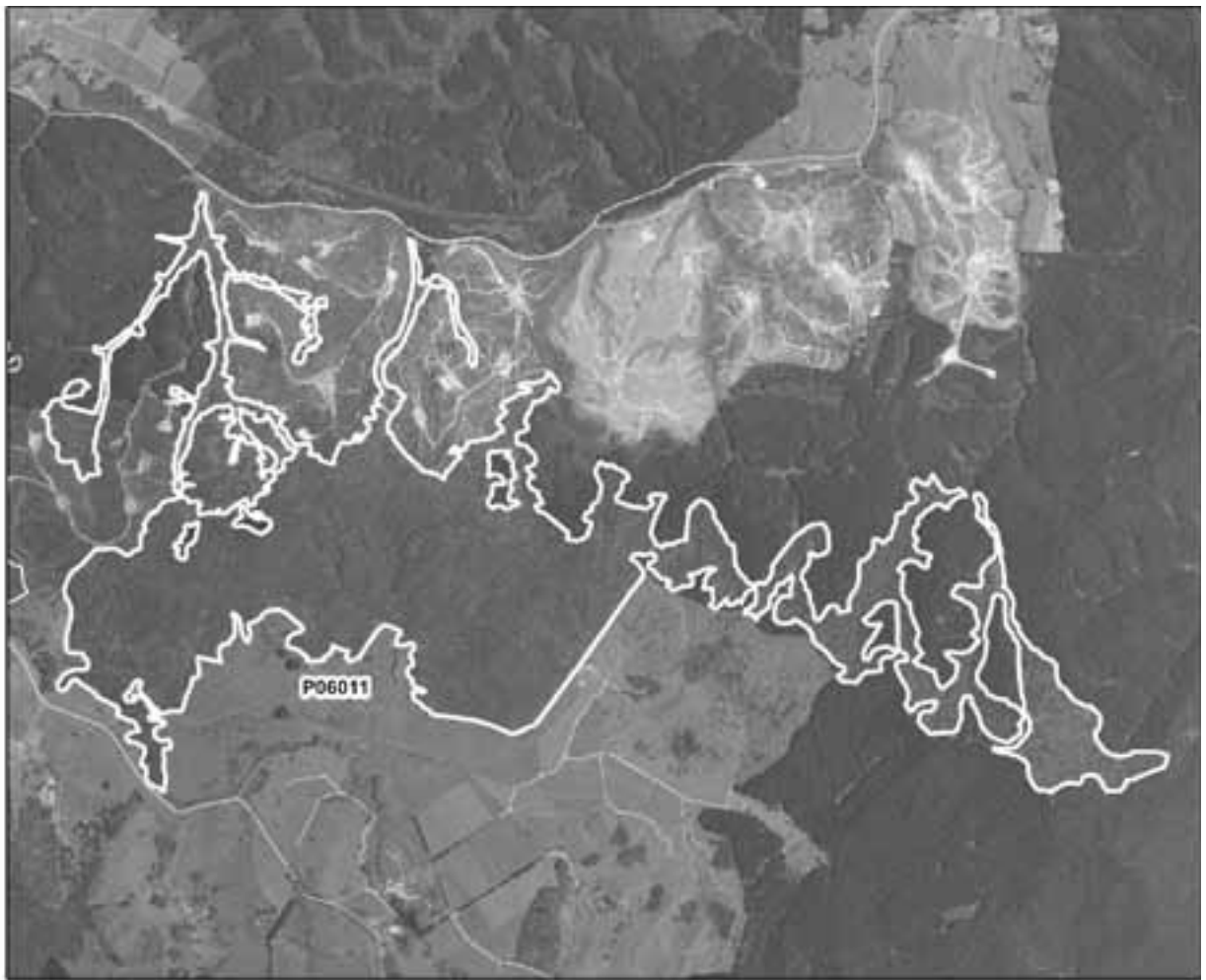
- (a) Taraire forest on hillslope
- (b) Rewarewa-taraire-towai forest on hillslope
- (c) Kahikatea forest on alluvium
- (d) Totara-kahikatea-kanuka forest on hillslope
- (e) Kanuka/manuka-totara forest on hillslope
- (f) Taraire-totara-towai forest on hillslope
- (g) Manuka-*Coprosma tenuicaulis* shrubland in gully

Landform/geology

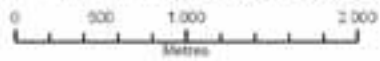
Hill country mostly underlain by Cretaceous sandstone (Punakitere Formation, Mangakahia Complex), with some Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex) in the eastern part.

Vegetation

The site consists of a large remnant of cut-over tall forest and secondary podocarp-broadleaved forest adjoining an extensive indigenous/plantation forest tract. The site encompasses a range of forest and shrubland types on hillslopes, in gullies and on alluvium. Taraire forest (a) is the most widespread forest type, with frequent kahikatea and puriri, and occasional rewarewa, nikau, kohekohe, totara, tawa, mamaku, mapou, miro, pukatea, and emergent kahikatea and rimu. Interspersed throughout the site are areas of rewarewa-taraire-towai forest (b) with frequent totara and occasional pukatea, puriri, rimu, kahikatea and kauri. Kahikatea forest (c) is locally common on alluvial flats near the Punakitere River, while other hillslope areas are characterised by totara-kahikatea-kanuka forest (d), kanuka/manuka-totara forest (e) with frequent mamaku and occasional tanekaha, and taraire-totara-towai forest (f) with frequent puriri, tawa, and kanuka, and emergent rewarewa, totara, kahikatea, kauri and rimu. The site also contains wetlands within gullies dominated by manuka-*Coprosma tenuicaulis* shrubland (g), with frequent kiokio and *Baumea arthropphylla*, and occasional mangemange, bracken, *Baumea teretifolia*, and emergent mamaku, ponga and hangehange.

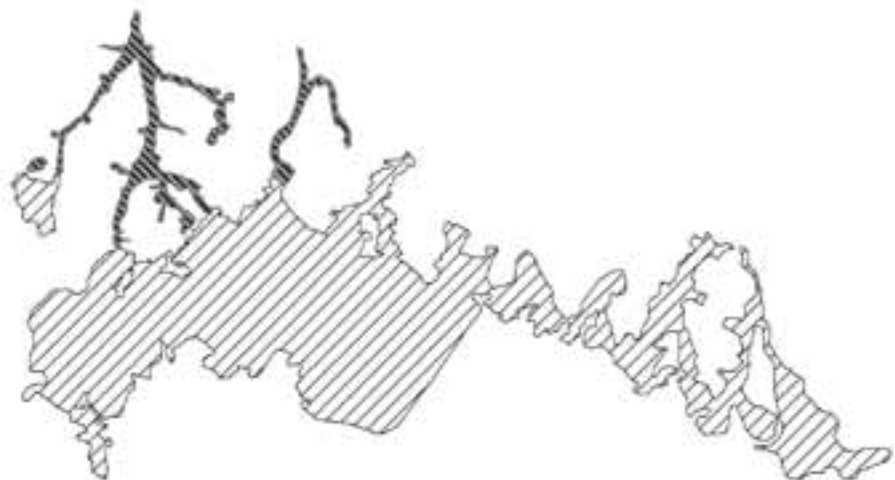


P06/011 Rakautao Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Significant flora

Coprosma tenuicaulis (regionally significant) was recorded during this survey.

Fauna

Historical records (1978) of NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline) NI tomtit (regionally significant), kukupa (regionally significant), grey warbler, NI fantail, tui, silvereye, Australasian harrier, morepork (reported), and several species of non-threatened land snail (SSBI P06/H007).

Significance

This site is the largest indigenous remnant within the contiguous Rakautao indigenous/plantation forest tract and would act as a refuge for species such as kiwi during the harvest of adjoining pines. It exhibits altitudinal and geomorphic gradients from ridge-top/hillslope to mid-altitude alluvial flats, and provides riparian and upper catchment protection for a tributary of the Punakitere River. The site is representative for five ecological units: (b), (c), (d), (f) and (g). There are records of three threatened fauna species and one regionally significant bird species. The site contains freshwater wetlands which are uncommon in Tangihua ED, providing habitat for one regionally significant plant species. Possum browse and pig rooting was evident in the forest during the current survey.

TE OI BUSH

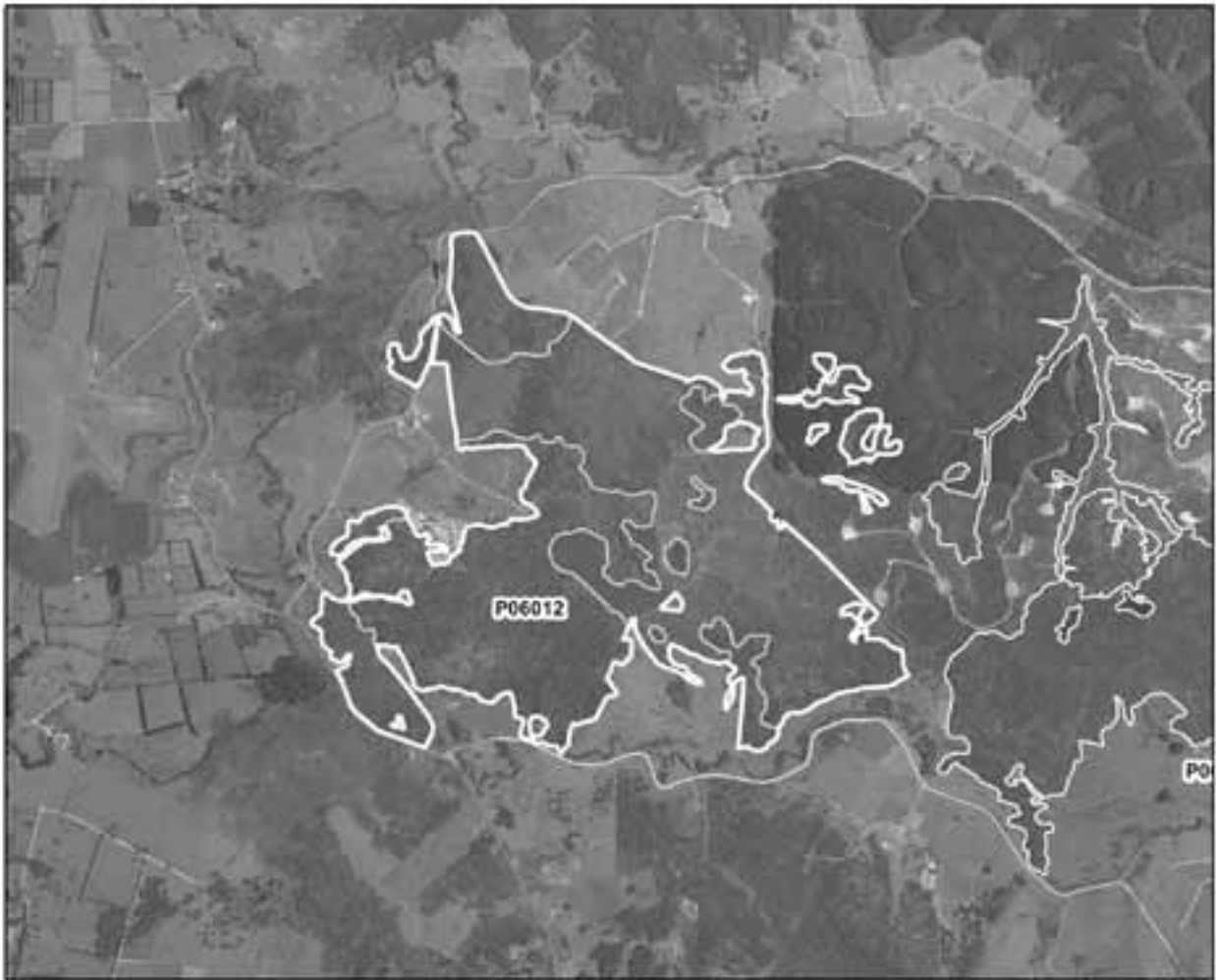
Survey no.	P06/012
Survey date	27 April 1994
Grid reference	P06 873372 (five remnants)
Area	311.5 ha (143.4 ha forest, 168.1 shrubland)
Altitude	100-207 masl

Ecological units

- (a) Kahikatea-totara forest on alluvial flats (20%)
- (b) Akeake-totara-towai forest gentle hillslope (5%)
- (c) Kauri-totara-towai forest on hillslope (30%)
- (d) Manuka-totara-towai shrubland on hillslope (5%)
- (e) Manuka shrubland on hillslope (40%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene basaltic lava flow; bounded by hill country underlain by Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex).



P06/012 Te Oi Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Vegetation

The site comprises a mosaic of secondary forest and shrubland on rolling hill country and flats. Kahikatea-torara forest (a) is dominant on alluvial flats, with frequent kauri and kanuka, and occasional tanekaha. On the lower, gentler slopes an unusual association of akeake, totara, and towai (b) dominates the canopy with frequent mamaku and manuka. Other hillslope areas include secondary kauri-totara-towai forest (c) with frequent tanekaha and puriri, and occasional miro, northern rata and tawa; and manuka shrubland (d) with common totara and towai, and frequent mamaku, ti kouka, and *Hebe* sp. Remaining shrubland is manuka-dominant (e) with occasional akeake and *Hakea* sp.

Significant flora

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

Fauna

Grey warbler, NI fantail, tui, and kingfisher were recorded in 1987 (SSBI P06/H006).

Significance

Te Oi Bush is situated at the easternmost end of a large indigenous/exotic forest tract and is thus likely to form part of a habitat network for mobile indigenous fauna. The site is relatively large and supports one regionally significant plant species as well as some uncommon vegetation types. The site is representative for four ecological units: (a) (b), (c) and (d).

HUEHUE FOREST AND MAUNGAKAWAKAWA FOREST

Survey no.	P06/013
Survey date	April and July 1994
Grid reference	P06 820320 (six remnants)
Area	1,479.7 ha (1,383.5 ha forest, 96.2 ha shrubland) (Small adjustments were made to the 1994/site boundary based on the 2006 aerial photography)
Altitude	70-355 m asl

Ecological units

- (a) Akeake-mamangi-manuka-tanekaha shrubland on steep hillslope
- (b) Taraire-towai forest on hillslope
- (c) Tanekaha-towai forest on hillslope
- (d) Kanuka-kauri-tanekaha forest on ridge
- (e) Manuka-kowhai shrubland on bluff
- (f) Manuka shrubland on steep hillslope
- (g) Kahikatea-pukatea-maire tawake forest on toeslope
- (h) *Glyceria maxima* grassland in swamp

- (i) Kahikatea forest on alluvium
- (j) *Juncus pallidus*-manuka-swamp millet rushland in swamp
- (k) Kanuka-totara forest on alluvium
- (l) Kahikatea-titoki-totara forest on alluvium
- (m) Raupo reedland in swamp

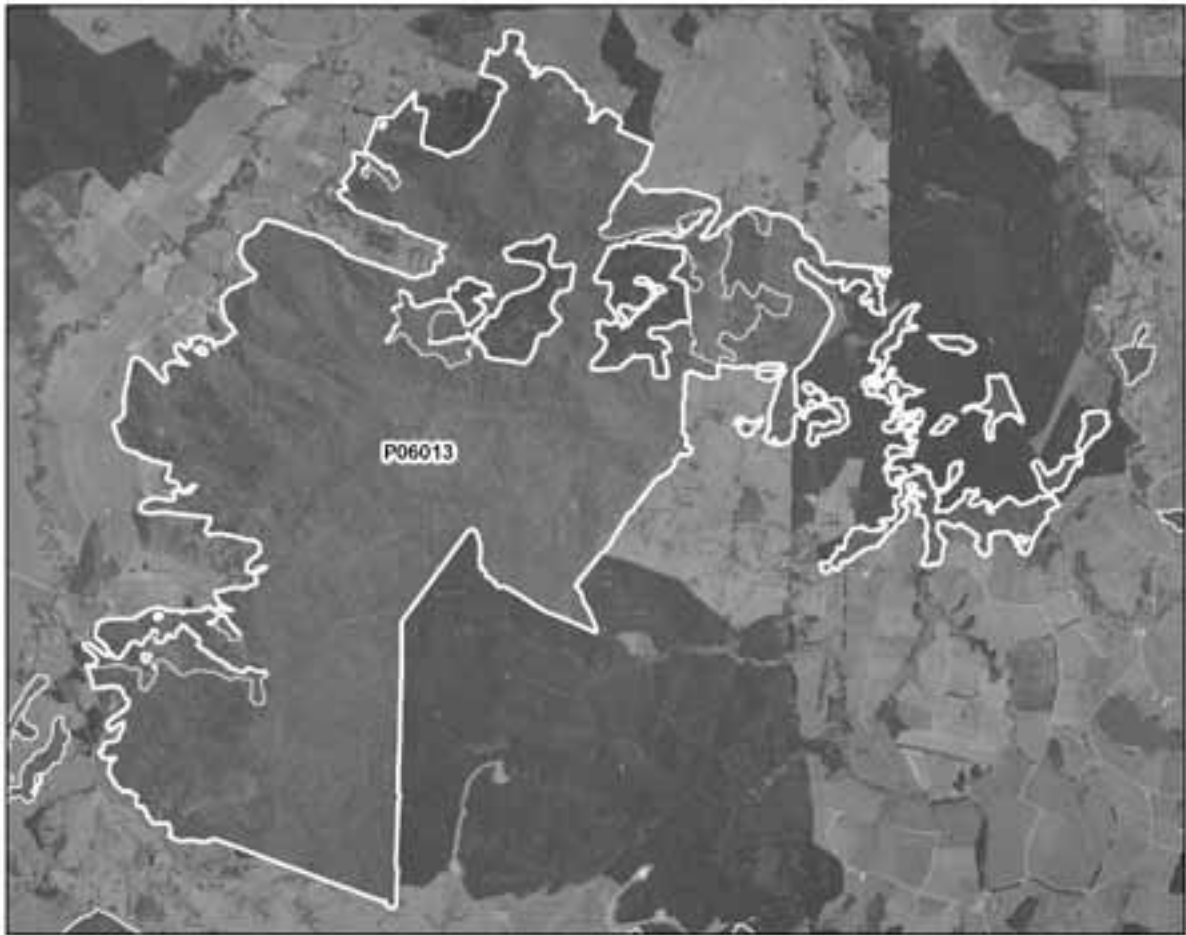
Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

A large tract of mostly secondary and cut-over tall podocarp-broadleaved forest types with shrubland on peripheral and recently disturbed sites, as well as extensive wetland areas. Akeake-mamangi-manuka-tanekaha shrubland (a), with frequent mingimingi, kowhai and totara, is a common vegetation type on the eastern side of Maungakawakawa Hill. The dominant forest type within the site is taraire-towai forest on hillslopes (b), with frequent tanekaha, puriri and rewarewa, and occasional kauri, kohekohe, titoki, karaka and northern rata. Forest type (b) also occurs with frequent tawa, rimu, miro, rewarewa, and occasional matai, pukatea, kawaka, mangeao, and emergent rimu and northern rata. Tanekaha-towai forest (c) occurs with frequent manuka, akeake, mamangi and rewarewa, and occasional puriri, totara and kahikatea. Kanuka-kauri-tanekaha forest (d) occupies ridges in the centre of site, while manuka-kowhai shrubland (e) is common on the rocky faces with frequent akeake. Manuka dominated shrubland (f) also occurs on steep hillslopes with frequent akeake and occasional *Hebe* sp., kumarahou, hangehange, gorse and *Hakea* sp.

On the south-eastern toeslope of Maungakawakawa Hill, kahikatea-pukatea-maire tawake forest (g) occurs with ti kouka and putaputaweta. The wetland adjacent to the toeslope is dominated by *Glyceria maxima* grassland (h), with occasional harakeke, *Carex virgata* and *Eleocharis sphacelata*. This vegetation unit is contiguous with alluvial kahikatea forest (i), which includes frequent pukatea, ti kouka, and totara and occasional titoki. Abundant divaricating shrubs such as kaikomako, *Coprosma rigida* and *C. rotundifolia* are evident in the sub-canopy. The neighbouring wetland is characterised by *Juncus pallidus*-manuka-swamp millet rushland (j) with occasional *Coprosma tenuicaulis*, kiokio, *Carex virgata*, *Eleocharis acuta* and ti kouka. Kanuka-totara forest (k) on alluvium occurs alongside Mangaone Stream with frequent towai, matai and kahikatea. Occasional species include pukatea, miro, titoki and kohuhu. Kahikatea forest (i) is locally common in this area. Kahikatea-titoki-totara forest (l) is another alluvial forest type that occurs next to Mangaone Stream. Occasional species include taraire, kanuka, ti kouka and matai. A wetland dominated by raupo reedland (m) in the southern part of the site includes putaputaweta, *Baumea* sp. and occasional ti kouka.

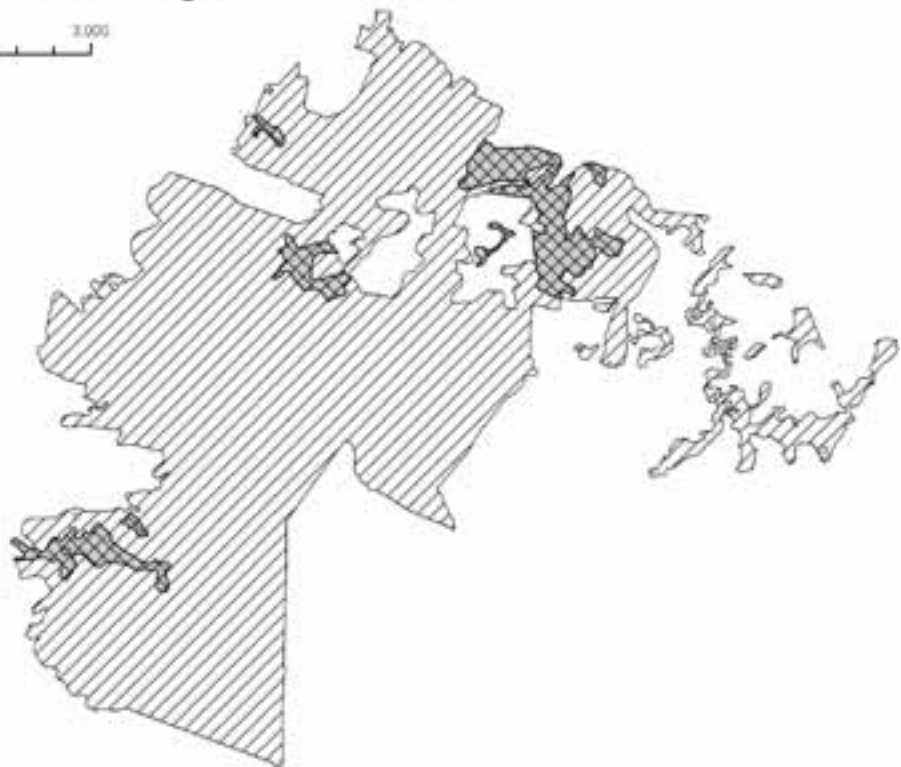


P06/013 Huehue Forest & Maungakawakawa Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Significant flora

King fern (Declining) (2001 record SSBI P06/H023), kawaka (Naturally Uncommon), *Lobelia angulata* (regionally significant), *Coprosma rotundifolia* (regionally significant), *C. tenuicaulis* (regionally significant), *Dicksonia lanata* (regionally significant) (all 1988 records, SSBI P06/H023*1) and maire tawake (regionally significant), kaikomako (regionally significant), and *Coprosma rigida* (regionally significant) were recorded in 2005 (W. Holland, DOC, pers. comm.). Northern rata (regionally significant) was recorded in 1987 (SSBI P06/H023).

Fauna

Historical records (1978) of NI brown kiwi (Nationally Vulnerable), NI tomtit (regionally significant), kukupa (regionally significant), grey warbler, NI fantail, silvereye, tui, kingfisher, Australasian harrier, and *Peripitus* sp. (Range Restricted) (SSBI P06/H023). NI brown kiwi, kukupa (regionally significant), NI tomtit, kauri snail (Gradual Decline) and common forest birds were recorded during the present survey (2005). The land snail *Amborbytida dunniae* (Gradual Decline) (Brook 2002) is known from the site. Wetlands are likely to support Australasian bittern (Nationally Endangered), spotless crane (Relict), and NI fernbird (Declining) (R. Pierce pers. comm.), although there are no substantiated records of these species from the site.

Significance

This site covers a large contiguous area which provides upper catchment protection to tributaries of the Punakitere River. It is representative for 11 ecological units: (a), (c), (d), (e), (f), (g), (i), (j), (k), (l) and (m). Four threatened fauna species, one regionally significant bird species, two threatened plant species, and eight regionally significant plant species have been recorded from this site. From Maungakawakawa Hill the forest grades into alluvial wetland and alluvial forest which extends southward towards Knudsen Road. This is representative of a freshwater-terrestrial ecotone which is now rare in Northland. Wetlands and alluvial forest are also threatened and uncommon habitat types in Tangihua ED and in Northland. The wetland at the base of Maungakawakawa Hill is dominated by the exotic plant *Glyceria maxima*, however, there is potential for this site to be converted to indigenous cover through strict management. All wetlands within this site are worthy of protection and would provide potential habitat for threatened indigenous birds such as NI fernbird (Declining) and spotless crane (Relict). 62.3 ha lie within a Queen Elizabeth II Open Space Covenant, while 11.4 ha are protected within the Maungakawakawa Conservation Area administered by DOC.

KAIKAU FOREST

Survey no.	P06/014
Survey date	2003-04
Grid reference	P06 027250 (four remnants)
Area	31 ha
Altitude	73-118 m asl

Ecological units⁴

- (a) Totara-kanuka forest on hillslope
- (b) Open grassland on hillslope
- (c) Harakeke-raupo flaxland in swamp
- (d) Rimu-kahikatea-kauri forest on moderate hillslope
- (e) Taraire-kahikatea forest in shallow gully

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces; bounded by steep hill of Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site comprises four small remnants within the Kaikau Forest pine plantation. The western-most remnant is dominated by totara and kanuka (a) with occasional tanekaha, mamaku, and local open grassland (b). This remnant contains one small wetland characterised by raupo and harakeke (c). The south-western remnant includes one larger area of secondary forest on hillslope above the Patutahi River where rimu, kahikatea and kauri (d) are emergent over taraire and tanekaha. Also present are narrow areas of secondary riverine vegetation, comprising mainly totara, kahikatea, mamaku and wheki. The northern remnant is characterised by modified primary podocarp-broadleaved forest in a shallow basin, with large mature taraire emergent over a canopy of kahikatea (e), nikau and mamaku.

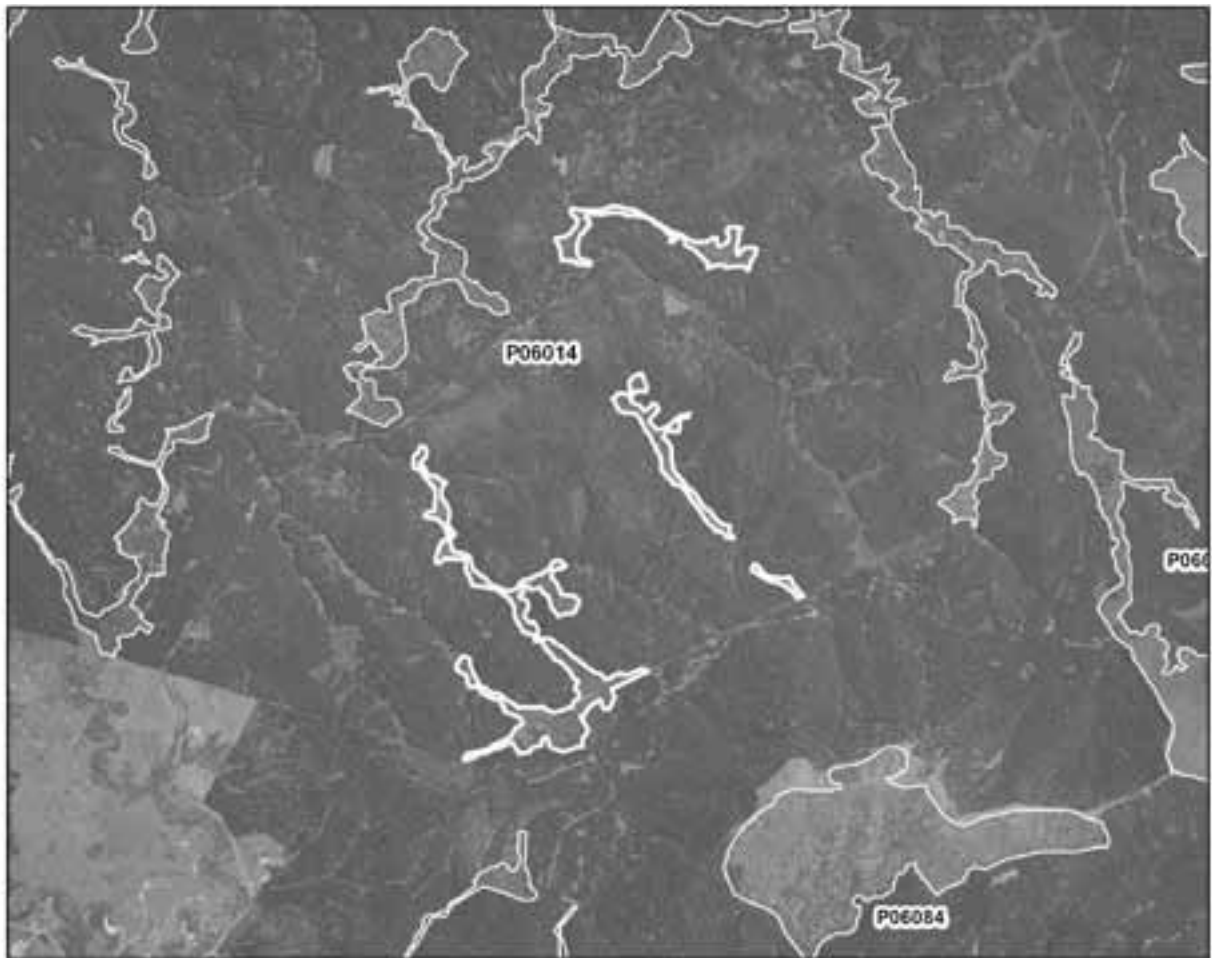
Fauna

Not surveyed, however, NI tomtit (regionally significant) was recorded during the 2004 Wildland Consultants survey of this site.

Significance

Kaikau Forest contains two vegetation types (c & d) that are uncommon in Tangihua ED and should therefore be considered representative. The site functions as a protective buffer along the Patutahi River and its tributaries, and is one of several natural areas alongside streams in the Kaikau Forest. It supports one regionally significant bird species and is contiguous with nearby Kahuwera Stream (P06/010), which supports three threatened species (grey duck, NI brown kiwi and NI fernbird). The site is also likely to provide a refuge for indigenous fauna during the logging of surrounding pine forest. Pigs are adversely affecting the understorey in the northern remnant (Wildland Consultants 2004).

⁴ Habitat maps were not produced for this site due to a lack of available information at the time of survey.



P06/014 Kaikau Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Unclassified habitat type



Aerial photography from 2005

ORCHID ROAD PODOCARP FOREST

Survey no. P06/015
Survey date 11 August 1994
Grid reference P06 835284
Area 18 ha
Altitude 140-240 m asl

Ecological units

- (a) Totara-rimu forest on moderate hillslope (70%)
- (b) Taraire-totara forest on moderate hillslope (30%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site is a small secondary and cut-over tall forest forest remnant which is surrounded by pasture and recently cleared pine plantation. Most of the site consists of podocarp forest characterised by abundant totara and common rimu (a). Rewarewa is frequent with occasional pukatea, miro, towai, kanuka and kahikatea. This forest type exhibits excellent podocarp regeneration. The remainder of the site is occupied by taraire-totara forest (b) with frequent towai and rewarewa, and occasional miro, puriri, kahikatea, rimu, pukatea, lancewood and emergent northern rata.

Significant flora

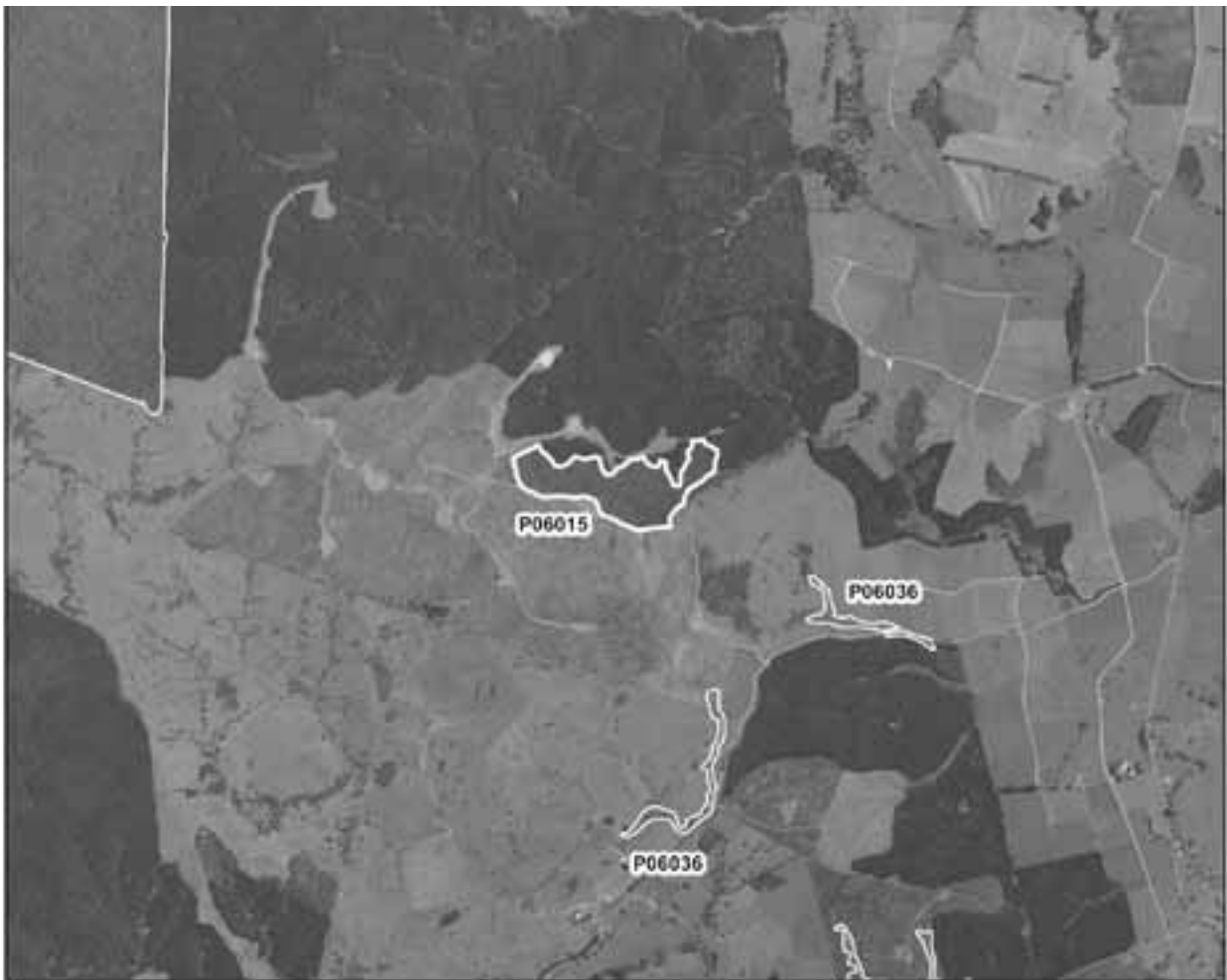
Northern rata (regionally significant) was recorded during this survey.

Fauna

Kauri snail (Gradual Decline) was recorded during this survey, and kukupa (regionally significant) were recorded in a prior survey by Wildland Consultants in 2004. NI brown kiwi (Nationally Vulnerable) are not specifically recorded from this site, but are known from the greater forest tract.

Significance

This site is a potential stepping stone as it is situated between two large indigenous forest tracts to the east and north-west, although recently cleared pine plantation has left the remnant largely unbuffered. It is representative for one ecological unit: (a). The site provides habitat for two threatened species of fauna and one regionally significant plant species. It also provides a protective buffer for a c.1.5 km section of Kawaka Stream. Lack of buffering on its northern margins following pine harvesting will make the site vulnerable to weed invasions.



P06/015 Orchid Road Podocarp Forest



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography from 2006

HUEHUE STREAM RIPARIAN FOREST AND WETLAND

Survey no. P06/017
Survey date 1 May 1994
Grid reference P06 787295 (five remnants)
Area 37 ha (32.5 ha forest, 4.5 ha wetland)
Altitude 80-120 m asl

Ecological units

- (a) Taraire-tanekaha forest on toeslope
- (b) Manuka forest on hillslope
- (c) Kahikatea-kanuka forest on toeslope
- (d) Raupo reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

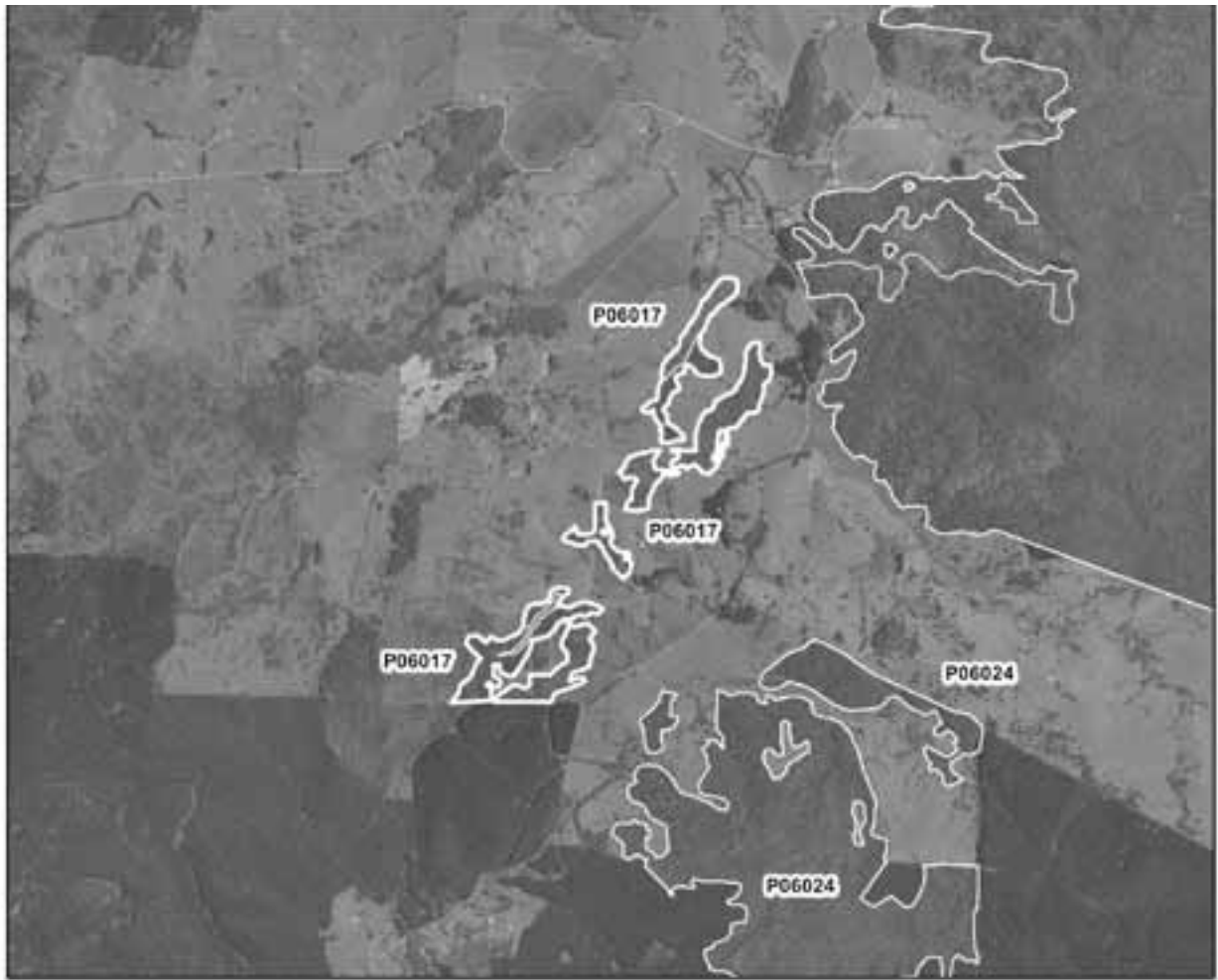
The site comprises secondary riparian forest adjoining a small mineralised wetland and the Huehue Stream. It is surrounded by pasture, but is close to the large forest tracts of Huehue Forest and Maungakawakawa Forest (P06/013) to the east. Secondary taraire-tanekaha forest (a) on toeslope occurs in the south of the remnant, and includes frequent kowhai, titoki, totara, and manuka, with occasional rewarewa, pukatea, rimu and karaka. In the same area manuka forest (b) dominates peripheral and ridge sites with frequent tanekaha. Kahikatea-kanuka forest (c) occurs on toeslopes in the catchment of the wetland. Other species include frequent totara with occasional taraire, rimu, maire tawake, titoki and rewarewa. Raupo reedland (d) dominates the wetland, with frequent *Baumea* sp. and *Juncus* sp., and occasional manuka.

Significant flora

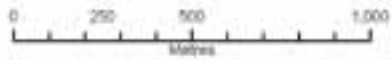
Ileostylus micranthus (regionally significant) was recorded during this 1994 survey. It was hemiparasitic on secondary riparian totara, adjoining parts of the stream and wetland. It is one of only two known localities for this species in Tangihua ED. Maire tawake (regionally significant) has also been recorded (SSBI P06/H027).

Fauna

Historical reports (1978) of Australasian bittern (Nationally Endangered), NI fernbird (Declining), spotless crane (Relict) and banded rail (Naturally Uncommon) (SSBI P06/H027).

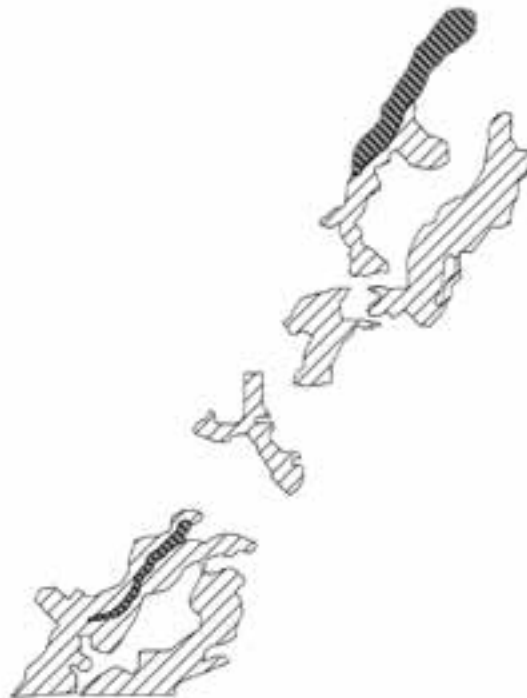


P06/017 Huehue Stream Riparian Forest and Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Significance

The site contains a freshwater-terrestrial ecological sequence, an uncommon and threatened habitat type in Tangihua ED and throughout Northland. Wetland vegetation, which would have been common on the extensive alluvial plains in Tangihua Ecological District in the past, now comprises only c.0.5% of the ED (MfE 2004). The site is representative for four ecological units: (a), (b), (c) and (d). There are past records of four threatened bird species, and they are still likely to frequent the wetland. The site also supports two regionally significant plant species and provides riparian buffering for Huehue Stream.

TE TOA BUSH

Survey no.	P06/024
Survey dates	12 August 1994 and 2003-04
Grid reference	P06 795274 (seven remnants)
Area	179.7 ha
Altitude	90-220 m asl

Ecological units

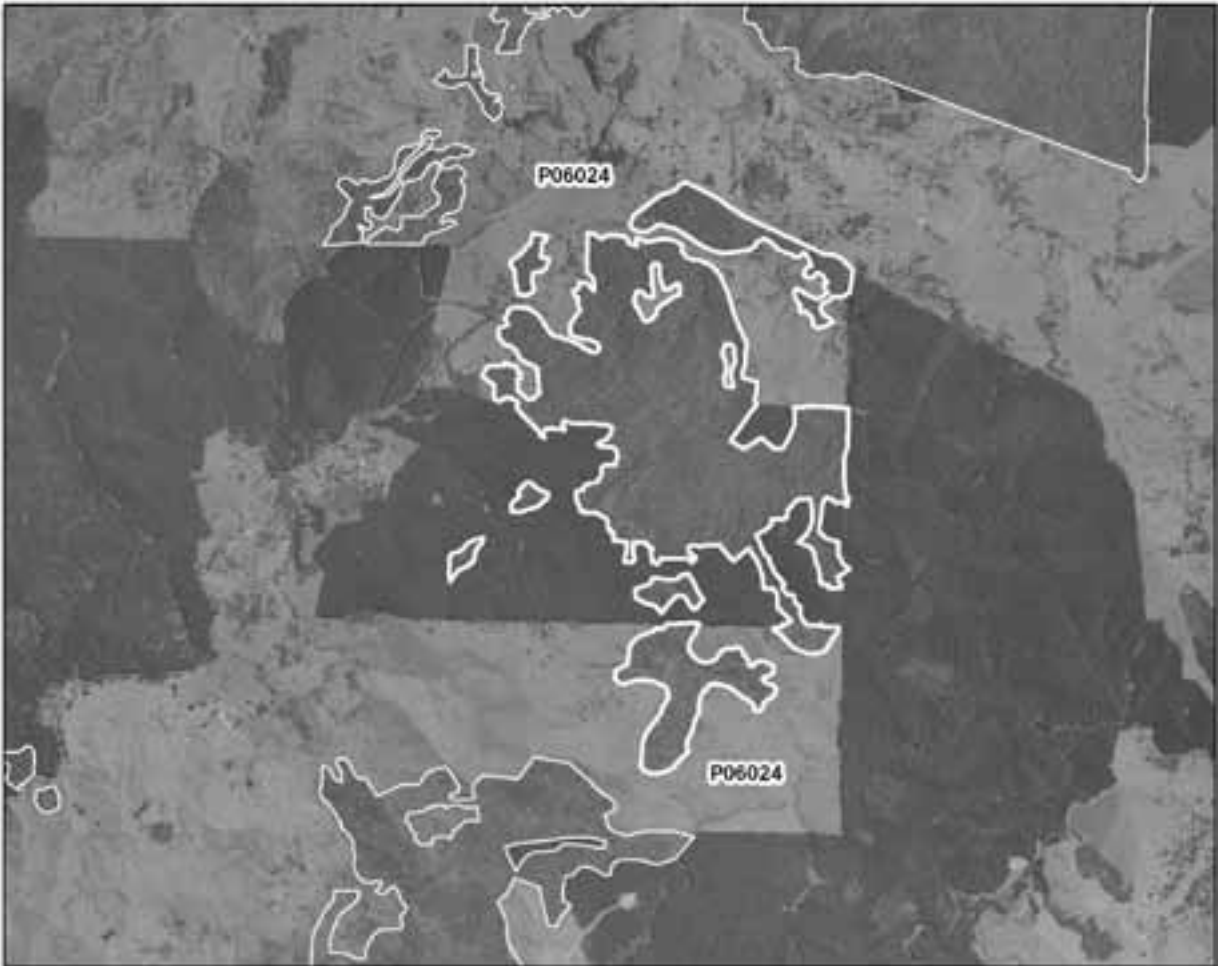
- (a) Totara-towai forest on moderate hillslope
- (b) Taraire-rewarewa forest on moderate hillslope
- (c) Kanuka-totara-towai forest on moderate hillslope
- (d) Kanuka forest on moderate hillslope
- (e) Tanekaha-totara forest on moderate hillslope
- (f) Taraire-towai forest on undulating-low hillslope
- (g) Kahikatea treeland on stream terrace
- (h) Totara-mamaku forest on moderate hillslope

Landform/geology

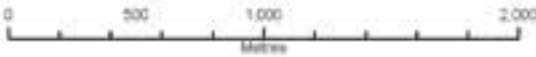
Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site encompasses a large area of secondary and cut-over tall kauri-podocarp-broadleaved forest and three smaller outlying areas. The site is contiguous with plantation forestry on its eastern and western borders. Totara, towai, and taraire are common in the canopy, with towai and pukatea as co-dominants near the stream. Kauri, rewarewa and northern rata are scattered emergents. The site is largely characterised by totara-towai forest (a) on moderate hillslopes, with frequent taraire, miro, tawa, kauri, and occasional matai, kohekohe, kahikatea, mamaku and nikau. The second most common forest type is taraire-rewarewa forest (b), which occurs with frequent puriri, tawa, kauri, mamaku and towai. Occasional species include rimu, miro, northern rata, matai and kawaka. Kanuka-totara-towai forest (c) with frequent mamaku is



P06/024 Te Toa Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

locally common in one small area, while kanuka forest (d) occupies a similar area with frequent puriri and totara. Tanekaha-totara forest (e) is confined to one very small area on a moderate hillslope. On the lower, undulating hills, taraire-towai forest (f) occurs with frequent pukatea and emergent rewarewa, kauri, and northern rata, while kahitea treeland (g) is common on the stream terrace with frequent totara and creeping buttercup. Totara-mamaku forest (h) occupies areas of moderate hillslope.

Significant flora

Kawaka (Naturally Uncommon) and northern rata (regionally significant) were recorded during the 1994 survey of this site.

Fauna

Historical records (1978) of NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), grey warbler, tui and silvereye (SSBI P06/H030). NI tomtit (regionally significant), morepork, silvereye, NI fantail, grey warbler and tui were recently recorded (Wildland Consultants 2004).

Significance

Te Toa Bush is part of an indigenous/exotic forest mosaic which links Huehue and Mataraua forests to Mangakahia and Tokawhero forests. The site is representative for three ecological units: (c), (d) and (h). Two threatened fauna species, one threatened plant species, one regionally significant bird species and one regionally significant plant species have been recorded at this site. The site may also provide a potential refuge for birds during harvesting of adjoining plantation forests, and forested areas provide partial riparian buffering for Te Toa Stream. The survey by Wildland Consultants found that totara in the canopy is being browsed by possums, especially beside the stream. Dog prints were seen along tracks; goats and cattle were also present throughout the site.

DAVID CARSON KAURI GROVE

Survey no.	P06/025
Survey date	12 August 1994
Grid reference	P06 763260
Area	4.7 ha (two remnants)
Altitude	190-240 m asl

Ecological units

(a) Kauri-taraire forest on steep to moderate hillslope (100%)

Landform/geology

Steep hillslope underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small area of unmodified, mature kauri-taraire forest



P06/025 David Carson Kauri Grove



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

(a) with frequent tawa, towai, miro, kahikatea, and occasional pukatea and rimu. It is currently well-buffered by pine plantation but is divided in two parts by a road.

Significant flora

A mature carmine rata (regionally significant) is present on a road cutting just south of the site (L. Forester pers. comm.).

Fauna

Not surveyed.

Significance

A small remnant linked by plantation forestry to eastern Mataraua Forest and containing a representative example of mature (a) kauri-taraire forest on steep to moderate hillslope, a rare forest type within Tangihua ED. Given the site's size and isolation, its viability will be compromised unless buffering is maintained after pine harvesting.

GAMMON ROAD BUSH

Survey no.	P06/026
Survey date	11 August 1994
Grid reference	P06 783245
Area	230.9 ha (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	130-440 m asl

Ecological units

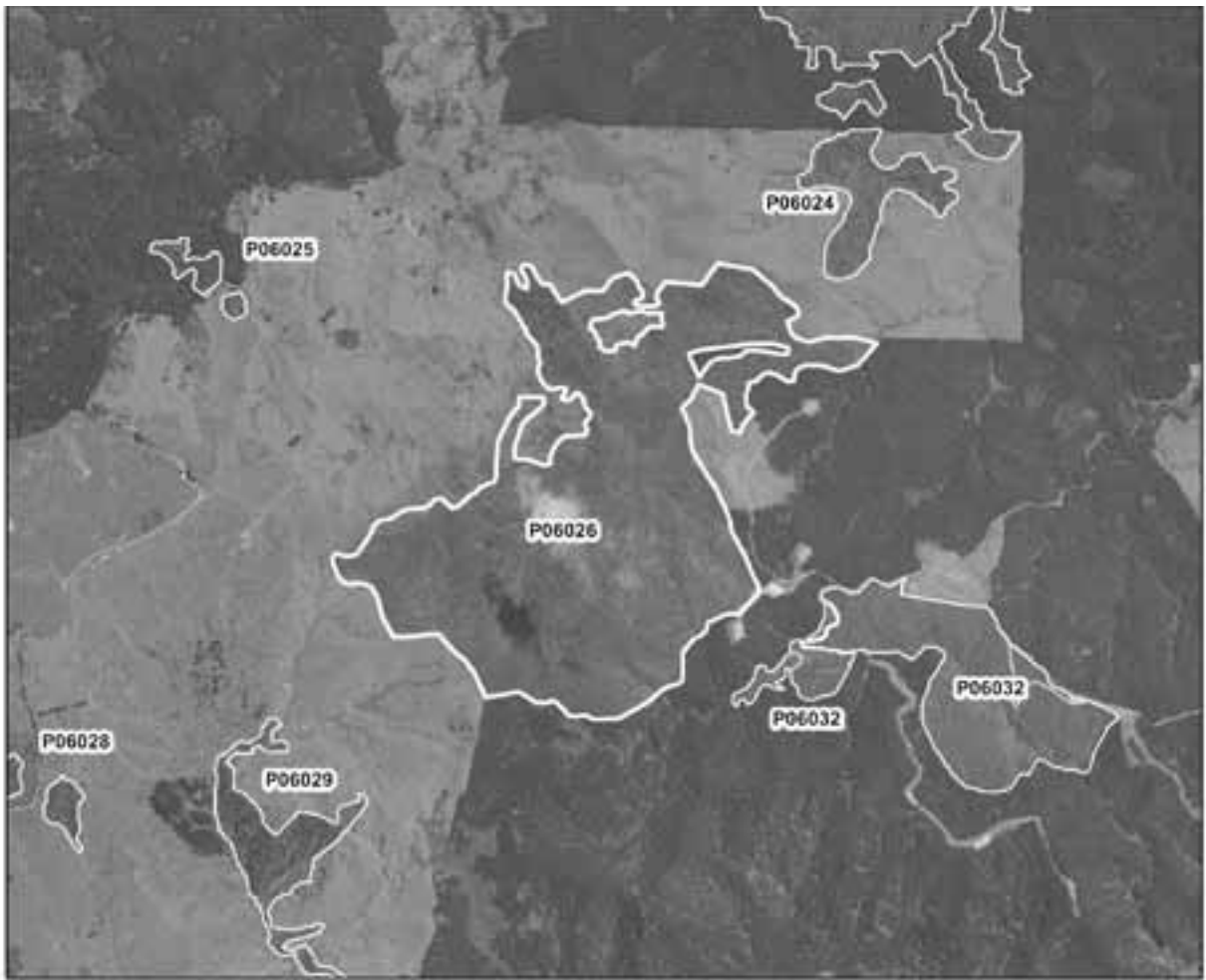
- (a) Miro-towai forest on moderate to steep hillslope (65%)
- (b) Towai forest on moderate to steep hillslope (15%)
- (c) Kanuka-kauri-taraire forest on moderate to steep hillslope (10%)
- (d) Kahikatea-totara-towai forest on moderate hillslope (5%)
- (e) Kanuka-kohuhu-mamaku forest on moderate to steep hillslope (5%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a large, hilly remnant containing unmodified, cut-over, and secondary podocarp-broadleaved forest, which is currently buffered by pine plantation along its eastern border. Miro-towai forest (a) on moderate to steep hillslope dominates over half of the site, and occurs with frequent taraire, tawa, rewarewa, and occasional rimu and kohekohe. In areas where miro is less common, towai forest (b) occurs on moderate to steep hillslope, with frequent taraire, rewarewa, tawa



P06/026 Gammon Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

and kohekohe, and occasional miro and totara. Secondary kanuka-kauri-taraire forest (c) covers a similar area and includes frequent tawa, totara, rewarewa and mamaku, and occasional matai and kowhai. Other forest types which occupy relatively small areas include kahikatea-totara-towai forest (d) with frequent rewarewa, mamaku and kanuka, and kanuka-kohuhu-mamaku forest (e) with frequent towai, and occasional tawa and rewarewa.

Fauna

NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), NI tomtit (regionally significant), kukupa (regionally significant), grey warbler, silvereve, tui, and kingfisher were recorded in 1987 (SSBI P06/H031). NI tomtit and kauri snail were subsequently recorded during a recent survey (Wildland Consultants 2004).

Significance

The site contains an excellent example of primary unmodified mid-altitude (a) miro-towai forest on moderate to steep hillslope - a very unusual forest type within Tangihua ED and Northland. It is representative for four ecological units which have been recorded only once in Tangihua ED: (a), (c), (d) and (e). The site supports two threatened fauna species and one regionally significant bird species. The site is part of a large indigenous/plantation forest tract which links forests to the north, west and east, including linkages to the DOC-administered Mangakahia Forest Addition Stewardship Area. A total of 141 ha lies within the Mataraua Forest Conservation Park.

PARKER ROAD RIVERINE ASSOCIATION

Survey no.	P06/030
Survey date	2003-04
Grid reference	P06 750220 (four remnants)
Area	31.9 ha
Altitude	180-290 m asl

Ecological units

- (a) Taraire forest on alluvium and steep hillslope
- (b) Towai-taraire forest on moderate hillslope
- (c) Kahikatea forest on flat-undulating land
- (d) Kahikatea treeland on alluvium
- (e) Taraire-totara treeland on alluvium
- (f) Totara-kahikatea-towai treeland on alluvium
- (g) Northern rata-rewarewa forest on river terrace
- (h) Taraire-kahikatea-totara forest on moderate hillslope
- (i) Makamaka-towai forest on moderate hillslope

Landform/geology

Valley floor on Holocene bouldery alluvium; bounded by hillslopes underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies) and landslide debris of basaltic boulders.

Vegetation

The site comprises a discontinuous strip of remnant forest and treeland along the banks of, and hillslopes above, the upper Mangakahia River. Secondary broadleaved forest dominates the eastern remnants, in which taraire forest (a) is the most abundant, occurring on both alluvium and steep hillslope. Other species in this unit include frequent totara, kahikatea and rewarewa, and occasional titoki and emergent northern rata. Another common forest type in this area is towai-taraire forest (b), which is restricted to the slopes above the river. It includes frequent tawa, rewarewa, and kahikatea, and occasional pukatea, mamaku and emergent northern rata.

Further west (upstream) along the Mangakahia River, the vegetation is predominantly modified primary podocarp-broadleaved forest with kahikatea, totara and taraire common in the canopy, emergent northern rata, rewarewa and rimu, and a mixed exotic-indigenous ground cover (Wildland Consultants 2004). Western remnants are generally flatter and contain a greater range of alluvial vegetation. Kahikatea forest (c) on flat-undulating land graduates into kahikatea treeland (d) on alluvium, where it occurs with taraire-totara treeland (e) and totara-kahikatea-towai treeland (f). The latter forest type includes emergent rewarewa and occasional titoki. A small but diverse band of northern rata-rewarewa forest (g) occupies a small area of the river terrace, and includes occasional taraire, mahoe, titoki, towai and kahikatea over an understorey of narrow-leaved plantain, browntop, creeping buttercup and cocksfoot. Remaining areas of hillslope are characterised by taraire-kahikatea-totara forest (h), with occasional tawa and emergent rimu and rewarewa, and makamaka-towai forest (i).

Significant flora

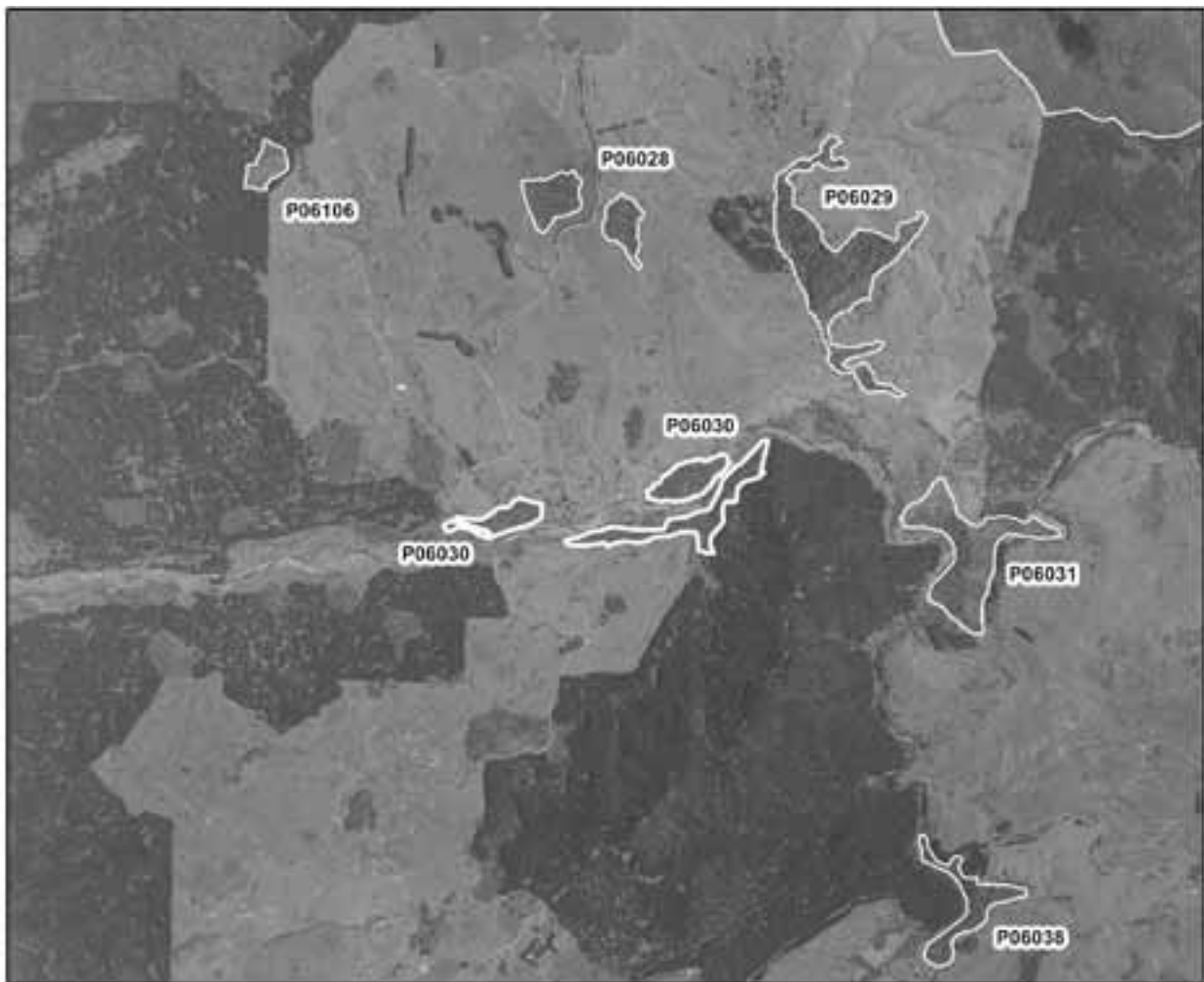
Northern rata (regionally significant) was recorded during this survey.

Fauna

Recent records of kauri snail (Gradual Decline), New Zealand pipit (Declining) silvereye, NI fantail, grey warbler, paradise shelduck, Australasian harrier, spur-winged plover, and welcome swallow (Wildland Consultants 2004). Longfin eel (Gradual Decline) and Cran's Bully have been recorded from the Mangakahia River, close to the site (NIWA 2009a).

Significance

The site is representative for six ecological units: (a), (d), (e), (f), (g) and (h). Forest on alluvial flats is under-represented at a national level, most of which have been cleared for agricultural purposes. The site provides habitat for two threatened fauna species and one regionally significant



P06/030 Parker Road Riverine Association



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

plant species. The site contains a small area (1.6 ha) of protected Marginal Strip (Mangakahia River Marginal Strip No 4, DOC-administered), which lies outside the Tangihua ED boundary. Western remnants are threatened by heavy grazing and trampling by cattle. Possum browse is evident on towai, totara, and mahoe, while goats are heavily browsing mahoe. Pest plants are common in some areas, including local patches of mistflower and Japanese honeysuckle, and widespread African club moss (Wildland Consultants 2004).

MANGARAUPO STREAM BUSH

Survey no. P06/032
Survey date 11 August 1994
Grid reference P06 800240
Area 67.2 ha (62.2 ha forest, 5 ha shrubland)
(Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude 200-300 m asl

Ecological units

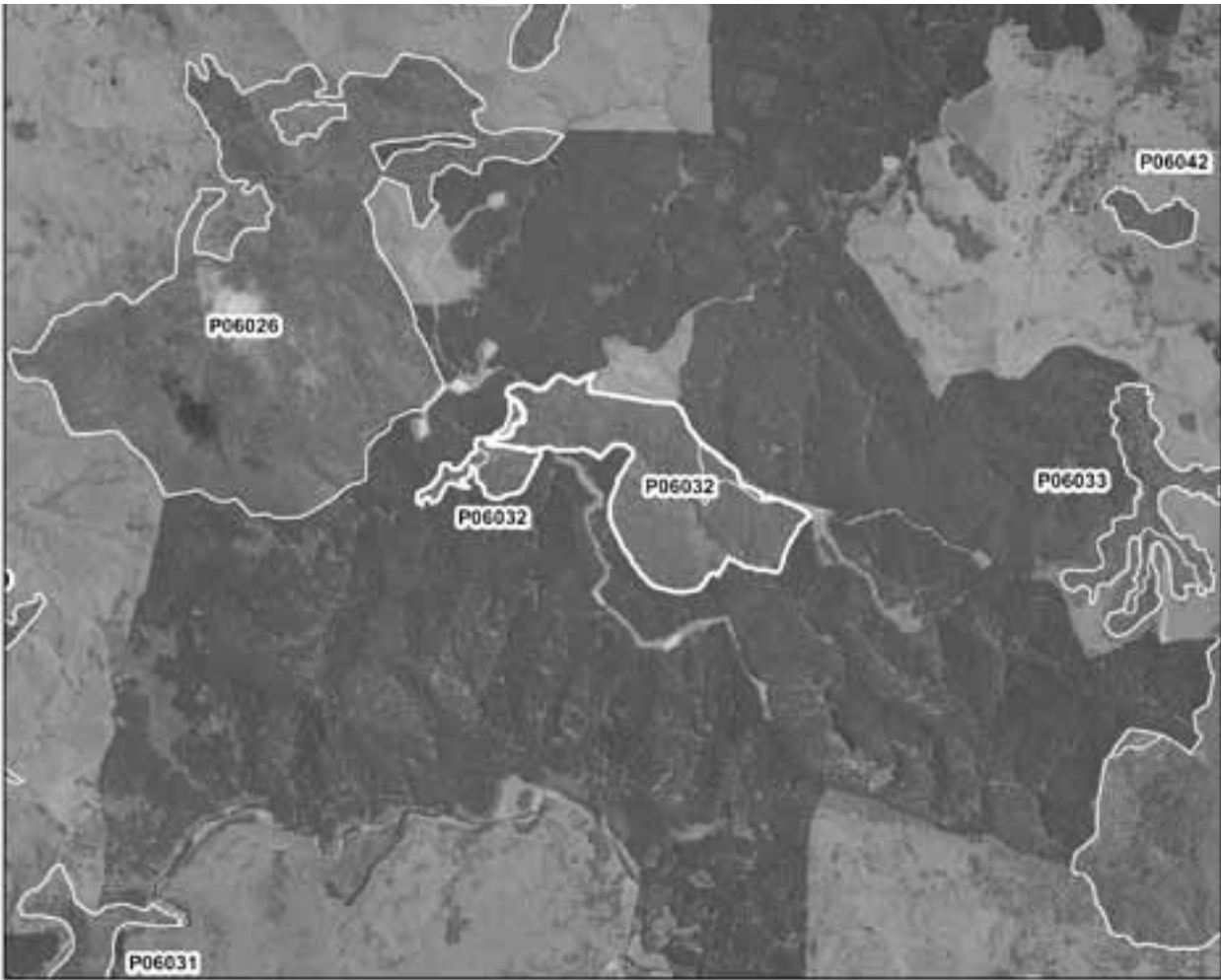
- (a) Taraire-towai forest on moderate to steep hillslope (42%)
- (b) Kahikatea-mamangi-towai forest on gentle hillslope (20%)
- (c) Kanuka-towai shrubland on hillslope (8%)
- (d) Towai-wheki shrubland on moderate to steep hillslope (10%)
- (e) Taraire-kauri forest on hillslope (20%)

Landform/geology

Hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site consists of a diverse mix of lightly cut-over, secondary forests and shrublands currently buffered by mature pine plantation along the eastern boundary. Taraire-towai forest (a) is the most common vegetation unit, and includes frequent rewarewa with emergent totara, rimu and miro. Occasional species in this unit include tawa and hinau with emergent kauri, kawaka, northern rata and kahikatea. Kahikatea-mamangi-towai forest (b) occupies gentle hillslope, where it occurs with frequent taraire, rewarewa, and kohuhu. Occasional species include tawheowheo, toro, pukatea, nikau and kiekie. Areas of shrubland are less widespread, and include kanuka-towai shrubland (c) with frequent lancewood and mahoe, and occasional totara and kahikatea; and towai-wheki shrubland (d) with frequent kanuka, manuka and kohuhu, and occasional putaputaweta, toro, mingimingi and hangehange. In other areas of hillslope forest kauri is commonly emergent over a canopy dominated by taraire (e).



P06/032 Mangaraupo Stream Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Significant flora

Kawaka (Naturally Uncommon) and toro (regionally significant) were recorded during this 1994 survey. Northern rata (regionally significant) was recorded in 1987 (SSBI P06/H034).

Fauna

Kauri snail (Gradual Decline), kukupa (regionally significant), grey warbler, silverye, NI fantail, tui, and welcome swallow were recorded in 1986 (SSBI P06/H034). Kukupa (regionally significant), NI tomtit (regionally significant), and kauri snail were recorded in a recent survey (Wildland Consultants 2004). The land snail Punctidae sp. 225 (Range Restricted) has also been recorded at the site (Brook 2002).

Significance

This site is part of a larger indigenous/plantation forest tract that supports NI brown kiwi (Nationally Vulnerable), and it would also act as an important refuge for indigenous fauna during logging operations. It is contiguous with the Mangakahia Forest Addition Stewardship Area (administered by DOC) and is a good example of podocarp-broadleaved forest in Tangihua ED. At least half of the site includes an excellent diversity of emergent species (including some very large trees). The site is representative for four ecological units: (b), (c), (d) and (e). These units are the only examples of their type recorded in Tangihua ED. The site supports two threatened fauna species, one regionally significant fauna species, one threatened plant species and two regionally significant plant species. The site provides a riparian function and buffer for upper Mangaraupo Stream. 24.4 ha are protected within the DOC-administered Mataraua Valley Scenic Reserve. Goats are having a noticeable impact on the understorey, and pigs are rooting the forest floor and preying on kauri snails (Wildland Consultants 2004).

OTIWHERO BUSH

Survey no.	P06/034
Survey date	18 July 1994
Grid reference	P06 825225 (three remnants)
Area	205.9 ha (204.7 ha forest, 1.3 ha wetland)
Altitude	70-266 m asl

Ecological units

- (a) Towai forest on moderate hillslope (45%)
- (b) Kauri-tanekaha-towai forest on moderate hillslope (30%)
- (c) Taraire-puriri forest on steep hillslope (10%)
- (d) Kahikatea-totara forest on moderate hillslope (5%)
- (e) Kahikatea-taraire forest on gentle hillslope (<1%)
- (f) Kahikatea-taraire-totara forest on moderate hillslope (<1%)
- (g) Totara-towai forest on hillslope (<10%)
- (h) Raupo reedland in swamp (<1%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

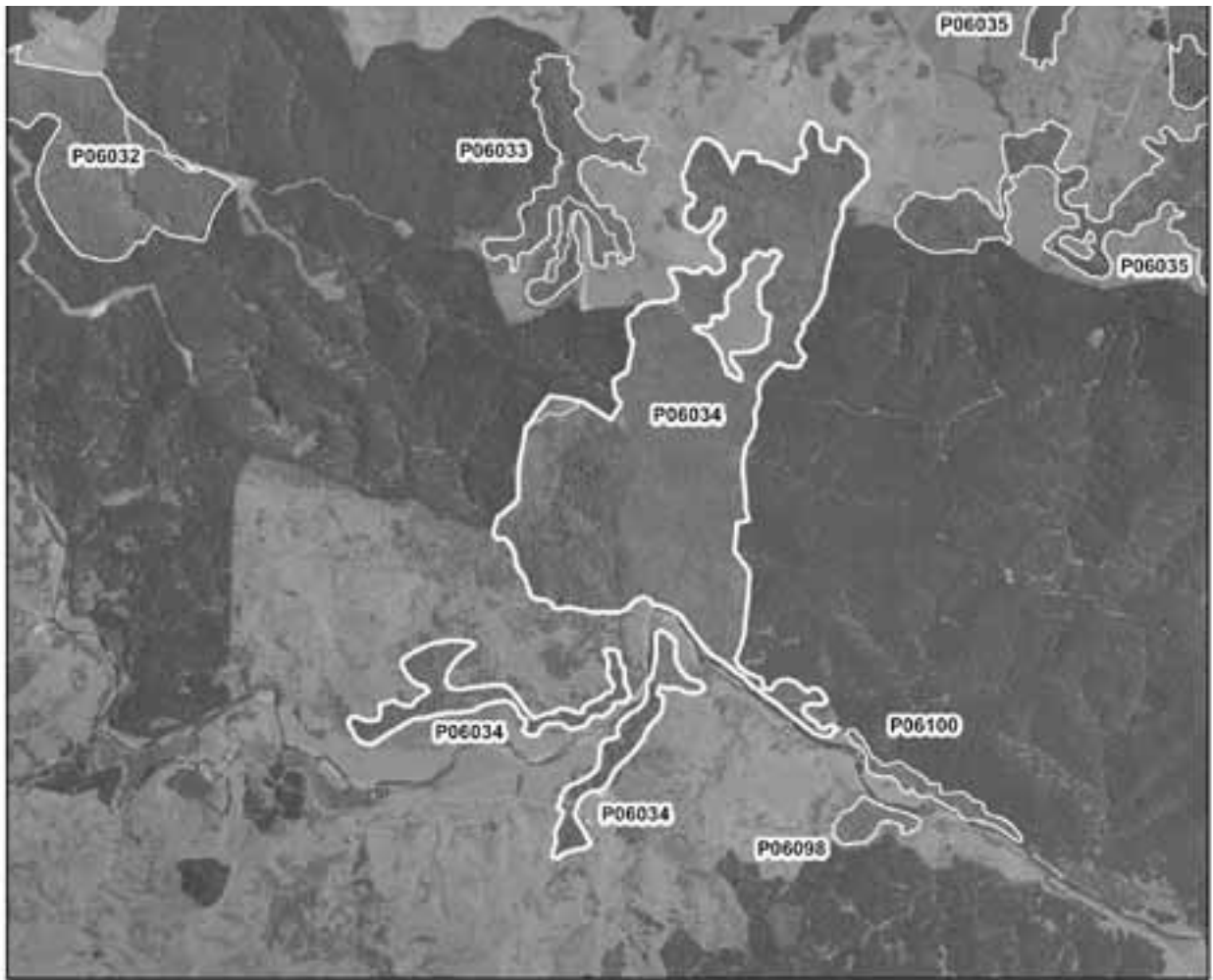
The site comprises three remnants, the largest of which is a large area of cut-over tall forest and secondary indigenous forest currently buffered by large tracts of pine plantation, and encompasses steep slopes, deeply incised gullies, and wetlands. Towai forest (a) covers nearly half of the site with tawa and taraire as frequent species. Occasional species include hinau, matai, and emergent kahikatea, rimu, kauri and northern rata. Kauri, tanekaha, and towai forest (b) is also common on moderate hillslopes, with occasional taraire, rewarewa and northern rata. The remaining forest type dominated by broadleaved species is taraire-puriri forest (c), which occurs on steep hillslopes with occasional rewarewa and kahikatea. Interspersed within the major forest types are patches of kahikatea-totara forest (d) with occasional pukatea and titoki; kahikatea-taraire forest (e) with occasional pukatea, rewarewa and matai; and kahikatea-taraire-totara forest (f), which is present in the Mangakahia Scenic Reserve with frequent titoki and occasional pukatea. Totara and towai forest (g) also occurs here with occasional kahikatea and kanuka. On the western boundary of the site, raupo reedland (h) dominates a small wetland with frequent *Juncus* sp. and occasional emergent kahikatea. The smaller remnants were not surveyed, but interpretation of aerial photography indicates that they contain similar vegetation types to those of the larger remnant.

Fauna

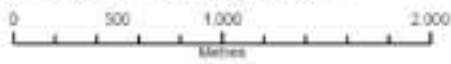
NI brown kiwi (Nationally Vulnerable) recorded in 1978 and kauri snail (Gradual Decline) and NZ pipit (Declining) recorded in 1986 (SSBI P06/H037), along with common bird species such as grey warbler, NI fantail, tui, kingfisher, Australasian harrier, and morepork.

Significance




This large indigenous forest would provide a potential refuge for indigenous fauna during the harvest of adjoining pine plantation. The site has uninterrupted altitudinal sequences from mid-catchment riverine forest up to the ridge-top and over into the adjoining catchment. It also contains a freshwater wetland, which is an increasingly rare and valuable habitat type in Tangihua ED and Northland. It is representative for at least two ecological units: (b) and (h). There are records of three threatened fauna species, although further surveys are required to determine current fauna values. A very small area (0.8 ha) is protected within the Otiwhero Conservation Area (DOC-administered). Riverine and gully forest provides riparian buffering for the Putaka Stream.



P06/034 Otiwhero Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

OTAENGA ROAD/AWARUA RIVERINE FOREST

Survey no. P06/035
Survey date 18 July 1994
Grid reference P06 850236 (five remnants)
Area 81.5 ha
Altitude 80-160 m asl

Ecological units

- (a) Totara forest on alluvium
- (b) Taraire forest on hillslope
- (c) Kanuka/manuka totara forest on hillslope

Landform/geology

Valley floor on Holocene alluvium; bounded by hillslopes underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises secondary alluvial, riverine and low-relief hill country forest generally adjoining the Awarua River, Otaenga Stream and its tributaries. Alluvial areas are dominated by totara forest (a), with frequent taraire, kahikatea, kowhai, matai, and occasional titoki, manatu, towai, tanekaha, rewarewa, miro and kohuhu. Taraire forest (a) on hillslope comprises abundant taraire with frequent puriri and occasional pukatea, rewarewa, towai, tanekaha and puka. Other hillslope areas are characterised by kanuka/manuka and totara forest (c), with frequent tanekaha and mamaku and occasional ti kouka.

Significant flora

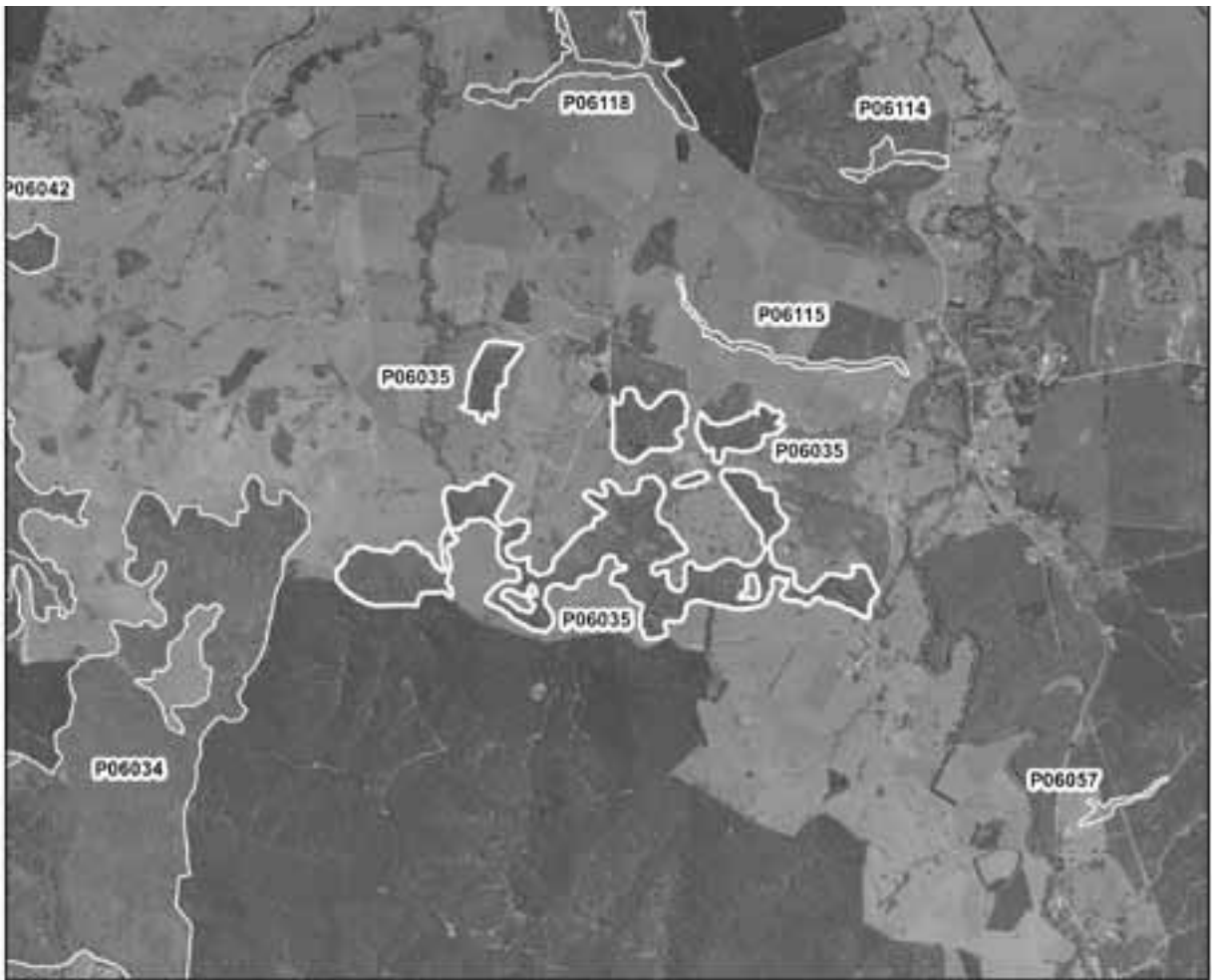
Manatu (regionally significant) was recorded during this survey.

Fauna

Not surveyed.

Significance

The site is relatively diverse and provides habitat for one regionally significant plant species. It also contains alluvial forest, an uncommon and threatened habitat type in Tangihua ED and Northland. Given its close proximity to several other natural areas, it is likely to form part of an important habitat corridor for mobile fauna. 2.6 ha of the site are within a recreation reserve (FNDC).

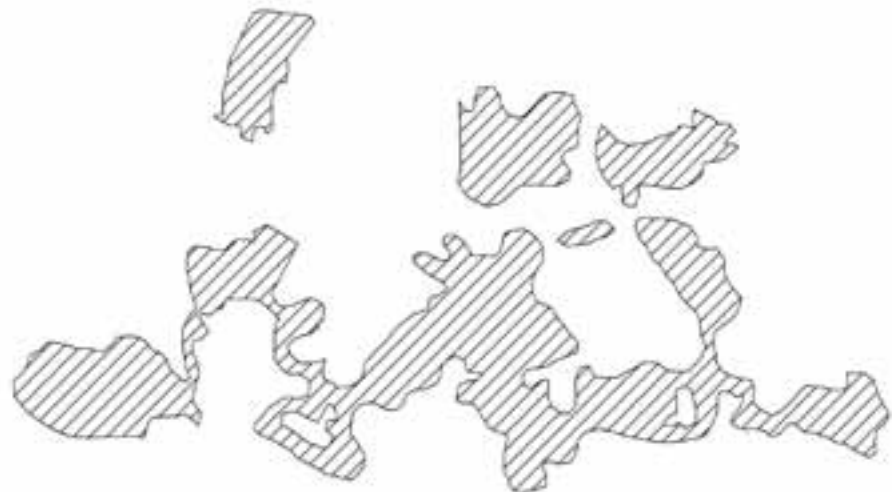


P06/035 Otaenga Road/Awarua Riverine Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

OTAENGA SWAMPS

Survey no. P06/036
Survey date 10 February 2009
Grid reference P06 840273 (three remnants)
Area 6 ha
Altitude 100 m asl

Ecological units

- (a) Raupo reedland in swamp (70%)
- (b) Harakeke flaxland in swamp (30%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

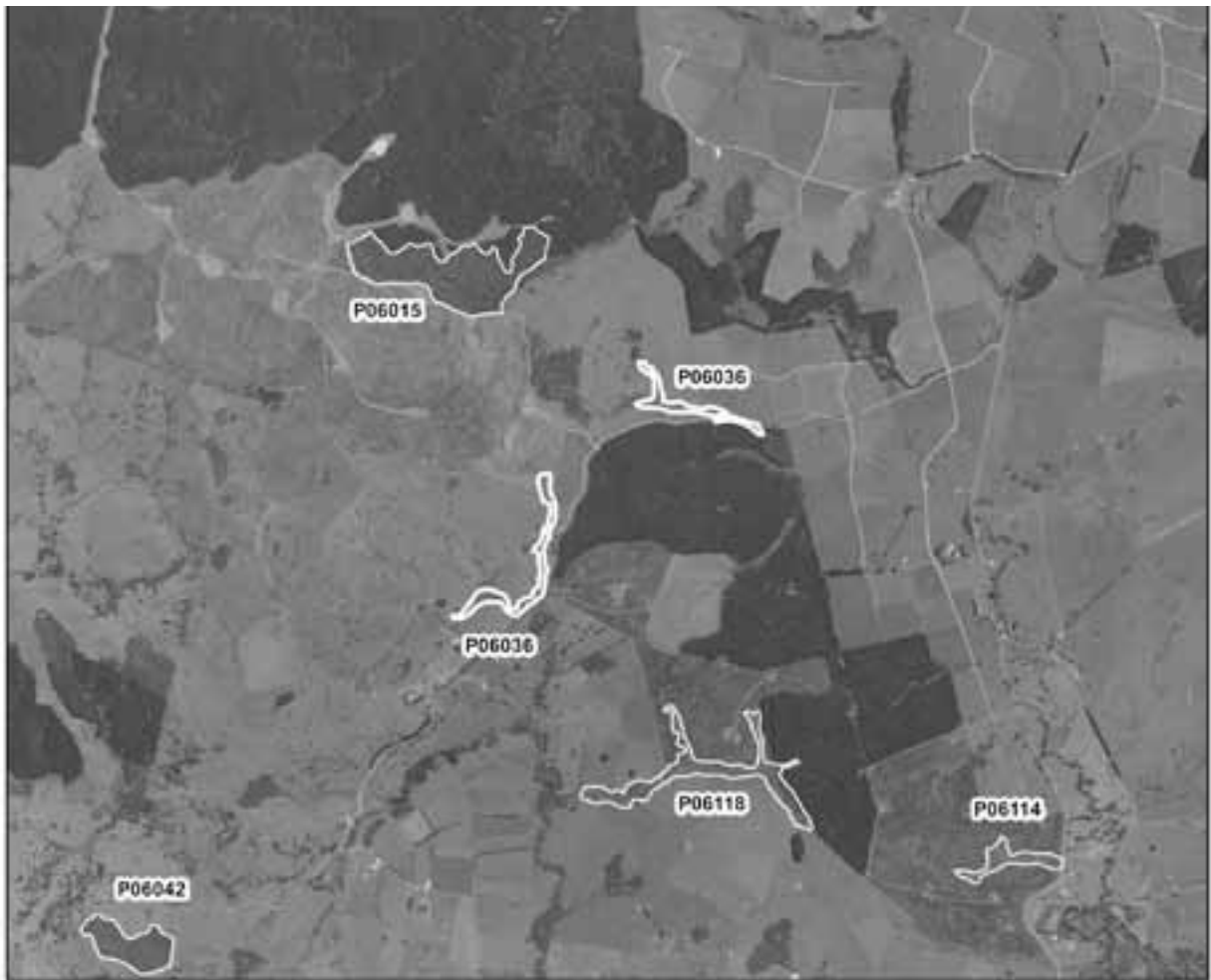
The site is largely comprised of three small, scattered mineralised freshwater wetlands dominated by raupo reedland (a). Harakeke (b) is dominant in drier sites, with occasional ti kouka, kahikatea and totara.

Fauna

Historical records of spotless crane (Relict), NI fernbird (Declining), NI fantail, kingfisher, and pukeko, all of which were recorded in 1978 (SSBI P06/H062).

Significance

The site is representative for both ecological units: (a) and (b). Wetlands are a diminishing and threatened habitat type in Northland, and harakeke wetlands are particularly under-represented. Historical records of two threatened bird species, but these were not recorded by Wildland Consultants during the present survey (2009). The site's shape and lack of buffering leave it vulnerable to weed invasion. Cattle were observed grazing amongst the raupo reedland; both flax and raupo are especially vulnerable to stock as flax is palatable and trampling of raupo crowns kills it (L. Forester pers. comm.).



P06/036 Otaenga Swamps



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

PATUTAHU RIVER SYSTEM

Survey no.	P06/037
Survey date	2003-04
Grid reference	P06 015 240
Area	93.4 ha (two remnants)
Altitude	97-188 m asl

Ecological units⁵

- (a) Towai-taraire-kanuka forest on hillslope
- (b) Mapou-putaputaweta-kohuhu shrubland on hillslope
- (c) Raupo reedland in swamp
- (d) Raupo-cocksfoot-tall fescue-creeping buttercup reedland in swamp
- (e) Harakeke flaxland in swamp
- (f) Manuka-harakeke shrubland in swamp
- (g) *Baumea* sp. sedgeland in swamp
- (h) Kauri-tanekaha forest on hillslope

Landform/geology

Valley floor on Holocene alluvium.

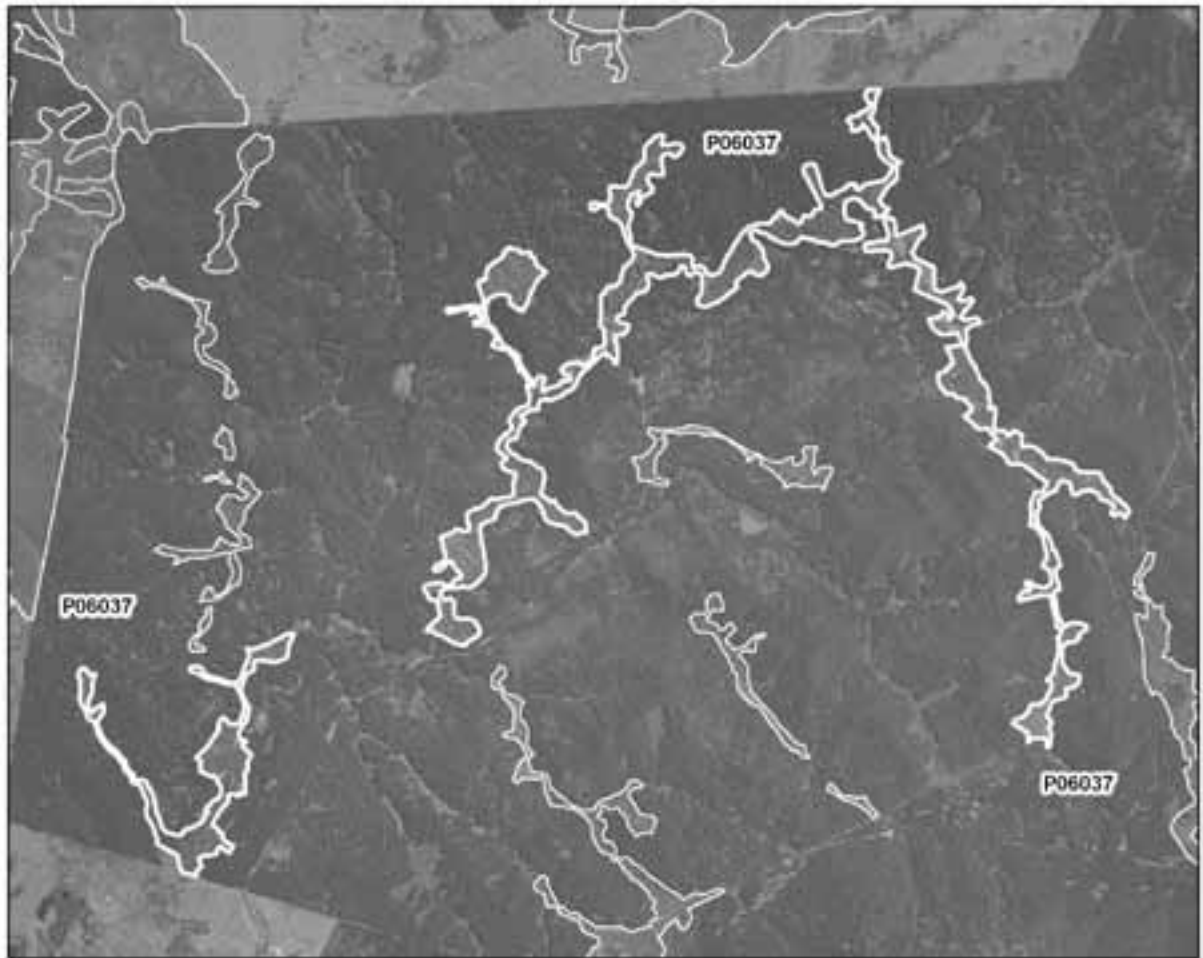
Vegetation

The site comprises a large mosaic of several vegetation types along the Patutahi River banks, situated within the Kaikau Forest pine plantation. Vegetation present includes secondary forest dominated by towai, taraire and kanuka (a), with frequent kahikatea, totara and tanekaha, and occasional emergent rewarewa, rimu and kahikatea. Secondary shrubland dominated by mapou, putaputaweta and kohuhu (b) occurs alongside the upper reaches of one small tributary stream. Several small wetlands occur throughout the site, including three dominated by raupo (c), one of which includes raupo with frequent cocksfoot, tall fescue and creeping buttercup (d). Other wetlands are characterised by abundant harakeke (e), co-dominant manuka and harakeke (f), and dominant *Baumea* sp. (g). Kauri is emergent over tanekaha (h) in a small hillslope area. Pines are planted very close to the river banks in the upper reaches, and pampas is scattered through open areas at the downstream end of the site. Wilding pines are present in one of the wetland areas. Tradescantia is widespread through the downstream units of the site.

Fauna

NI tomtit (regionally significant), kukupa (regionally significant), grey warbler, NI fantail, tui, Australasian harrier and kingfisher were recorded in this 2004 survey.

5 Habitat maps were not produced for this site due to a lack of available information at the time of survey.

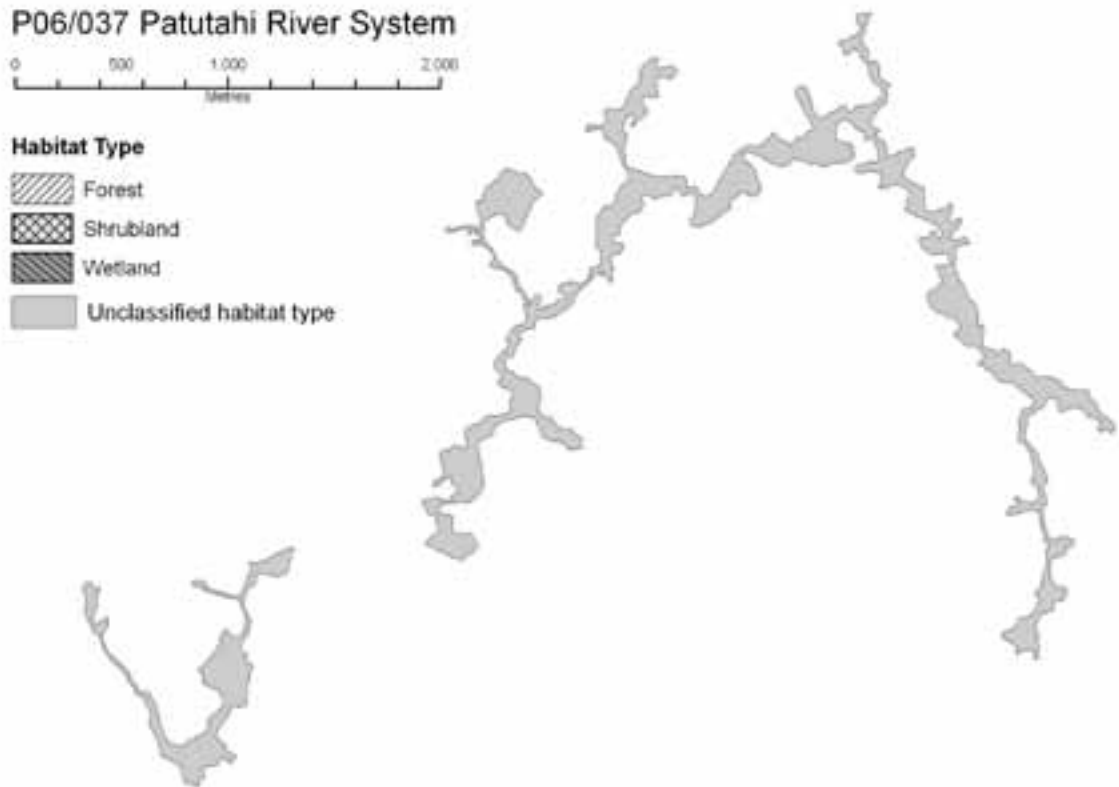


P06/037 Patutahi River System



Habitat Type

-  Forest
-  Shrubland
-  Wetland
-  Unclassified habitat type



Aerial photography from 2006

Significance

Patutahi River System has significance as it contains a good representative sequence of lowland vegetation associated with streamside, terrace and wetland. Such sequences are now uncommon in Tangihua ED (L. Forester pers. comm.). It supports one regionally significant bird species, and is likely to provide refugia for forest species during felling of nearby plantation forest. The site is representative for five ecological units: (a), (b), (c), (e) and (f). The site functions as a protective buffer along the Patutahi River and is one of several natural areas alongside streams in Kaikau Forest. Pigs are common throughout the site, with widespread rooting of the soil, especially in wetland areas. Possum browse was recorded on mahoe, totara and mamaku.

WAIMATENUI EAST ROAD RIVERINE FOREST

Survey no.	P06/038
Survey date	19 July 1994
Grid reference	P06 773205
Area	6.6 ha
Altitude	170-180 m asl

Ecological units

- (a) Taraire forest on alluvium (50%)
- (b) Towai forest on alluvium (50%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

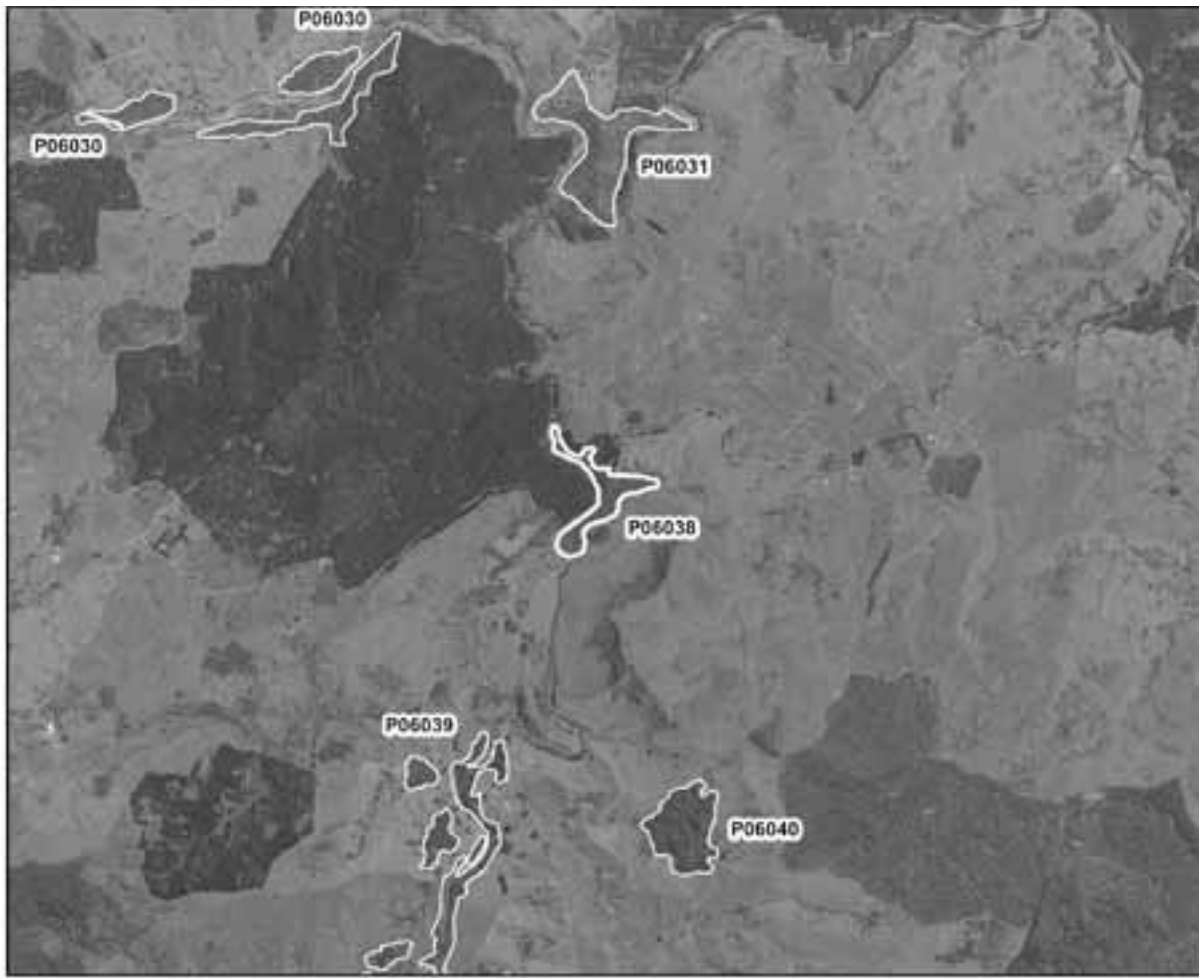
The site encompasses a small but diverse area of riverine forest along the Waikumurau Stream. There are two vegetation units present on alluvium, evenly distributed throughout the site. Taraire forest (a) occurs with frequent kahikatea and rewarewa, and occasional matai, titoki, mangeao, tawa and totara. Towai forest (b) occurs with occasional rewarewa, kahikatea and tawa.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline) and common bully have been recorded in tributaries of the Waikumurau Stream, close to the site (NIWA 2009a).

Significance

The site contains two representative examples of alluvial forest: (a) and (b), both of which are uncommon and threatened forest types in Tangihua ED and Northland. The site provides riparian buffering to the Waikumurau Stream, which supports at least one threatened fish species.



P06/038 Waimatenui Road Riverine Forest



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography from 2006

WAIOKUMURAU STREAM RIVERINE FOREST

Survey no.	P06/039
Survey date	19 July 1994
Grid reference	P06 767190 (six remnants)
Area	39 ha (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	180-240 m asl

Ecological units

- (a) Taraire-towai riverine forest on alluvium (85%)
- (b) Kahikatea forest on hillslope (15%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces; bounded by steep hillslopes of Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a winding strip of fragmented riverine forest along the lower reaches of Waiokumurau Stream. Taraire-towai riverine forest (a) is the most common vegetation unit, occurring with frequent totara, tawa, kahikatea, mahoe, and occasional kowhai, miro, pigeonwood, rewarewa, pukatea, matai, titoki and northern rata. Kahikatea forest (b) cloaks a small hillslope.

Significant flora

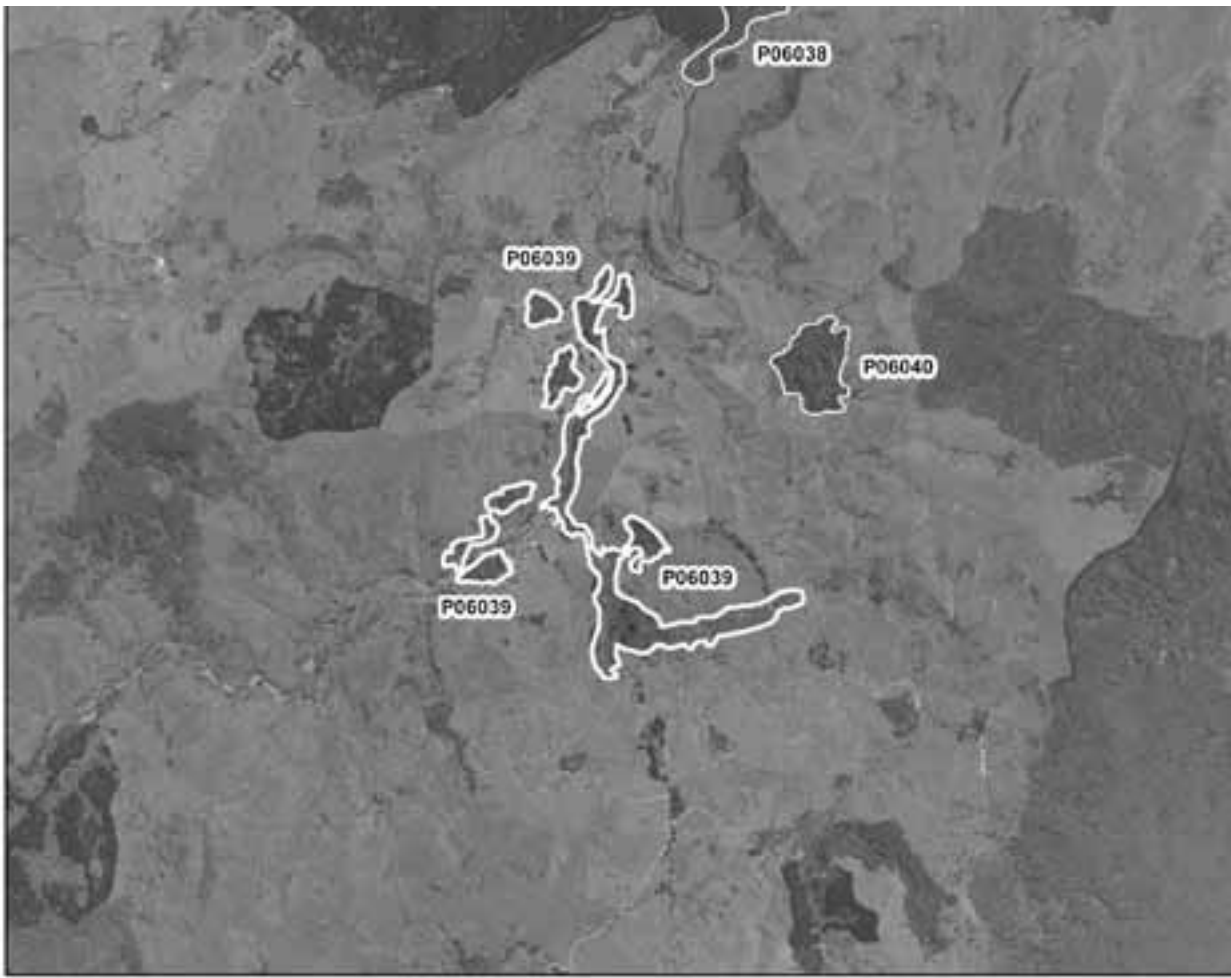
Northern rata (regionally significant) recorded during this survey.

Fauna

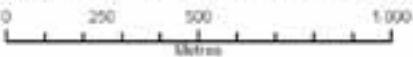
Terrestrial fauna not surveyed. Longfin eel (Gradual Decline) and common bully have been recorded in a tributary of Waiokumurau Stream, downstream of the site (NIWA 2009a).

Significance

This site forms part of the Mangakahia River catchment whose forested headwaters are largely intact and may have significant indigenous fish values. It provides riparian buffering for the Waiokumurau Stream, which supports at least one threatened fish species, and contains one regionally significant plant species. The site is representative for one ecological unit: (a) taraire-towai riverine forest on alluvium, which comprises the majority of the site. Alluvial forest is an uncommon and threatened habitat type in Tangihua ED and throughout Northland. The site contains 1.9 ha of protected land (Waiokumurau Stream Marginal Strip No 1, DOC-administered).



P06/039 Waiokumurau Stream Riverine Forest



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006

HORAHORA ROAD GUMLAND

Survey no. P06/041
Survey date 9 February 2009
Grid reference P06 070300
Area 170.8 ha
Altitude 72-76 m asl

Ecological units

(a) Manuka-*Gleichenia* sp. shrubland on gentle hillslope (100%)

Landform/geology

Valley floor on Holocene alluvium, bounded by hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

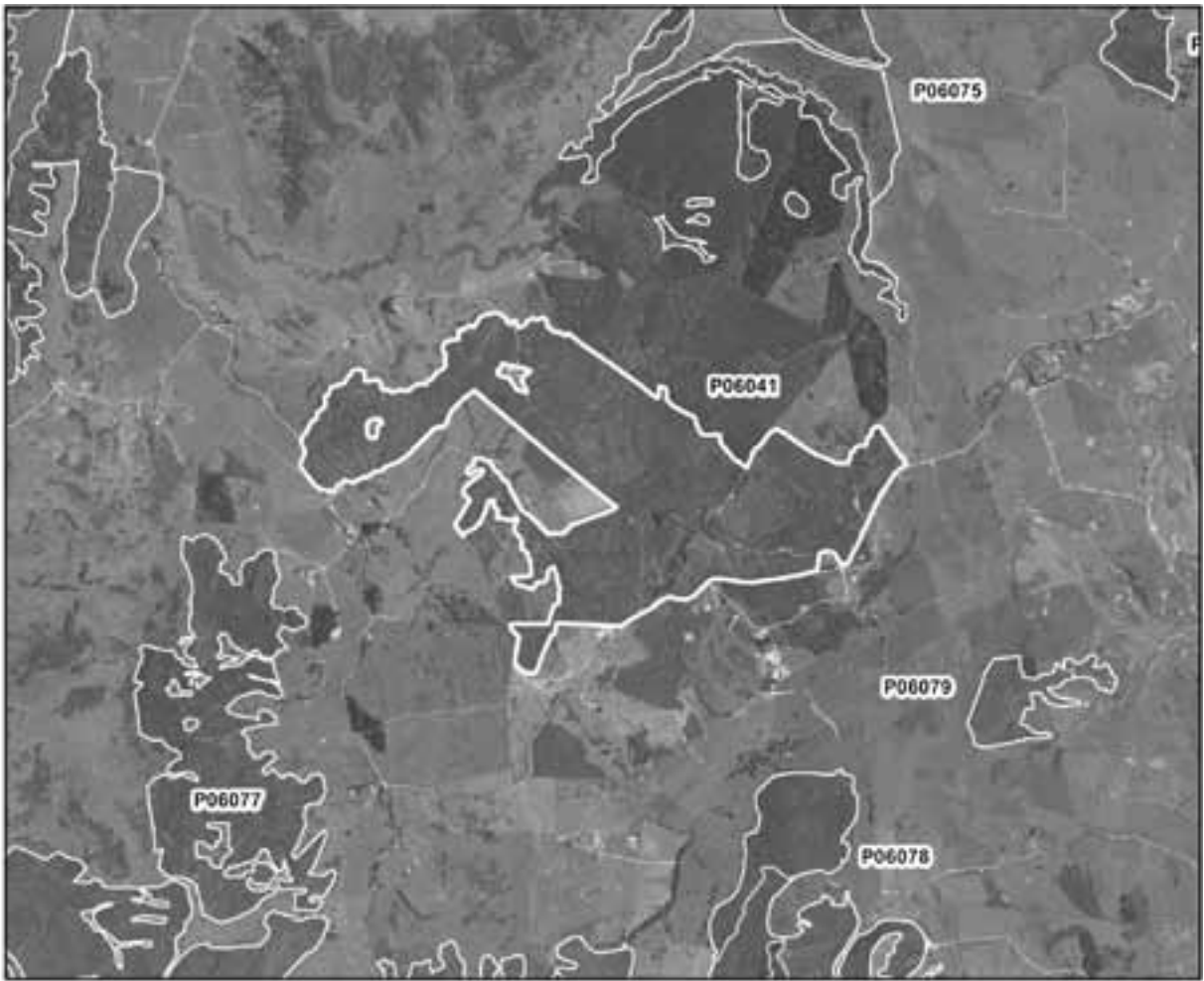
The site consists of gumland characterised by manuka-*Gleichenia* sp. shrubland (a). Other associated shrubland taxa include *Gabnia xanthocarpa*, kiokio and *Baumea* sp., *Schoenus tendo*, *Dracophyllum lessonianum*, bracken and towai, which occur occasionally on the periphery of the site. Most of the the site was not easily visible during this survey, however, interpretation of 2006 aerial photography indicates it supports a similar vegetation type to that surveyed.

Fauna

NI fernbird (Declining) and grey warbler were recorded during this 2009 survey.

Significance

The site contains an interesting assemblage of plant species within gumland, a rare habitat type within Tangihua ED and throughout Northland. It is representative for (a) manuka-*Gleichenia* sp. shrubland on gentle hillslope and provides abundant habitat for one threatened bird species. Flatter areas of the site are likely to contain ephemeral wetlands. Weed presence is generally low, with pampas, gorse, and Chinese privet occasional on the road margins. *Hakea* sp. is present but has largely been controlled.

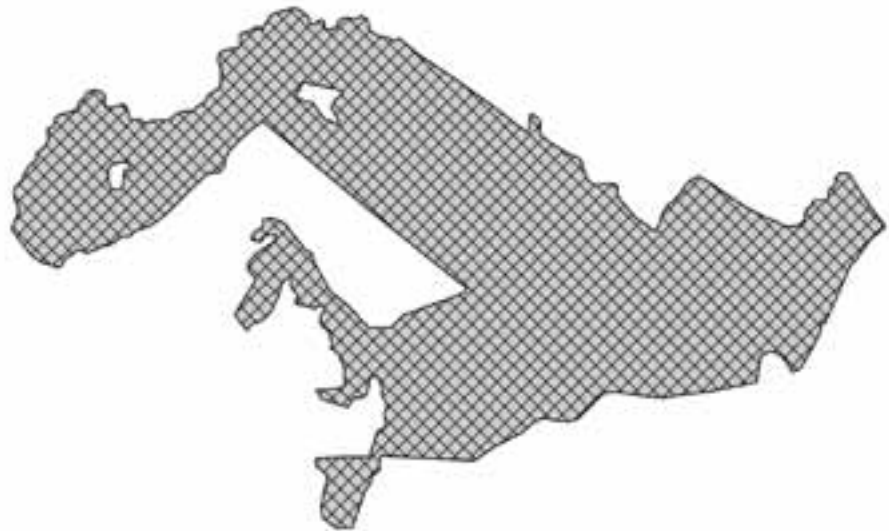


P06/041 Horahora Road Gumland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2000

OPOUTEKE STREAM RESERVE AND SURROUNDS

Survey no.	P06/043
Survey date	3 August 1994 and 2003-04
Grid reference	P06 850118 (three remnants)
Area	26.2 ha. (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	93-221 m asl

Ecological units

- (a) Totara forest on hillslope (30%)
- (b) Taraire forest on hillslope (30%)
- (c) Kahikatea-totara forest on hillslope (15%)
- (d) Taraire-towai forest on hillslope (15%)
- (e) Totara forest on alluvial terrace (10%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

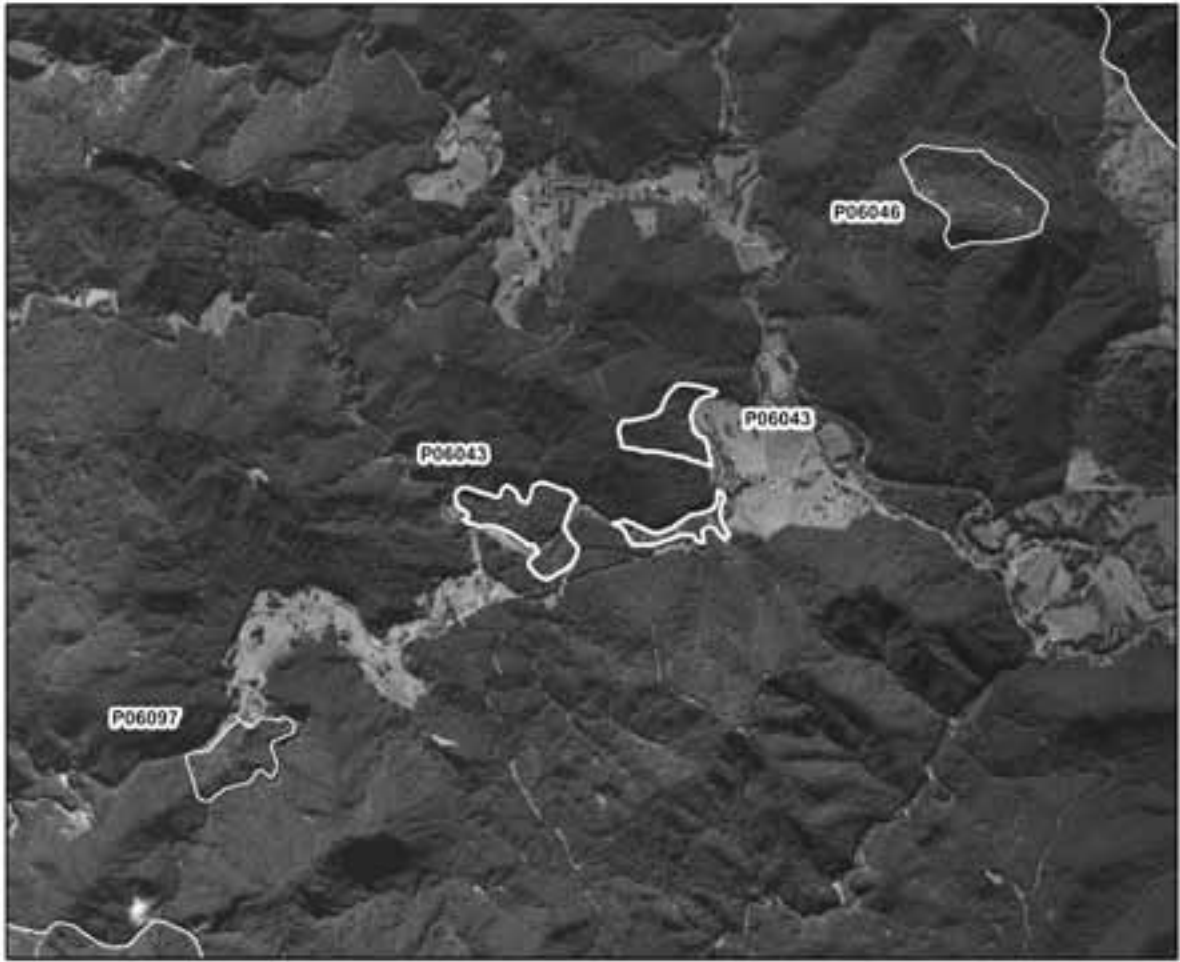
The site is part of a series of natural areas along Opouteke Stream, and comprises two remnants of riverine forest on hillslope and alluvial terraces. Totara forest is common on hillslopes, where it occurs with frequent rewarewa and kanuka/manuka. Occasional species include rimu, towai and tanekaha. The other common forest type is dominated by taraire (b) with frequent emergent kahikatea, and occasional kowhai, miro, titoki, pukatea, rewarewa, totara and tawa. Kahikatea-totara forest (c) is also common on hillslopes, as is taraire-towai forest (d) with frequent rewarewa and puriri, and occasional nikau, tawa and pukatea. Totara forest (e) is the most common canopy species on alluvial terraces in the western remnant, where it occurs with emergent rimu, kauri, rewarewa and puriri.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline) and common bully have been recorded in the Opouteke Stream (NIWA 2009a).

Significance

The site has a good diversity of plant species, it is currently well-buffered by pine plantation, and it contains a representative example of (e) totara forest on alluvial terrace, which is under-represented at both a regional and national level. It also contains many large, mature, and healthy puriri that would provide a valuable food source for kukupa, which are likely to utilise the site. One threatened fish species has been recorded upstream, and this site may help buffer an important migratory route for this indigenous species. 4.6 ha of the site are protected within the DOC-administered Opouteke Scenic Reserve while 5.3 ha lie within a WDC-administered scenic reserve. Titoki and totara were being browsed by possums during this survey.

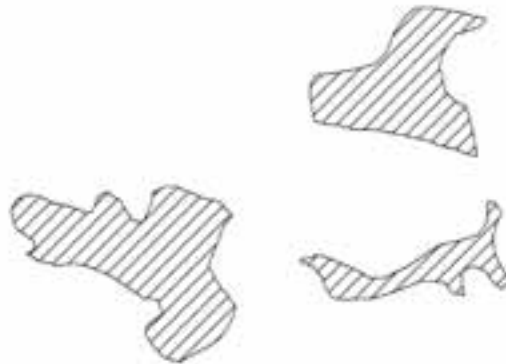


P06/043 Opouteke Stream Reserve and Surrounds



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

CORONET ROAD BUSH

Survey no.	P06/044
Survey date	2 August 1994
Grid reference	P06 855160 (two remnants)
Area	38.7 ha
Altitude	135-259 m asl

Ecological units

- (a) Rewarewa-tanekaha-taraire-towai forest on moderate to steep hillslope (60%)
- (b) Taraire forest on moderate to steep hillslope (30%)
- (c) Mamaku-titoki forest on steep hillslope (10%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site contains three types of hillslope forest. Rewarewa-tanekaha-taraire-towai forest (a) is the most abundant of the vegetation units, and includes frequent kawaka, kauri, rimu, monoao, matai, and emergent northern rata, and occasional miro. Taraire forest (b) is also common, occurring with frequent rewarewa and occasional pukatea, nikau, tawa, lancewood, tanekaha, and emergent kahikatea and kauri. The remainder of the site comprises a canopy dominated by mamaku and titoki (c), but is broken up by open areas of grassland, bracken and *Gabnia* sp. Other species include frequent taraire, tawa, kowhai and mahoe, and occasional tanekaha, pukatea and puriri.

Significant flora

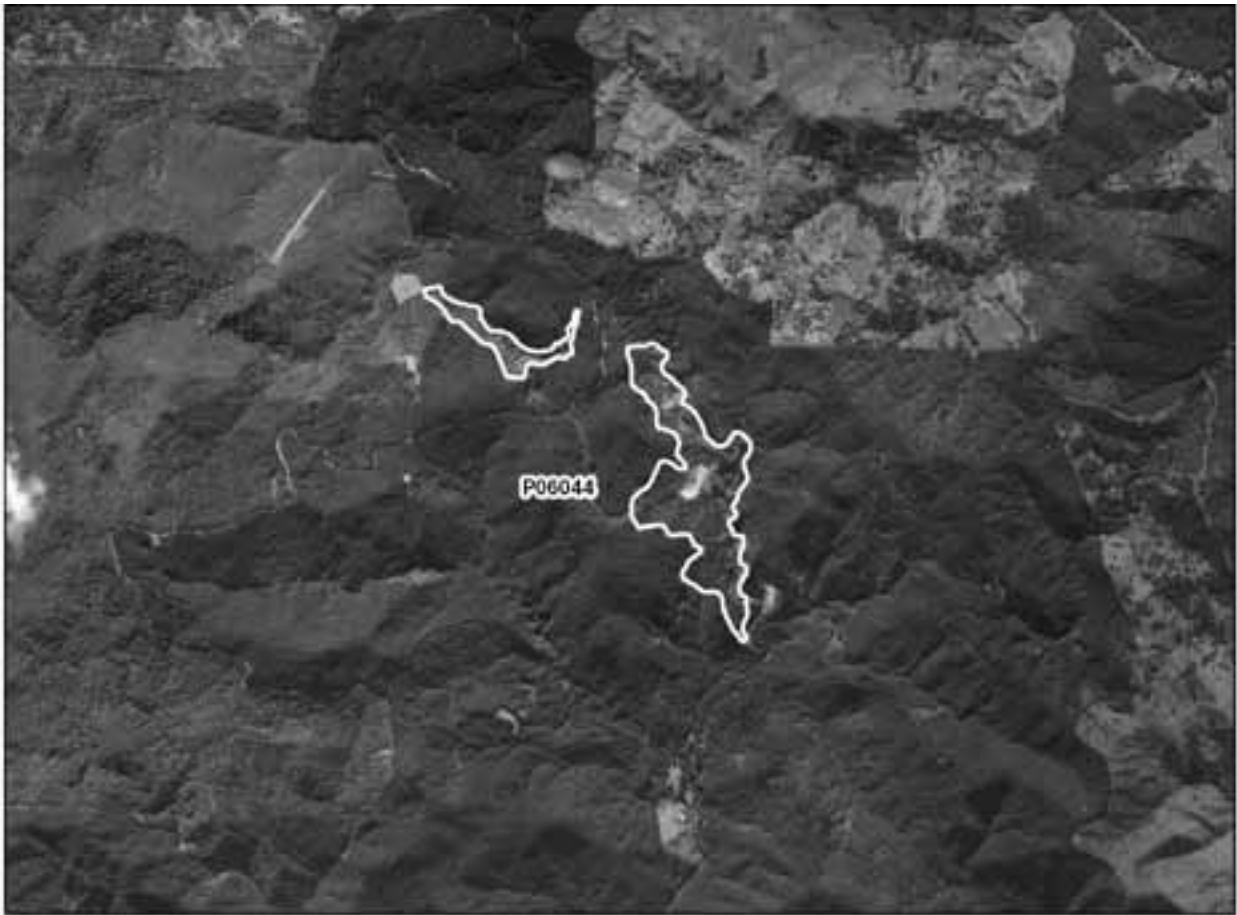
Kawaka (Naturally Uncommon), monoao (Naturally Uncommon), and northern rata (regionally significant) were recorded during this 1994 survey.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline), and common bully have been recorded in Takitu Stream, while longfin eel and common bully are present in one of its tributaries (NIWA 2009a).

Significance

The site has special importance due to the large component of the nationally threatened tree, kawaka, and is representative site for three ecological units: type (a), (b) and (c). It also contains one other threatened plant species (monoao) and one regionally significant plant species. Two threatened aquatic fauna species have been recorded upstream of the site, and the site may therefore buffer an important migratory route for indigenous fish. The site is contiguous with Marlborough Forest Addition Stewardship Area (administered by DOC).



P06/044 Coronet Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

PUTAKA STREAM FOREST REMNANTS

Survey no.	P06/046
Survey date	2 August 1994
Grid reference	P06 890125 (two remnants)
Area	188.3 ha
Altitude	94-416 m asl

Ecological units

- (a) Taraire-puriri-towai forest on moderate to steep hillslope (60%)
- (b) Totara forest on hillslope (20%)
- (c) Totara-towai forest on hillslope (10%)
- (d) Towai forest on hillslope (10%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

This site comprises two separate areas of secondary forest largely characterised by taraire, puriri, towai, kahikatea and rimu emerging through a sub-canopy of mamaku and kanuka. Occasional stands of kauri rickers are also present (Wildland Consultants 2004). Forest in the larger, eastern remnant occupies moderate to steep south-west facing hillslope and spurs with partial buffering by pine plantation. The western remnant encompasses scattered forest on south-facing slopes bordering the Putaka Stream. An association of cut-over tall taraire with puriri and towai (a) is the most common forest type in the site. Tawa is frequent with occasional tanekaha, totara, pukatea and emergent kahikatea. Totara forest (b) occurs with occasional puriri and tanekaha. Totara is also co-dominant with towai (c) in some areas, occurring with occasional tanekaha and kahikatea. The remainder of the site comprises towai forest (d) with frequent kohekohe, tawa and emergent kahikatea, and occasional epiphytic puka and emergent northern rata.

Significant flora

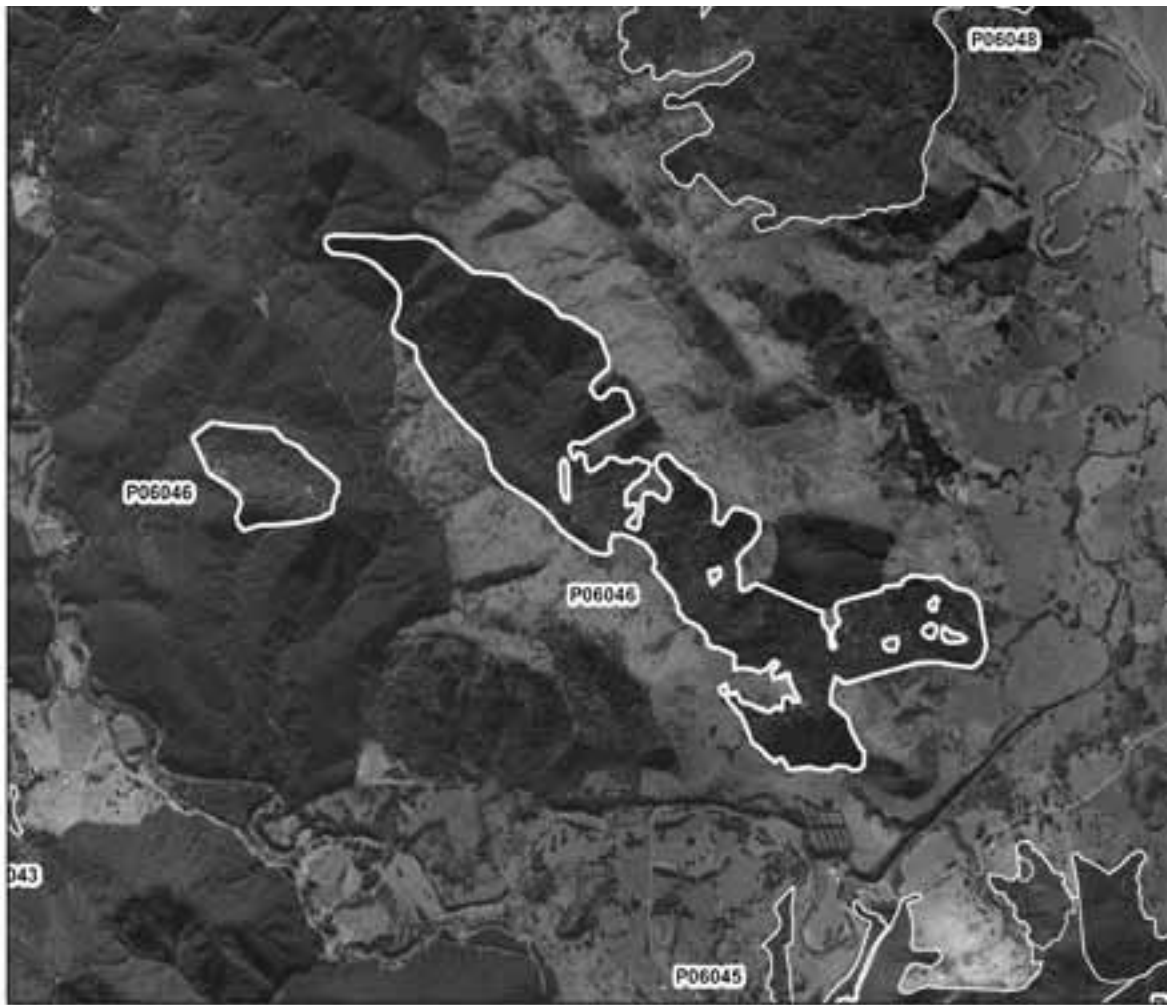
Northern rata (regionally significant) was recorded during this survey.

Fauna

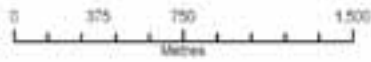
Terrestrial fauna not surveyed. Putaka Stream is a tributary of the Opouteke Stream, which is known to support longfin eel (Gradual Decline) and common bully (NIWA 2009a).

Significance

The site is significant because it contains a relatively large, intact forest which is part of a complex of indigenous forest and pine plantation. It also supports one regionally significant plant species and provides a protective buffer for a tributary of the Opouteke Stream, a known migratory pathway for one threatened fish species. The site may provide a refuge for less mobile species (e.g. NI brown kiwi) during harvesting of contiguous pine plantation located to the north-west.



P06/046 Putaka Stream Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

PAKOTAI SWAMP

Survey no. P06/047
Survey date 18 August 1994
Grid reference P06 912116
Area 9.4 ha
Altitude 70 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

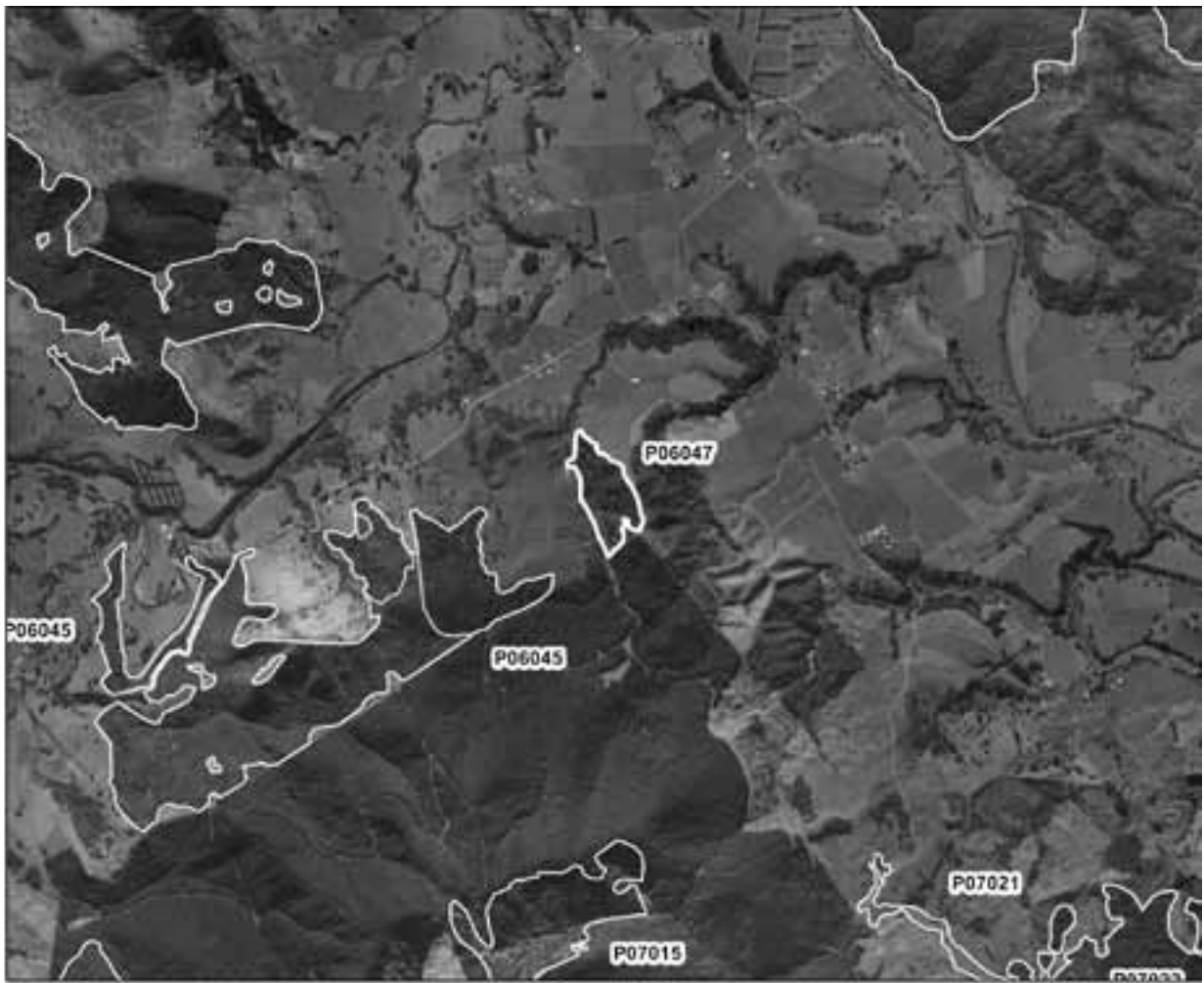
The site comprises a raupo (a) dominant swamp with occasional ti kouka and wheki.

Fauna

Not surveyed.

Significance

This site is significant given its size and the fact that eutrophic wetlands are a diminishing and rare habitat type in Tangihua ED and in Northland, with an estimated 1% of their original extent remaining. The site is representative for one ecological unit: (a) raupo reedland in swamp. The wetland was not grazed by stock at the time of survey and may provide habitat for threatened indigenous birds such as Australasian bittern, spotless crane (Relict) and NI fernbird (Declining). Weeds were not recorded.



P06/047 Pakotai Swamp



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bown 2002

TAURANGAKAWAU STREAM BUSH

Survey no. P06/048
Survey date 1 August 1994
Grid reference P06 890150 (three remnants)
Area 377.8 ha
Altitude 37-100 m asl

Ecological units

(a) Kanuka/manuka-totara forest on hillslope (100%)

Landform/geology

Steep hill country, mostly underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex), but eastern part underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises three areas of secondary forest dominated by abundant kanuka/manuka and totara (a) interspersed with pine plantation, east of the Mangakahia River.

Fauna

Not surveyed.

Significance

The site is significant because of its size relative to other similar habitat types within the ED. Furthermore, its location between two large tracts of indigenous forest - Mangakahia Forest (P06/001) to the east and Marlborough Forest to the west (outside Tangihua ED) - may make it a useful stepping stone for mobile species such as kukupa, NI kaka and NI brown kiwi. The site also provides a protective buffer for a tributary of the Opouteke Stream, a known migratory pathway for a threatened fish species.



P06/048 Taurangakawau Stream Bush



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography from 2002

TWIN BRIDGES RIPARIAN FOREST

Survey no.	P06/050
Survey date	9 August 1994
Grid reference	P06 880188 (four remnants)
Area	27.5 ha
Altitude	36-72 m asl

Ecological units

- (a) Kanuka/manuka-totara forest on toeslope (70%)
- (b) Kanuka-kauri-tanekaha forest on upper hillslope (15%)
- (c) Totara-towai-taraire treeland on gentle hillslope (15%)

Landform/geology

Steep lower hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site consists of two areas of riparian forest either side of the Mangakahia River. The vegetation is predominantly kanuka/manuka-totara forest (a) occupying the lower hillslopes, with occasional tanekaha, kahikatea, rimu, puriri, kowhai and towai. Kanuka, kauri, and tanekaha (b) are co-dominant on the upper hillslopes, with frequent kowhai, rewarewa and taraire, and occasional miro, karaka, puriri and titoki. Totara-towai-taraire treeland (c) dominates the remnant located upstream on the true right of the Mangakahia River, near to where it merges with the Awarua River.

Significant flora

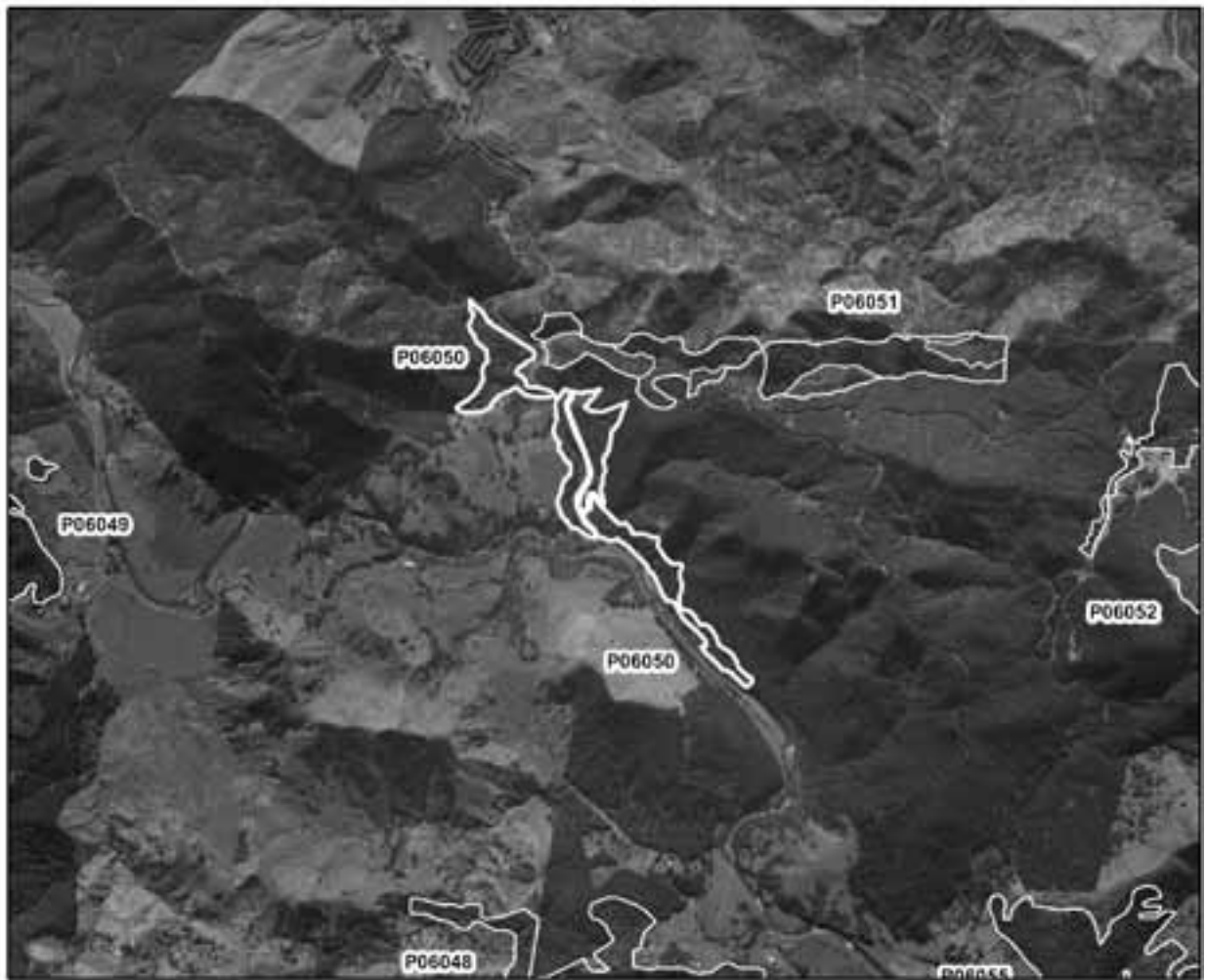
Manatu (regionally significant) (L. Forester pers. comm.). Kotukutuku (regionally significant) was recorded during this PNAP survey.

Fauna

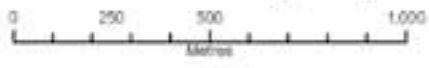
The Mangakahia River supports longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully and grey mullet (NIWA 2009a). Black shag (Naturally Uncommon) and other waterbirds are likely to frequent the site, and several species of indigenous forest bird, including NI kiwi (Nationally Vulnerable), may utilise the riparian habitat (R. Pierce pers. comm.).




Significance

This site contains two well-buffered areas of riparian forest, an uncommon habitat type in Tangihua ED, and is representative for three ecological units: (a), (b) and (c). It supports two regionally significant plant species. The site also provides riparian buffering for c.1 km of the Mangakahia River, which is utilised by a range of indigenous fish, including three threatened species and one regionally significant fish species.



P06/050 Twin Bridges Riparian Forest



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

TE HUIA FALLS BUSH

Survey no.	P06/051
Survey date	18 July 1994 - 10 February 2009
Grid reference	P06 870203
Area	39.9 ha (26.5 ha forest, 13.4 ha shrubland) (In comparison to 2006 aerial photography, this site has changed from the 1994 survey. The site now includes a greater area to the east)
Altitude	40-240 m asl

Ecological units

- (a) Taraire-totara forest on steep hillslope (50%)
- (b) Akeake-kanuka/manuka-totara shrubland on steep hillslope (40%)
- (c) Kanuka/manuka-tanekaha shrubland on steep hillslope (<10%)
- (d) Kauri forest on hillslope (1%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

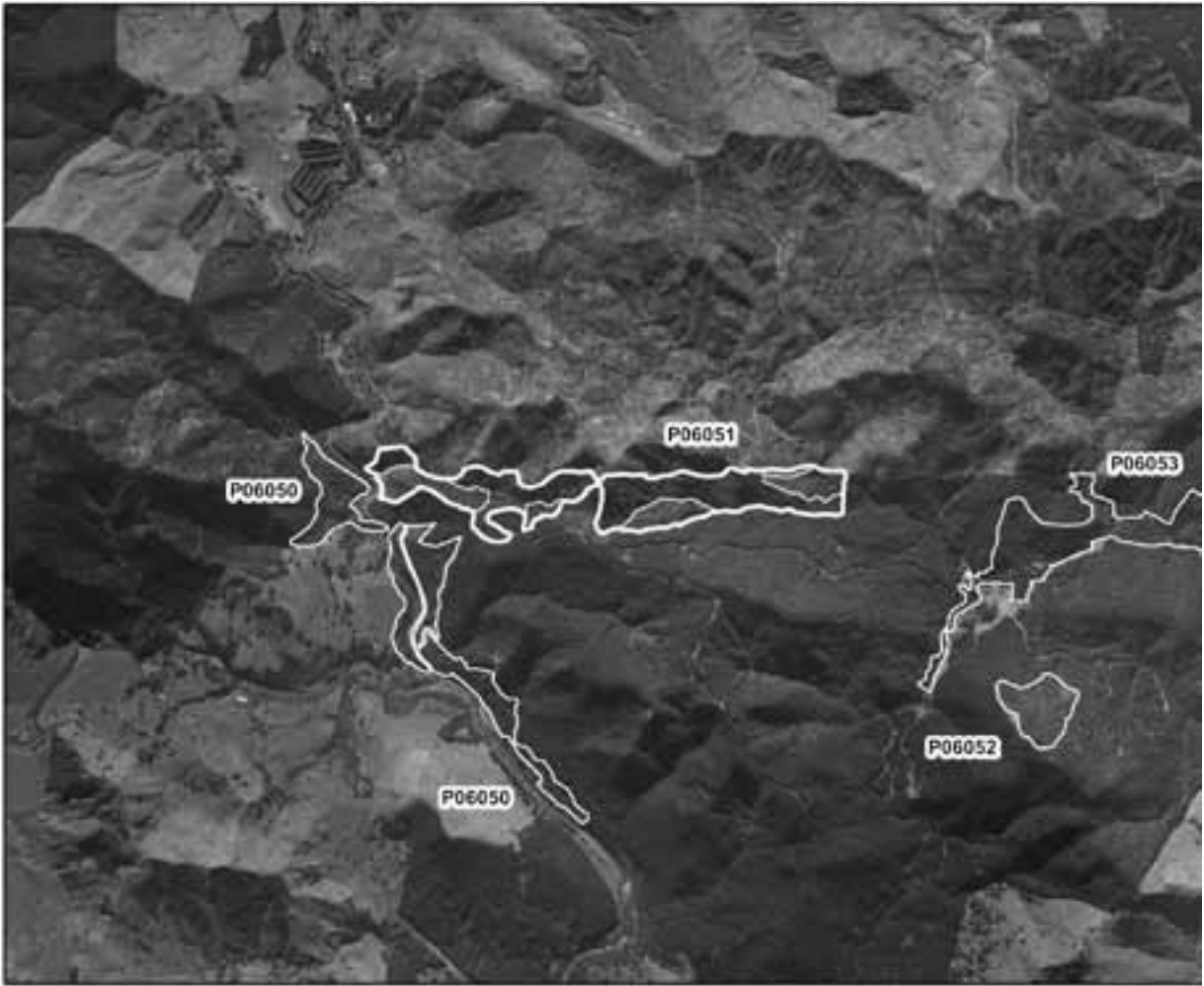
The site comprises secondary forest and shrubland including some riparian forest adjacent to the Awarua River, extending down to the Mangakahia River confluence where it adjoins the northern tip of site P06/050. Two forest types are dominant within the site, the first being taraire-totara forest (a), which occurs with frequent houhere and tanekaha, and occasional tawa, rewarewa, matai and towai. The second most abundant unit comprises akeake-kanuka/manuka-totara shrubland (b) on steep hillslopes, with frequent koromiko and occasional ti kouka. Advanced kanuka/manuka-tanekaha shrubland (c) occurs on steep hillslopes with frequent towai, and occasional totara and rewarewa. A small area of primary modified kauri riverine forest (d) is located on a hillslope on the true right of the Awarua River. Other species include frequent tanekaha and occasional northern rata, rewarewa, taraire, totara, titoki, tanekaha and rimu.

Significant flora

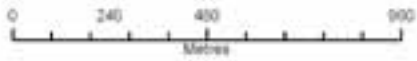
Northern rata (regionally significant) was recorded during this survey.

Fauna

Australasian harrier, grey warbler, NI fantail, and silvereye were recorded in 1978 (SSBI P06/H039). Although no freshwater fish information could be found for the Awarua River, it is a major tributary of the Mangakahia River and species recorded in the latter may also occur in the Awarua River. Such species include longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully and grey mullet (NIWA 2009a).



P06/051 Te Huia Falls Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

Significance

Riparian forest is becoming increasingly rare both regionally and nationally. This site contains representative examples of (d) kauri riverine forest and (b) akeake-kanuka/manuka-totara shrubland, both of which have not been recorded elsewhere in Tangihua ED. Moreover, the site's location is critical for linking the large pine plantation tracts to the east and west, which in turn are contiguous with significant indigenous forests. The site provides essential riparian buffering and serves as erosion protection for the Mangakahia River. It supports one regionally significant plant species, and is likely to provide habitat and a migratory pathway for a range of indigenous fish.

ALLAN ROAD BUSH

Survey no.	P06/052
Survey date	17 August 1994 and 2003-04
Grid reference	P06 902193
Area	7.6 ha
Altitude	80-240 m asl

Ecological units

- (a) Taraire forest on steep hillslope (95%)
- (b) Puriri-taraire-totara forest on steep hillslope (5%)
- (c) Totara-taraire-puriri-rimu forest on undulating-low hills (5%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

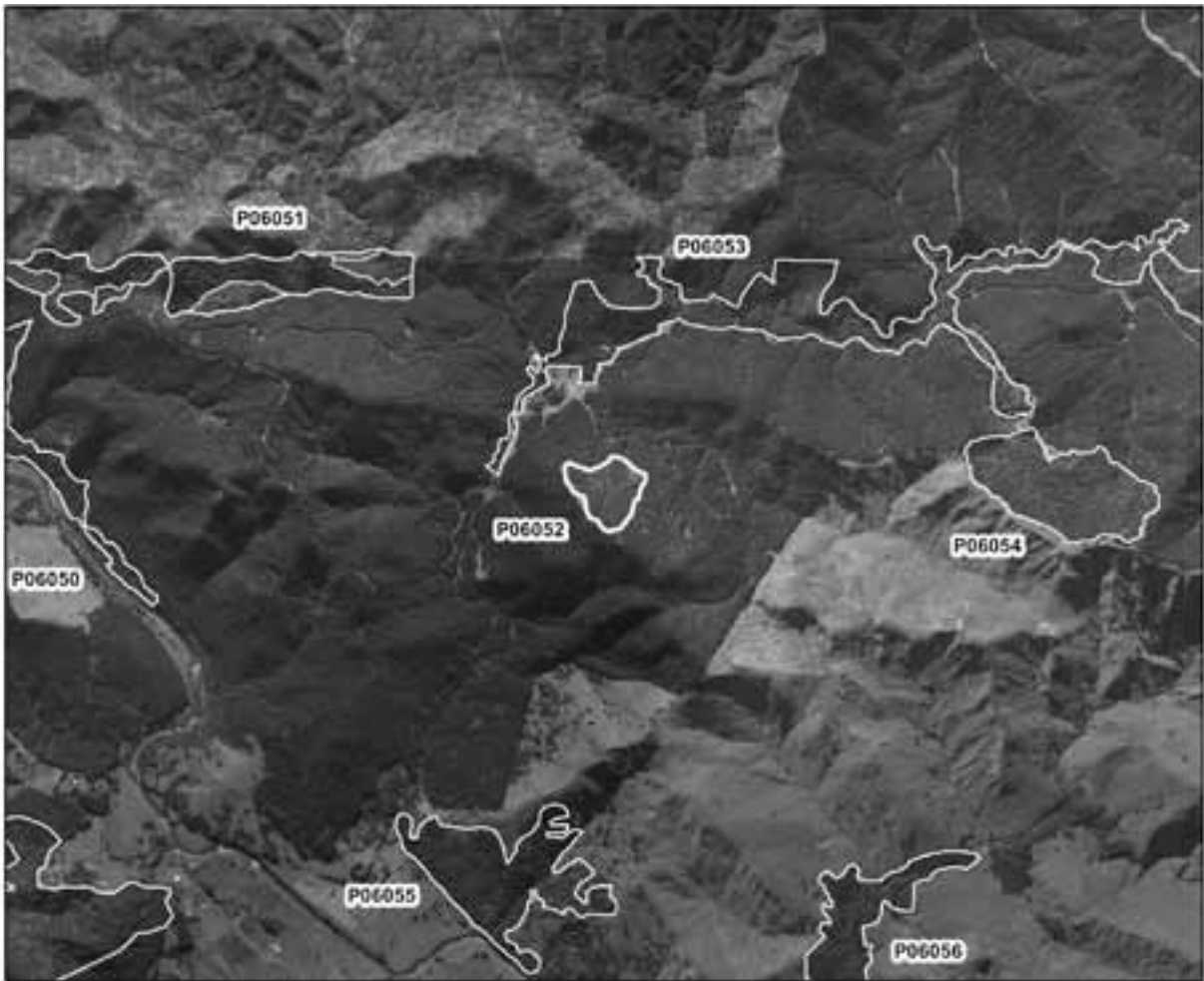
The site comprises a small north-east-facing remnant of broadleaved-podocarp forest. Taraire (a) is the dominant canopy species, occurring on steep hillslope with frequent tawa, puriri and emergent rimu, with occasional matai and emergent totara and kahikatea. Puriri-taraire-totara forest (b) is present as a minor component, occurring with occasional rewarewa. Totara, taraire, puriri and rimu (c) form a diverse forest type on the lower, undulating hills. Occasional species include rewarewa, puriri, rimu, tanekaha, northern rata, karaka, kowhai, titoki and kahikatea. Mahoe, mamaku, ponga, nikau, kiokio, *Blechnum filiforme*, hangehange and kiekie are present in the understorey (Wildland Consultants 2004).

Significant flora

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

Fauna

Kukupa (regionally significant), tui, NI fantail and grey warbler were recorded by Wildland Consultants (2004).

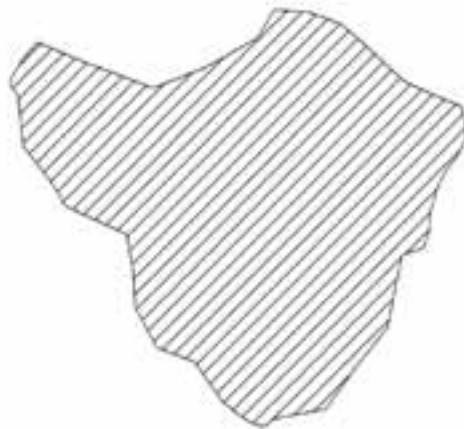


P06/052 Allan Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bvnh 2002

Significance

The site contains taraire forest (a) that is possibly unmodified due to frequency of emergents, and for this reason is considered representative of its vegetation type. Type (c) totara-taraire-puriri-rimu forest on undulating-low hills is the only example of its type in Tangihua ED and is also representative. The site is currently well-buffered by pine plantation and thus is valuable as an indigenous forest refuge. It is also part of a continuous area of indigenous vegetation alongside the Omahu Stream down to where it drains into the Mangakahia River. The site provides habitat for one regionally significant plant species.

OMAHU STREAM RIVERINE FOREST

Survey no.	P06/053
Survey date	17 August 1994 and 2003-04
Grid reference	P06 910200
Area	55.4 ha
Altitude	60-140 m asl

Ecological units

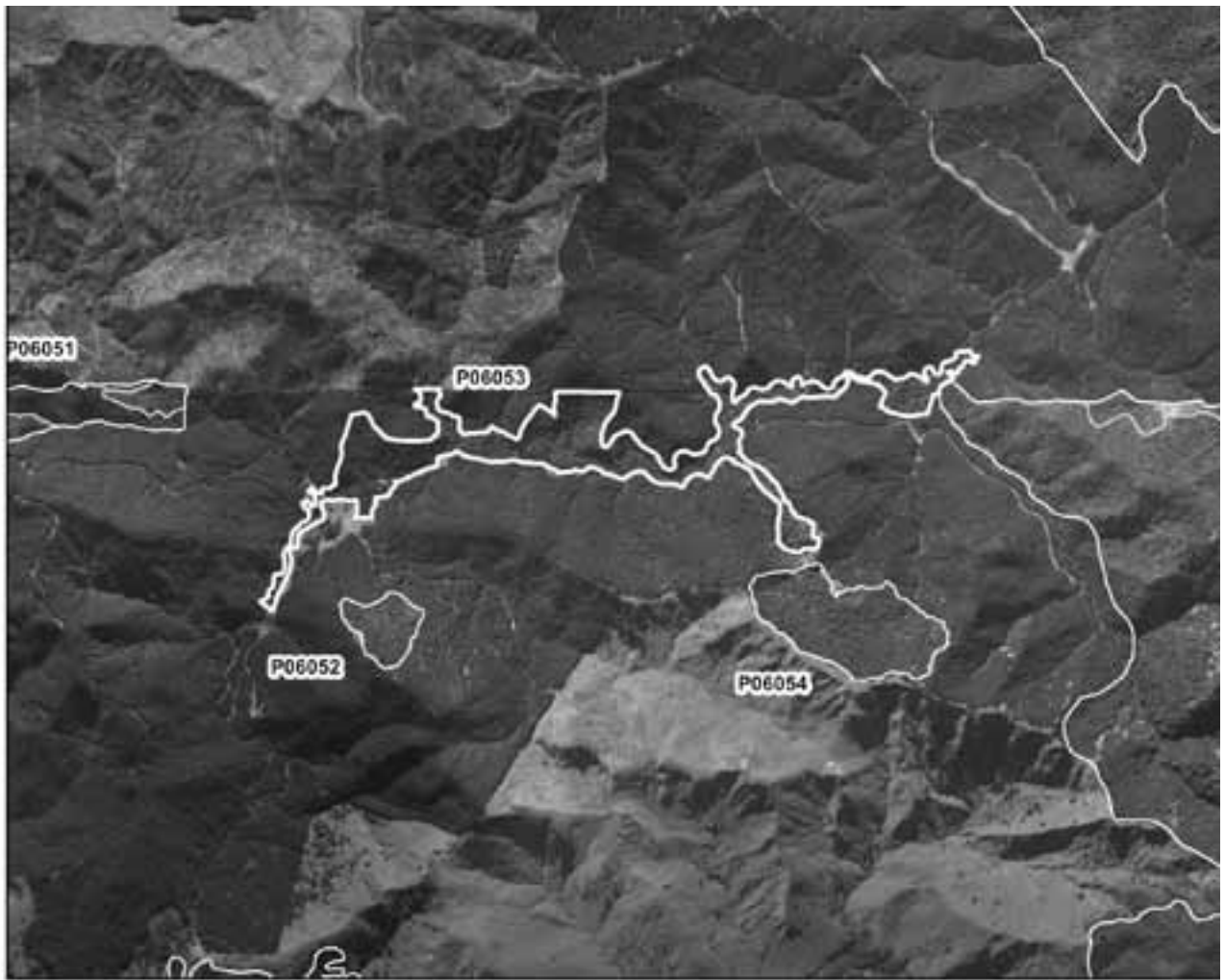
- (a) Totara forest on alluvium
- (b) Taraire forest on hillslope
- (c) Totara-kahikatea forest on hillslope and alluvium
- (d) Kahikatea-totara forest on flat-undulating land
- (e) Totara-tawa-rimu forest on hillslope
- (f) Totara-kanuka-manuka forest on hillslope
- (g) Taraire-totara forest on moderate hillslope

Landform/geology

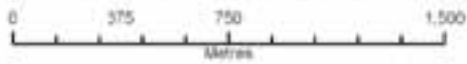
Valley floor on Holocene alluvium, bounded by steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a long band of totara-dominated riverine forest buffering the Omahu Stream and extending into adjacent hillslope forest. Totara on alluvium (a) is a major component of the site, and includes frequent kowhai and tanekaha, and occasional matai, miro, titoki, kowhai, kahikatea and emergent northern rata. Taraire forest (b) on hillslope is also common, occurring with frequent tawa, tanekaha and rewarewa, and occasional towai, kahikatea, kohekohe, and emergent rimu, miro, kowhai, matai and totara. Totara-kahikatea forest is common on hillslope above the stream (c), while kahikatea-totara forest (d) is prevalent on flat-undulating land. Type (c) occupies a small area on alluvium near the Omahu-Allan roads junction. Other forested areas on hillslope include totara-tawa-rimu forest (e) with occasional tanekaha and mamaku, and totara-kanuka-manuka forest (f). Remaining areas of hillslope are occupied by taraire-totara forest (g) with occasional kohekohe and emergent rimu.



P06/053 Omahu Stream Riverine Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Significant flora

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

Fauna

Kauri snail (Gradual Decline), NI tomtit (regionally significant), grey warbler, tui, NI fantail, Australasian harrier, welcome swallow and morepork were recorded by Wildland Consultants (2004). Longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully and grey mullet have been recorded upstream of the Omahu Stream-Mangakahia River confluence (NIWA 2009a).

Significance

The site contains a good example of diverse riverine forest, an uncommon habitat type in Tangihua ED and in Northland, and is representative for three ecological units: (a), (c) and (e). The site is also contiguous with the DOC-administered Mangakahia Forest (P06/001) to the east and provides a protective buffer to the mid-reaches of the Omahu Stream, a tributary of the Mangakahia River. The site provides habitat for one threatened invertebrate species, one regionally significant bird species and one regionally significant plant species. Two threatened fish species and one regionally significant fish species have been recorded within the catchment. Possum browse on kohekohe and totara was observed in the present survey, although the site retained a relatively dense, healthy understorey of shrubs and saplings.

OMAHU ROAD BUSH

Survey no.	P06/054
Survey date	17 August 1994
Grid reference	P06 923193
Area	27.9 ha
Altitude	80-360 m asl

Ecological units

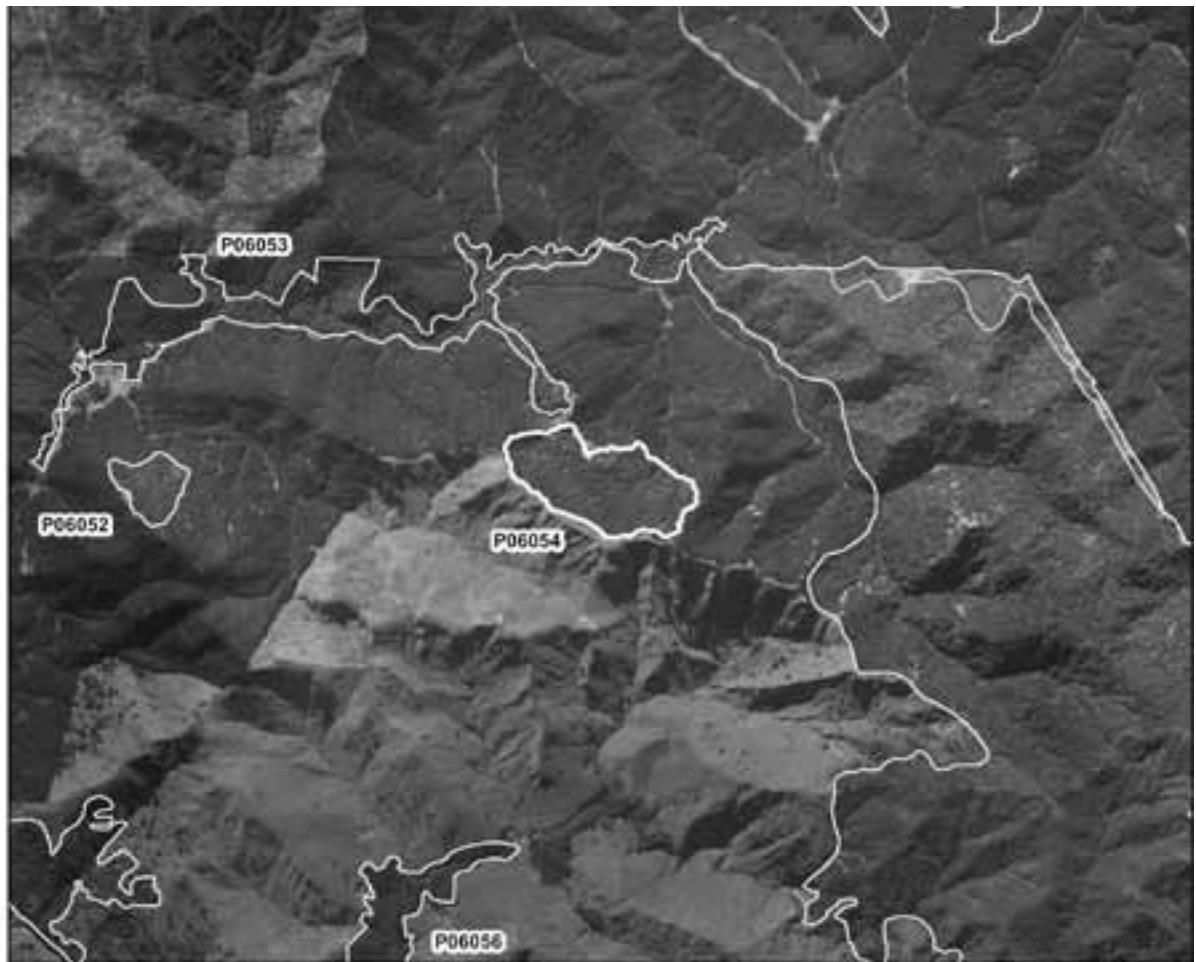
- (a) Taraire-tawa forest on hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small remnant of hillslope forest flanking a tributary of the Omahu Stream. The forest is dominated by taraire, with common tawa (a), frequent towai, puriri, and emergent rimu, and occasional kohekohe, emergent kahikatea, miro and kauri.



P06/054 Omaha Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Fauna

Not surveyed.

Significance

The site is significant given that tawa as a common species in the canopy is a rare occurrence in Northland. In addition, the abundance of tawa and taraire provides a valuable seasonal food source for kukupa. The site may be important as part of a habitat network for mobile species (i.e. by providing linkages with large tracts of forest to the north and south-east) as well as providing refuge for NI brown kiwi during harvesting of adjoining pine plantation. The site also provides riparian buffering for a tributary of the Omaha Stream.

MANGAROA STREAM RIVERINE FOREST AND GUMLAND

Survey no.	P06/059
Survey date	27 July 1994
Grid reference	P07 025130
Area	790.4 ha (95.2 ha forest, 695.2 ha shrubland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	10-160 m asl

Ecological units

- (a) Manuka shrubland on hillslope (90%)
- (b) Kowhai forest on alluvium (4%)
- (c) Kahikatea-kowhai-ti kouka riverine forest on alluvium (3%)
- (d) Kahikatea-kowhai-totara riverine forest on alluvium (3%)
- (e) Totara forest on hillslope (<1%)

Landform/geology

Valley floor wetland on Holocene alluvium, and Pleistocene alluvial terraces; bounded by steep hill country of Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site comprises a large gumland area adjoining riverine forest along the Mangaroa Stream. The vegetation is mostly gumland dominated by low manuka shrubland (a). Other species were not identified within this ecological unit due to the reconnaissance nature of the survey, but are likely to include *Dracophyllum lessonianum*, *Schoenus tendo*, *Baumea teretifolia*, *Gleichenia* sp. and kumarahou (Esler & Rumball 1975). Totara forest (e) occurs in a small area with frequent kanuka and manuka in the canopy. The remaining three units consist of alluvial forest. Kowhai-dominated forest (b) includes frequent kahikatea and occasional karaka, matai, totara and titoki. The other two alluvial areas consist of kahikatea-

dominated riverine forest, the first of which occurs with frequent kowhai and ti kouka (c), and occasional matai, totara and titoki. In the second, kahikatea occurs with kowhai and totara (d), and occasional matai, houhere, karaka, titoki and taraire.

Significant flora

Drosera pygmaea (Nationally Vulnerable) and *Dianella haemtica* (Declining) have been recorded from the site (L. Forester pers. comm.). *Fuchsia perscandens* (regionally significant), *Coprosma rotundifolia* (regionally significant), *C. rigida* (regionally significant) and *Rubus schmidtioides* (regionally significant) were recorded in 1994 (SSBI P06/H066).

Fauna

1994 records of grey duck (Nationally Critical), NI brown kiwi (reported only) (Nationally Vulnerable), kukupa (regionally significant), tui, silvereye, grey warbler, NZ kingfisher, longfin eel (Gradual Decline), freshwater mussel (Gradual Decline) and koura (Gradual Decline) (SSBI P06/H066). Kauri snail (Gradual Decline) was recorded in 2008 (L. Forester pers. comm.).

Significance

The site contains some unusual and very uncommon associations, as well as the largest area of gumland in Tangihua ED, which is a very rare vegetation type in Northland. The site is representative for four ecological units: (a), (b), (c) and (d), riverine and alluvial forests, which are under-represented and threatened habitat types within Northland. The site supports two threatened plant species, four regionally significant species and provides good orchid habitat. There are records of five threatened fauna species, although further surveys are required to assess the site's current fauna values. Mangaroa Riverine Forest and Gumlands provide riparian buffering for the entire length of the Mangaroa Stream and several of its tributaries. Mangaroa Stream itself is a tributary of the Mangakahia River, a known migratory pathway utilised by at least two threatened fish species (longfin eel and lamprey). Fringes have gorse and woolly nightshade on the more fertile soil (L. Forester pers. comm.).

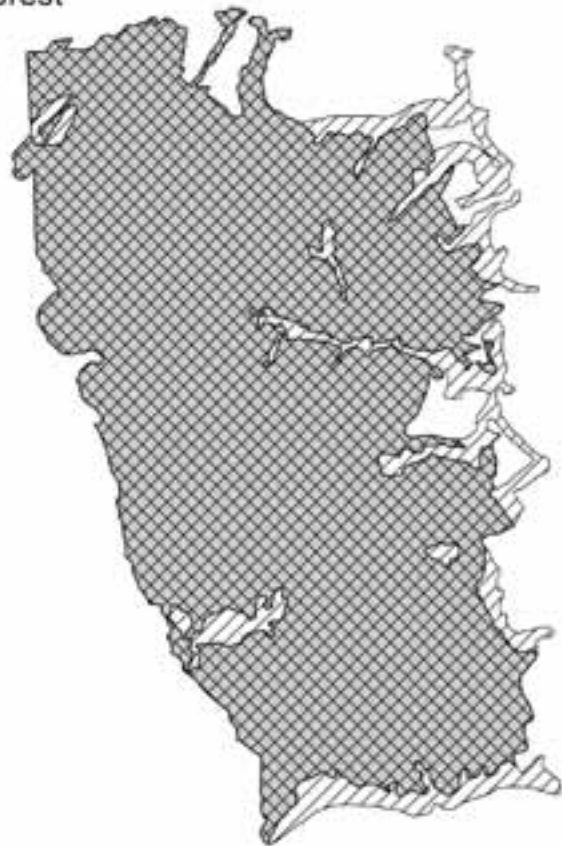


P06/059 Mangaroa Stream Riverine Forest and Gumland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bovin 2002

MANGAROA WETLAND

Survey no.	P06/060
Survey date	16 August 1994
Grid reference	P06 010150 (five remnants)
Area	48.5 ha (36.6 ha forest, 11.9 ha wetland)
Altitude	20-120 m asl

Ecological units

- (a) Kahikatea-ti kouka-harakeke swamp forest on alluvium (75%)
- (b) *Glyceria maxima*-raupo grassland in swamp (10%)
- (c) *Glyceria maxima* grassland in swamp (10%)
- (d) Pampas tussockland in swamp (5%)

Landform/geology

Valley floor on Holocene alluvium; bounded by steep hillslope underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site comprises a narrow area of freshwater wetland and swamp forest near the headwaters of the Mangaroa Stream, which extends into a large gully floor to the north-west. Most of the site appears to be kahikatea-, harakeke- and ti kouka-dominated swamp forest (a). Wetter areas are dominated by *Glyceria maxima*-raupo grassland (b) as well as small monocultures of *Glyceria maxima* (c) and pampas (d).

Fauna

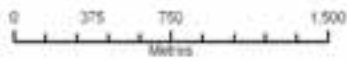
Not surveyed.

Significance

Mangaroa Wetland contains a representative example of (a) harakeke-kahikatea-ti kouka swamp forest on alluvium, an under-represented and threatened ecological unit within this Ecological District and Northland, although its overall ecological value is compromised by the abundance of exotic plants (*Glyceria maxima* and pampas) within the contiguous wetland areas. However, such vegetation can still provide potential habitat for some indigenous wetland birds, e.g. spotless crane (Relict) (P. Anderson, DOC, pers. comm.).



P06/060 Mangaroo Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

PIPIWAI STREAM OLD GROWTH FOREST REMNANT

Survey no. P06/061
Survey date 18 August 1994
Grid reference P06 004165
Area 2.4 ha
Altitude 20-80 m asl

Ecological units

(a) Taraire forest on alluvium (100%)

Landform/geology

Steep hillslope underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

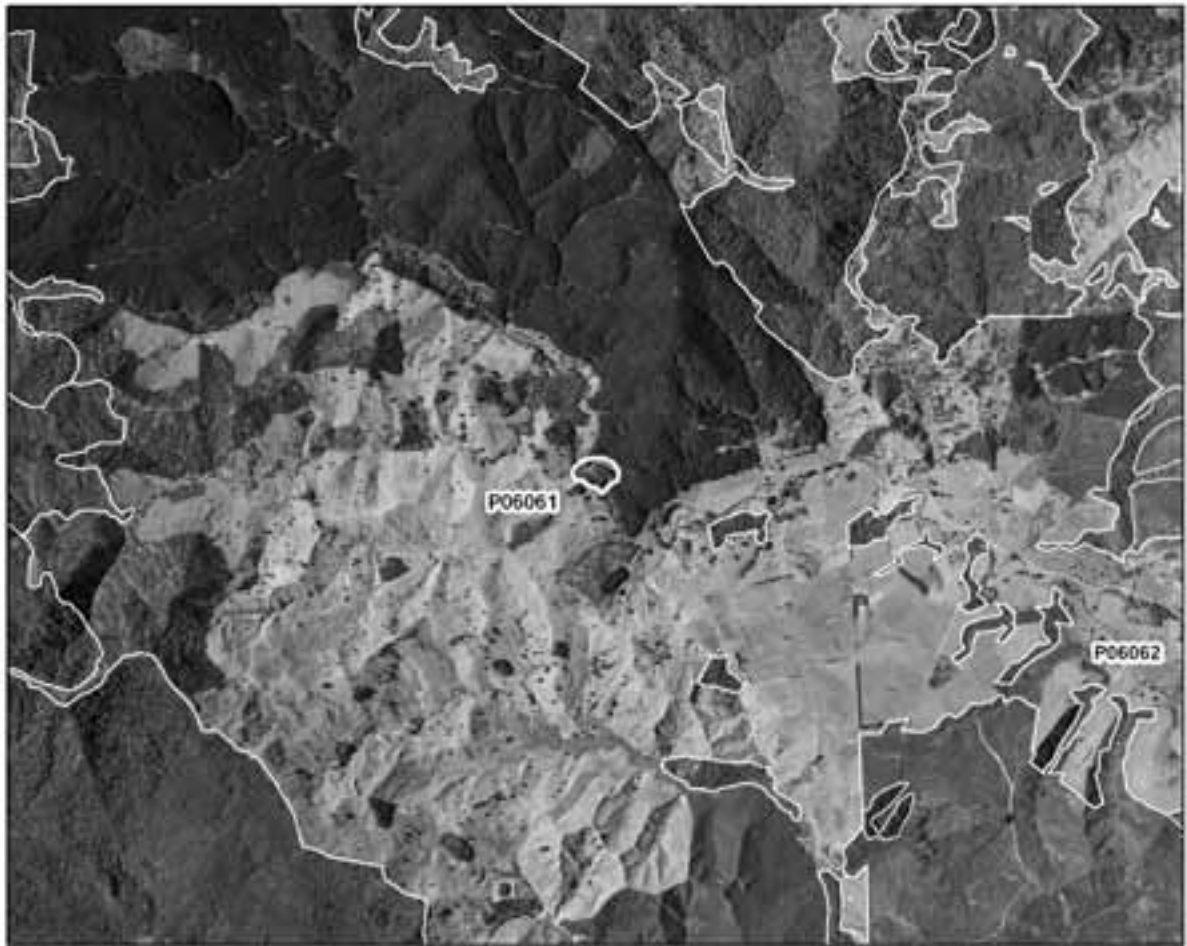
The site comprises a small area of alluvial taraire forest (a) currently buffered by pine plantation on its eastern margin. Other species include frequent titoki and occasional totara, karaka and pukatea. Mangeao is present in the sub-canopy.

Fauna

Longfin eel (Gradual Decline), koura (Gradual Decline) and torrentfish have been recorded near the site in the Pipiwai Stream (NIWA 2009a). Sightings of a large brown gecko were reported at the time of survey in 1994, and these are probably of Pacific gecko (Gradual Decline). Black shags (Naturally Uncommon) also utilise Pipiwai Stream (R. Pierce pers. comm.).

Significance

The site contains an old-growth unmodified forest remnant (unfenced at the time of survey) on the banks of the Pipiwai Stream. Unmodified riparian forest on alluvium is particularly rare in Tangihua ED and Northland, therefore type (a) taraire forest on alluvium is a representative ecological unit. This remnant also contains an uncommon association of canopy species and provides partial riparian buffering for the Pipiwai Stream, with three threatened fauna species. At the time of survey a gecko - probably the nationally threatened Pacific gecko (Gradual Decline) - was reported.

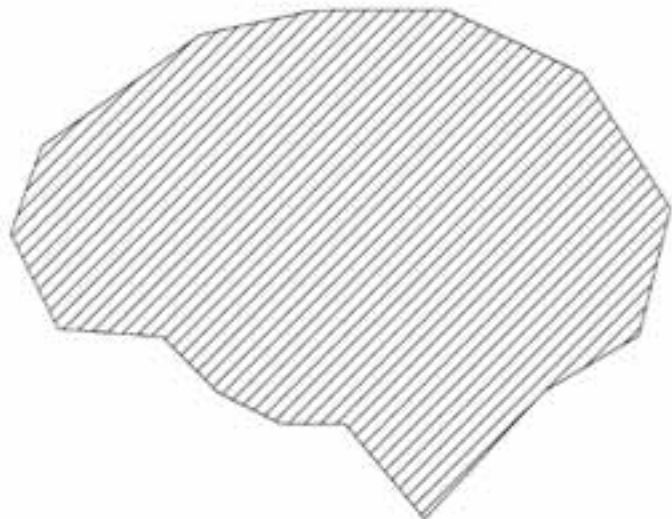


P06/061 Piiwai Stream Old Growth Forest Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2000

PIPIWAI STREAM RIVERINE FOREST REMNANTS

Survey no. P06/062
Survey date 18 August 1994
Grid reference P06 022161 (eight remnants)
Area 22.3 ha
Altitude 20-60 m asl

Ecological units

- (a) Titoki-totara forest on alluvium (85%)
- (b) Kahikatea forest on alluvium (5%)
- (c) Totara forest on alluvium (10%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces.

Vegetation

The site comprises eight small separate alluvial forest remnants scattered along the Pipiwai Stream. Titoki and totara-dominated riverine forest (a), with frequent kahikatea and occasional black maire, manuka, kanuka, matai, taraire, pukatea and tawa. Kahikatea riverine forest (b) is the least frequent forest type within the remnants. Totara riverine forest (c) comprises the remaining forest type and includes frequent kowhai, matai, kanuka, manuka, and occasional kahikatea.

Significant flora

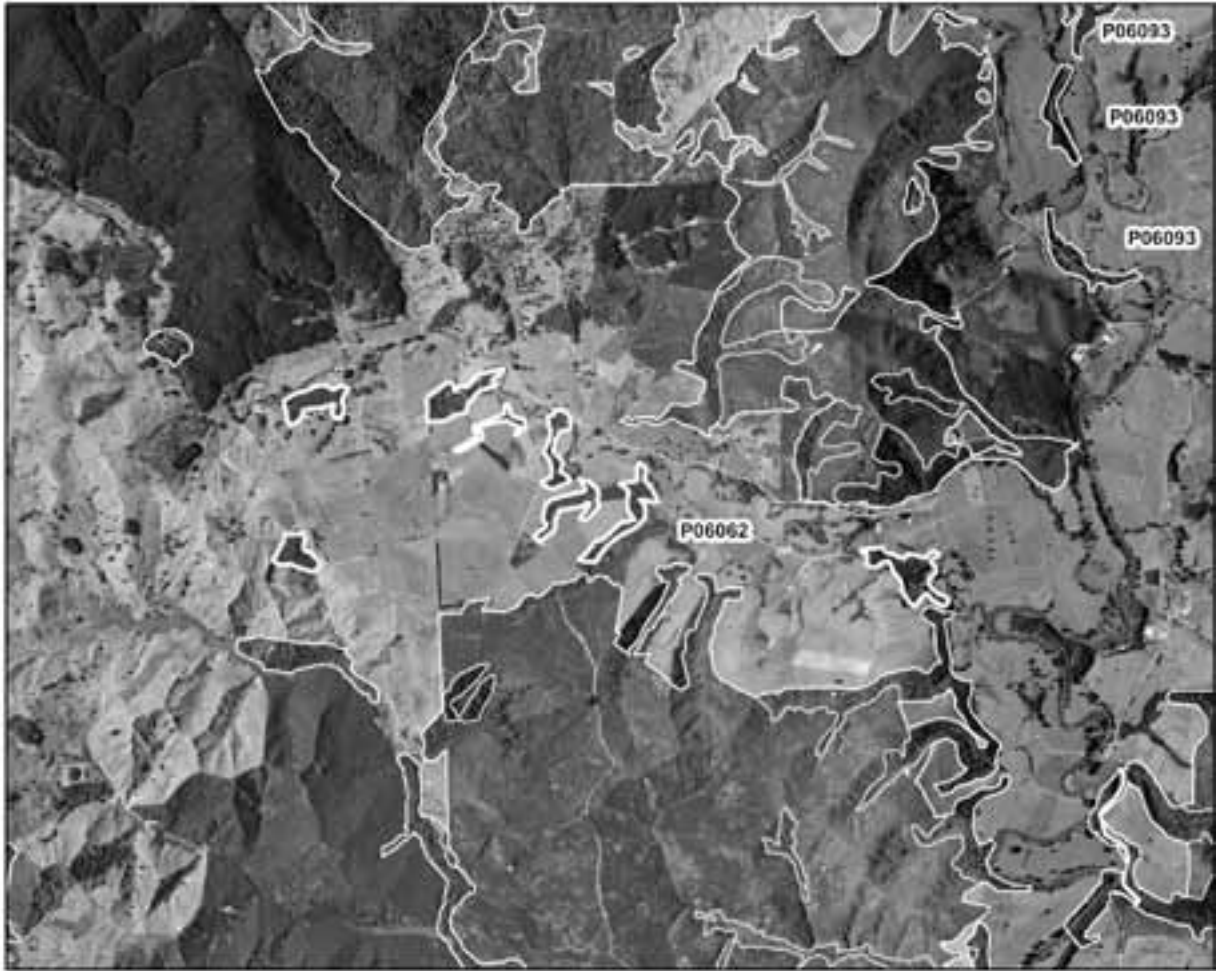
At the time of survey in 1994 a good population of the regionally significant mistletoe (*Ileostylus micranthus*, c.12-15 individuals) was present on scattered totara at the site. Black maire (regionally significant) was also recorded in this survey.

Fauna

Longfin eel (Gradual Decline), koura (Gradual Decline), and torrentfish have been recorded slightly upstream of the site in the Pipiwai Stream (NIWA 2009a). Black shag (Naturally Uncommon) utilise Pipiwai Stream (R. Pierce pers.comm.).

Significance

The site contains uncommon vegetation types and species, including old growth alluvial riverine forest and two regionally significant plants, and it is representative for at least one ecological unit: (a). The Pipiwai Stream supports three threatened fauna species (black shag, longfin eel and koura). Additional survey is recommended to determine the site's full ecological values.



P06/062 Pipiwai Stream Riverine Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

KAIKOU RIVER BUSH

Survey no. P06/063
Survey date 13 July 1994 and 2003-04
Grid reference P06 027210
Area 116.2 ha
Altitude 40-120 m asl

Ecological units

- (a) Totara-kanuka/manuka forest on alluvium
- (b) Kanuka/manuka-totara forest on hillslope and in gullies

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex) with some Holocene alluvium at north-west end of site.

Vegetation

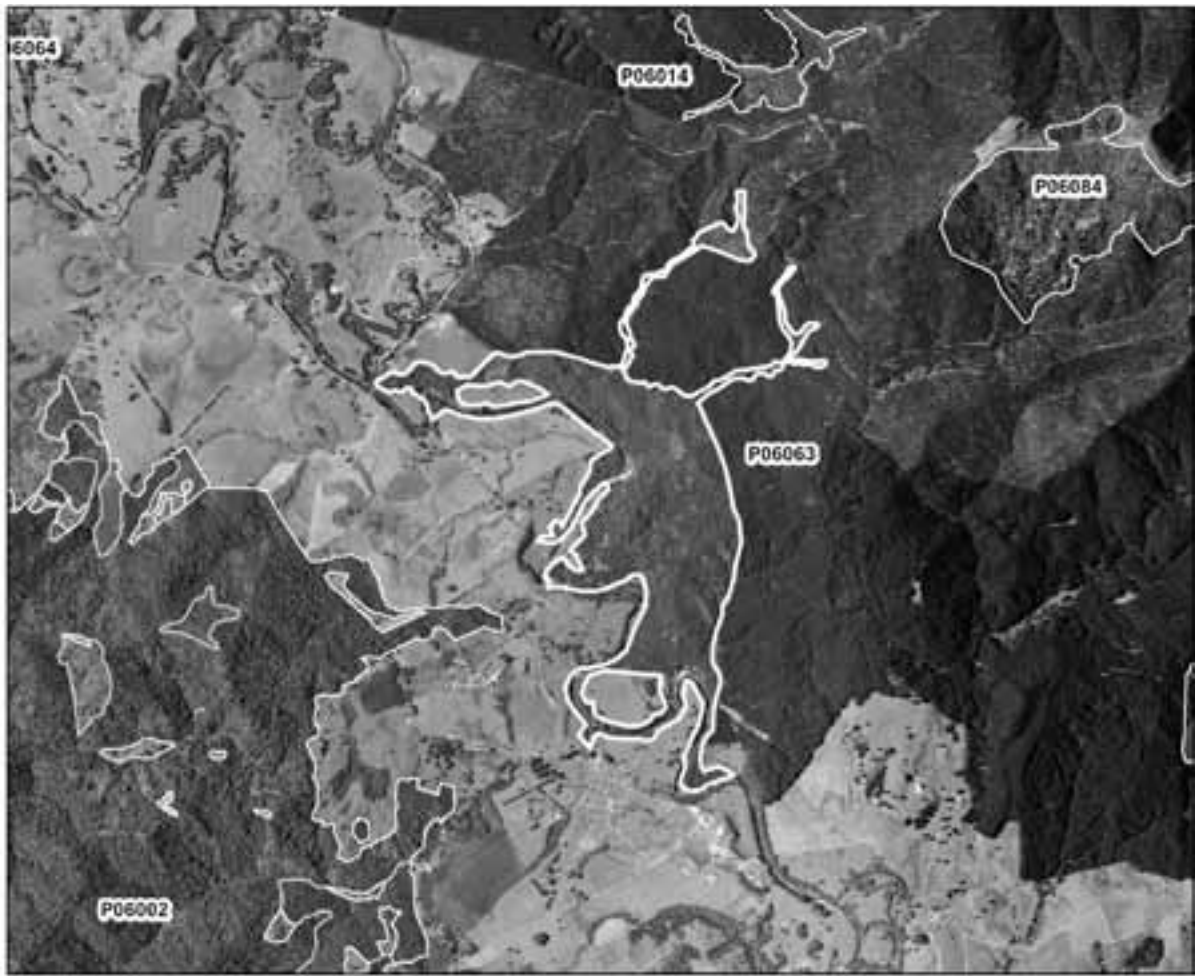
The site comprises riverine, hillslope, and gully forest bordering Kaikou River. Alluvial areas consist of secondary totara-kanuka/manuka riverine forest (a) with frequent titoki and occasional matai, rewarewa, puriri, kowhai and rimu. Kanuka/manuka and totara (b) are common on hillslope and in the northern gullies buffering the Kotiti Stream and its tributary. Occasional species include tanekaha, taraire and titoki.

Fauna

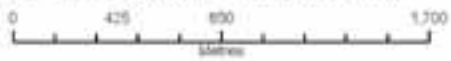
NI brown kiwi (Nationally Vulnerable) tracks were recorded in the site's northern gullies. Grey warbler and NI fantail were also recorded (Wildland Consultants 2004).

Significance

The site is representative for one ecological unit: (a) Alluvial riverine forest is an under-represented forest type in the Tangihua ED and Northland, and supports one threatened bird species (NI brown kiwi). Protective buffering is provided for the Kotiti Stream and a very short (c.200 m) section of the Kaikou River. The site's location in relation to large tracts of pine plantation and other indigenous remnants may be important as part of a habitat network for mobile species such as kukupa as well as providing refuge for NI brown kiwi during plantation harvesting. Goats, possums and pigs were recorded in 1993 (SSBI P06/H067), and domestic livestock were recorded in the site during the present survey, although damage is minor.



P06/063 Kaikou River Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bawn 2002

KAIKOU RIVERINE BUSH

Survey no. P06/064
Survey date 13 July 1994
Grid reference P06 986245 (four remnants)
Area 79.3 ha
Altitude 60 m asl

Ecological units

(a) Kanuka/manuka-totara forest on alluvium (100%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces.

Vegetation

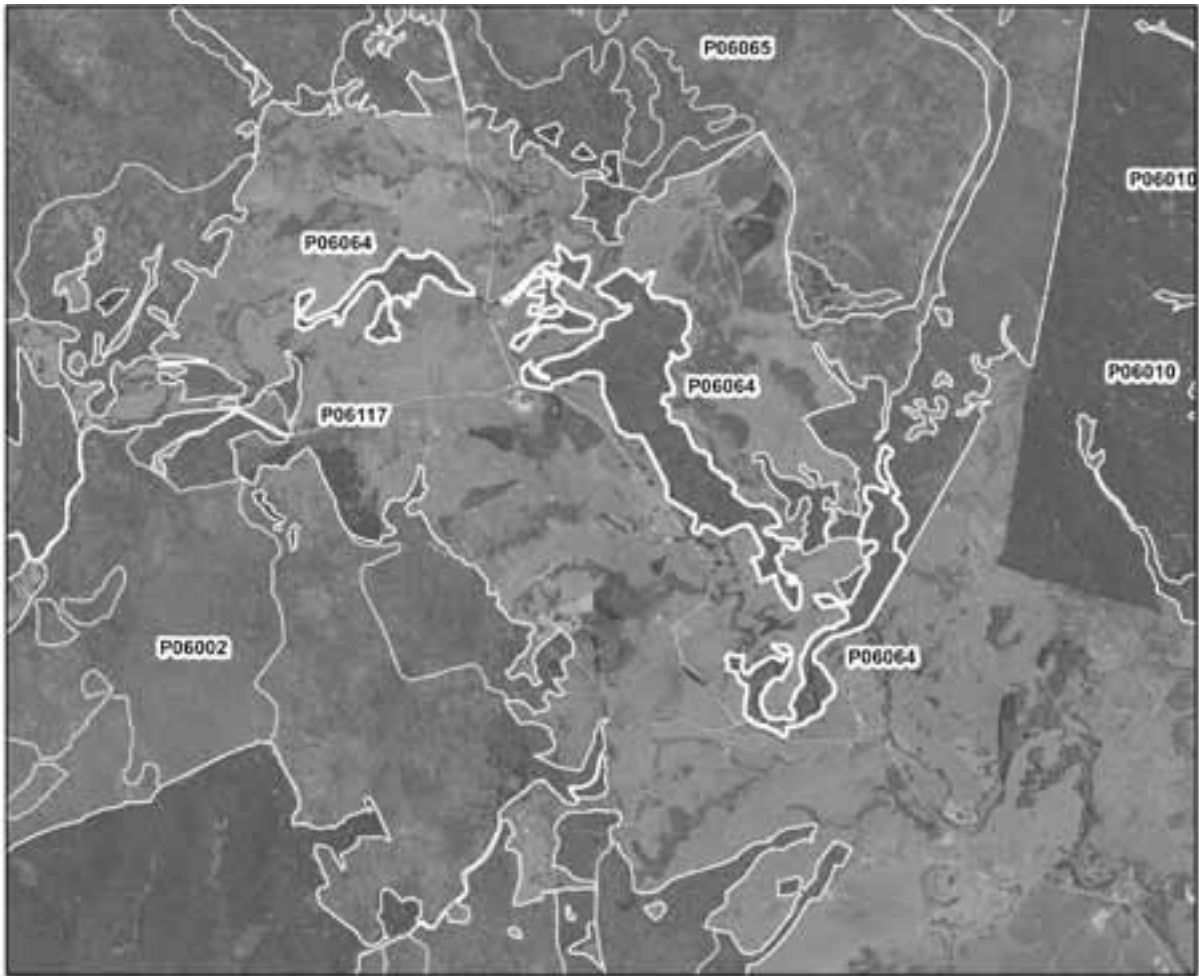
The site encompasses four secondary riverine forest remnants on a low alluvial terrace bordering the Kaikou River. Kanuka/manuka and totara (a) are co-dominant with frequent tanekaha, kahikatea, matai, and occasional rimu and kowhai. Much of the site maintains a vigorous understorey of divaricating shrubs despite periodic grazing.

Fauna

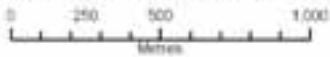
Kauri snail (Gradual Decline), kukupa (regionally significant), grey warbler, silvereve, NI fantail, tui, and kingfisher were recorded during this 1994 survey.

Significance

Riverine forest remnants of this size and quality are rare in Northland, most being no more than thin strips of riverside trees with heavily grazed and often grassed understories. The largest remnant within Kaikou Riverine Bush is approximately 400 m wide in places, increasing its viability and reducing the adverse effects of external pressures (e.g. weeds and drying winds). The site is therefore representative for type (a) kanuka/manuka-totara forest on alluvium. The site provides partial riparian buffering for the Kaikou River and supports one threatened fauna species.



P06/064 Kaikou Riverine Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bown 2002

KOTARETAHI BUSH AND NGARURUNUI SHRUBLANDS

Survey no.	P06/065
Survey date	13 October 1994 and 2003-04
Grid reference	P06 991290 (five remnants)
Area	695.1 ha (258.4 ha forest, 436.7 ha shrubland) (This site has been adjusted to fit 2006 aerial photography. The main changes were the addition of forest remnants to the north, within the Ngati Hine Forest)
Altitude	60-220 m asl

Ecological units

- (a) Kanuka/manuka shrubland on hillslope
- (b) Taraire forest on hillslope
- (c) Kanuka/manuka forest on hillslope
- (d) Taraire-towai forest on hillslope
- (e) Towai-manuka shrubland on hillslope
- (f) Manuka shrubland on hillslope
- (f) Raupo reedland in swamp

Landform/geology

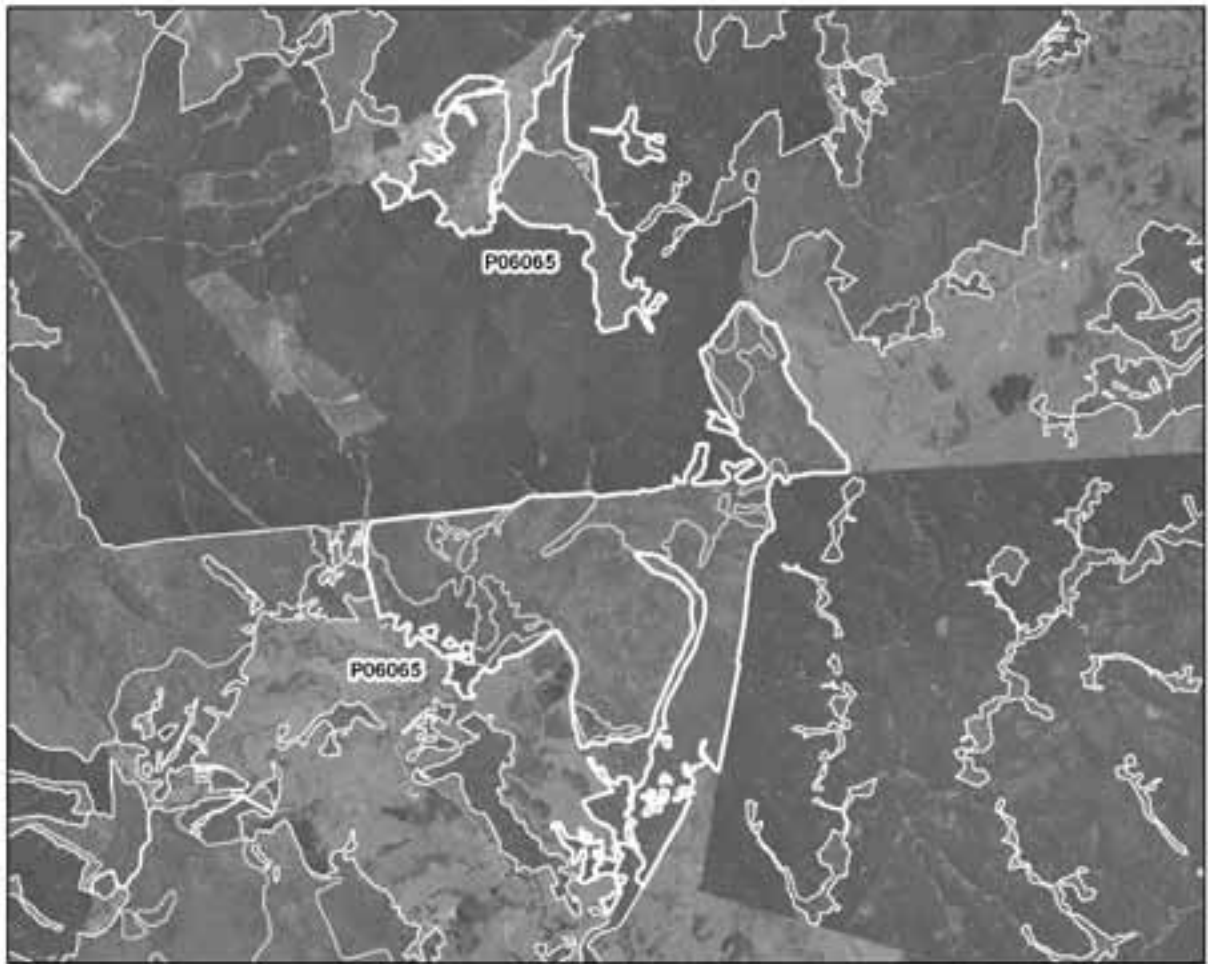
Northern area: steep hillslopes and gullies underlain by Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex).

Southern area: hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex), with Holocene alluvium on valley floors.

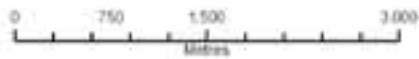
Vegetation

The site comprises a number of different ecological units, including forest and wetland areas surveyed by Wildland Consultants (2004) that lie within the Ngati Hine Forest pine plantation. Shrubland areas are dominated by kanuka/manuka (a), while the northern forested area consists of taraire (b) with frequent puriri and occasional kauri, rimu, kohekohe, rewarewa, pukatea and northern rata. A small area of kanuka/manuka forest (c) occurs on hillslope, with frequent tanekaha, rewarewa, and occasional kauri, kahikatea, totara, rimu and towai.

North of the main site are four remnants of secondary podocarp-broadleaved forest. Taraire and towai (d) are common in the canopy, and emergents include tanekaha, kahikatea and rewarewa. Several areas of towai-manuka shrubland (e) are contiguous with manuka shrubland (f) to the south and east outside the Ngati Hine Forest boundary. A convoluted wetland dominated by raupo (g) is located on the southern margins of the Ngati Hine Forest pine plantation, and includes scattered emergent kahikatea, manuka and ti kouka.



**P06/065 Koteretahi Bush
and Ngarurunui Shrublands**



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Significant flora

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

Fauna

NI brown kiwi (Nationally Vulnerable), NI tomtit (regionally significant), kukupa (regionally significant), and NI kaka (Nationally Vulnerable) (probably now a rare visitor at most (R. Pierce pers. comm.)) were recorded in the northern remnant (SSBI P06/H059) in 1978. NI fernbird (Declining) was recently recorded in raupo reedland (Wildlands 2004).

Significance

The linkage between remnants by pine forest potentially provides additional habitat for some indigenous forest species. Extensive areas of shrubland have become uncommon within Tangihua ED and Northland, as these areas are often targeted for establishment of pine plantation. The site is therefore representative for three ecological units: (a), (e) and (f). There are past records of two threatened bird species and one regionally significant bird species, as well as recent records of an additional threatened species (NI fernbird). The general area is still (2009) a stronghold for kiwi and kukupa. The site also provides habitat for one regionally significant plant species (northern rata) and riparian buffering for the Ketekaraka Stream. Japanese honeysuckle is scattered throughout the raupo wetland, and pampas occurs in scattered clusters.

TE WHATIANGA SWAMP AND ENVIRONS

Survey no.	P06/066
Survey date	11 May 1994 and 10 February 2009
Grid reference	P06 000310 (eight remnants)
Area	391.1 ha (121.9 ha forest, 190.1 ha shrubland, 79.1 ha wetland) (The site has been adjusted to fit 2006 aerial photography. The main changes were the addition of shrubland areas to the south-west, south and north-east, and a forested remnant to the south-east)
Altitude	60-246 m asl

Ecological units

- (a) Taraire-puriri-towai forest on hillslope
- (b) Kanuka-tanekaha-towai forest on hillslope
- (c) Puriri-taraire forest on hillslope
- (d) Manuka forest on hillslope
- (e) Maire tawake forest on alluvium
- (f) Kahikatea forest on alluvium and hillslope
- (g) Raupo reedland in swamp
- (h) *Baumea articulata-raupo* sedgeland in swamp
- (i) Gorse-manuka shrubland on hillslope

- (j) Manuka shrubland on hillslope
- (k) Kahikatea-manuka forest on alluvium
- (l) *Glyceria maxima* grassland in swamp
- (m) *Coprosma propinqua* shrubland in swamp
- (n) *Carex* sp.-harakeke sedgeland in swamp
- (o) Totara-kanuka-puriri-taraire forest on hillslope
- (p) Totara-taraire-towai forest on hillslope
- (q) Totara-kanuka forest on hillslope
- (r) Taraire-puriri-kanuka-mamaku forest on hillslope
- (s) Manuka-mamaku shrubland on hillslope

Landform/geology

Valley floor wetland on Holocene alluvium; bounded mostly by steep hillslopes and gullies underlain by Eocene glauconitic sandstone (Ruatangata Sandstone), but Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex) present locally.

Vegetation

The site is large and encompasses a diverse assemblage of vegetation types reflecting topography, substrate fertility and hydrological gradients. It also includes Te Whatianga Swamp, a significant wetland within Tangihua ED, and areas of broadleaved-podocarp forest surveyed by Wildland Consultants (2004), which lie within the Ngati Hine Forest pine plantation to the east and south-east.

Taraire-puriri-towai forest (a) is abundant on surrounding hillslopes in the north-eastern forest remnant. Tanekaha, rewarewa, emergent kauri and rimu are frequent with occasional hinau, kanuka, emergent kahikatea and northern rata. An association of kanuka, tanekaha, and towai (b) also occurs in this part of the site. Other species include frequent totara, kauri, taraire, puriri, rewarewa, and occasional miro, rimu, kahikatea, pukatea and karaka. Hillslopes in the south-eastern part of the site are characterised by puriri and taraire (c) with frequent kowhai and occasional kahikatea, and manuka forest (d), which occurs with frequent rewarewa, totara, tanekaha, and mamangi, and occasional kowhai. Maire tawake forest (e) occurs in a small alluvial remnant at Te Whatianga Swamp, with frequent kahikatea and ti kouka, and occasional *Glyceria maxima*. Kahikatea forest (f) is also common with frequent maire tawake and ti kouka, while raupo reedland (g) is locally common in one small part of the swamp. Kahikatea forest (f) is also common on hillslopes in the south-western remnant, occurring with frequent pukatea and occasional maire tawake.

The north-west part of the site (alongside Pipiwai Road) is characterised by raupo reedland (g), *Baumea articulata*-raupo sedgeland (h), gorse-manuka shrubland on hillslope (i), and areas of manuka shrubland (j) with frequent totara and tanekaha, and occasional kahikatea. Kahikatea forest (f) is also prominent in this part of the site, occurring with frequent kowhai and occasional titoki, totara and ti kouka. Remaining alluvial areas are characterised by co-dominant kahikatea and manuka (k) with frequent

ti kouka and *Coprosma propinqua*, and occasional totara. Wetland vegetation types in the north-west of the remnant include dominant *Glyceria maxima* (l), *Coprosma propinqua* shrubland (m) with frequent putaputaweta, mapou, ti kouka and manuka, and occasional *Coprosma tenuicaulis*, and *Carex* sp.-harakeke sedgeland (n) with frequent raupo.

To the east, indigenous areas within the Ngati Hine Forest pine plantation are dominated by totara and kanuka, while puriri and taraire (o) are common. Emergent tanekaha are frequent and rewarewa, kauri, rimu and kahikatea are scattered throughout. Further south, a diverse band of broadleaved-podocarp forest on hillslope is characterised by common totara and taraire, and frequent towai (p). Occasional species include rimu, puriri, kahikatea, matai, rewarewa and kauri. Also present in this area is a small remnant of secondary totara-kanuka forest (q) on a west-facing hillslope, with frequent taraire, puriri, towai and mamaku. Occasional species include emergent kahikatea, rewarewa and tanekaha. Further south, a relatively large area of modified primary taraire forest is present, with puriri, kanuka and mamaku (r) common in the canopy. Occasional species include emergent kahikatea, rewarewa, tanekaha, rimu and northern rata, while kauri is locally emergent.

The south-west of the site comprises a long band of indigenous shrubland on hillslope, currently buffered by pine plantation. This area is characterised by manuka-mamaku shrubland (s) and locally abundant manuka (j).

Significant flora

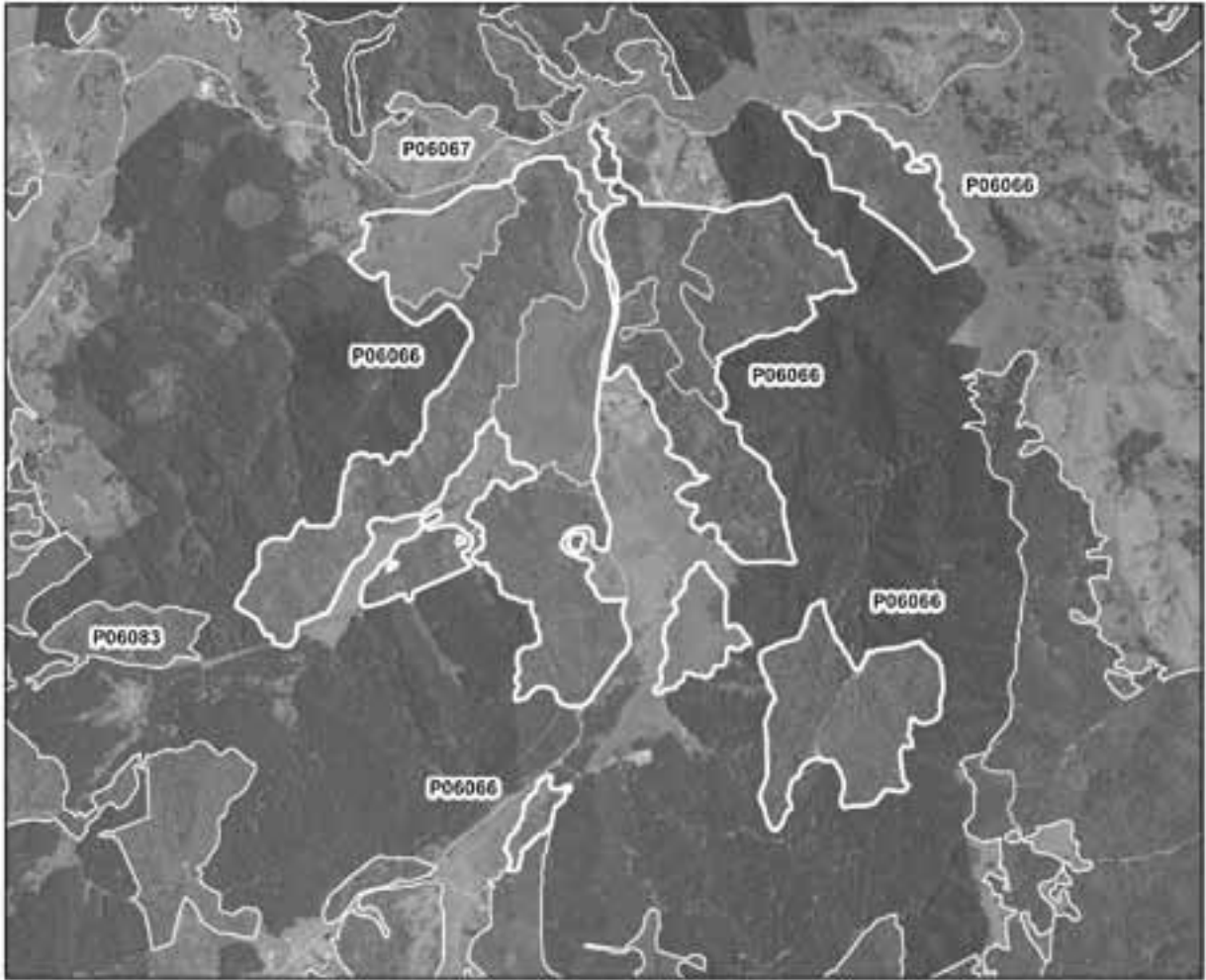
Coprosma tenuicaulis (regionally significant), maire tawake (regionally significant) and northern rata (regionally significant) were recorded during this survey.

Fauna

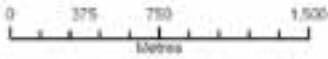
Forest and shrubland areas have been known to support NI brown kiwi (Nationally Vulnerable) and NI tomtit (regionally significant). Australasian bittern (Nationally Endangered), grey duck (Nationally Critical), spotless crane (Relict), NI fernbird (Declining), NI fantail, welcome swallow, and Australasian harrier were recorded from this site in 1987 (SSBI P06/H017), with Australasian bittern also seen in the 1994 PNAP survey. Kukupa (regionally significant) was recorded by Wildland Consultants (2004).

Significance

This site exhibits several attributes which are rare in the Northland region or which are part of an ecological complex which is of outstanding quality within Tangihua ED. The site is representative for five low altitude swamp forest and marsh ecological units: (e), (f), (h), (k) and (m); five ecological units within regenerating kauri-podocarp-broadleaved forest: (a), (b), (r), (o) and (p); and extensive mineralised wetlands, forming part of a large wetland complex within the Taikirau/Takapau Stream system. There are records of at least five threatened bird species and one regionally significant bird species. The wetlands of this wider area are particularly important for bittern (R. Pierce pers. comm.). The wetlands and forested areas also support three regionally significant plant species and provide riparian buffering for the upper reaches of the Waiopiko Stream.



P06/066 Te Whatianga Swamp and Environs



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

PATAKOROKORO HILL BUSH

Survey no.	P06/067
Survey date	14 November 1994 and 10 February 2009
Grid reference	P06 985343 (six remnants)
Area	329.5 ha (200.8 ha forest, 128.7 ha shrubland) (This site has been adjusted to fit 2006 aerial photography. The main changes were the addition of forest and shrubland remnants to the west and south-west of the original boundary)
Altitude	60-252 m asl

Ecological units

- (a) Tanekaha-taraire forest on steep hillslope
- (b) Kanuka forest on hillslope
- (c) Kanuka-tanekaha-totara forest on hillslope
- (d) Totara forest on hillslope
- (e) Manuka-kanuka shrubland on hillslope
- (f) Totara-taraire-puriri-kanuka forest on hillslope

Landform/geology

Steep hillslopes and gullies underlain by Eocene glauconitic sandstone (Ruatangata Sandstone), and Oligocene calcareous mudstone and micritic limestone (Mahurangi Limestone, Motatau Complex).

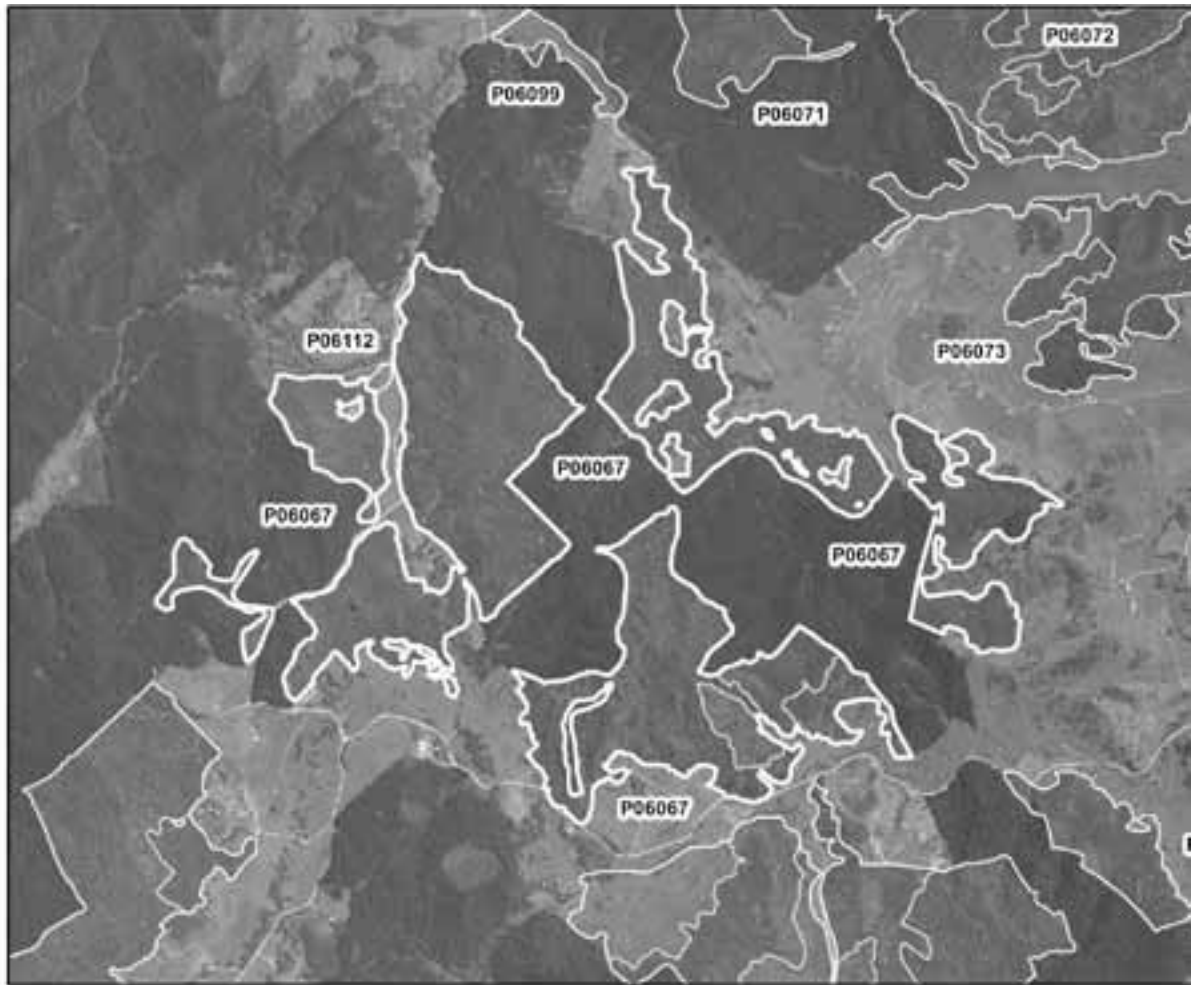
Vegetation

The site comprises cut-over tall forest, predominantly on a steep south-facing hillslope and secondary and cut-over tall forest forest on hill country. Contiguous indigenous areas inside the Ngati Hine Forest pine plantation have been included in this site (Wildland Consultants 2004). In the northern part of the site, forest on steep hillslope is dominated by tanekaha and taraire (a), with frequent kauri and puriri, and occasional miro, tawa, pukatea and kahikatea. Kanuka forest (b) is the most common ecological unit, occurring with frequent kahikatea, totara, towai, and occasional kauri. Kanuka is also locally co-dominant with tanekaha and totara (c), and occasional mamaku.

Southern areas of Patakorokoro Bush (inside the Ngati Hine Forest boundary) include secondary totara forest (d) with tawa, mamaku, and scattered emergents, and secondary manuka-kanuka shrubland (e) with occasional emergent totara, rewarewa and tanekaha. Remaining hillslope is covered by secondary totara-taraire-puriri-kanuka forest (f) with occasional kauri, rewarewa, matai, kahikatea and rimu.

Fauna

Historical records (1978) NI tomtit (regionally significant), kukupa (regionally significant), grey warbler, silvereye, NI fantail, tui, morepork and Australasian harrier (SSBI P06/H016). A range of non-threatened land snails were collected in 1987 (SSBI P06/H016). NI brown kiwi (Nationally



P06/067 Patakorokoro Hill Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Vulnerable) are still present in this general area (2000s) (R. Pierce pers. comm.).

Significance

This site is significant because of its relative size and as an enclave within a larger indigenous/plantation forest tract, which will help to maintain viable populations of some forest species between pine rotations. The site contains a relatively diverse canopy and is representative for one ecological unit: (f). There are past records of one regionally significant bird species, however, further surveys are required to assess the site's current fauna values. NI kiwi are present in the general area. Scattered populations of black wattle, gorse, and Mexican devil were recorded in southern forested areas (Wildland Consultants 2004).

RUATORO BUSH

Survey no.	P06/068
Survey date	10 May 1994 and 2003-04
Grid reference	P06 953378 (three remnants)
Area	17.6 ha (15.5 ha forest, 2 ha wetland) (The site has been adjusted to fit with 2006 aerial photography. The main change was the addition of a third remnant to the east)
Altitude	70 m asl

Ecological units

- (a) Kahikatea-taraire forest on alluvium (45%)
- (b) Kanuka forest on hillslope (45%)
- (c) Harakeke-manuka flaxland in swamp (10%)

Landform/geology

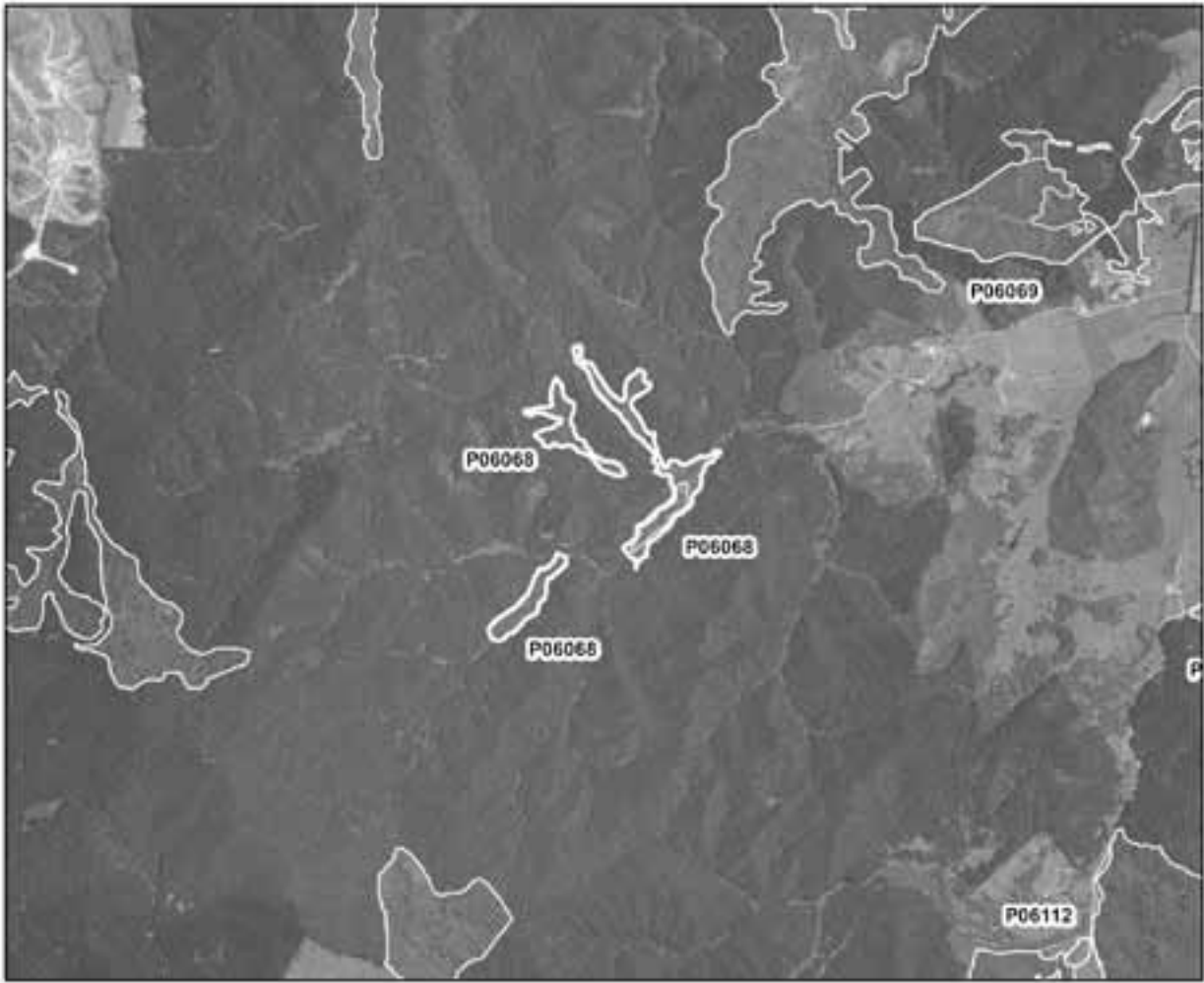
Steep gully underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

Ruatoro Bush comprises a small alluvial terrace and gully of secondary forest within the Ngati Hine Forest pine plantation. Kahikatea-taraire forest (a) is abundant on alluvial terraces, where it is associated with frequent totara, titoki, manuka and wheki. Occasional species include pukatea, putaputaweta and kotukutuku. Hillslope areas within the gully are characterised by kanuka forest (b) with frequent kauri, taraire, and totara, and occasional rimu, rewarewa, tawa and tanekaha. The Ruatoro Stream is associated with a small wetland dominated by harakeke with manuka (c), while ti kouka and wheki are locally common.



Significant flora

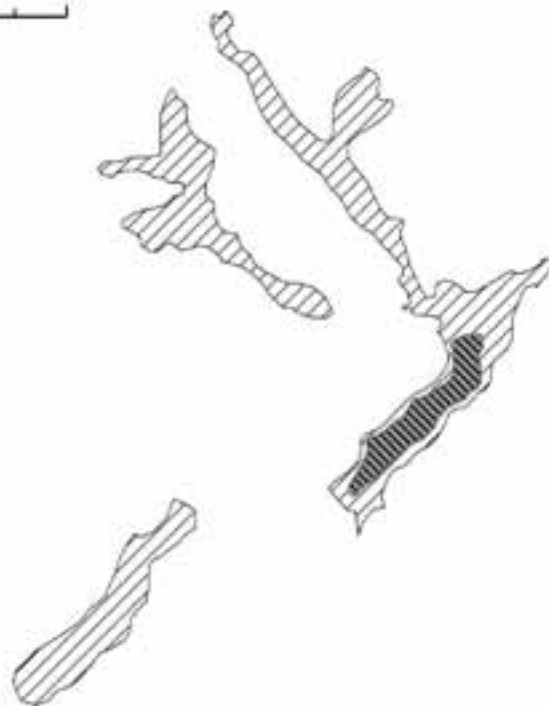
Kotukutuku (regionally significant) was recorded during this survey.



P06/068 Ruatoro Bush



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006

Fauna

Not surveyed.

Significance

Despite its small size, the site contains a representative example of three ecological units: (a), (b), and (c). Harakeke-dominated wetlands are particularly uncommon in Tangihua ED and in Northland. Ruatoro Bush supports one regionally significant plant species and provides riparian buffering for most of the Ruatoro Stream. The site may also act a refuge for indigenous fauna during the logging of adjoining plantation forest.

TOTARA BUSH ASSOCIATIONS

Survey no.	P06/069
Survey date	10 May 1994 and 2003-04
Grid reference	P06 965395 (three remnants)
Area	225.7 ha (183.5 ha forest, 38.3 ha shrubland, 3.9 ha wetland)
Altitude	100-226 m asl (The site has been adjusted to fit with 2006 aerial photography. The main change was the addition of shrubland to the south-east)

Ecological units

- (a) Nikau-puriri-taraire forest on hillslope
- (b) Rimu-tanekaha forest on hillslope
- (c) Kanuka/manuka forest on hillslope
- (d) Taraire-totara-tawa-towai-kanuka forest on moderate hillslope
- (e) Kauri-kanuka/manuka-tanekaha forest on ridge
- (f) Kahikatea-ti kouka forest on alluvium
- (g) *Carex* sp.-maire tawake-raupo sedgeland in swamp
- (h) Raupo reedland in swamp
- (i) Maire tawake-kahikatea forest in swamp
- (j) Kanuka/manuka shrubland

Landform/geology

Steep hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site encompasses a mosaic of modified primary and secondary podocarp-broadleaved forest grading into alluvial and swamp forest associations, before joining a large mineralised freshwater wetland in the lower catchment. Wetlands are dominated by *Carex* sp., raupo and harakeke with common manuka and toetoe, and locally common maire

tawake and kahikatea. Natural areas within the adjoining Ngati Hine Forest pine plantation surveyed by Wildland Consultants (2004) are considered part of the site. The site includes a diverse range of forest types on hillslope and ridges. Nikau-puriri-taraire forest (a) is locally common, occurring with frequent towai and puka, and occasional rimu, totara and tawa. Rimu and tanekaha (b) are associated with occasional northern rata and kauri, while on other areas kanuka/manuka (c) is dominant with occasional kahikatea, pukatea and rewarewa. An assemblage of taraire, totara, tawa, towai and kanuka (d) occupies moderate hillslope, occurring with emergent rimu, kahikatea, rewarewa, kauri and pukatea, and occasional puriri, pigeonwood and maire tawake. Mahoe, ti kouka, wheki, nikau, mamaku and ponga are present in the sub-canopy. On ridges, kauri is emergent over a manuka- or manuka-tanekaha canopy (e), with frequent rewarewa and occasional rimu.

Alluvial areas on the gully floor include co-dominant kahikatea and ti kouka (f), with frequent maire tawake and pukatea, and occasional northern rata, towai and tawa. A swamp association of *Carex* sp., maire tawake and raupo (g) occurs with frequent pukatea, kahikatea and putaputaweta, and occasional supplejack and ti kouka. Raupo reedland (h) is dominant in wetter areas, occurring with occasional ti kouka and harakeke. *Coprosma tenuicaulis*, koromiko, *Eleocharis sphacelata*, and *Carex virgata* are present on the drier margins. A diverse stand of maire tawake-kahikatea forest (i) also occurs in swamp, with occasional manuka, putaputaweta, ti kouka, kanuka, wheki, ponga, kiekie, nikau, and emergent pukatea. Toetoe, kiokio, raupo, koromiko, *Baumea arthrophylla* and Mexican devil are present in the shrub tier. The additional remnant to the south-east was not surveyed, but interpretation of aerial photography indicates that it is largely comprised of kanuka/manuka shrubland (j) and forest types which are similar to those present in the main remnant.

Significant flora

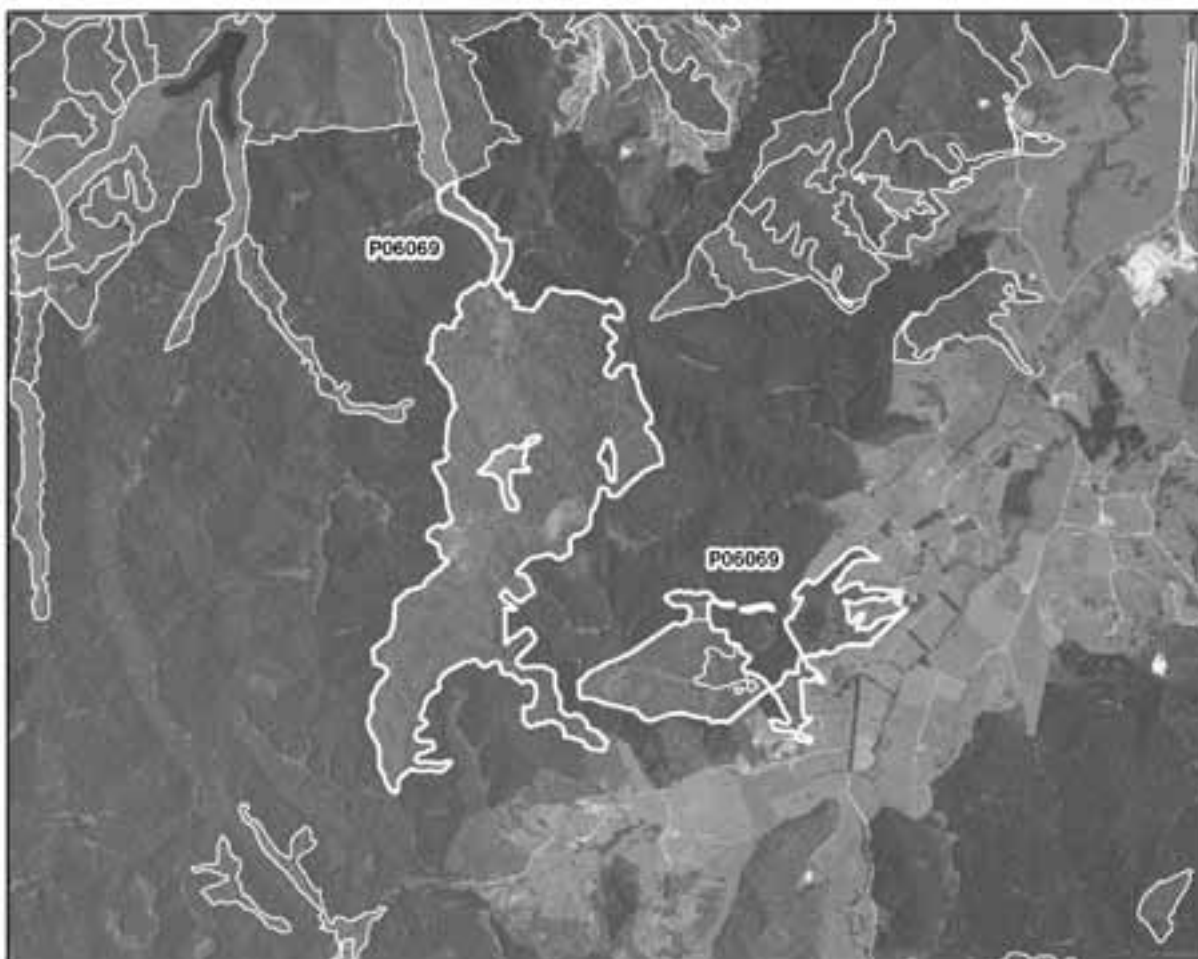
Northern rata (regionally significant) was recorded in the 1994 survey of this site. *Coprosma tenuicaulis* (regionally significant) and maire tawake (regionally significant) were recorded by Wildland Consultants (2004).

Fauna

Kukupa (regionally significant), tui, grey warbler, silvereye, and NI fantail were recorded in 1987 (SSBI P06/H009). NI brown kiwi (Nationally Vulnerable) captured from cleared shrubland were released into forested areas by Carter Holt Harvey c.1987 (SSBI P06/H009). Kauri snail (Gradual Decline) is also known from the site. Tui, NI fantail, grey warbler, and kingfisher were recorded by Wildland Consultants (2004).

Significance

The outstanding feature of this site is its sequential gradient from young secondary and cut-over hill country forest through to alluvial and swamp forests, and eventually into extensive freshwater wetland. Such sequences are extremely rare, especially sites containing such a large swamp forest component. The site contains five representative ecological units: (a),



P06/069 Totara Bush Associations



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

(d), (e), (f) and (i). There are records of two threatened fauna species. The site is contiguous with Te Ahu Ahu Wetland and Environs (P05/048), which has high botanical and wildlife values, including the presence of spotless crane (Relict) and NI fernbird (Declining) (Wildland Consultants 2004). Three regionally significant plant species are present, as are a high concentration of kauri and podocarps. This indigenous forest enclave will function as a refuge for indigenous fauna during the logging of adjoining pines in the Ngati Hine Forest pine plantation. Water quality and riparian functions are also implied.

DAVIS ROAD BUSH

Survey no.	P06/070
Survey date	26 October 1994
Grid reference	P06 014396 (two remnants)
Area	153.6 ha (50.9 ha forest, 102.7 ha shrubland) (The site has been adjusted to fit with 2006 aerial photography. The main change was the addition of shrubland to the north)
Altitude	60-130 m asl

Ecological units

- (a) Kanuka/manuka shrubland on hillslope (75%)
- (b) Kanuka/manuka forest on hillslope (10%)
- (c) Kanuka/manuka-kahikatea forest on hillslope (5%)
- (d) Kanuka/manuka-taraire forest on hillslope (5%)
- (e) Kauri-tanekaha forest on hillslope (5%)

Landform/geology

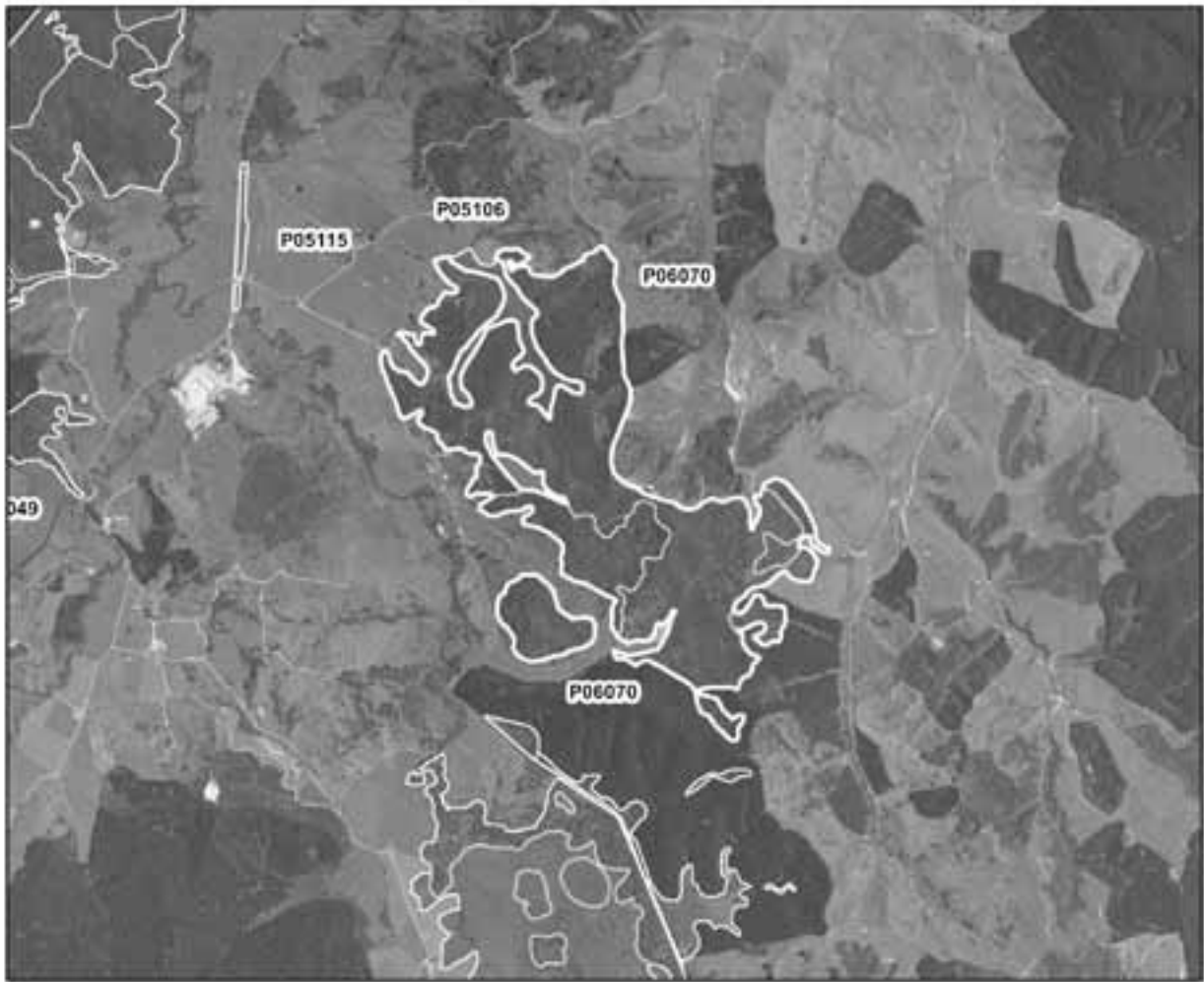
Western remnant - knoll underlain by Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex); eastern remnant - hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site comprises two closely associated secondary forest and shrubland remnants. Kanuka/manuka shrubland (a) dominates the site, occurring with occasional gorse and prickly hakea. Kanuka/manuka forest (b) occurs with frequent totara and occasional puriri and kahikatea. Kanuka/manuka and kahikatea (c) are associated with occasional totara and matai, and kanuka/manuka and taraire (d) are common with frequent totara and rewarewa. Occasional emergents include tawa, tanekaha, pukatea, northern rata, kauri and kahikatea. The remaining canopy is defined by kauri-tanekaha forest (e) with occasional rimu and kanuka.

Significant flora

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



P06/070 Davis Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Fauna

Not surveyed.

Significance

Davis Road Bush is one of the few indigenous forest remnants in the lower end of the Taikirau Stream catchment, which contains the largest mineralised freshwater wetland system in Northland. It contains a large area of shrubland, which is an uncommon habitat type in Tangihua ED and can provide important habitat for threatened species such as NI fernbird, Auckland green gecko, and orchids and ferns. The site is representative for one ecological unit: (c) kanuka/manuka-kahikatea forest on hillslope. It provides habitat for one regionally significant plant species, but is largely comprised of common forest types.

TAIKIRAU WETLAND AND SHRUBLANDS

Survey no.	P06/072
Survey date	5 October 1994 and 2003-04
Grid reference	P06 013377 (five remnants)
Area	376.8 ha (106.6 ha forest, 126 ha shrubland, 144.2 ha wetland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	50-180 m asl

Ecological units

- (a) Kahikatea forest on alluvium
- (b) Kanuka/manuka-kowhai forest on alluvium
- (c) Manuka shrubland on hillslope and gullies
- (d) Puriri forest on hillslope
- (e) *Coprosma propinqua*-ti kouka shrubland in swamp
- (f) Harakeke-raupo flaxland in swamp
- (g) Willow-*Carex* sp. treeland in swamp
- (h) Raupo reedland in swamp
- (i) *Baumea* sp.-*Juncus* sp. sedgeland in swamp
- (j) *Eleocharis sphacelata*-raupo reedland in swamp
- (k) Manuka-*Baumea* sp. shrubland on alluvial floodplain
- (l) Kahikatea-totara forest on stream terrace
- (m) *Coprosma tenuicaulis*-manuka shrubland on alluvial floodplain
- (n) *Eleocharis sphacelata* reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by steep hillslopes and gullies mostly underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex), but with a small area of Oligocene

micritic limestone (Mahurangi Limestone, Motatau Complex) at the southern margin.

Vegetation

The site is predominantly comprised of swamp-marsh associations within the Taikirau floodplain system, with occasional areas of shrubland on hillslope and in gullies. The site includes a small mosaic of swamp and alluvial vegetation east of the Taikirau Stream, which was surveyed by Wildland Consultants (2004) and lies within the Waiomio Forest pine plantation. Alluvial vegetation includes kahikatea forest (a) kanuka/manuka-kowhai forest (b), with frequent matai, manatu and puriri, and occasional taraire, karaka, and emergent northern rata and kahikatea. Surrounding hillslope and gullies are dominated by manuka shrubland (c) with occasional kahikatea, totara, tanekaha and pine. Puriri forest (d) is also common on hillslope, occurring with frequent kahikatea and kanuka/manuka, and occasional tanekaha and kowhai.

Within wetland areas, *Coprosma propinqua* and harakeke (e) are co-dominant with frequent *Carex secta* (open water is also evident), and occasional manuka. Harakeke and raupo (f) also occur with frequent kahikatea and occasional ti kouka, while in other areas willow occurs over an understorey of *Carex* sp. (g), harakeke and raupo, and dominant raupo is present with frequent *Baumea articulata* (h). Vegetation in the east of the site comprises *Baumea* sp.-*Juncus* sp. sedgeland (i) grading into manuka-dominated shrubland, *Eleocharis sphacelata*-raupo reedland (j) in the wettest locations, and kahikatea forest (a) on alluvium.

In the east, manuka-dominated shrubland (k) occurs with *Baumea* sp. and kiokio in the understorey, while kahikatea-totara forest (l) on raised margins grades into mixed *Coprosma tenuicaulis*-manuka shrubland (m). *Eleocharis sphacelata* reedland (n) is present in the wettest locations. There are some areas of scattered planted pines over grassland inside the site boundary.

Significant flora

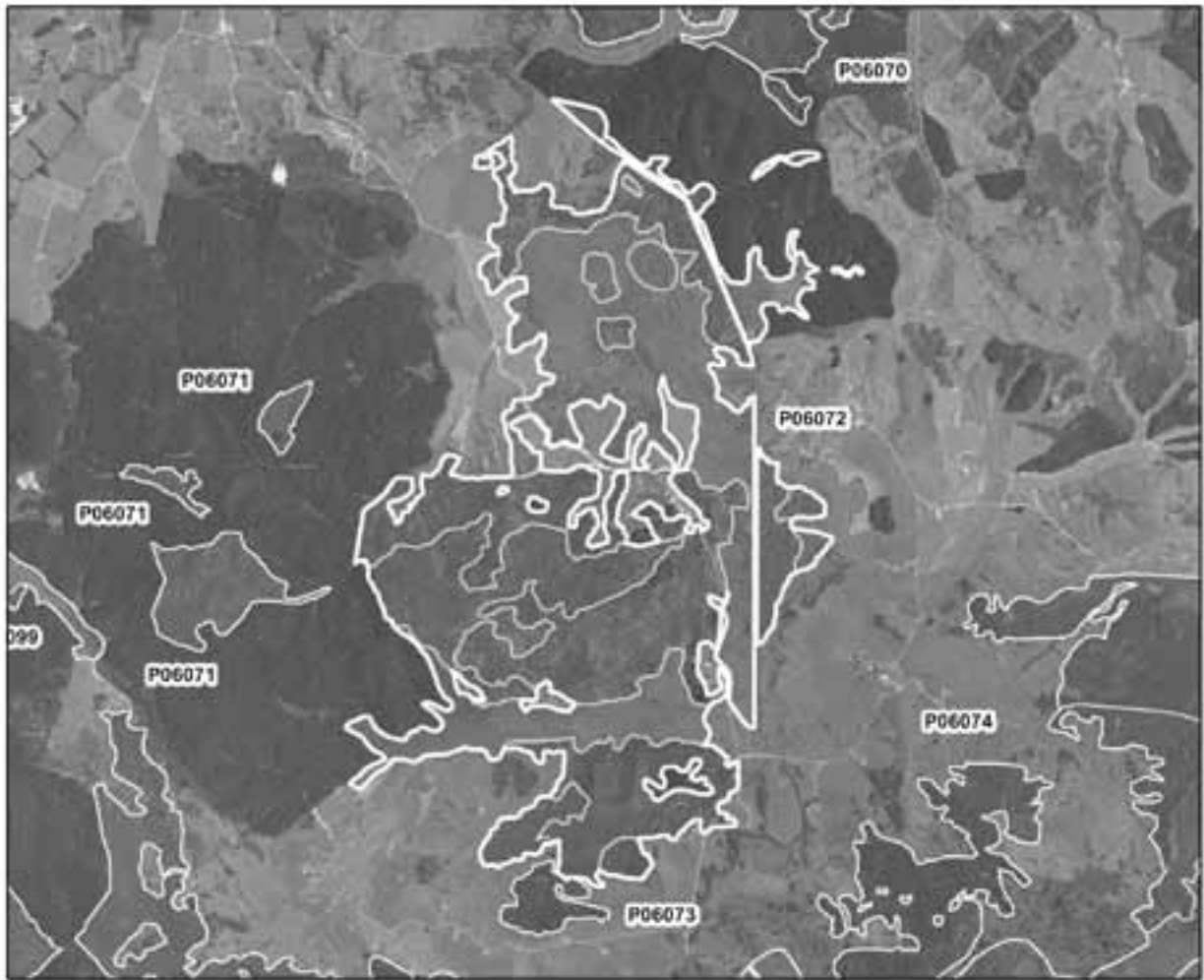
Carex secta (regionally significant), *Coprosma tenuicaulis* (regionally significant), manatu (regionally significant) and northern rata (regionally significant) were recorded during the 1994 PNAP survey of this site. *Astelia grandis* (regionally significant) was recorded in 2006 (M. Young & L. Forester pers. comm.).

Fauna

Australasian bittern (Nationally Endangered), grey duck (Nationally Critical), spotless crane (Relict), NI fernbird (Declining), pied stilt (Declining), NZ shoveler (regionally significant), kingfisher, pukeko, welcome swallow, Australasian harrier, black swan, paradise shelduck, white-faced heron, tui and silvereye were recorded in 1987 (SSBI P06/H010).

Significance

The Taikirau wetland complex is part of the Motatau wetland complex,



P06/072 Taikirau Wetland and Shrublands



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bvsn 2006

which is probably the largest and most significant mineralised freshwater wetland system remaining in Northland. It comprises a diverse assemblage of mostly indigenous swamp-marsh associations and riverine plants with some areas of open water, and adjoining manuka-dominated shrublands on the south-western edge. The site is representative for 11 ecological units: (a), (b), (c), (d), (e), (f), (h), (j), (l), (m) and (n). Wetland vegetation, which would have been more widespread in the past, now covers <0.5% of Tangihua ED (MfE 2004). The site provides habitat for five regionally significant plant species, five threatened birds species and one regionally significant bird species. Some portions of this wetland system have been ponded by the Moerewa-Whangarei Railway, providing extensive areas of permanent wetland. The resultant open and deep water has provided a greater number of ecotones that would otherwise be likely lost due to peripheral drainage. Taikirau Wetland is an important wetland system, and has been assigned the highest priority for protection in the Northland Protection Strategy (Conning 2001). Four hectares are within local purpose reserves (FNDC). Cattle were observed grazing throughout the site in a recent survey. Gorse and Tasmanian blackwood are scattered throughout the drier areas of the site (Wildland Consultants 2004). Willows are becoming a problem in some parts of the site (L. Forester pers. comm.).

POKERE KAHIKATEA REMNANT

Survey no.	P06/073
Survey date	5 October 1994
Grid reference	P06 009352
Area	9 ha
Altitude	50 m asl

Ecological units

(a) Kahikatea-pukatea forest on alluvial flats (100%)

Landform/geology

Valley floor on Holocene alluvium.

Vegetation

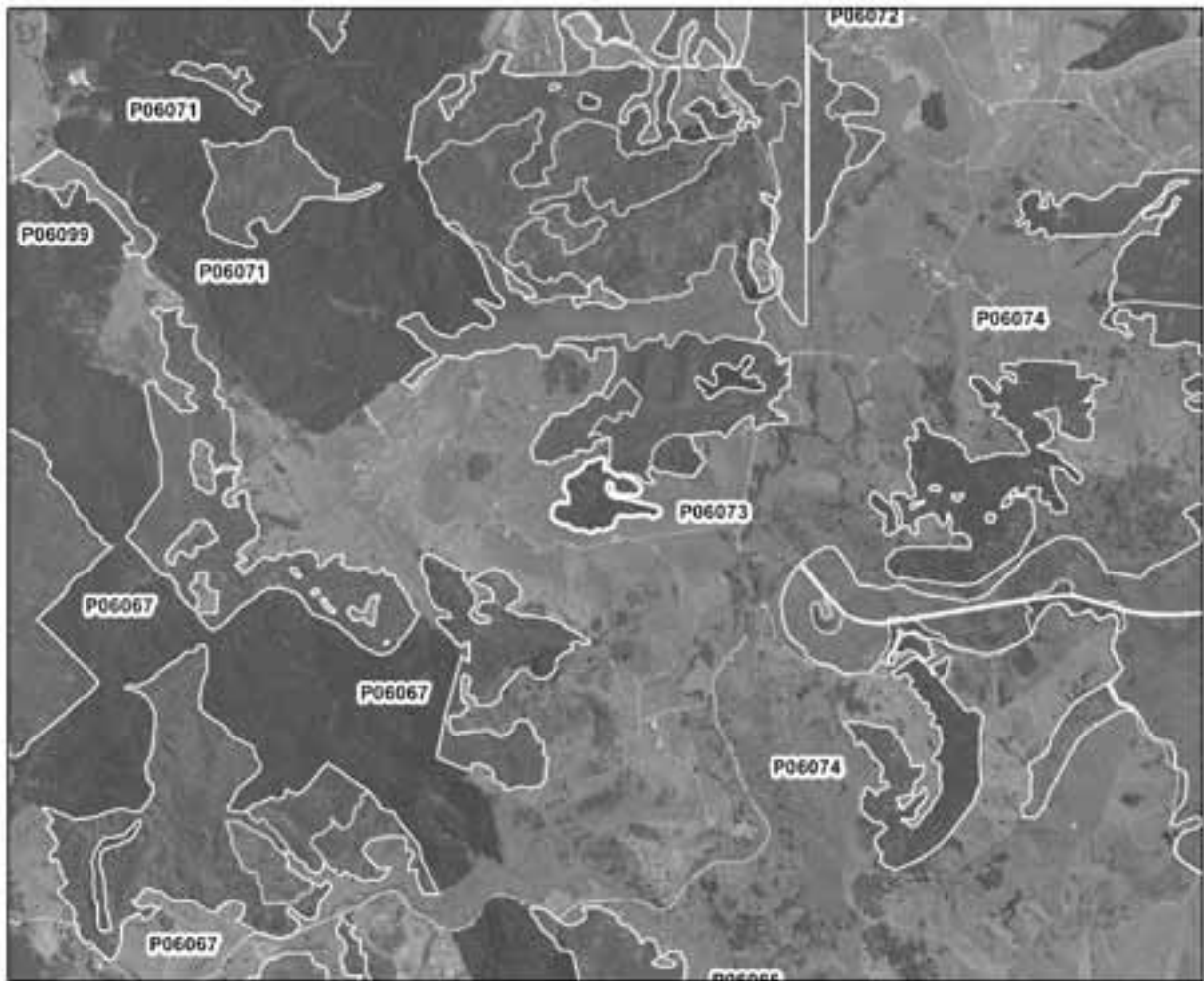
The site is located just south of the Taikirau Swamp (P06/074) and comprises dominant kahikatea with common pukatea (a), and occasional ti kouka, titoki and taraire. Several old growth kahikatea are emergent in the canopy.

Fauna

Grey warbler, silvereve, NI fantail and kingfisher were recorded at the site in 1987 (SSBI P06/H015).

Significance

Forest on alluvium is a very rare, fragmented and under-represented forest

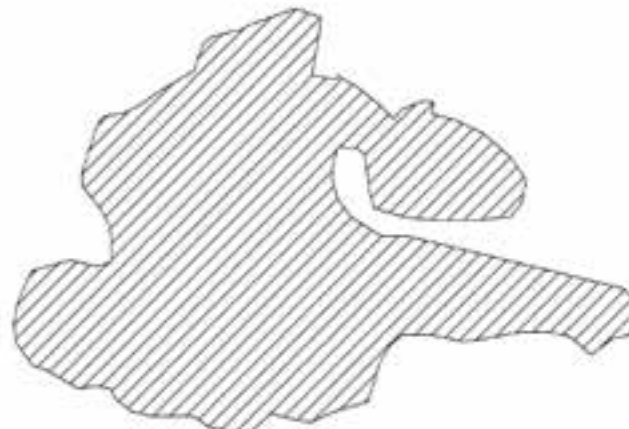


P06/073 Pokere Kahikatea Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

type throughout New Zealand. Historically, this habitat type was one of the first forest types to be replaced by pasture. The site also features old-growth kahikatea, although it was heavily grazed by cattle when surveyed in 1987 (SSBI P06/H015) and was noted as being grazed in 1994 PNAP survey. Unit (a) kahikatea-pukatea forest on alluvial flats is uncommon in Tangihua ED and is therefore representative of its type. Due to the rarity of the habitat type and its relatively large size this site has been accorded Level 1 status, however, an updated survey is needed to determine the current values of this site.

TAIKIRAU SWAMP

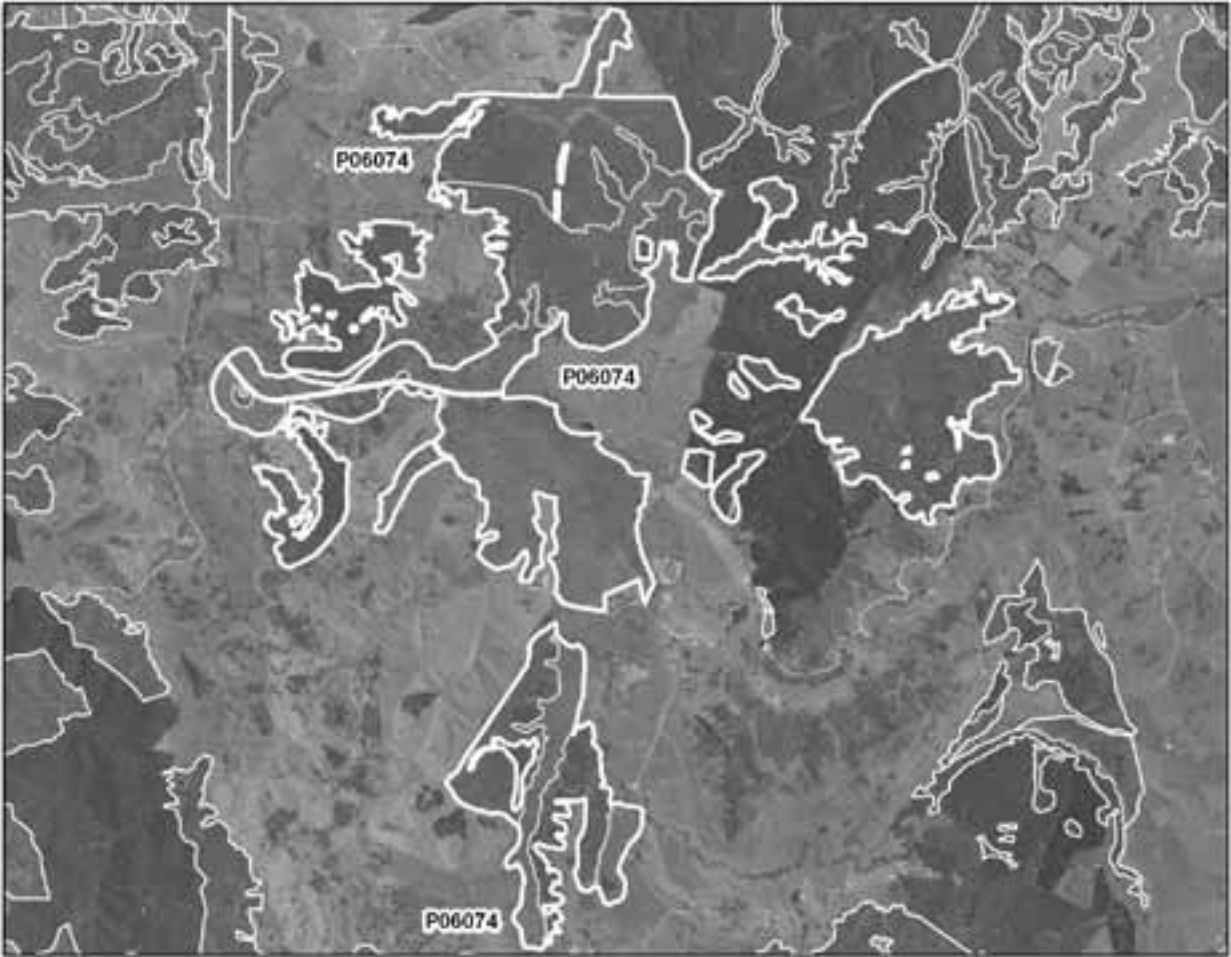
Survey no.	P06/074
Survey date	6 September 1994
Grid reference	P06 040340 (twelve remnants)
Area	803.8 ha (216.1 ha forest, 342.7 ha shrubland, 244.9 ha wetland) (This site has been adjusted to fit 2006 aerial photography. The main change was the addition of forest remnants to the east)
Altitude	50-200 m asl

Ecological units

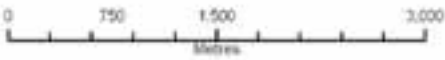
- (a) Manuka-totara forest on hillslope
- (b) Kahikatea-kanuka-kowhai forest on hillslope
- (c) Manuka shrubland on hillslope
- (d) Taraire forest on hillslope
- (e) Kanuka/manuka forest on hillslope
- (f) Totara forest on hillslope
- (g) Puriri-totara forest on steep hillslope
- (h) Manuka-totara forest on hillslope
- (i) Raupo reedland in swamp
- (j) *Carex* sp.-raupo sedgeland in swamp
- (k) *Baumea* sp. sedgeland in marsh
- (l) Ti kouka forest in marsh
- (m) Kahikatea swamp forest in marsh
- (n) *Azolla filiculoides* herbfield on alluvium
- (o) Open water in swamp and stream channel

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by steep hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex), Eocene glauconitic sandstone (Ruatangata Sandstone), Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex) and melange (undifferentiated Mangakahia & Motatau Complex lithologies).



P06/074 Taikirau Swamp



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Vegetation

This large site contains sequential gradients from hill forest/shrubland at 200 m asl through to swamp forest, wetland, and open water in a ponded floodplain at 50 m asl. It is bisected by the North Auckland Railway and Motatau Road. Manuka and totara (a) are co-dominant in the north-eastern forested area of the site, occurring with frequent karaka and occasional puriri, kowhai, kahikatea and titoki. This area also contains kahikatea, kanuka and kowhai (b) in association with frequent pukatea. North-east shrubland areas are defined by abundant manuka (c) with frequent hakea and emergent ti kouka, and occasional kahikatea. *Coprosma propinqua* is a common understorey shrub. Taraire (d) is also common in the canopy, with frequent puriri, totara and rewarewa, and occasional kahikatea, rimu and kauri. Other areas of hillslope in this part of the site include kanuka/manuka forest (e) with frequent rewarewa, tanekaha and mamaku, and occasional totara, while totara forest (f) occurs in a small area with frequent kahikatea and occasional rimu and towai.

Forested hillslopes in the north-west region are characterised by co-dominant puriri and totara (g), with frequent taraire, karaka and kowhai. Occasional species include nikau, akeake, mamaku, tawa, matai and titoki. Abundant manuka with common totara (h) also occur here. The main body of the wetland is predominantly raupo reedland (i), with small areas of *Carex* sp. and raupo (j) associated with occasional *Juncus* sp., and areas where *Baumea* sp. (probably *Baumea articulata*) (k) is dominant. Surrounding areas of marsh are dominated by ti kouka forest (l), with frequent kahikatea, manatu, and *Coprosma propinqua*, and occasional *Muehlenbeckia australis*. The shrub tier is moderately dense and consists primarily of the divaricating shrubs *Coprosma propinqua*, *C. rigida*, *C. rotundifolia*, *C. areolata*, and *Meliclytus micranthus*. Kahikatea (m) is dominant with manatu in another area, occurring with frequent ti kouka, kowhai and *M. australis*. Remaining habitat types largely comprise open water (n) in swamp and stream channel, with *Azolla filiculoides* (o) dominant on a small area of alluvium.

Significant flora

Juncus pauciflorus (Declining), *Doodia squarrosa* (Naturally Uncommon), *Azolla filiculoides* (regionally significant), manatu (regionally significant), *Carex maorica* (regionally significant), *C. secta* (regionally significant), *Hydrocotyle pterocarpa* (regionally significant) and *Rubus squarrosus* (regionally significant) were recorded in the present survey. *Coprosma rigida* (regionally significant) and *C. rotundifolia* (regionally significant) were recorded in 1985 (SSBI P06/H014). *Astelia grandis* (regionally significant) and *Viola filicaulis* (regionally significant) were recorded in 2006 (M. Young & L. Forester pers. comm.).

Fauna

Past records of grey duck (Nationally Critical), Australasian bittern (Nationally Endangered), NI fernbird (Declining), pied stilt (Declining), black shag (Naturally Uncommon), little shag (Naturally Uncommon), spotless crane (Relict), NZ shoveler (regionally significant), pukeko,

Australasian harrier, NZ kingfisher, welcome swallow, paradise shelduck, NI fantail and spur-winged plover (recorded in 1978, SSBI P06/H014). Banded rail (Naturally Uncommon) was reported by residents during the same survey. Australasian bittern booming was heard during the 1994 PNAP survey.

Significance

As with site P06/072, Taikirau Swamp forms an important component of the Taikirau wetland complex, one of Northland's most significant wetland complexes. The site has been given a habitat ranking of 'regionally outstanding' (Ogle 1981). A survey undertaken in 1985 (P. Bellingham, SSBI P06/H014) described the wetland as large and relatively unmodified. Seven threatened fauna and one regionally significant bird species have been recorded from this site and unconfirmed reports of one other threatened bird species (banded rail). The site contains plentiful habitat for waterbirds, with open water areas suitable for diving and wading species. The site contains a very diverse flora, including some nationally rare plant associations, two nationally threatened species and ten regionally significant plant species. It is representative for 12 ecological units: (a), (b), (c), (d), (e), (f), (g), (h), (i), (l), (m) and (n). Wetland vegetation, which would have been common on the extensive alluvial plains in Tangihua ED in the past, now comprises only c.0.5% of the ED (MfE 2004). The 1994 survey found that cattle were given access to areas of the site during summer. The impounding of water caused by willows blocking stream channels is a problem, making the wetland more vulnerable to invasion by weeds such as *Glyceria maxima*. Marginal parts of the wetland are weedy, especially near Henare Road.

HORAHORA STREAM SWAMP ASSOCIATION

Survey no.	P06/075
Survey date	6 September 1994
Grid reference	P06 073325 (seven remnants)
Area	96.9 ha (33.3 ha forest, 39.6 ha shrubland, 24 ha wetland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	60-140 m asl

Ecological units

- (a) Taraire forest on hillslope (10%)
- (b) Kanuka/manuka-puriri-totara forest on toeslope (5%)
- (c) Kahikatea-totara forest on alluvium (10%)
- (d) Kahikatea-pukatea forest in marsh (10%)
- (e) *Coprosma propinqua*-kahikatea-ti kouka shrubland in marsh (5%)
- (f) Harakeke-ti kouka flaxland in swamp (20%)
- (g) Kanuka/manuka shrubland on hillslope (40%)

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by hillslopes and gullies underlain by Eocene glauconitic sandstone (Ruatangata Sandstone).

Vegetation

The site comprises a diverse assemblage of hill country forest and shrubland, wetland, swamp forest and riverine forest types. The forest in the northern end is represented by common taraire (a) with frequent puriri and occasional kahikatea, rewarewa, pukatea and rimu. Kanuka/manuka-puriri-totara forest (b) dominates the lower slopes, occurring with frequent kahikatea and occasional kowhai, northern rata, karaka, titoki and ti kouka. On the alluvial terraces adjacent to the Horahora Stream, kahikatea and totara (c) are co-dominant, with frequent titoki, kowhai, and occasional karaka and matai. Alluvial forest in the west is defined by common kahikatea and pukatea (d), with frequent ti kouka and occasional titoki, matai, tarata, kowhai, totara and maire tawake. In the south-west corner of the wetland, *Coprosma propinqua*, kahikatea, and ti kouka (e) occur with the occasional maire tawake. Harakeke and ti kouka (f) are co-dominant in the body of the wetland, with frequent *Coprosma tenuicaulis* and *Muehlenbeckia* sp., and occasional kohuhu, pampas, raupo and crack willow. Remaining hillslope areas are largely characterised by kanuka/manuka shrubland (g).

Significant flora

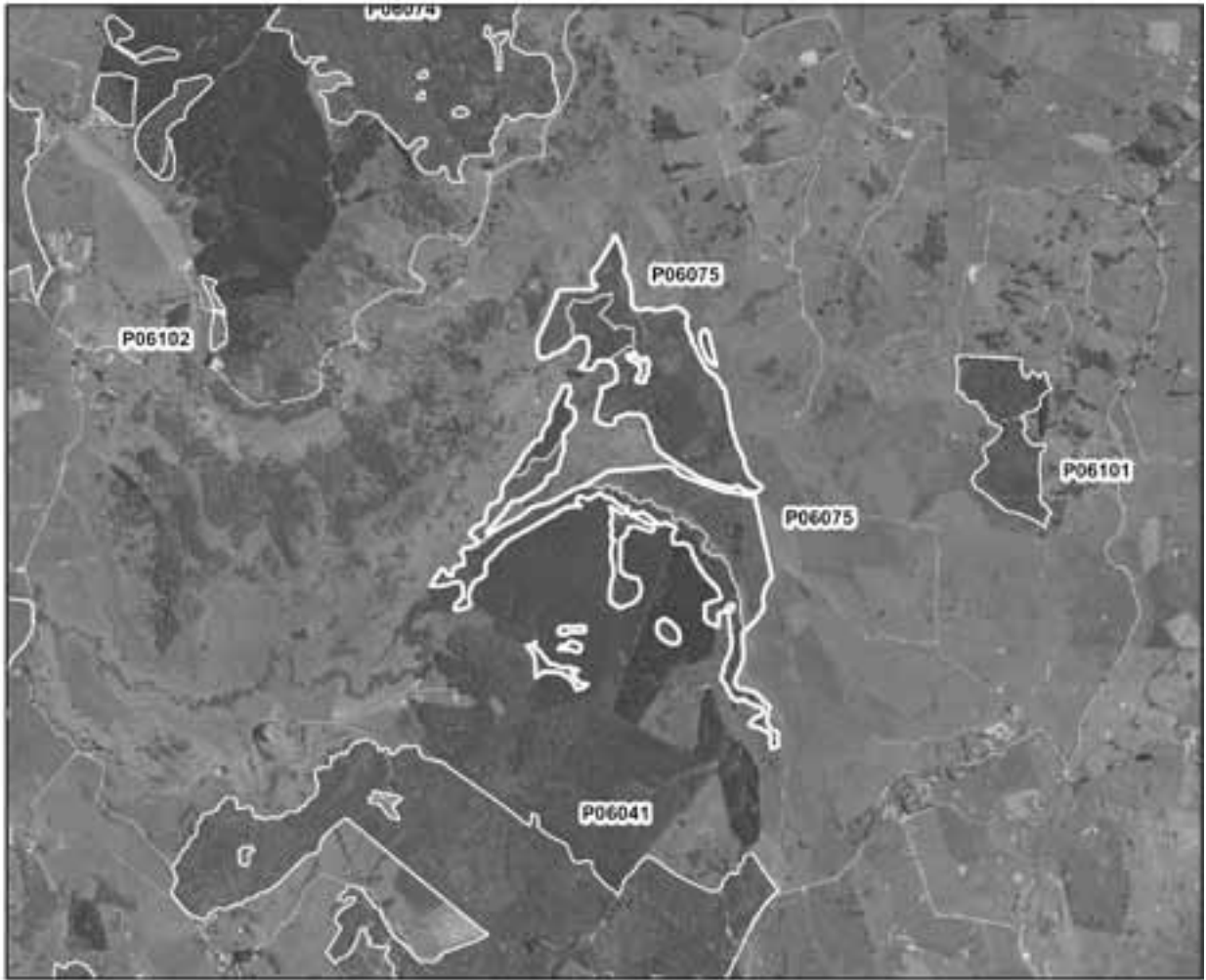
Coprosma tenuicaulis (regionally significant), maire tawake (regionally significant) and northern rata (regionally significant) recorded during this survey. This is the only site in Tangihua ED in which tarata was recorded, a species that is locally common in Northland (L. Forester pers. comm.).

Fauna

Not surveyed.

Significance

The site contains an excellent example of an alluvial floodplain swamp forest-wetland-terrestrial forest and shrubland ecological sequence, which is very rare in Tangihua ED and throughout Northland. The site is therefore representative for seven ecological units: (a), (b), (c), (d), (e), (f) and (g). Freshwater wetlands are also a threatened habitat type regionally and nationally. The site supports three regionally significant plant species (*Coprosma tenuicaulis*, maire tawake and northern rata), and provides potential habitat for indigenous wetland bird species such as NI fernbird and spotless crane. At the time of survey this site was being grazed.



P06/075 Horahora Stream Swamp Association



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

TARAKIHI WETLAND AND ENVIRONS

Survey no.	P06/076
Survey date	26 October 1994 and 2003-04
Grid reference	P06 068400 (ten remnants)
Area	665.6 ha (199.5 ha forest, 312.8 ha shrubland, 153.3 ha wetland) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	30-200 m asl

Ecological units

- (a) Manuka shrubland on hillslope
- (b) *Baumea arthrophylla-Gleichenia* sp.-manuka sedgeland in bog
- (c) Harakeke flaxland in bog
- (d) *Eleocharis sphacelata* reedland in bog
- (e) Totara forest on hillslope
- (f) Taraire-towai forest on hillslope
- (g) Totara forest in gully
- (h) Rimu-rewarewa forest in gully

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by steep hillslopes and gullies mostly underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex), but with some areas underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies).

Vegetation

The site comprises a mosaic of forested gullies and extensive shrublands adjoining acidic and intermediate fertility freshwater wetlands within several catchments linked by exotic plantation forest. Indigenous areas that fall within the boundary of the Waiomio Forest pine plantation were surveyed by Wildland Consultants (2004), and are included in the site. Hillslope vegetation within valleys includes dominant manuka (a) with occasional wattle on the edges. Other species include mingimingi, *Dracophyllum lessonianum*, kumarahou, *Lycopodium* sp., mangemange, *Gabnia* sp. and bracken, which are typical of gumland areas *Baumea arthrophylla-Gleichenia* sp.-manuka sedgeland (b) is widespread throughout a relatively large wetland along a valley floor, in the west side of the site. Kiokio occurs as a frequent wetland species. Harakeke (c) is locally abundant, occurring with frequent *Baumea* sp. and occasional *Gleichenia* sp., while *Eleocharis sphacelata* reedland (d) is abundant in the channels. Other areas of hillslope comprise secondary totara forest (e) with frequently occurring kanuka, puriri, and taraire, and occasional emergent kauri, rimu and kahikatea. Cut-over tall taraire-towai forest (f) is also present, occurring with frequent rewarewa and puriri, and occasional tawa, totara, rimu, pukatea and miro. Gullies are characterised by secondary podocarp-broadleaved forest types, the first of which is

totara forest (g) with emergent rewarewa and rimu over a sub-canopy of occasional towai, taraire, kohekohe, pigeonwood and mamaku. The shrub tier is comprised of frequent *Melicytus macrophyllus*, nikau, hangehange, kiekie, ponga and turutu. The second type is rimu-rewarewa forest (h) with occasional emergent totara, tanehaka and northern rata, and frequent puriri, kanuka and tawa in the understorey.

Significant flora

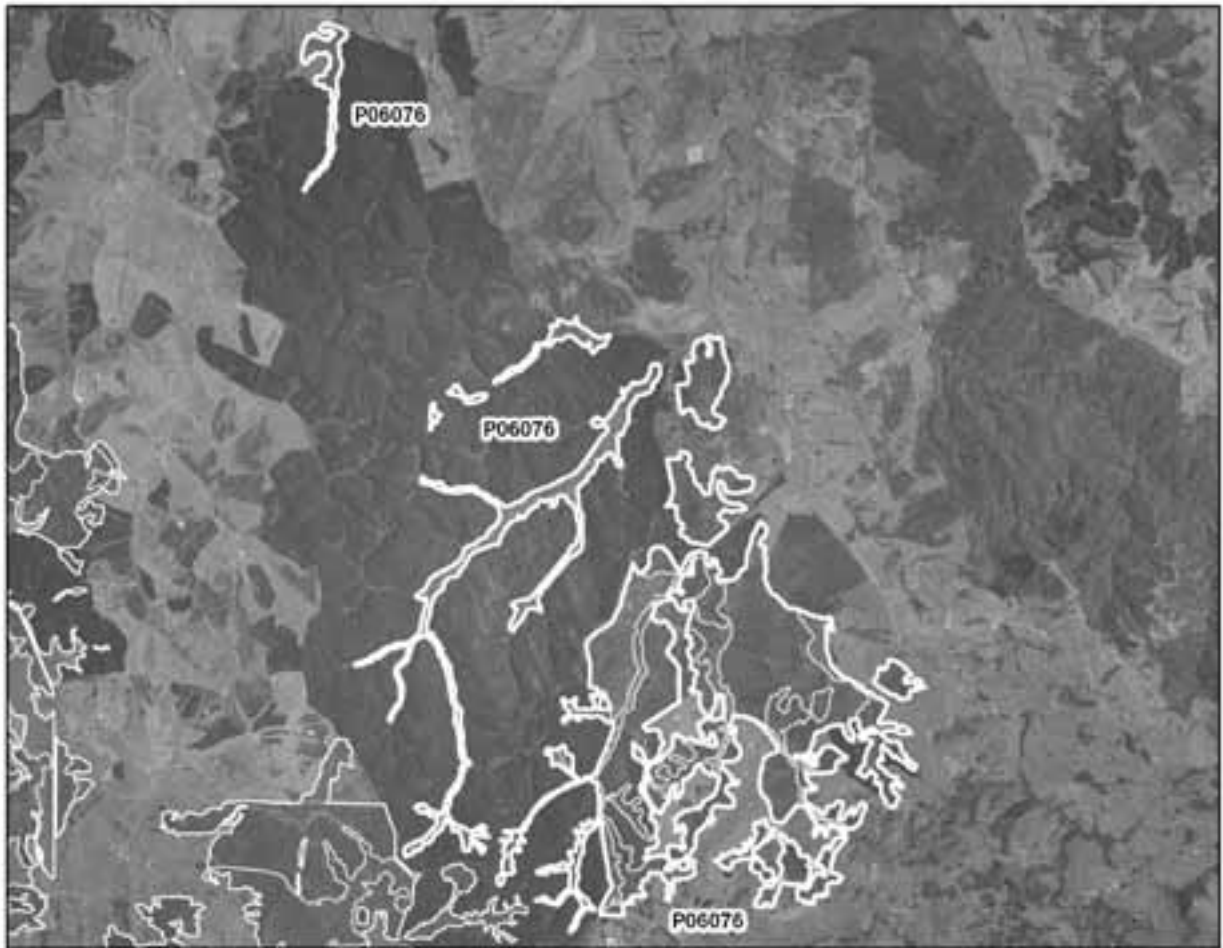
Coprosma tenuicaulis (regionally significant) and northern rata (regionally significant) were recorded in 1978 (SSBI P06/H011). Northern rata was also recorded by Wildland Consultants (2004).

Fauna

NI fernbird (Declining) was recorded in the 1994 PNAP survey and again by Wildland Consultants (2004), along with spotless crane (Relict) and NI tomtit (regionally significant). NI fernbird, grey warbler, silvereye, NI fantail and welcome swallow (recorded 1978, SSBI P06/H011).

Significance

The site contains 145 ha of wetland, much of it adjoining indigenous vegetation or plantation forest, and has been recognised as a priority for protection in Tangihua ED (Conning 2001) (although the site is currently still unprotected). Tarakihi Wetland is representative of intermediate wetland fertility with areas of acidic peat bog vegetation in poorly drained sites and more nutrient reliant species occurring around peripheral channels and in the upper catchment. Areas of intermediate wetland fertility are likely to comprise fens, which together with acidic beat bogs, are very uncommon in Northland (L. Forester pers. comm.). In this regard they function as an important addition to the diversity of the Motatau wetland complex. The site may also contain gumland, another rare vegetation type in Northland. Tarakihi Wetland and Environs supports two regionally significant plant species and is representative for five ecological units: (a), (b), (c), (d) and (h). Wetland vegetation, which would have been common on the extensive alluvial plains in Tangihua Ecological District in the past, now comprises only c.0.5% of the ED (MfE 2004). Large areas of gully forest buffer wetland vegetation and provide riparian protection for Pokapoka Stream. Tarakihi Wetland and the surrounding shrubland and forest provide important habitat for two threatened bird species, one regionally significant bird species, and a range of common indigenous birds. The site is particularly important in terms of habitat for Australasian bittern. There are past reports of cattle grazing in the swamp (SSBI P06/H011), but it is not known if the affected areas have since been fenced.



P06/076 Tarakihi Wetland and Environs



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

HURIHANGA STREAM FOREST REMNANTS

Survey no.	P06/077
Survey date	6 September 1994
Grid reference	P06 048282 (four remnants)
Area	229.6 ha
Altitude	80-250 m asl

Ecological units

- (a) Puriri-taraire forest on moderate to steep hillslope (50%)
- (b) Taraire-totara forest on moderate to steep hillslope (40%)
- (c) Puriri forest on moderate to steep hillslope (10%)

Landform/geology

Two southern remnants - steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex); northern remnant - steep hillslopes underlain by Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex).

Vegetation

The site comprises several remnants of scattered broadleaved-dominated forest on hillslopes. At least half of the site consists of co-dominant puriri and taraire (a), with frequent karaka and emergent totara, and occasional titoki, tawa, kohekohe, emergent northern rata and rimu. Taraire-totara forest (b) is also widespread, occurring with frequent puriri and occasional towai, karaka, mamaku and rewarewa. The remaining forest is characterised by puriri (c) with occasional taraire and totara.

Significant flora

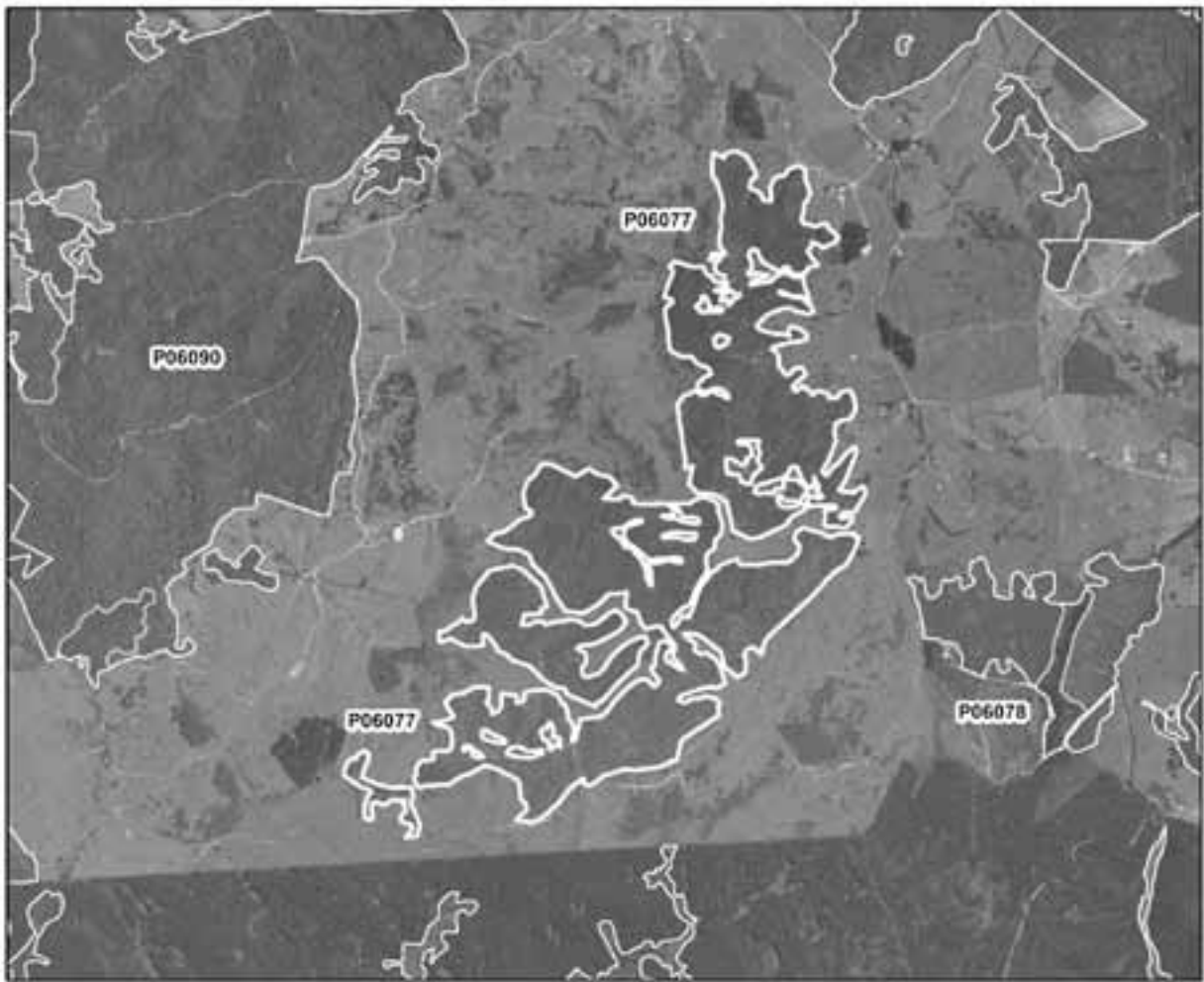
Northern rata (regionally significant) was recorded during this survey.

Fauna

Not surveyed.

Significance

This site covers a relatively large geographic area and contains good examples of broadleaved-dominated forests with a large puriri and emergent totara component. It supports one regionally significant plant species. The abundance of taraire and puriri provides a valuable seasonal food source for kukupa, and the site may act as a stepping stone for this and other mobile species to larger indigenous areas such as Motatau Forest (P06/084) to the south. It also provides riparian buffering for two small tributaries of the Hurihanga Stream.



P06/077 Hurihanga Stream Forest Remnants



Habitat Type



Aerial photography from 2006

RATA TIPENE SHRUBLAND

Survey no.	P06/078
Survey date	6 September 1994
Grid reference	P06 073285 (five remnants)
Area	153.5 ha (52.6 ha forest, 100.9 ha shrubland) (This site has been adjusted to fit 2006 aerial photography. The main changes were the addition of forested areas to the north and east as well as a large remnant to the west).
Altitude	80-193 m asl

Ecological units

- (a) Kanuka/manuka shrubland on hillslope (60%)
- (b) Kanuka/manuka totara forest gentle hillslope (40%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

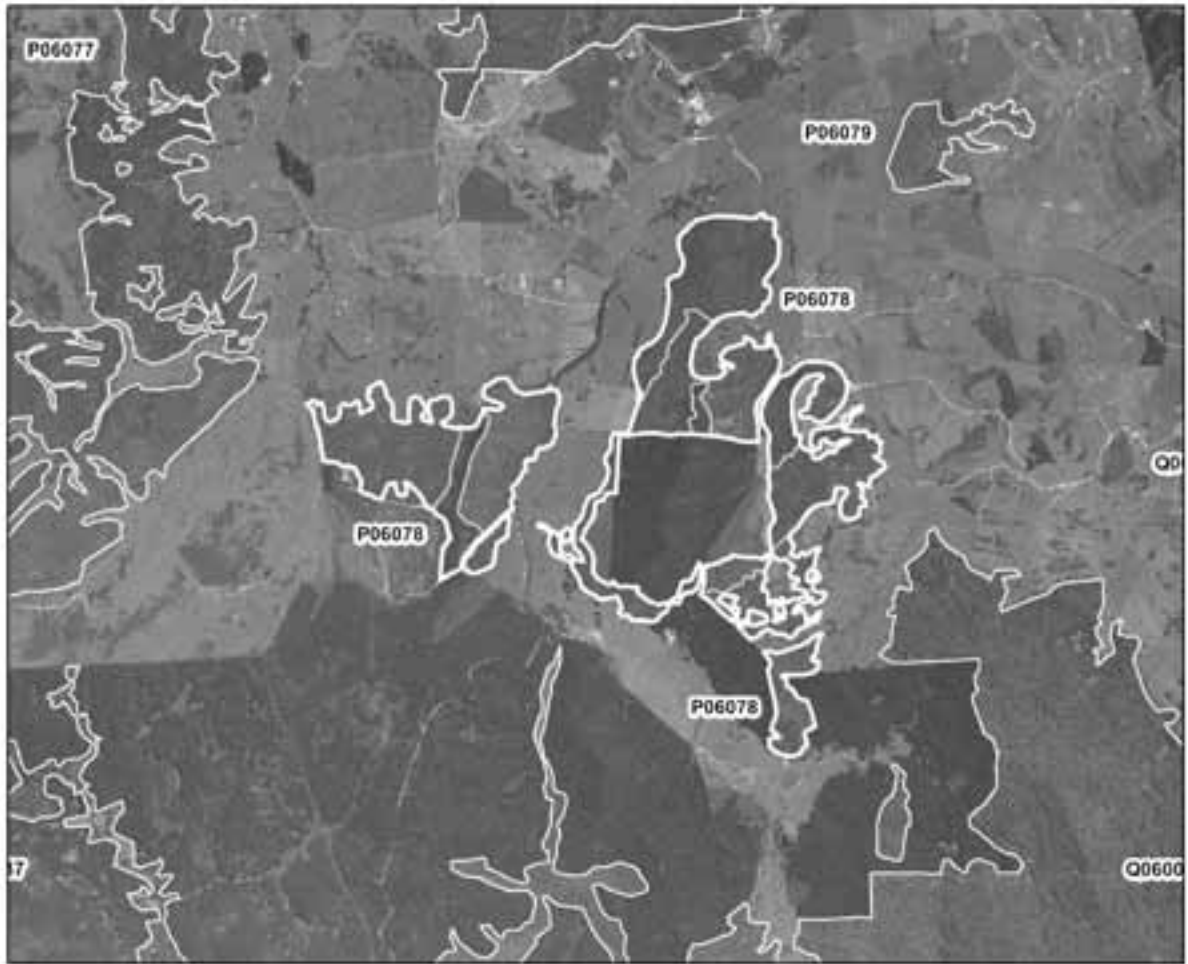
The site comprises a medium size remnant characterised by regenerating shrubland and forest. Kanuka/manuka shrubland (a) dominates the site, with the remaining vegetation defined by more advanced kanuka/manuka-totara forest (b). The additional remnant to the west was not surveyed, but interpretation of aerial photography indicates that it is largely comprised of kanuka/manuka shrubland (a) with a small area of kanuka/manuka totara forest (b) on the ridgeline.

Fauna

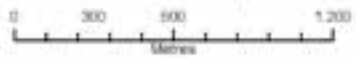
NI brown kiwi (Nationally Vulnerable) was reported in 1987 (SSBI P06/053). NI fernbird (Declining), grey warbler, NI fantail, kingfisher, welcome swallow, white-faced heron, pukeko and paradise shelduck were recorded in the same year. The non-threatened land snails *Liarea turriculata* and *Phenacobelix pilula* were also present in 1987 (SSBI P06/053).

Significance

Rata Tipene Shrubland is a small indigenous enclave on the periphery of a large indigenous/exotic forest tract. The site is significant because of its size and the fact that shrubland is a regionally uncommon habitat type, which in this case may provide a refuge for indigenous fauna during the harvesting of pine. Plantation forest also links the site to Atchinson's Bush (Q06/001) to the south. There are past records of two threatened bird species. A swamp area in which harakeke and raupo were previously abundant has now been drained (SSBI P06/H053). Further surveys are required to determine the site's current ecological values.



P06/078 Rata Tipene Shrubland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bowen 2006

RATA TIPENE ROAD HARAKEKE SWAMP

Survey no.	P06/079
Survey date	6 September 1994
Grid reference	P06 083294
Area	13 ha (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	70 m asl

Ecological units

- (a) Harakeke flaxland on alluvium (98%)
- (b) *Juncus* sp. rushland on alluvium (2%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

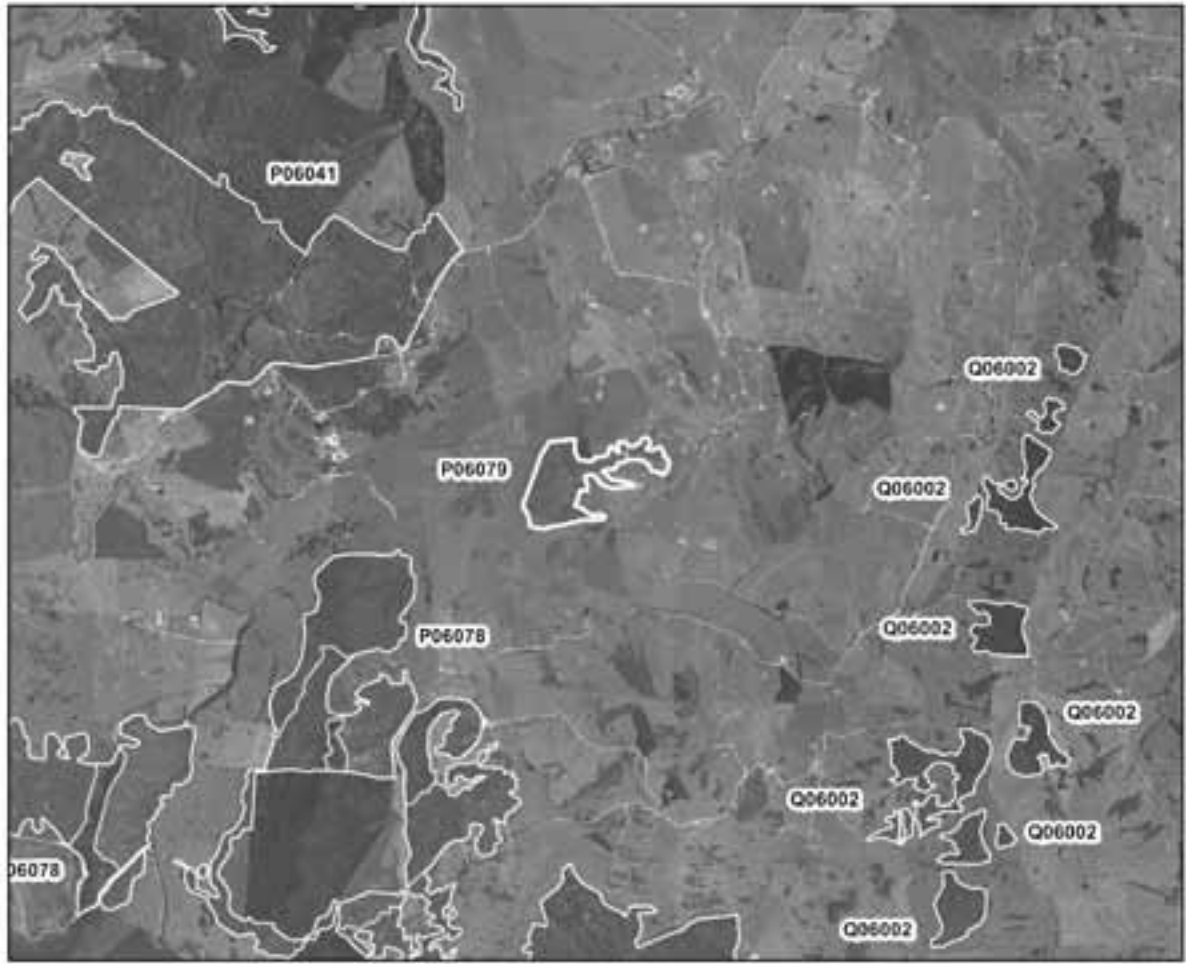
The Rata Tipene Road Harakeke Swamp is the upper-most component of the Taikirau wetland chain in the Horahora Stream catchment. This site is surrounded by rough pasture and peripheral drainage has encouraged harakeke flaxland (a) to dominate the site to the exclusion of most other competing plants. A very small area of *Juncus* sp. occurs on the periphery.

Fauna

Not surveyed.

Significance

The site contains one representative ecological unit: (a) harakeke flaxland on alluvium, which dominates the site. Harakeke-dominated wetlands (especially those which have not been invaded by Japanese honeysuckle) are very rare in Tangihua ED and throughout Northland, with only 168 ha remaining in the Northland region (MfE 2004). Additional survey is recommended to determine the full ecological values of this site.



P06/079 Rata Tipene Road Harakeke Swamp



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

KIEKIE BUSH

Survey no.	P06/081
Survey date	10 May 1994 and 2003-04
Grid reference	P06 946349
Area	78.6 ha
Altitude	90-240 m asl

Ecological units

- (a) Taraire forest on hillslope (90%)
- (b) Kauri-rimu-tanekaha forest on ridge (10%)

Landform/geology

Steep hill country of Cretaceous sandstone (Punakitere Formation, Mangakahia Complex).

Vegetation

Kiekie Bush comprises an area of east-facing cut-over tall forest forest with a secondary element dominating old, heavily disturbed sites. Taraire forest (a) (including old growth) dominates this site, with frequent tawa and towai, and occasional puriri, rewarewa, tanekaha, totara, kahikatea, mahoe, nikau, and emergent northern rata and rimu. On the west ridge, kauri, rimu, and tanekaha (b) are co-dominant, with occasional totara and tawa. The site's north and east boundaries are currently buffered by pine plantation within the Ngati Hine Forest pine plantation.

Significant flora

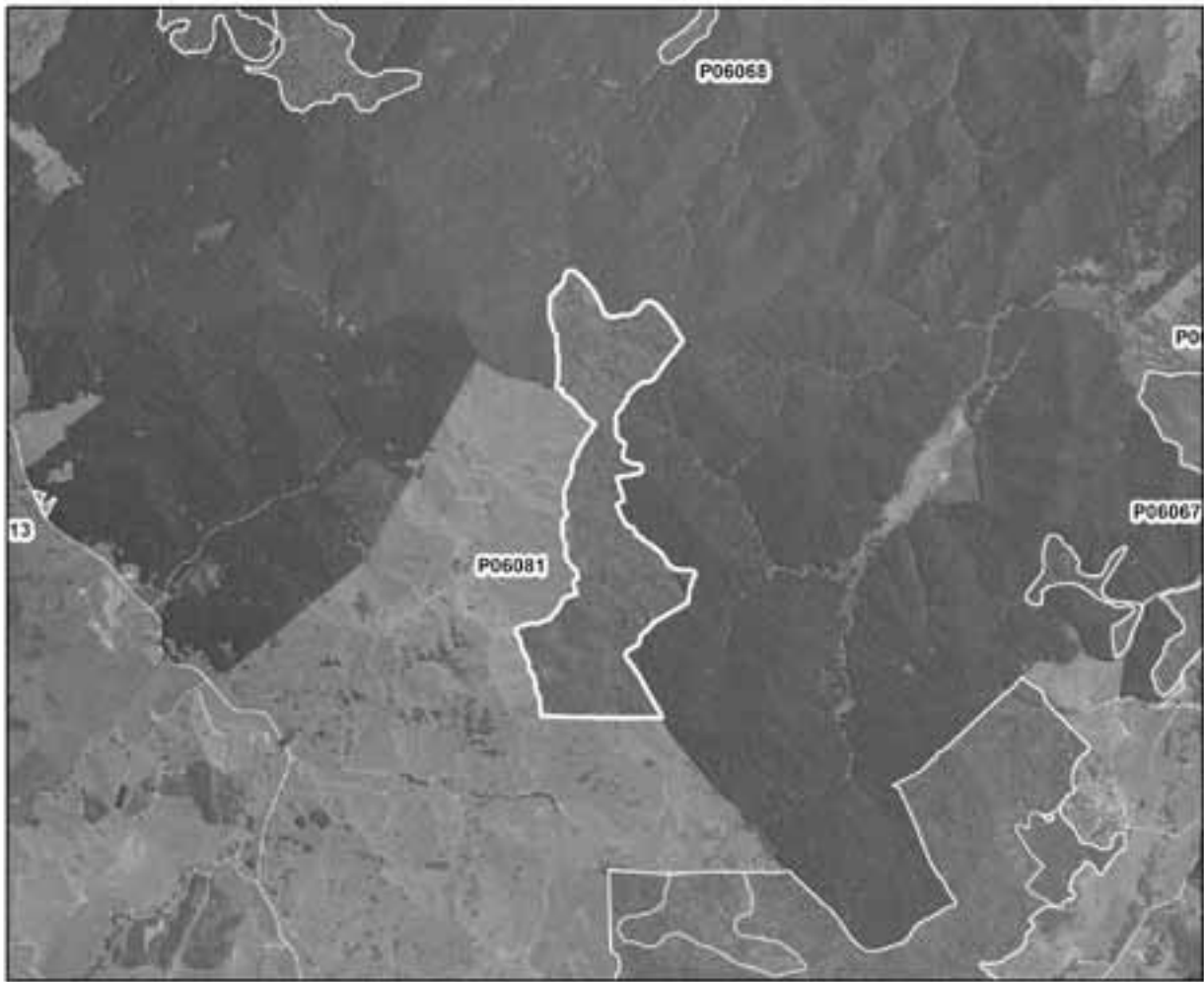
Northern rata (regionally significant) was recorded during this survey.

Fauna

Historical (1978) records of NI brown kiwi (Nationally Vulnerable), NI fernbird (Declining), NI tomtit (regionally significant), silvereye, NI fantail and tui (SSBI P06/H018).

Significance

This site is a medium size indigenous forest enclave within a much larger indigenous/plantation forest tract, and contains a substantial emergent element in the northern catchment as well as some old-growth taraire. It is representative for one ecological unit: (b) kauri-rimu-tanekaha forest, the only example of its type recorded in Tangihua ED. There are historical records of two threatened bird species and one regionally significant bird species. One regionally significant plant species is present. The site also provides riparian and upper catchment protection, a refuge for indigenous fauna during the logging of adjoining pines, and a valuable food source for kukupa. Further surveys are needed to determine current abundance of kiwi and other threatened species within the site.



P06/081 Kiekie Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

MATAWAIA BUSH

Survey no.	P06/082
Survey date	27 April 1994
Grid reference	P06 966324
Area	314.2 ha (222.2 ha forest, 92 ha shrubland) (This site has been adjusted to fit 2006 aerial photography. The original remnants are now part of a large, contiguous area of forest and shrubland).
Altitude	80-240 m asl

Ecological units

- (a) Taraire-rewarewa-totara forest on hillslope
- (b) Kanuka-manuka-totara forest on hillslope
- (c) Totara-kanuka forest on hillslope
- (d) Kanuka/manuka totara shrubland on hillslope

Landform/geology

Steep hill country underlain by Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex).

Vegetation

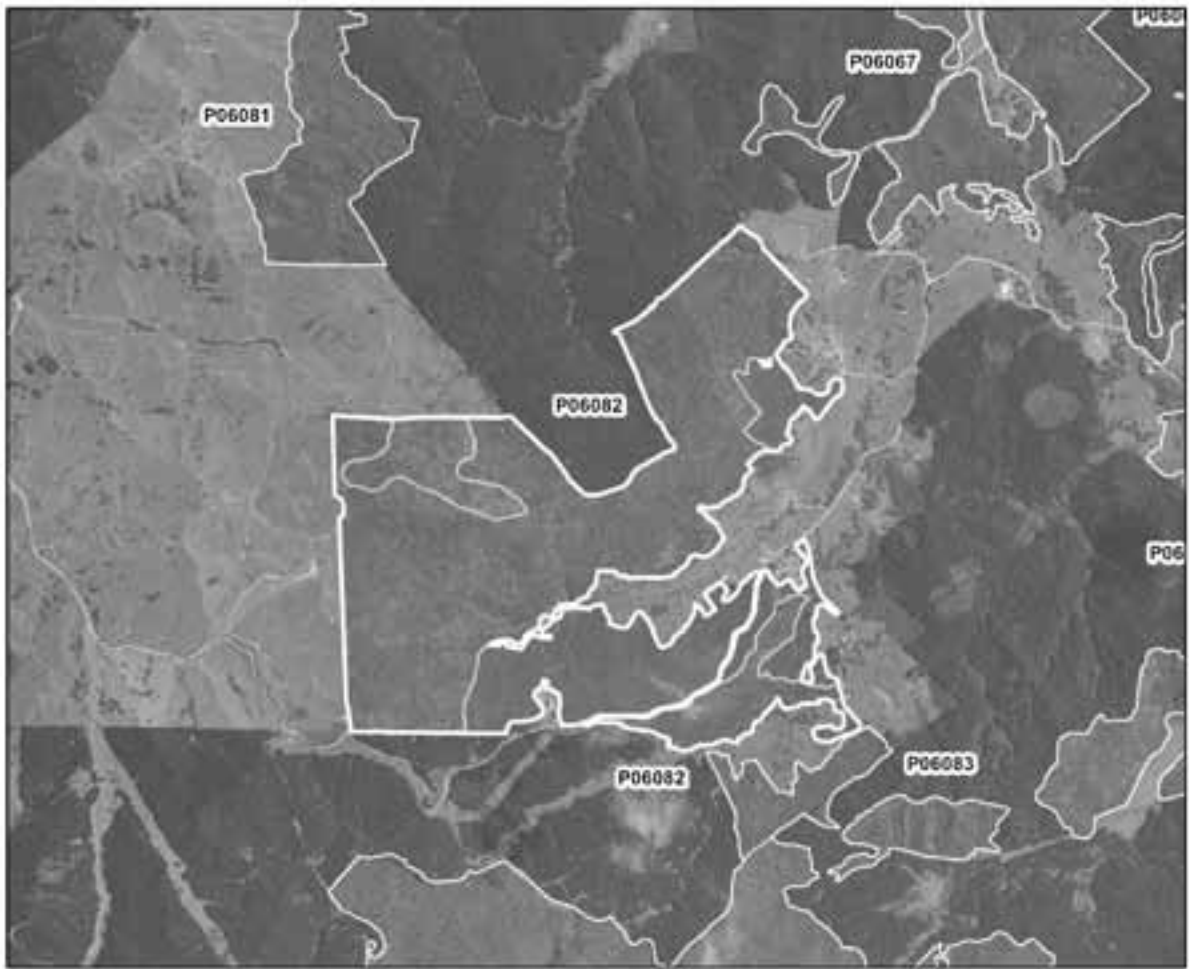
The site encompasses a mosaic of secondary forest types which vary in age and composition, making it difficult to categorise. The site includes indigenous forest surveyed by Wildland Consultants (2004), which is within the Ngati Hine Forest pine plantation boundary. Taraire, rewarewa and totara forest (a) occurs in the north-western area of the site with frequent puriri, towai, tawa and kanuka, and occasional kauri, rimu and pukatea. The sub-canopy consists of ponga, nikau, kohekohe, mamangi and mahoe, while the understorey includes *Coprosma rhamnoides*, hangehange, gully fern and hook sedge. Kanuka-manuka-totara forest (b) is also widespread, occurring with frequent rewarewa, kahikatea, mamaku, tanehaka, kauri and towai. Occasional species include puriri and kawaka. Remaining areas are defined by totara-kanuka forest (c) with occasional rewarewa, kahikatea and puriri, and (d) kanuka/manuka-totara shrubland with frequent kauri and towai, and occasional kawaka.

Significant flora

Kawaka (Naturally Uncommon), *Coprosma rigida* (regionally significant), gully tree fern (regionally significant) and maire tawake (regionally significant) were recorded in 1993 (SSBI P06/H019).

Fauna

NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), NI tomtit (regionally significant), kukupa (regionally significant), paradise shelduck, morepork, tui, silvereye, NI fantail and grey warbler were recorded in 1993 (SSBI P06/H019).



P06/082 Matawaia Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

Significance

Matawaia Bush is a large area of indigenous forest within a larger indigenous/plantation forest tract, which also provides a link between the large blocks of Hikurangi/Tokawhero and forests to the north-east. It was noted on an SSBI sheet in 1987 that the site's southern area has increased in size by c.200 ha. The forest has a healthy canopy and features some large puriri and notably large totara. It is representative for four ecological units: (a), (b), (c), and (d). Two threatened fauna species, one threatened plant species (kawaka), one regionally significant bird species, and three regionally significant plant species have been recorded from this site. Habitat quality and forest health increased after goats were shot in the early 1990s, despite signs of possum browse (SSBI P06/H019); however, it not known to what extent goats have since re-invaded the site. A local whanau was eager to protect an area containing a waahi tapu (SSBI P06/H019). This site performs a riparian and upper catchment protection function for the Mangawheki Stream and its tributaries.

JAMES ROAD BUSH

Survey no.	P06/083
Survey date	27 April 1994 and 2003-04
Grid reference	P06 970300 (two remnants)
Area	303 ha (284.4 ha forest, 18.6 ha shrubland)
Altitude	80-288 m asl (The site has been adjusted to fit with 2006 aerial photography. The main change is the addition of shrubland to the north-east).

Ecological units

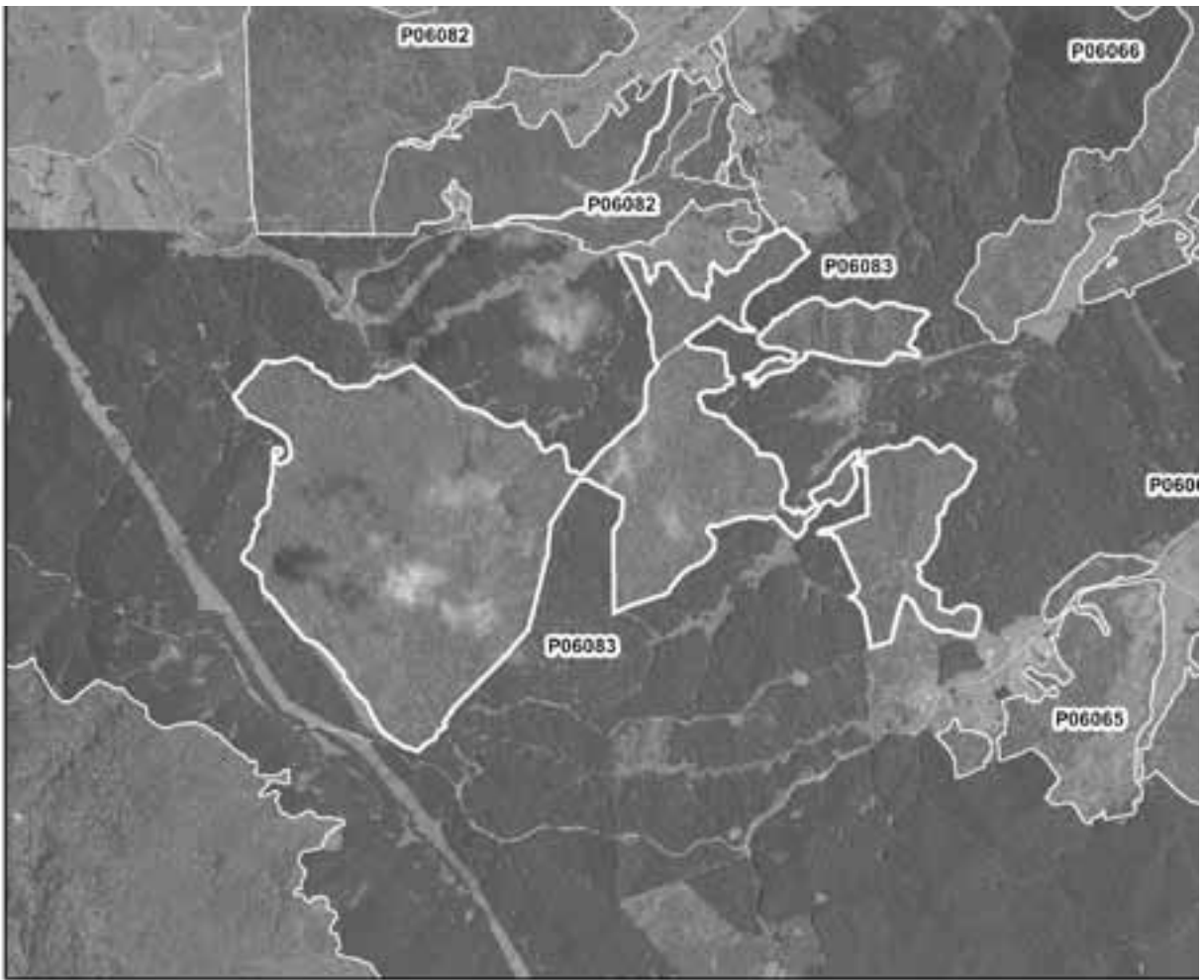
- (a) Taraire-rewarewa forest on hillslope (38%)
- (b) Kanuka-kauri-tanekaha-totara forest on hillslope (9%)
- (c) Kahikatea forest on alluvium (<1%)
- (d) Totara-taraire-puriri-towai forest on hillslope (57%)
- (e) Kanuka/manuka shrubland (6%)

Landform/geology

Steep hill country underlain by Cretaceous sandstone and minor siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex).

Vegetation

The site comprises three cut-over tall forest and secondary forest remnants adjoining the Ngati Hine plantation forest, including indigenous areas surveyed by Wildland Consultants (2004). Taraire-rewarewa forest (a) is abundant, with frequent puriri, kahikatea, rimu and totara, and occasional northern rata. Also prominent in the site is kanuka-kauri-tanekaha-totara forest (b), occurring with frequent rewarewa.



P06/083 James Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

A small area of secondary kahikatea forest (c) occurs on alluvium along the north-western edge of the eastern remnant. To the east, the canopy is defined by abundant totara with commonly occurring taraire, puriri and towai (d). Emergent species include rewarewa, kahikatea, rimu, tanekaha, kauri, pukatea, matai and northern rata. The shrub tier includes kanuka, pigeonwood, putaputaweta, mamaku and nikau. The additional area to the north-east was not surveyed, but interpretation of aerial photography indicates that it comprises kanuka/manuka shrubland (e).

Significant flora

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

Fauna

Grey warbler, silvereye, NI fantail, tui, and Australasian harrier were recorded in 1987 (SSBI P06/H051). NI tomtit (regionally significant), tui, grey warbler, NI fantail, Australasian harrier, and kingfisher were recorded by Wildland Consultants (2004). NI brown kiwi (Nationally Vulnerable) were reported to have occupied adjacent shrubland before it was cleared c.1987 (SSBI P06/H051).

Significance

James Road Bush will provide a potential refuge for indigenous fauna such as NI brown kiwi (if they are still present) and NI tomtit when the neighbouring plantation forest is logged. The site contains a good example of a highly diverse, intact kauri-podocarp-broadleaved forest, and it is representative for one ecological unit: (a). The site provides habitat for one threatened bird species, one regionally significant bird species, and one regionally significant plant species. The site performs a riparian and upper catchment protection function for the Te Raparapa Stream and its tributaries. Threats include erosion of forest edges by pine conversion, and pests such as possums and rabbits (Wildland Consultants 2004).

MOTATAU FOREST

Survey no.	P06/084
Survey date	22 March 1995
Grid reference	P06 080230 (three remnants)
Area	521.3 ha
Altitude	40-575 m asl

Ecological units

- (a) Taraire forest on hillslope (40%)
- (b) Towai forest on hillslope (40%)
- (c) Kanuka-totara-towai forest on hillslope (20%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

Motatau Forest comprises a large area of cut-over tall podocarp-broadleaved forest near the eastern boundary of Tangihua ED. Taraire forest (a) is widespread, with frequent tawa, rewarewa, and puka evident in the canopy. Occasional species include karaka, totara, rimu, pukatea and puriri. Towai forest (b) is of similar abundance, occurring with frequent rewarewa and occasional miro, totara and kauri. The remaining forest type includes co-dominant kanuka, totara and towai (c), with frequent kahikatea and rewarewa, and occasional rimu, tanekaha and mamaku.

Significant flora

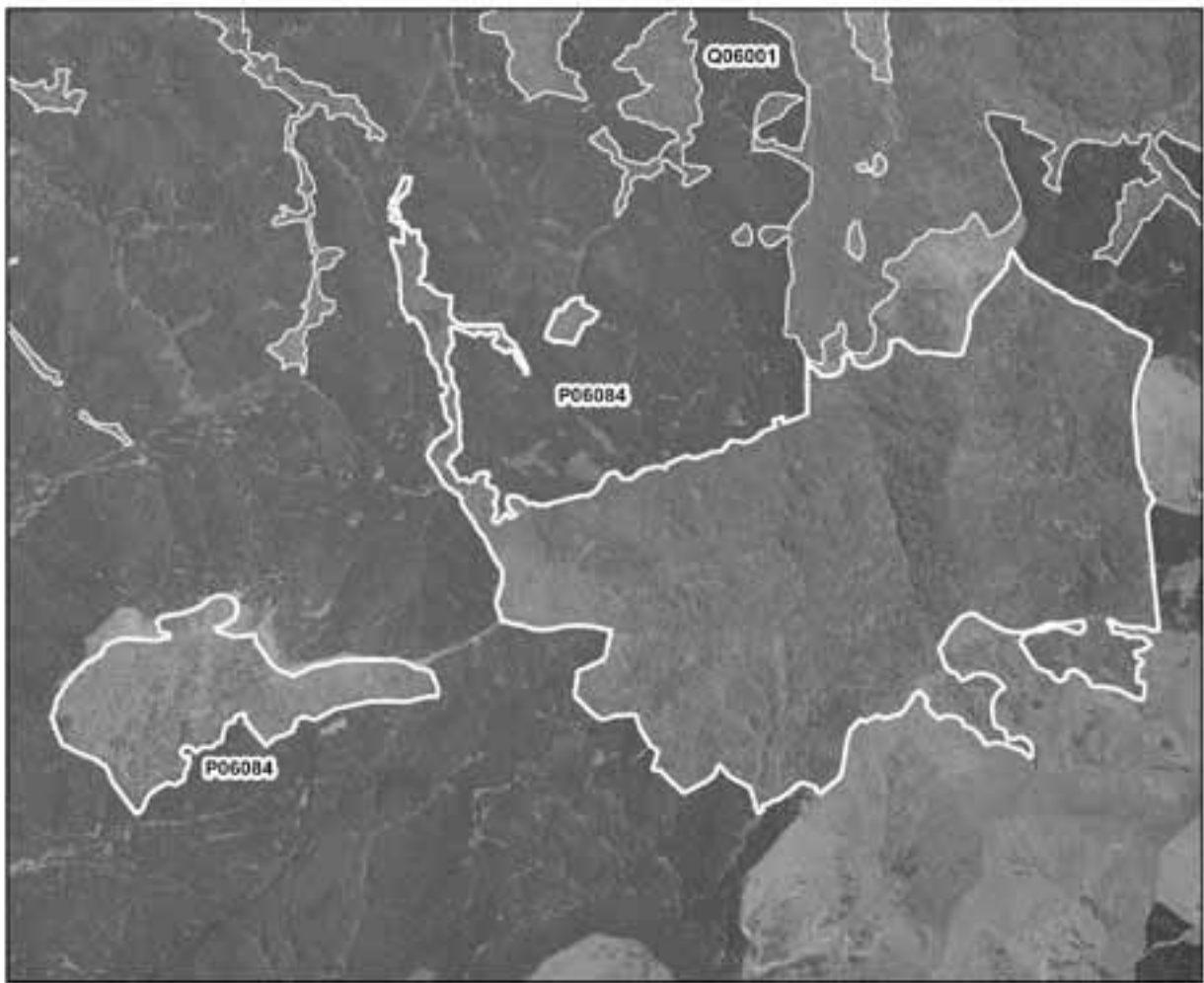
Northern rata (regionally significant) was recorded in 1992 (SSBI P06/H054).

Fauna

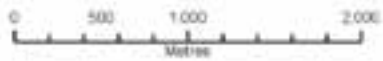
NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), *Liarea bicarinata* (Range Restricted), NI tomtit (regionally significant), kukupa (regionally significant), morepork, grey warbler, silvereye and tui were recorded in 1992 (SSBI H054). The land snail *Amborbytida forsythi* (Gradual Decline) is also known from the site (Brook 2002). A dead forest gecko (*Hoplodactylus granulatus*) was found in 2002 in the north-east of Motatau Forest (DOC Bioweb 2009). Kiwi call stations established at Motatau in 2001 indicate that kiwi appear to be holding their numbers (Pierce 2008).

Significance

Motatau Forest is a prominent, steeply clad podocarp-broadleaved forest which supports four threatened fauna species, one regionally significant bird species, and one regionally significant plant species. The kiwi population is an important one. The site also provides riparian buffering and upper catchment protection for several streams. In 1994 the guardianship of the forest was transferred from the Department of Conservation to Te Runanga O Ngati Hine who developed a management plan for the safekeeping of the forest. This included a pest control scheme under a Department of Labour programme, which trained a team of workers to undertake pest eradication in the forest. Landcare Research has also worked with the runanga and DOC at Motatau to develop strategies to manage the biodiversity of the forest. Ngati Hine has fenced off areas from cattle and culled goats, and a local landowner, Kevin Prime (Ngati Hine), enforced rahui on taking kukupa on his land. Breeding success rates of samples of kukupa nests increased from a 0% in the 1996/1997 breeding season (no pest control) to a 100% success rate in the 1998/1999 breeding season (pest control) (Innes *et al.* 2004). With the removal of goats and cattle, together with rat and possum control, the forest is regenerating quickly. This is an excellent example of how government agencies, iwi and communities can work together to protect indigenous biodiversity (MfE 2002). 391.4 ha are protected scenic reserve.



P06/084 Motatau Forest



Habitat Type

- Forest
- Shrubland
- Wetland



Aerial photography from 2008

PUHITIA ROAD BUSH

Survey no.	P06/090
Survey date	26 September 1994
Grid reference	P06 020300 (two remnants)
Area	524 ha (490.8 ha forest, 33.2 ha shrubland)
Altitude	80-260 m asl

Ecological units

- (a) Taraire forest on hillslope and in gullies
- (b) Kanuka-totara forest on hillslope
- (c) Manuka shrubland on hillslope

Landform/geology

Hill country mostly underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies), but locally underlain by Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex).

Vegetation

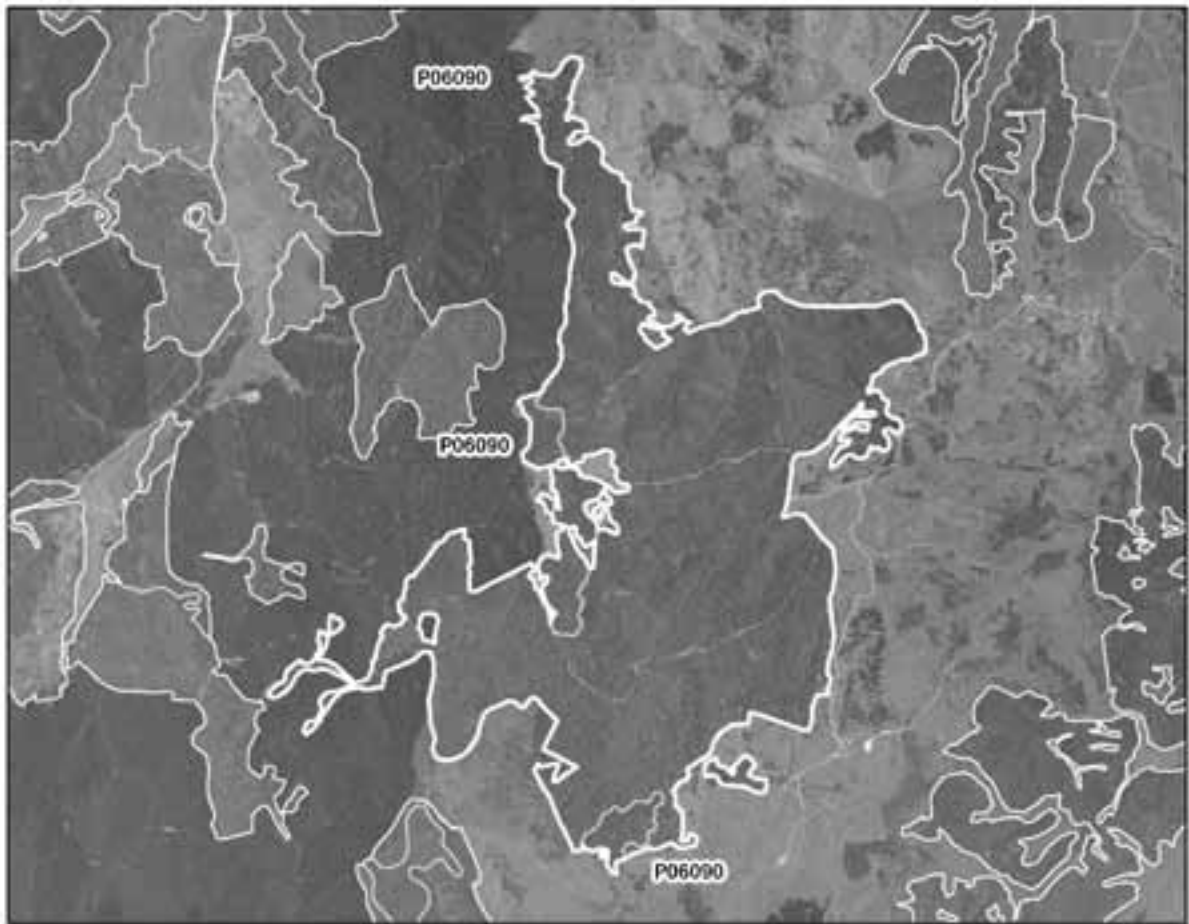
The site comprises a large area of predominantly broadleaved forest and manuka shrubland. Taraire forest (a) dominates the site, occurring with frequent puriri and towai, and occasional northern rata and rimu. Kanuka-totara forest (b) is also widespread throughout the site, and occurs with frequent taraire and towai, and occasional tanekaha, kahikatea and rewarewa. Manuka shrubland (c) is present in the most recently disturbed sites.

Fauna

The site is known to support NI brown kiwi (Nationally Vulnerable) (latest record 1992-1993 Northland kiwi survey), NI tomtit (regionally significant) and common forest birds. The endemic land snail *Liarea bicarinata* (Range Restricted) was recorded in 1987 (SSBI P06/H052).

Significance

Puhitia Road Bush is one of the two largest indigenous forest components of an extensive and unbroken indigenous/exotic forest tract which extends from Motatau Forest north to Matawaia Road. The site is therefore an important wildlife corridor for mobile indigenous species. It also supports two threatened fauna species, one regionally significant bird species, one regionally significant plant species, and it is representative for three ecological units: (a), (b) and (c). Buffering is provided for the headwaters of the Otai Stream. Further surveys are required to update fauna records.



P06/090 Puhitia Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2008

WORSP ROAD BUSH

Survey no.	P06/092
Survey date	6 January 1999
Grid reference	P06 063195 (two remnants)
Area	216.6 ha (185 ha forest, 31.6 ha shrubland)
Altitude	76-182 m asl

Ecological units

- (a) Kahikatea-totara forest on hillslope (18%)
- (b) Tanekaha-kanuka/manuka shrubland on hillslope (23%)
- (c) Kanuka/manuka shrubland on hillslope (28%)
- (d) Kanuka/manuka-totara forest on hillslope (23%)
- (e) Kauri-tanekaha-kanuka forest on ridgeline (8%)

Landform/geology

Hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex) and landslide debris.

Vegetation

The site comprises a mosaic of forest and shrubland centred on the small peak of Kauaeranga, south of the Motatau Forest (P06/084). A small area of kahikatea-totara forest (a) occurs to the west of Kauaeranga Peak, while on the southern slopes of Kauaeranga there is tanekaha and kanuka/manuka shrubland (b). Occasional species include mamaku and emergent rewarewa. To the east of here shrubland is dominated by kanuka and manuka (c) with occasional mamaku. Unit (b) tanekaha-kanuka/manuka shrubland also occurs to the north of Kauaeranga, with frequent emergent rewarewa. Forested areas in the east consist mainly of kanuka, manuka and totara (d), with frequent emergent rewarewa and occasional mamaku. A small area of ridgeline forest within the covenanted area is characterised by (e) kauri, tanekaha and kanuka.

Significant flora

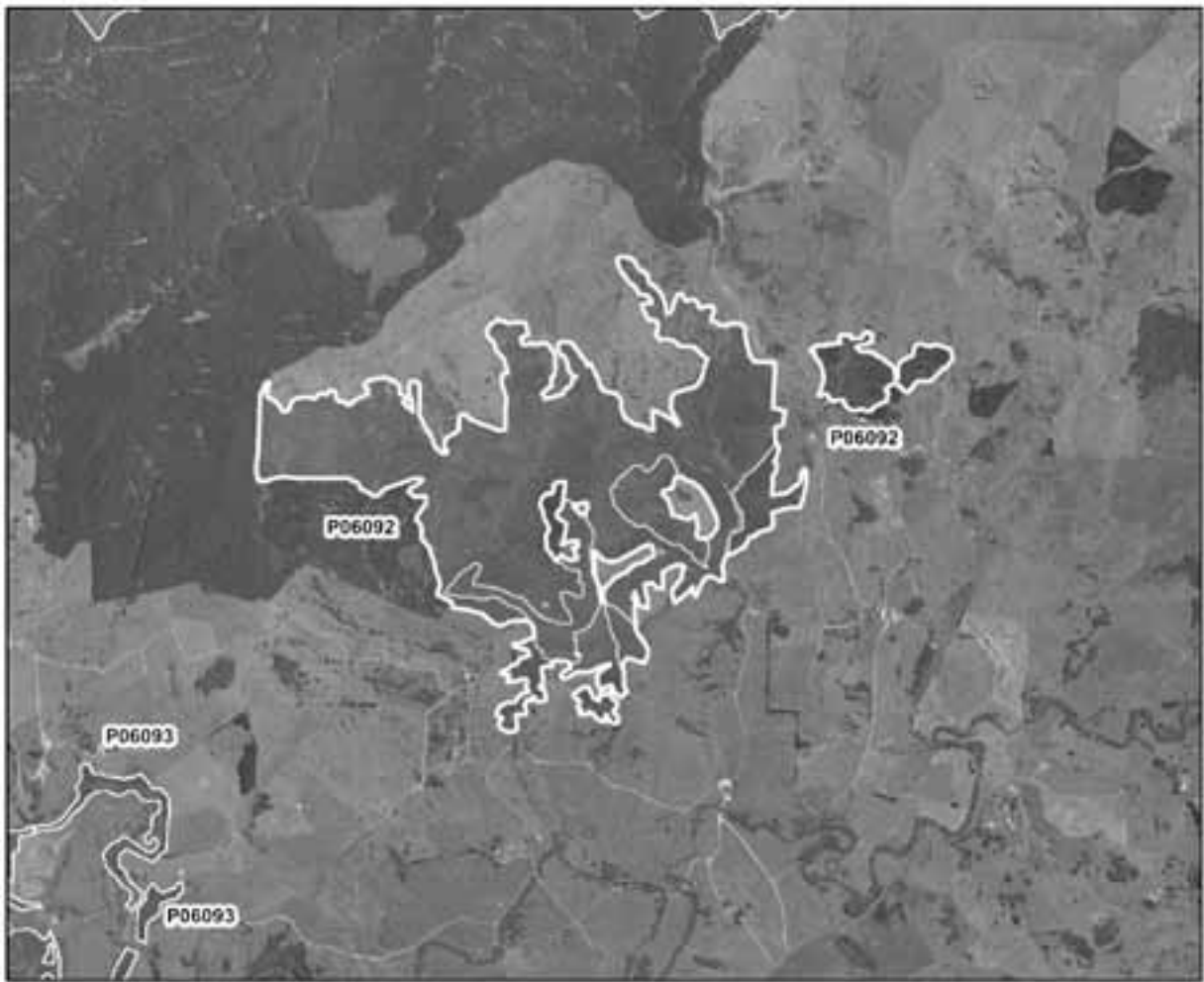
Pittosporum pimeleoides subsp. *pimeleoides* (Naturally Uncommon) was recorded in 1993 (SSBI P06/H064). In 2008 a very good population of this species was recorded growing under kauri-tanekaha (L. Forester pers. comm.).

Fauna

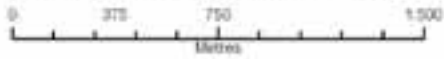
NI brown kiwi (Nationally Vulnerable) and kukupa (regionally significant) were recorded during a survey in 1993 (SSBI P06/H054). There is currently a breeding pair of kiwi residing in the site along with a couple of single birds (P. Graham, DOC, pers. comm.).

Significance

Worsp Road Bush is part of a large tract of plantation forest and indigenous vegetation which links with Motatau Forest in the north and forest and shrubland areas in the south. The site supports one threatened bird species and a good population of the threatened plant species



P06/092 Worsp Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Pittosporum pimeleoides subsp. *pimeleoides*. The site already contains some good areas of forest (> 100 years old) as well as some significant kauri ricker. It is representative for all five ecological units: (a), (b), (c), (d) and (e). Removal of Tasmanian blackwood is being undertaken.

KAIKOU RIVER FOREST REMNANTS

Survey no. P06/093
Survey date 6 January 1999
Grid reference P06 046180 (six remnants)
Area 20.5 ha
Altitude 28-34 m asl

Ecological units

(a) Totara forest on alluvium (100%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces.

Vegetation

The site comprises six small riverine forest remnants along Kaikou River. All the remnants are dominated by totara (a) with varying assemblages of associated canopy species. The northern remnant includes frequent kanuka and manuka, and occasional titoki, taraire, manatu, kahikatea and crack willow. To the south, the northern part of the next remnant also has frequent kanuka and manuka, with occasional titoki and tanekaha. The southern part of this remnant also has frequent kanuka, manuka, manatu and crack willow, and occasional titoki and kowhai. The two most southern remnants also have occasional titoki, kowhai and kahikatea in the canopy.

Significant flora

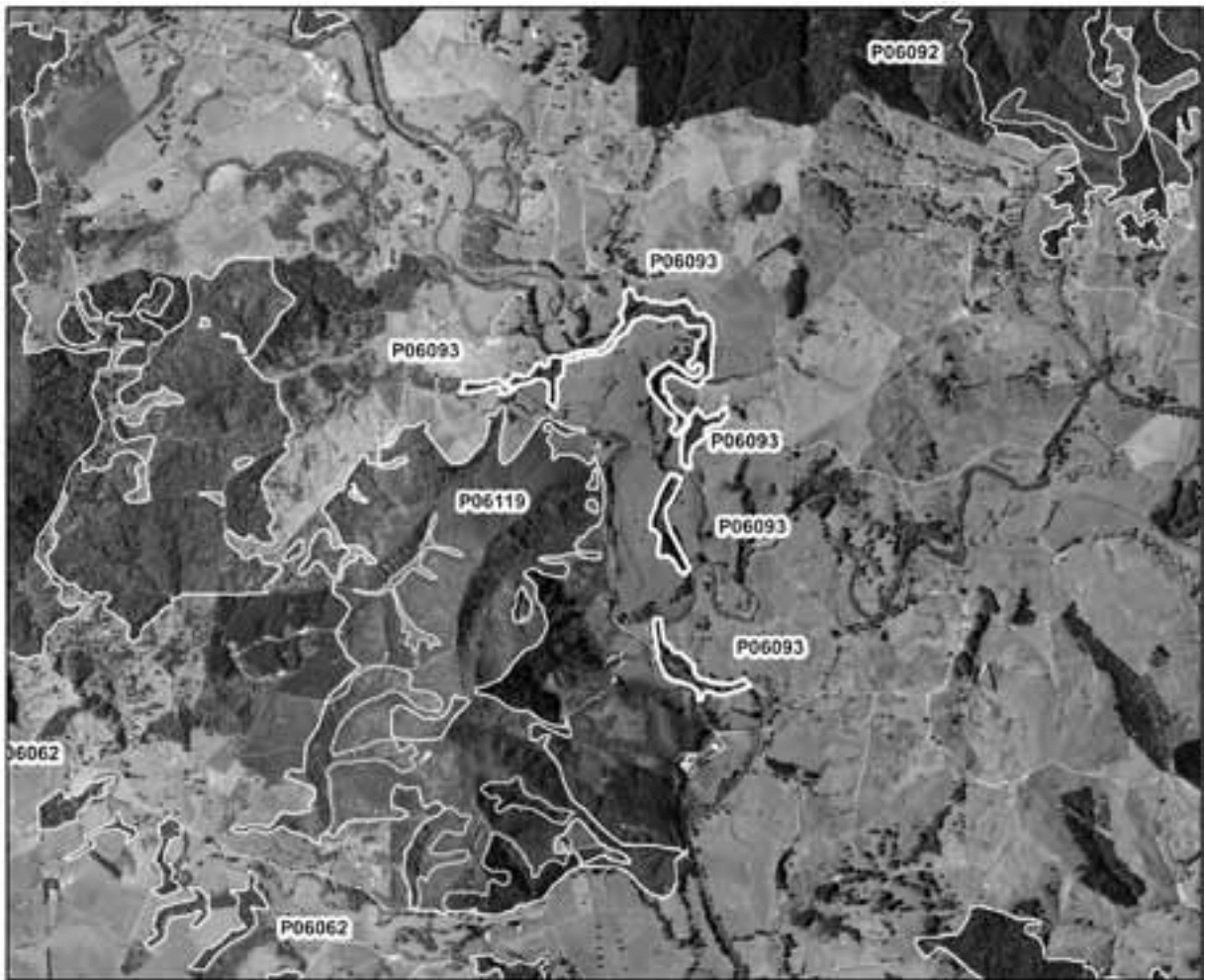
Manatu (regionally significant) was recorded during this survey.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline) and Cran's bully have been recorded in the headwaters of Kaikou River (NIWA 2009a). Black shags (Naturally Uncommon) also utilise the river (R. Pierce pers. comm.).

Significance

The site contains a representative example of one ecological unit: (a) totara forest on alluvium, a forest type which is uncommon in Tangihua ED and throughout Northland. The site supports one regionally significant plant species and provides partial buffering for the lower reaches of the Kaikou River, which supports three threatened fauna species. It is not known if the site is currently threatened by grazing.

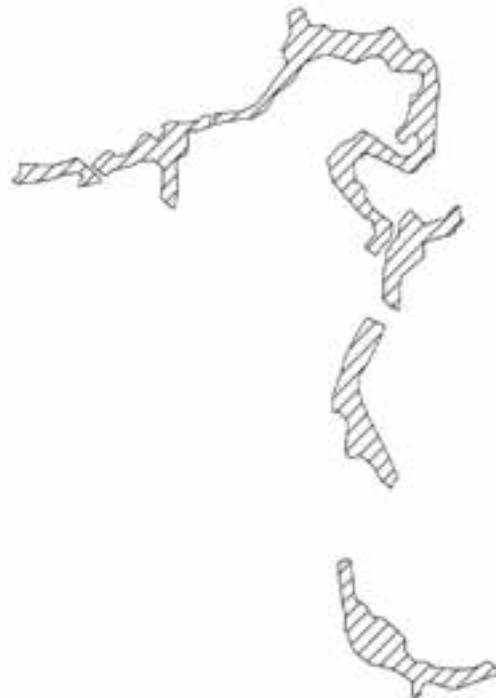


P06/093 Kaikou River Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

PUKETURUA BUSH

Survey no.	P06/094
Survey date	15 December 1998
Grid reference	P06 065151 (two remnants)
Area	168.8 ha (164.9 ha forest, 3.9 ha shrubland)
Altitude	34-120 m asl

Ecological units

- (a) Kanuka-mamangi-tanekaha shrubland on hillslope (10%)
- (b) Kanuka-rimu-totara forest on hillslope (10%)
- (c) Kahikatea forest on toeslope (15%)
- (d) Kanuka-totara forest on moderate hillslope (10%)
- (e) Kahikatea-totara forest on moderate hillslope (10%)
- (f) Kahikatea-rimu forest on moderate hillslope (10%)
- (g) Towai-tanekaha forest on moderate hillslope (10%)
- (h) Kauri-rimu-totara forest on moderate hillslope (5%)
- (i) Nikau-puriri-totara forest on moderate hillslope (5%)
- (j) Totara forest on gentle hillslope (5%)
- (k) Totara-kahikatea-matai forest on river terrace (5%)
- (l) Raupo-*Carex* spp. reedland in swamp (5%)

Landform/geology

Hillslopes and gullies underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies).

Vegetation

The site comprises mature broadleaved-podocarp forest containing totara, kahikatea and matai along river terraces, with a mix of regenerating kanuka forest on rolling country, and kauri regenerating on ridges. Shrubland in the very north is defined by kanuka, mamangi and tanekaha (a), with occasional rimu, totara, towai, and emergent kauri. Adjacent forest consists of co-dominant kanuka, rimu and totara (b), with occasional kauri, kahikatea, ti kouka and tanekaha. On the toeslope by the stream in the north of the site, kahikatea forest (c) occurs with occasional rimu, ti kouka, mamaku and totara. Kanuka and totara (d) are common, with frequent mamaku and occasional hangehange, ti kouka, and emergent kahikatea. Other hillslope areas in the north are dominated by kahikatea-totara forest (e), with occasional rimu, kauri, pukatea, kanuka/manuka, tanekaha and rimu. Kahikatea-rimu forest (f) occupies a moderate hillslope on the mid-eastern side of the site. Other species include frequent kauri and occasional rewarewa, tanekaha, lancewood, towai and kanuka/manuka (edges). Towai-tanekaha forest (g) also occurs in this area, with frequent totara and occasional kauri and lancewood. On the eastern margins, near the Aponga Stream, kauri, rimu and totara (h) occur with frequent kahikatea and occasional rewarewa. Unit (e) kahikatea and totara forest also occurs here with occasional kauri, pukatea, tanekaha, rimu

and rewarewa. A small area of nikau-puriri-totara forest (i) occupies a hilltop in the centre of the site. Occasional species include pukatea, mamaku, puka, karaka, kahikatea, rimu, kowhai and kauri. Downslope on the eastern side by the Aponga Stream, unit (c) kahikatea forest is dominant, with frequent rimu and occasional pukatea and totara. The site contains one area of alluvial riverine forest along the Aponga Stream, comprising large totara, kahikatea and matai (k). The understorey consists of small-leaved divaricating plants including coprosmas, ramarama, turepo and kaikomako. On the southern slope of the hill unit (e) kahikatea-totara forest occurs with frequent kauri and occasional pukatea, tawa, rimu and matai. Remaining areas on gentle slopes are dominated by totara forest (j), while small areas of swamp in valley bottoms are defined by common raupo and *Carex* spp. (l).

Significant flora

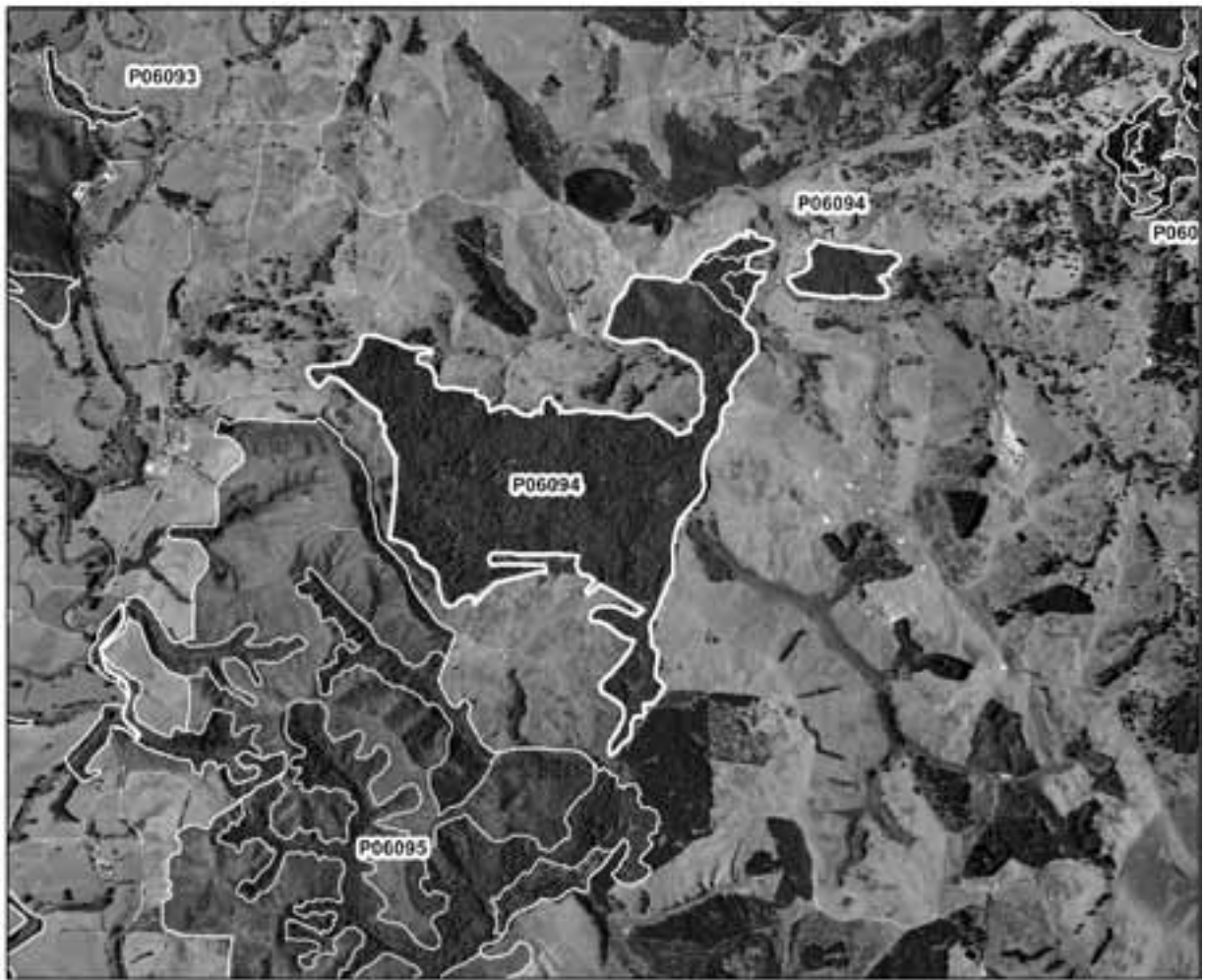
Doodia squarrosa (Naturally Uncommon) (AK 300807). Regionally significant species: *Carex secta*, *Coprosma rigida*, *C. rotundifolia*, *C. tenuicaulis* (AK 280075), kaikomako, manatu, northern rata, *Passiflora tetrandra*, *Raukaua anomalus* (recorded in 2008, L. Forester & M. Young pers. comm.) and *Rubus schmidelioides*. All species without herbarium references were recorded in 2007 (SSBI P06/H058).

Fauna

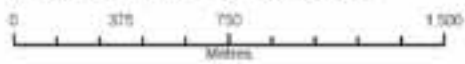
Historical records (1978) of NI brown kiwi (Nationally Vulnerable) (SSBI P06/H058) with none recorded since. Kukupa (regionally significant), tui, NI fantail, and kingfisher were recorded in June 2007 by L. Forester and the Northland Farm Forestry Association (SSBI P06/H058).

Significance

Puketurua Bush encompasses the Papakuri Scenic Reserve, administered by the Department of Conservation. It is contiguous with the William Hewett Memorial Reserve (P06/095) to the south, which is owned and managed by the NZ Forest Restoration Trust. The site contains a full sequence of physiographic features from hillslopes and ridges to alluvial terrace marsh treeland, freshwater wetlands and valley bottoms. It is representative for ten ecological units: (a), (b), (c), (d), (e), (f), (g), (h), (i) and (k). There are historical records of NI brown kiwi, although further surveys are required to determine current abundance. The site exhibits exceptional floral diversity and it supports one threatened plant species and ten regionally significant plant species. The 2007 survey found a small amount of Japanese honeysuckle in forest clearings. There was also heavy possum damage throughout the area, and cattle sign and browse was recorded, mainly towards the margins where cattle are encroaching from a neighbouring property. Feral pigs were also recorded (SSBI P06/H058). This is of concern given that the site is a representative example of intact floodplain and lowland forest, which is a very rare habitat type. Most of the site is protected, including 15.2 ha of Marginal Strip (Aponga Stream Marginal Strip, DOC-administered), 104.5 ha which lies within the Papakuri Scenic Reserve (DOC-administered), and a 6.2 ha scenic reserve administered by WDC.



P06/094 Puketurua Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

WILLIAM UPTON HEWETT MEMORIAL RESERVE

Survey no.	P06/095
Survey date	15 December 1998
Grid reference	P06 061135 (six remnants)
Area	543.2 ha (219.2 ha forest, 301.5 ha shrubland, 22.5 ha wetland) (The site has been adjusted to fit with 2006 aerial photography. The main change is the addition of shrubland and forest to the south-east)
Altitude	34-182 m asl

Ecological units

- (a) Harakeke flaxland on alluvium
- (b) Totara forest on alluvium
- (c) Kahikatea-kanuka/manuka forest on alluvium
- (d) *Coprosma propinqua*-harakeke-ti kouka shrubland on alluvium
- (e) Harakeke-raupo flaxland on alluvium
- (f) Manuka shrubland on alluvium and moderate hillslope
- (g) Totara-maire tawake forest on alluvium
- (h) Kanuka/manuka-tanekaha shrubland on moderate hillslope
- (i) Totara forest on gentle hillslope
- (j) Kahikatea-totara forest on gentle hillslope
- (k) Kanuka/manuka shrubland on moderate hillslope
- (l) *Gleichenia* sp.-kanuka/manuka fernland on moderate hillslope
- (m) Hangehange-mahoe-mamaku shrubland in gully
- (n) Towai forest in gully
- (o) Kanuka/manuka-tanekaha forest in gully
- (p) Manuka-towai shrubland on moderate hillslope
- (q) *Dracophyllum lessonianum*-manuka-mingimingi shrubland on moderate hillslope
- (r) Mamaku-totara treefernland in gully

Landform/geology

Valley floor wetland on Holocene alluvium; bounded by steep hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex), with a small area of melange (undifferentiated Mangakahia & Motatau Complex lithologies) at the northern end.

Vegetation

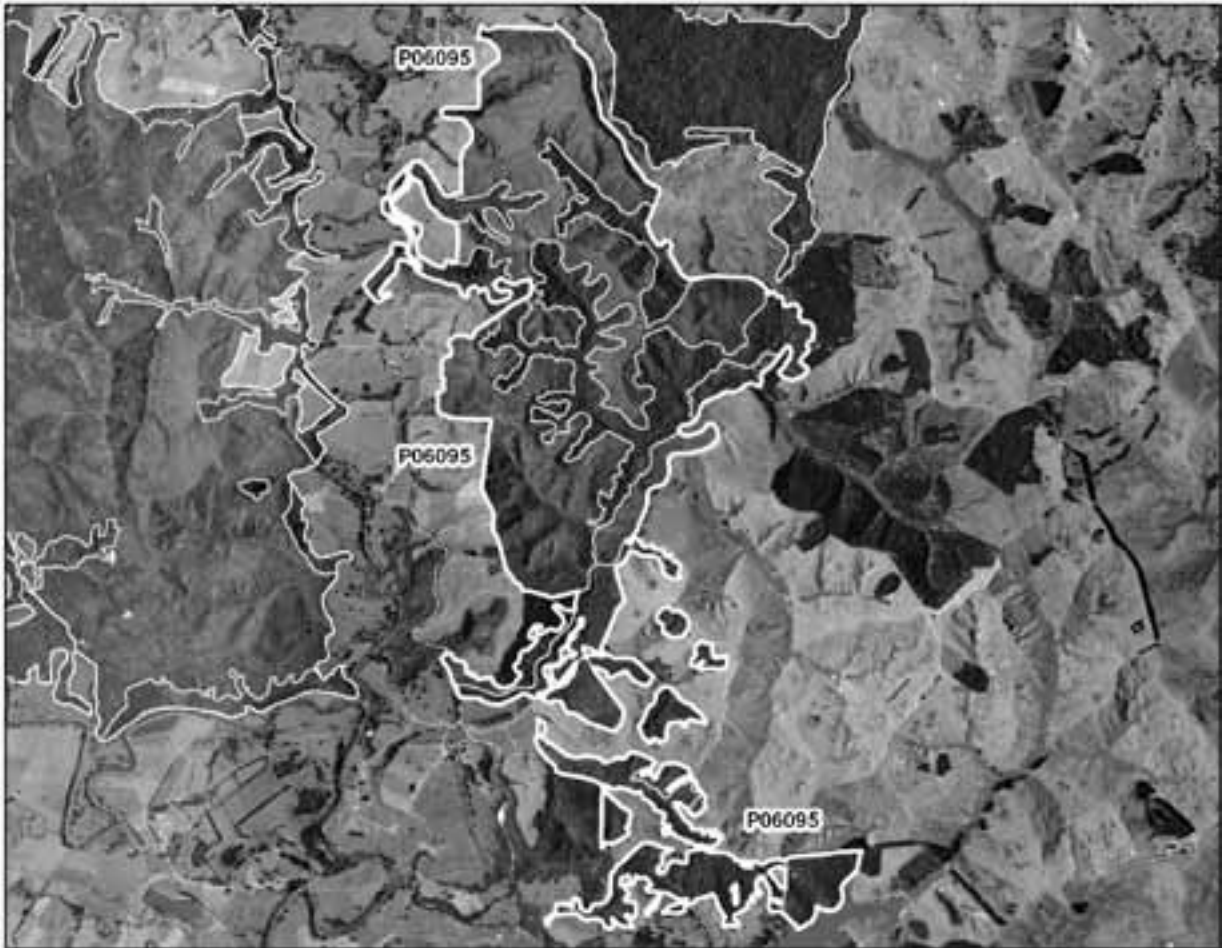
The William Upton Hewett Memorial Reserve comprises a large, diverse assemblage of wetland (including gumland), alluvial, hillslope, and gully vegetation which is contiguous with Puketurua Bush (P06/094) to the north. Wetland and alluvial habitat types are located along the Aponga Stream, on the eastern side of the site. Harakeke (a) is dominant in

one area, occurring with occasional ti kouka. Alluvial riverine forest includes dominant totara (b) with frequent kowhai and kahikatea. Slightly upstream, kahikatea and kanuka/manuka forest (c) occurs with frequent kowhai and totara, and occasional mamaku, while *Coprosma propinqua*, harakeke, and ti kouka (d) are present with frequent kahikatea, *Coprosma tenuicaulis* and raupo. Occasional species are maire tawake, kowhai, manatu, putaputaweta, matai and kanuka/manuka. Harakeke also occurs with common raupo (e) and occasional ti kouka, *Coprosma tenuicaulis* and pukatea. Southern parts of the wetlands are manuka dominant (f), with occasional harakeke, and emergent maire tawake. Totara-maire tawake forest (g) also occurs in this area with frequent kanuka/manuka, and occasional kahikatea, kiekie, ti ngahere and ti kouka.

Shrubland in the very north is defined by co-dominant kanuka/manuka and tanekaha (h), with frequent totara and occasional emergent pine. Hillslope forest bordering the Aponga Stream includes abundant totara (i) with frequent kahikatea and occasional rewarewa and emergent kauri. Kanuka/manuka and kowhai are also frequent in parts with occasional mamaku. Kahikatea and totara (j) are co-dominant in the general area, with occasional kowhai, kanuka/manuka and rimu. Shrubland just to the west comprises dominant kanuka/manuka (k) with frequent tanekaha. Unit (f) tall manuka shrubland occurs in the south-west with occasional ti kouka and towai. Also present in this part of the site is *Gleichenia* sp.-kanuka/manuka fernland (l) and hangehange-mahoe-mamaku shrubland (m), the latter occurring in a gully with frequent puka and occasional pate, manuka, towai, mapou, ti kouka, wheki and bracken. The southern pocket of forest in the south-west is towai (n) dominant with frequent totara and occasional kauri, nikau, tanekaha, mamaku and rewarewa. The forest remnant in the middle of the site comprises common kanuka/manuka and tanekaha (o) with occasional totara, towai, pukatea, rimu, mamaku, and emergent kauri. Manuka-towai shrubland (p) occurs around the pockets of forest in gullies. *Dracophyllum lessonianum*-manuka-mingimingi shrubland (q) defines an area of shrubland in the south, occurring with occasional totara, mapou and ti kouka. In a similar shrubland area manuka is more dominant, with common *Dracophyllum lessonianum* and occasional mingimingi and hangehange. In a gully in the south, mamaku and totara (r) are co-dominant with frequent towai and occasional pukatea, ti kouka, ti ngahere and hangehange. Unit (k) kanuka/manuka shrubland characterises most of the shrubland in the south.

Significant flora

The reserve contains *Pomaderris phyllicifolia* (Nationally Endangered), *Brachyglottis kirkii* var. *kirkii* (Declining), *Doodia squarrosa* (Naturally Uncommon), *Pittosporum pimeleoides* subsp. *pimeleoides* (Naturally Uncommon) (AK 215068, Young 2007), *Stegostyla atradenia* (Naturally Uncommon) (AK 21701) and *Thelymitra* aff. *ixioides* (Naturally Uncommon). Regionally significant species: *Dicksonia lanata*, *Hoberia angustifolia*, *Coprosma rigida*, *C. rotundifolia*, *C. tenuicaulis*, kaikomako, *Fuchsia perscandens*, maire tawake, manatu, *Myrsine divaricata*, *Luzula picta*, *Sticherus flabellatus*, *Raukaua anomalous*, *Schizaea bifida*, toatoa



P06/095
William Upton Hewett Memorial Reserve



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

and toro. Four threatened orchid species have been recorded: *Anzybas rotundifolius* (Naturally Uncommon) (recorded in 1996, AK231699), *Tbelymitra* (c) (“rough leaf”) (Naturally Uncommon), *Petalochilus alatus* (Naturally Uncommon), and *Corunastylis pumila* (Naturally Uncommon). The site also has the northern-most record in New Zealand for *Hoberia angustifolia*. All species without herbarium references were recorded in 1998 (SSBI P06/H063).

Fauna

NI brown kiwi (Nationally Vulnerable), NI fernbird (Declining), pied stilt (Declining), spotless crane (Relict), NI tomtit (regionally significant), kukupa (regionally significant), kingfisher, shining cuckoo, grey warbler, welcome swallow, morepork, pukeko, tui, NI fantail, silvereye and spur-winger plover were recorded in 1992 (SSBI P06/H063). Auckland green gecko (Gradual Decline) was also recorded in the same survey.

Significance

The site was purchased in 1991 under the Native Forests Restoration Trust’s ‘Memorial Forest Scheme’. The reserve is currently a diverse ecosystem predominantly characterised by gumland shrubland, one of Northland’s rarest habitat types, but also includes rare wetland habitat types along the Aponga Stream. It is representative for 15 ecological units: (a), (b), (c), (d), (e), (f), (g), (h), (k), (l), (m), (o), (p), (q) and (r). This site supports five threatened fauna species, one regionally significant bird species, ten threatened plant taxa and 16 regionally significant plant taxa. The reserve contains a high diversity of orchids, several of which are regionally significant and threatened. Large shrubland areas provide very important habitat for kiwi and invertebrates and lizards, many species of which are becoming increasingly rare on the mainland. 252.6 ha lie within a Queen Elizabeth II Open Space Covenant, while 32.1 ha of Marginal Strip are protected (Aponga Stream Marginal Strip DOC-administered). Some weeds (e.g. hakea) were present in 1992, but generally the site was free from stock and development. The wetland is largely unmodified, although cattle from a neighbouring property occasionally entered through an open gate (SSBI P06/H063). Possum and mustelid control has been in place since 1992, and this has been complimented with occasional pig hunting. Wilding pines, pampas and prickly hakea are monitored and controlled where necessary to prevent their spread through regenerating shrubland. *Tradescantia* is controlled along the banks of Aponga Stream to prevent its spread into new areas.

MANGU ROAD WETLAND

Survey no.	P06/099
Survey date	10 February 2009
Grid reference	P06 983367
Area	7.4 ha (0.7 ha shrubland, 6.7 ha wetland)
Altitude	60 m asl

Ecological units

- (a) Raupo reedland in swamp (80%)
- (b) Harakeke-raupo flaxland reedland in swamp (10%)
- (c) Manuka shrubland on toeslope (10%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site comprises a moderate-sized freshwater wetland within the boundary of the Ngati Hine Forest pine plantation. Raupo (a) dominates the wetland, but is most abundant in the middle to northern part of the site. Exotic willow weed and exotic grasses are locally common on the periphery. Harakeke and raupo (b) are co-dominant throughout the narrow eastern arm of the wetland, while a small pocket of manuka shrubland (c) is nestled between pine plantation and raupo reedland in the west end of the site. Other species include scattered *Coprosma tenuicaulis*, *Schoenoplectus tabernaemontani*, *Calystegia sepium*, kahikatea, ti kouka, kanuka and totara.

Significant flora

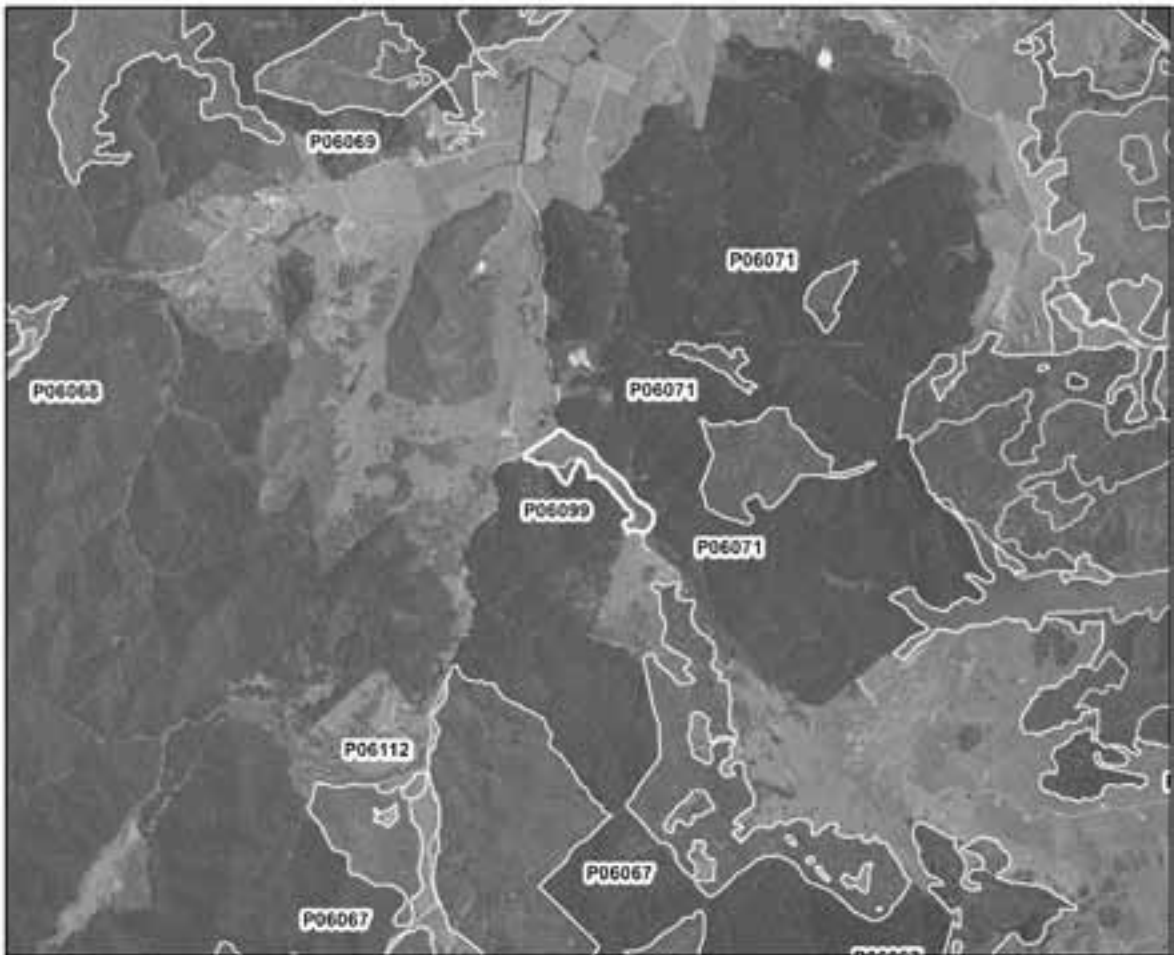
Coprosma tenuicaulis (regionally significant) was recorded during this survey.

Fauna

NI fernbird (Declining), Australasian harrier, and pukeko were recorded during the present survey. Spotless crane (Relict) were heard during a survey by Wildland Consultants (2004).

Significance

The site is representative for two ecological units: (a) and (b). Wetlands are a diminishing and rare habitat type regionally and nationally (< 1% of land cover in Tangihua ED), and harakeke-dominated wetlands are particularly rare in the region. The site provides habitat for two threatened bird species and one regionally significant plant species. The site is currently well-buffered by mature pine plantation and most weed species are confined to the wetland margins, e.g. pampas, gorse and blackberry. Two grey willows are present in raupo reedland and should be removed before they can spread. Parts of the site have been planted with pines, which are in poor condition and only sparsely distributed. Feral pigs were observed in adjacent pine forest on the eastern side of Mangu Road.



P06/099 Mangu Road Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bavin 2006

TOKAWHERO ROAD FOREST REMNANTS

Survey no. P06/104
Survey date 2003-04
Grid reference P06 903245 (six remnants)
Area 83.5 ha
Altitude 99-243 m asl

Ecological units

- (a) Totara-kanuka forest on hillslope
- (b) Eucalyptus forest on hillslope
- (c) Totara-towai forest on hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises several irregularly-shaped areas of secondary podocarp-broadleaved forest within the Pipiwai Forest pine plantation. Totara and kanuka (a) are common, occurring with occasional mamaku, titoki, towai and mamangi, and emergent kahikatea and rimu. Tutu is frequent in the shrub tier. An area of eucalyptus forest (b) occurs with occasional kahikatea, totara, titoki, taraire and maire tawake. Kanuka is frequent in the sub-canopy, along with occasional putaputaweta, towai and mamaku. Remaining areas are characterised by totara-towai (c) with occasional emergent kahikatea and rewarewa. Kanuka and mamaku are frequent in the sub-canopy.

Significant flora

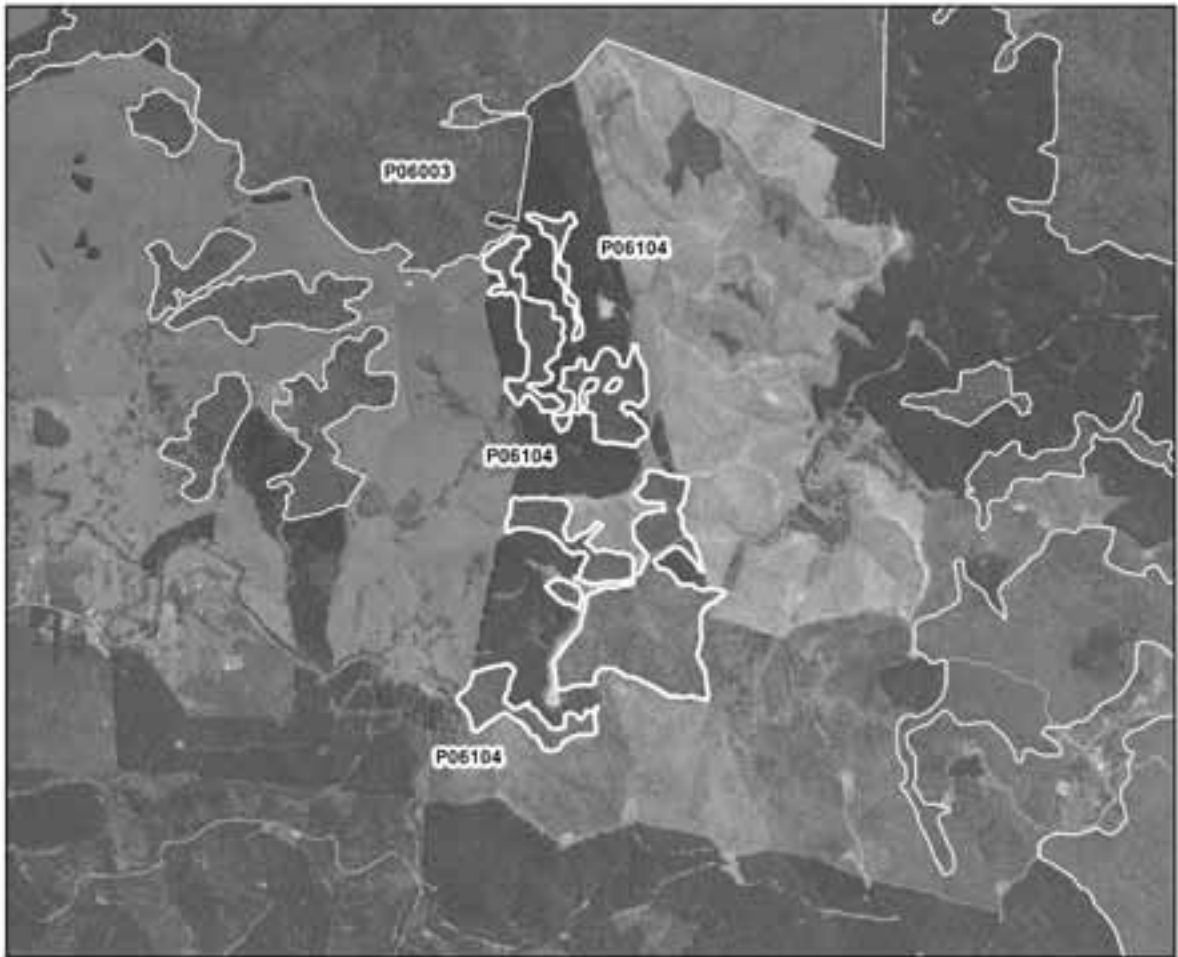
Maire tawake (regionally significant) was recorded during this survey.

Fauna

Tui, grey warbler, NI fantail and Australasian harrier were recorded during this survey.

Significance

The site is relatively large and compact, and is part of a large indigenous/exotic forest tract which includes Hikurangi and Tokawhero Forests (P06/003). The site supports one regionally significant plant species and is likely to provide refugia for forest species during the logging of adjoining pine plantation. Protective buffering is provided to short sections of the Tokawhero Stream and Te Karaka Stream. Possum browse is evident throughout the site and some damage to indigenous vegetation from harvesting practices was observed during this survey.



P06/104 Tokawhero Road Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

WAIOTOTAKANGA STREAM WETLAND

Survey no. P06/106
Survey date 2003-04
Grid reference P06 741237
Area 2.7 ha
Altitude 355 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

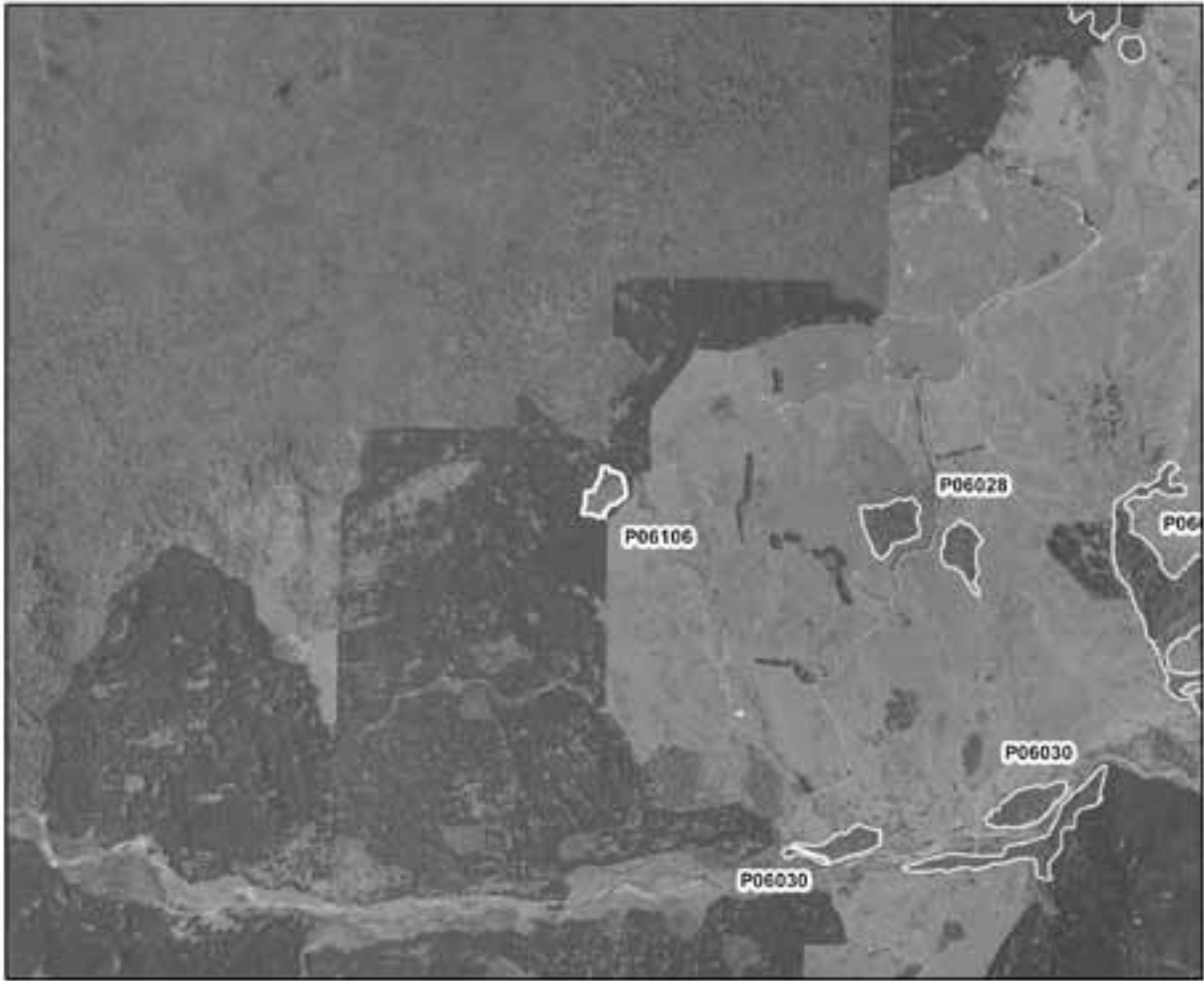
The site comprises a relatively small freshwater wetland dominated by raupo reedland (a), with scattered emergent kahikatea and adventive grass on the margins. The site may be drying out and grasses are invading the raupo (Wildland Consultants 2004).

Fauna

NI fernbird (Declining) was recorded by Wildland Consultants (2004).

Significance

The site provides habitat for at least one threatened bird species. Freshwater wetlands are a rare and threatened vegetation type in Tangihua ED, and even small areas are worthy of protection due to their high habitat values. The site is representative for (a) raupo reedland in swamp. Cattle were grazing and trampling the wetland margins during this survey.



P06/106 Waioitakanga Stream Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography Brown 2006

LOVATT ROAD WETLAND

Survey no. P06/117
Survey date 18 March 2009
Grid reference P06 969244
Area 4.7 ha (2.1 ha shrubland, 2.6 ha wetland)
Altitude 76-78 m asl

Ecological units

- (a) Manuka shrubland in swamp (60%)
- (b) Swamp millet-*Baumea rubiginosa* grassland in swamp (30%)
- (c) Kanuka shrubland on alluvium (10%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces.

Vegetation

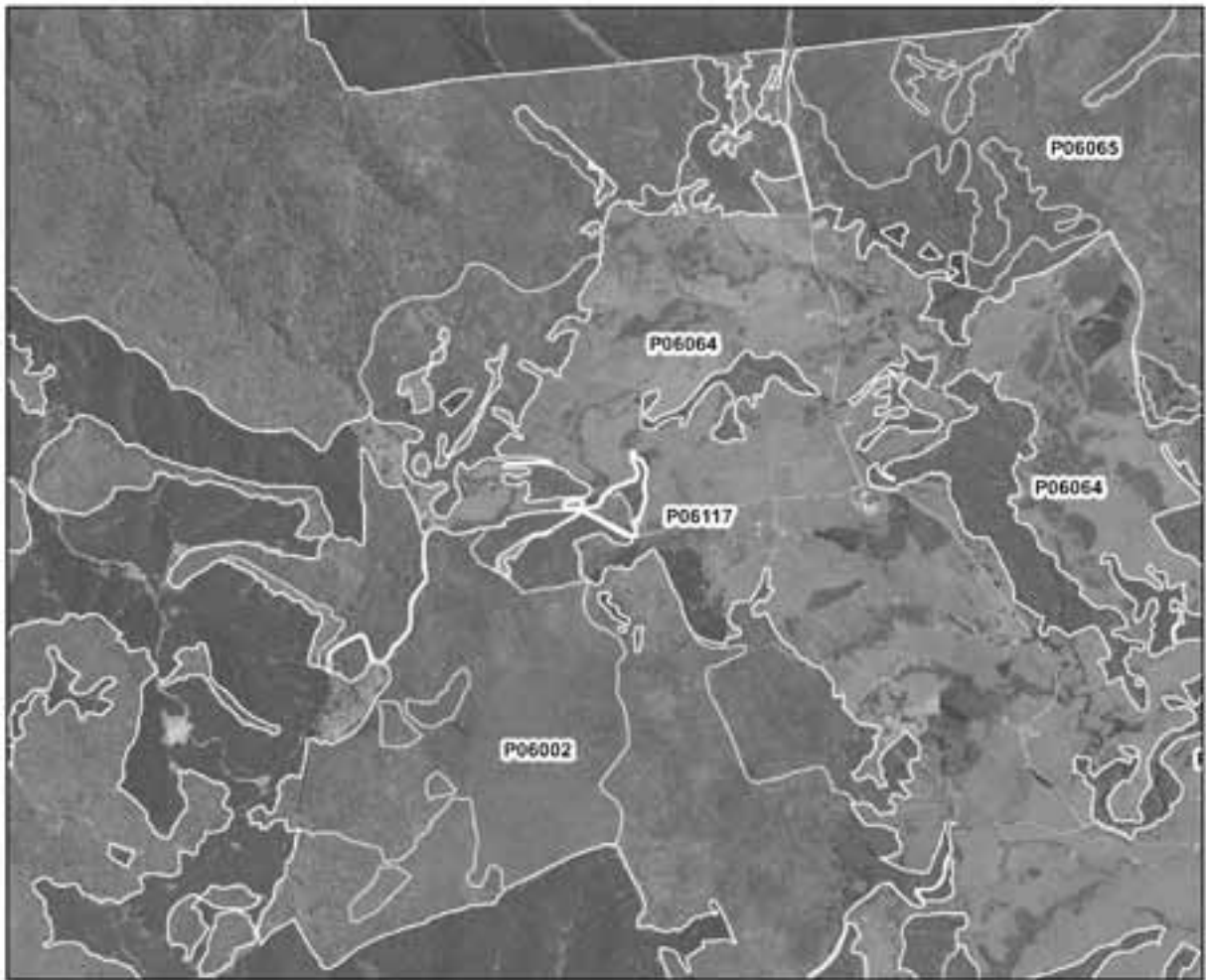
The site comprises a good sized wetland which is dominated by manuka shrubland (a). The lower half of the wetland consists of a narrow area of swamp millet-*Baumea rubiginosa* grassland (b) buffered by kanuka shrubland (c). Kiokio, *Carex* and raupo occur occasionally throughout the wetland, while occasional kahikatea, pukatea, putaputaweta, totara, bracken and ponga occur on the wetland margins.

Fauna

NI fernbird (Declining) (NRC 2009).

Significance

This site is relatively diverse and is representative for all three ecological units: (a), (b) and (c). It provides habitat for one threatened bird species. No weeds were recorded during this survey.



P06/117 Lovatt Road Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

AWARUA TRUST FARM WETLAND

Survey no. P06/118
Survey date 21 January 2009
Grid reference P06 847260
Area 9.4 ha
Altitude 93-98 m asl

Ecological units

- (a) Raupo-*Baumea* sp. reedland in swamp (75%)
- (b) Kahikatea treeland in swamp (20%)
- (c) *Carex secta* sedgeland in swamp (5%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site comprises a good-sized wetland characterised by abundant raupo and common *Baumea rubiginosa* (a) with occasional patches of swamp millet and rushes. Kahikatea (b) is locally common at the foot and head of the wetland, with an understorey consisting of occasional *Coprosma tenuicaulis*, wheki and manuka over a dense swathe of swamp millet and *Carex geminata*. There is occasional manuka and totara on the margins. Locally common *Carex secta* (c) occupies a small area of open water in upper arm of swamp, occurring with locally frequent *Baumea rubiginosa* and Yorkshire fog. Other species include koromiko, *Baumea arthrophylla*, *Persicaria decipiens* and swamp millet.

Significant flora

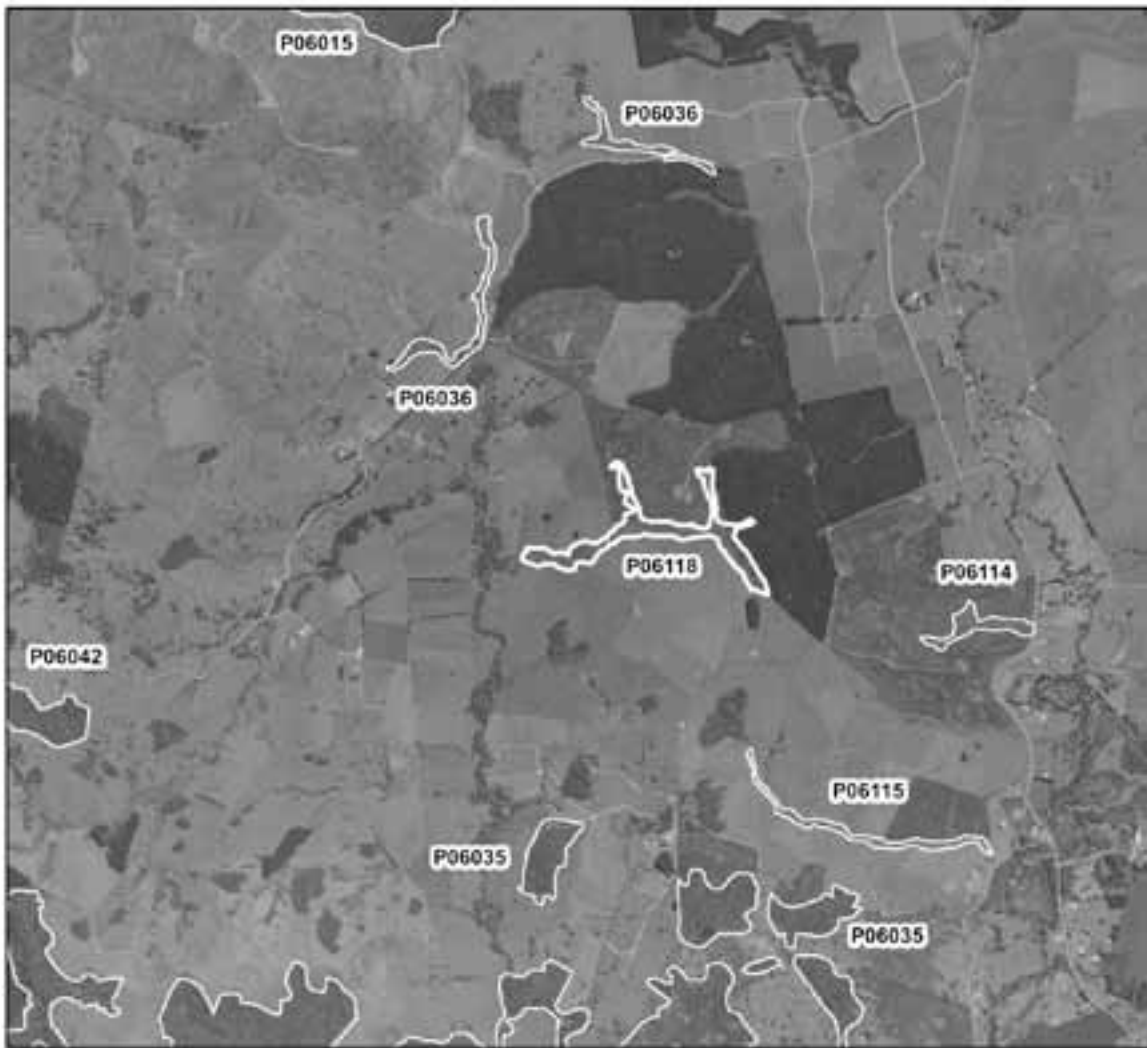
Carex secta (regionally significant) and *Coprosma tenuicaulis* (regionally significant) (NRC 2009).

Fauna

Grey duck (Nationally Critical), NI fernbird (Declining) and grey warbler were recorded during this survey (NRC 2009).

Significance

The wetland is significant because of its size, relative intactness and the habitat it provides for indigenous waterbirds. It supports two threatened bird species, one regionally significant species, and two regionally significant plant species. It is representative for two ecological units: (b) and (c). Weed species include mistflower, hakea, gorse, mist flower, soft rush, *Azolla pinnata* and *Utricularia gibba*. It is not known if stock have access to the site.



P06/118 Awakino Trust Farm Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



MOORE ROAD MOSAIC

Survey no.	P06/119
Survey date	Site not visited
Grid reference	P06 035170 (two remnants)
Area	209 ha (35 ha forest, 171 ha shrubland, 3 ha wetland)
Altitude	40-168 m asl

Ecological units

- (a) Kanuka/manuka-towai shrubland on hillslope
- (b) Taraire-kohekohe-tawa forest in gullies
- (c) Kauri forest on ridgeline
- (d) Raupo reedland in swamp

Landform/geology

Unknown.

Vegetation

The majority of Moore Road Mosaic has not been surveyed, hence the site description is derived from an initial assessment for a QEII Open Space Covenant as well as comments provided by a property owner. Habitat types have been mapped using estimates from aerial photography. The site comprises a diverse mosaic of vegetation types that are in various stages of regeneration after being burnt off. The site is dominated by areas of abundant kanuka/manuka and commonly occurring towai (a), some of which occurs on podzolised soil. Gorse is locally common. Gullies are characterised by diverse broadleaved forest, including some old-growth forest which escaped the fires. Taraire and kohekohe are co-dominant with frequent tawa (b), while occasional species include puriri, hinau, matai and mida. Ridges are dominated by kauri forest (c). Several small wetlands occupy swampy gully bottoms in the site and are characterised by dominant raupo (d) with patches of locally frequent indigenous *Carex* species and Mexican devil.

Significant flora

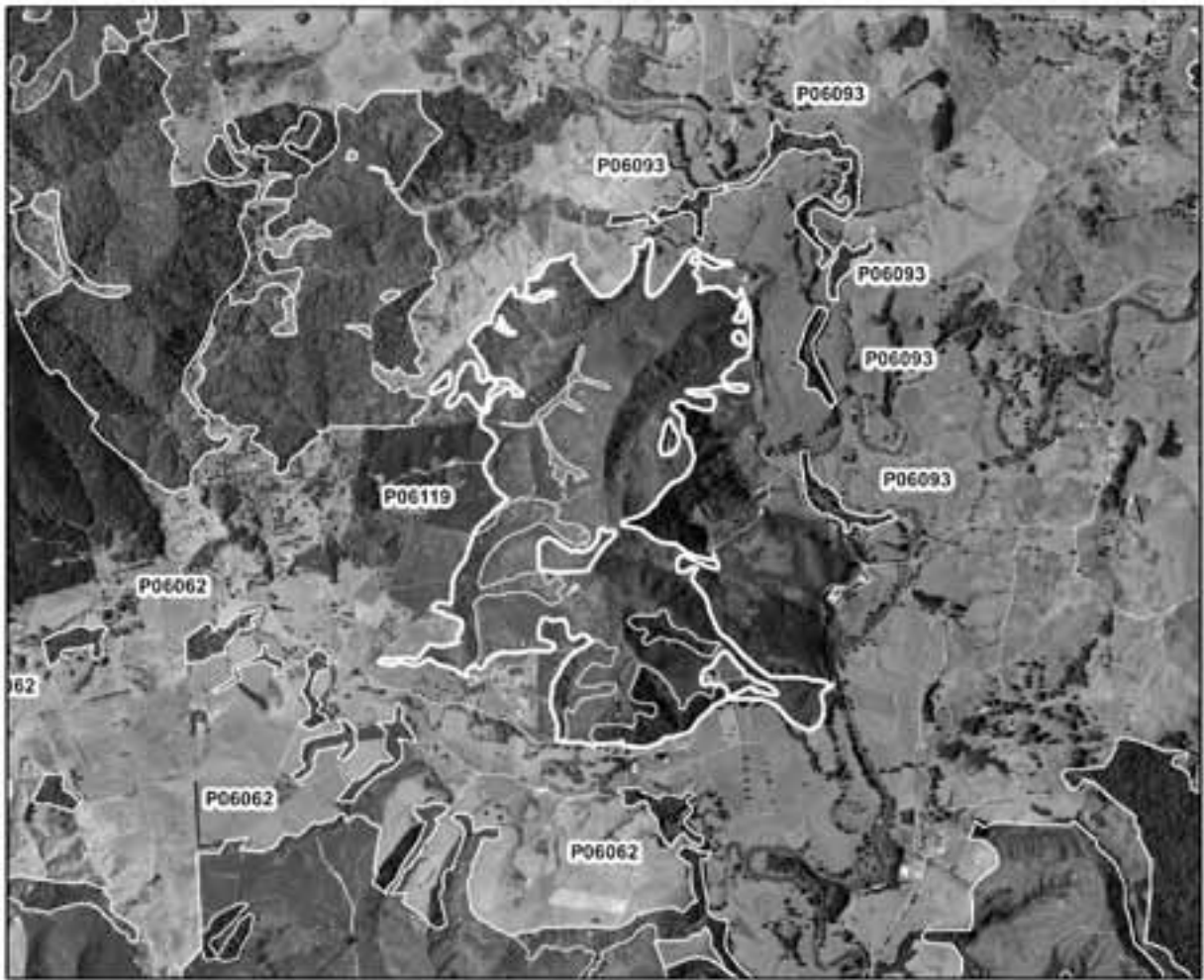
Thelymitra ixioides (Naturally Uncommon) (L. Forester, pers. comm.) and maire tawake (regionally significant) (T. Rudgely, pers. comm.).

Fauna

Kauri snail (Gradual Decline), NI fernbird (Declining), NI tomtit (regionally significant), kukupa (regionally significant) and common bush birds have been recorded from the site (T. Rudgely, pers. comm.). There are reported sightings of geckos and skinks by a landowner, but the species have not been identified.

Significance

Moore Road Mosaic is relatively large and contains a good diversity of habitat types. It contains good examples of mature broadleaved forest and



P06/119 Moore Road Mosaic



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

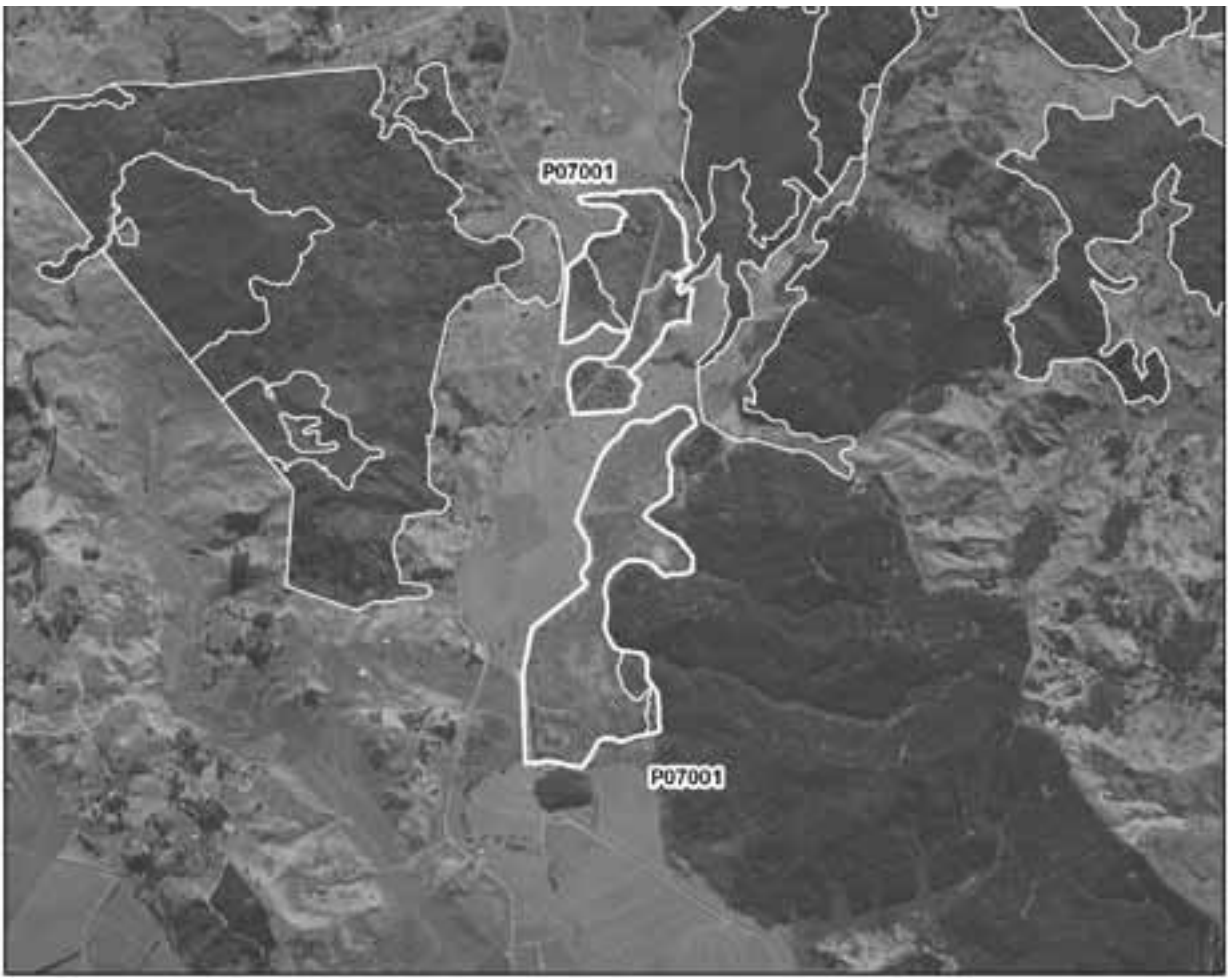
it is representative for three ecological units: (a), (b) and (c). It provides habitat for at least one threatened plant species, one regionally significant plant species, at least two threatened fauna species, one regionally significant bird species, and a number of as yet unidentified species of gecko and skink. The site is likely to contain a range of orchid species, including additional threatened species (L. Forester, pers. comm.). The site contains 12.5 ha of private land which is currently being assessed for a QEII Open Space Covenant. A small area of fencing is required to be completed before the covenant can be finalised. The landowner applying for the covenant has undertaken possum, mustelid and rat control for the past 20 years, all of which are now at relatively low levels (T. Rudgey, pers. comm.). Weed infestations are problematic throughout the site: Mexican devil currently threatens wetlands while Tasmanian blackwood has become invasive in shrubland areas. Approximately 20,000 pines have been planted on podzolised soil but are in poor health (T. Rudgey, pers. comm.). Goats and pigs have not been seen in the site. Further survey is recommended to determine the site's full ecological values, particularly in terms of herpetofauna and orchid diversity.

AWAKINO AND FLAXMILL SWAMPS

Survey no.	P07/001
Survey date	11 March 1999, 12 October 2006 and 4 February 2009
Grid reference	P07 875905 (two remnants)
Area	96.6 ha (25.8 ha forest, 1 ha shrubland, 69.8 ha wetland) (This site was originally included as part of P07/047. Awakino Swamp (29.4 ha) and Flaxmill Swamp (67.2 ha) have now been combined to form one site)
Altitude	9-115 m asl

Ecological units

- (a) Raupo reedland in swamp
- (b) Raupo-harakeke-ti kouka reedland in swamp
- (c) Kahikatea forest on alluvium
- (d) Manuka-harakeke shrubland on alluvium
- (e) *Bolboschoenus fluviatilis* sedgeland in swamp
- (f) Raupo-ti kouka reedland in swamp
- (g) Raupo-*Baumea articulata*-alligator weed reedland in swamp
- (h) Open water
- (i) Alligator weed herbfield in open water
- (j) *Lepidosperma laterale-Gleichenia* sp. sedgeland on alluvium
- (k) Raupo-harakeke reedland in swamp
- (l) Ti kouka-*Coprosma propinqua* shrubland in swamp
- (m) Ti kouka-kahikatea forest in swamp
- (n) *Eleocharis sphacelata-Baumea rubiginosa* reedland in swamp



P07/001 Awakino and Flaxmill Swamps



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site encompasses three broad vegetation types: (1) areas mostly dominated by raupo with occasional to frequent emergent ti kouka, occasional kahikatea, harakeke, manuka, *Coprosma propinqua* and *C. rigida*; (2) areas where *Eleocharis sphacelata* is dominant, *Baumea rubiginosa* is common, with occasional raupo, harakeke, mauka, wheki, *Carex secta* and *C. virgata*. Swamp millet is a locally abundant ground-cover species; and (3) a buffer to the wetland comprising manuka shrubland with frequent totara and occasional ti kouka and kahikatea.

The southern part of the site is occupied by Flaxmill Swamp, an area dominated by raupo reedland (a) with a diverse range of occasional emergents which include totara, kahikatea, ti kouka, harakeke, nikau, *Coprosma tenuicaulis*, *Eleocharis sphacelata*, *Baumea articulata* and *Bolboschoenus fluviatilis*. Raupo-harakeke-ti kouka reedland (b) is another common vegetation type, particularly in the northern region of the site (Awakino Swamp). Willow weed is locally common on the wet margins of the raupo reedland. A small remnant of kahikatea forest (c) occurs on alluvial flats in the north-east part of Flaxmill Swamp (beside Waihue Road), north of which is an area characterised by manuka with locally common harakeke (d). *Bolboschoenus fluviatilis* sedgeland (e) is locally abundant on the swamp margins in the south-west corner of Flaxmill Swamp. A nearby unit comprises raupo and ti kouka reedland (f), with harakeke, *Isolepis prolifer*, alligator weed and pampas. Raupo and *Baumea articulata* (g) are co-dominant in the same general area, albeit on wetter margins of the swamp. Other species include *Isolepis prolifer*, *Lepidosperma laterale* and alligator weed.

A relatively large body of open water (h) occurs in the south-east corner of the site. This has been induced and maintained by activities associated with the management of Flaxmill Swamp for gamebirds (L. Forester pers. comm.). Alligator weed (i) forms clumps in the shallow margins of the pond and is also common along the edge, while on the drier margins *Lepidosperma laterale* and *Gleichenia* sp. (j) are locally common with frequent *Coprosma propinqua* and manuka. Local patches of raupo-harakeke reedland (k) occur on the site's eastern margins. The south-east corner of the site includes small areas of ti kouka-*Coprosma propinqua* shrubland (l) with occasional harakeke, pampas, and emergent kahikatea and totara. Ti kouka-kahikatea swamp forest (m) is also present, and includes occasional pukatea. *Eleocharis sphacelata* is locally common with *Baumea rubiginosa* (n) throughout the site, occurring with occasional raupo, harakeke, manuka, wheki, *Carex secta* and *C. virgata*.

Significant flora

Baumea complanata (Nationally Vulnerable) and *Coprosma rigida* (regionally significant) were recorded in 1999 and 2006 (SSBI P07/H040). *Carex secta* (regionally significant), *Coprosma rigida* (regionally significant), and *Potamogeton suboblongus* (regionally significant) were

recorded in 2006 (SSBI P07/H040). *Coprosma tenuicaulis* (regionally significant) was recorded in 2009 during a survey by Wildland Consultants.

Fauna

Australasian bittern (Nationally Endangered), grey duck (Nationally Critical), spotless crane (Relict), NI fernbird (Declining), kingfisher, grey warbler, NI fantail, black mudfish (Gradual Decline), *Peripatus* sp. (Range Restricted), shortfin eel, and inanga were recorded in 2006 (SSBI P07/H040). Black shag (Naturally Uncommon), NI fernbird, paradise shelduck, NI fantail, welcome swallow, and pukeko were recently recorded by Wildland Consultants in 2009. Pied stilt (Declining), banded rail (Naturally Uncommon), Australasian harrier, pukeko, and paradise shelduck are also known from the site (SSBI P07/H040). Grey teal (regionally significant) also utilise the site (R. Hoetjes, NZ Fish & Game, pers. comm.).

Significance

The site comprises two nationally significant, large and adjoining semi-fertile freshwater wetlands. Wetlands are a regionally and nationally uncommon habitat type, and this site is representative for ten ecological units: (a), (b), (d), (e), (f), (j), (k), (l), (m) and (n). The wetlands provide an important area for at least nine threatened fauna species, one threatened plant species, and four regionally significant plant species. The discovery of black mudfish in the Awakino Wetland will have important implications for future water level manipulations; at present mosquitofish (*Gambusia affinis*) do not appear to be present in the Awakino Wetland due to two possible factors: an upstream barrier and/or the periodic drying out of the wetland. Raising the water level could be disastrous to the resident mudfish population should mosquitofish gain access and water levels remain high throughout the year (McGlynn 2006). Flaxmill Wetland is owned by Fish and Game NZ, and it is accessible to the public. The wetland includes large areas of open water, which have been enhanced by management and provide habitat for diving and wading birds. NZ Fish & Game allow cattle to graze Flaxmill Wetland on a seasonal basis in order to control weeds such as kikuyu and pampas (R. Hoetjes, NZ Fish & Game, pers. comm.). Cattle, however, not only threaten indigenous vegetation, they also pose a risk to birds nesting in the wetland and threaten mudfish through increased eutrophication. Cattle were seen grazing amongst the raupo during the most recent survey, and other indigenous plants (e.g. harakeke) had been heavily browsed (Wildland Consultants 2009).

KIRIKOPUNI ROAD REMNANT

Survey no. P07/003
Survey date 3 February 2009
Grid reference P07 980062
Area 5.4 ha
Altitude 73-100 m asl

Ecological units

- (a) Kahikatea-totara forest on hillslope (70%)
- (b) Kowhai-kahikatea forest on toeslope (30%)

Landform/geology

Hillslope underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises a small secondary and cut-over tall podocarp-broadleaved forest remnant just to the east of North Houto Forest (P07/036). Most of the site consists of kahikatea-totara forest (a), with occasional taraire, kanuka and towai in the canopy, and kauri, pukatea, matai, tanehaka and rimu as scattered emergents. Riverine kowhai-kahikatea forest (b) is locally common in a small area adjacent to the Ruahua Stream.

Fauna

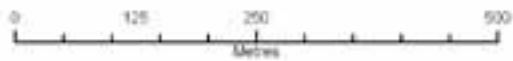
Kukupu (regionally significant) and tui were recorded during this survey.

Significance

Kirikopuni Road Remnant is significant because of its high diversity of plant species and proximity to North Houto Forest, to which it may be a valuable stepping stone for indigenous fauna. The site contains a representative example of (b) riverine kowhai-kahikatea forest on toeslope, which is a rare vegetation type in Tangihua ED. The site is largely surrounded by pasture and is possibly grazed by stock.



P07/003 Kirikopuni Road Remnant



Aerial photography from 2002

AWAKINO EAST BUSH

Survey no.	P07/005
Survey date	20 April 1999
Grid reference	P07 890925 (six remnants)
Area	378.6 ha (298.2 ha forest, 50.8 ha shrubland, 29.6 ha wetland) (Small adjustments were made to the 1999 site boundary based on the 2006 aerial photography)
Altitude	20-80 m asl

Ecological units

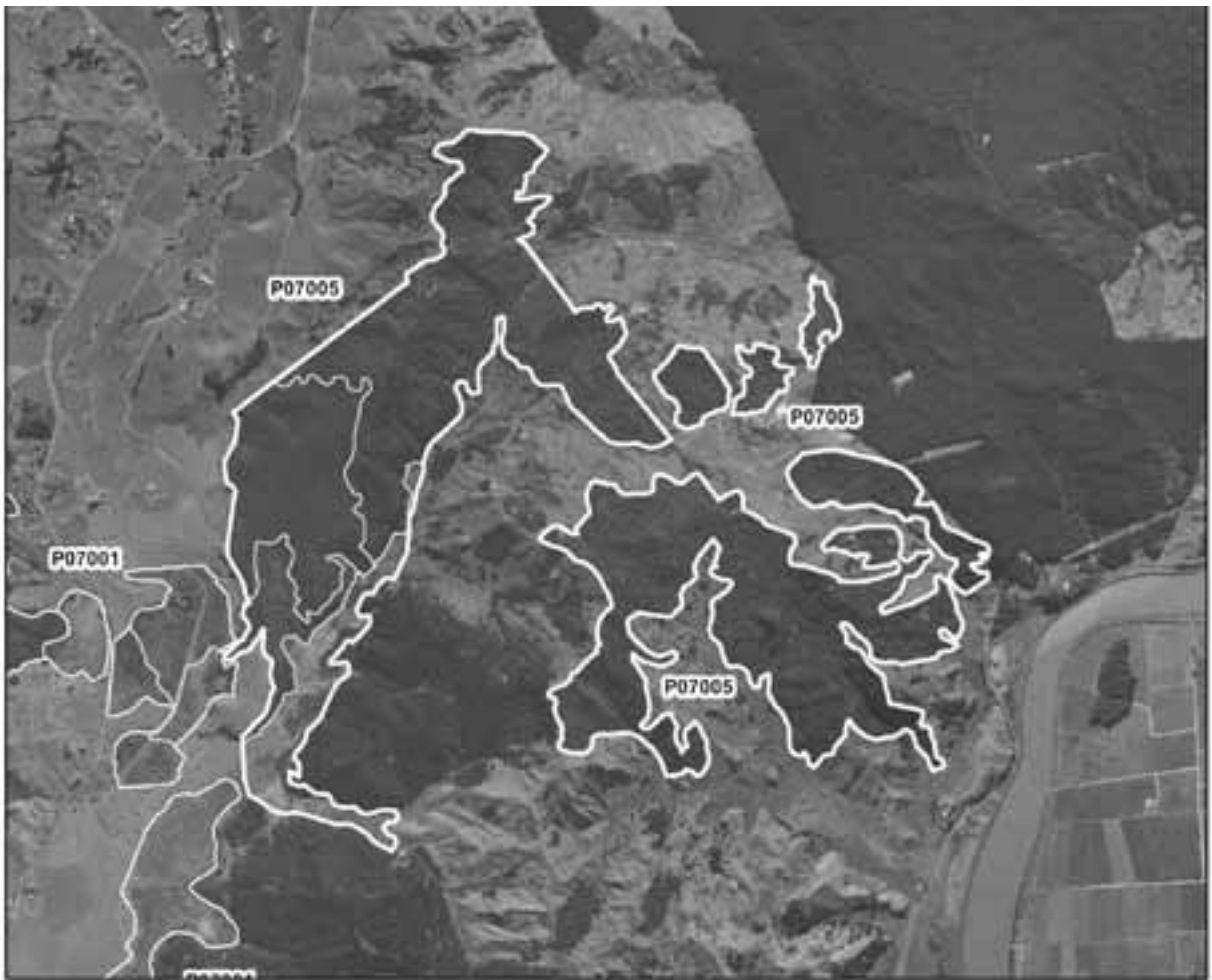
- (a) Kahikatea-taraire forest on moderate to steep hillslope
- (b) Totara forest on moderate hillslope
- (c) Kanuka/manuka-totara shrubland on moderate hillslope
- (d) Totara-towai forest on moderate hillslope
- (e) Kanuka/manuka shrubland on moderate hillslope
- (f) Tanekaha-totara forest on moderate hillslope
- (g) Kahikatea-totara forest on moderate hillslope
- (h) Taraire forest on moderate hillslope
- (i) Taraire-totara forest on moderate hillslope
- (j) Puriri-taraire forest in gully
- (k) Raupo reedland in swamp

Landform/geology

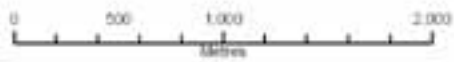
Hill country underlain by Cretaceous mudstone and minor sandstone (Mangakahia Complex).

Vegetation

The site comprises a large mosaic of indigenous forest and shrubland to the east of Flaxmill and Awakino Swamps (P07/001). The small northern remnant alongside Ounuwhao Road is forest comprising common kahikatea and taraire (a) with frequent puriri. Occasional species include rimu, tawa, nikau, puka, rewarewa and kanuka/manuka (edges). The northern end of the largest remnant comprises dominant totara (b) with frequent kahikatea and occasional rewarewa, puriri and pine. Kanuka/manuka and totara shrubland (c) is locally common on moderate hillslope, and totara and towai (d) are common with occasional rimu and kauri. Also in this part of the site is dominant low kanuka/manuka (e) with frequent totara and occasional emergent puriri, ti kouka and mamaku. Tanekaha and totara (f) are common with frequent kanuka/manuka, and co-dominant kahikatea and totara (g) occurs with occasional rimu, puriri and rewarewa. Unit (g) kahikatea-totara forest also occurs with frequent puriri and nikau and occasional emergent northern rata, puka and rewarewa. Other forest types in this area include taraire (h) with occasional pukatea, puriri, kahikatea, rewarewa and nikau; and taraire-totara forest (i) with frequent rimu, and occasional puka, nikau, rewarewa, pukatea and puriri.



P07/005 Awakino East Bush



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

In the eastern arm of the largest remnant, unit (g) kahikatea-totara forest occurs with frequent rimu, and occasional emergent kauri, nikau, rewarewa and kanuka/manuka on the edges. Unit (c) kanuka/manuka-totara shrubland occurs with occasional kahikatea, puriri, and rewarewa. The southern small remnant adjacent to Ounuwahao Road includes unit (i) taraire-totara forest with frequent kahikatea and emergent kauri, and occasional puriri, rewarewa, rimu, tawa, titoki, nikau, and kanuka- or manuka. In a gully on the eastern side of this remnant, puriri and taraire (j) are common with frequent nikau, and occasional emergent old growth totara and kahikatea, as well as occasional pukatea, titoki, puka, rimu and mamaku. At the western end of this remnant, unit (b) totara forest occurs with frequent towai and occasional rimu, kahikatea and kanuka/manuka. The remaining south-eastern remnant is characterised by unit (b) totara forest with occasional puriri, kahikatea, ti kouka, matai, nikau, and kanuka/manuka on the edges.

Aerial photography indicates that a large area in the south-west part of the site is likely to comprise a wetland dominated by raupo reedland (k). The wetland is buffered by pine plantation on its eastern and southern margins.

Significant flora

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

Fauna

Kauri snail (Gradual Decline) (empty shells) were found, and NI fantail and grey warbler were recorded during this 1999 survey.

Significance

This relatively large and diverse network of remnants, located within a highly modified area, provides an important buffer and linkage for Flaxmill and Awakino Swamps (P07/001). The site supports one threatened fauna species and one regionally significant plant species, and provides potential habitat for kukupa. 3.4 ha of the site is Queen Elizabeth II Open Space Covenant, while 26.3 ha are protected within the Awakino Government Purpose Wildlife Management Reserve (DOC-administered). An additional survey is recommended to establish the full significance of this site, and in particular the main body of the site (P07 882 925) for which information is lacking.

NATHAN ROAD SHRUBLAND

Survey no.	P07/007
Survey date	1 September 1994
Grid reference	P07 793995
Area	90.5 ha (60.2 ha forest, 30.3 ha shrubland)
Altitude	40-168 m asl

Ecological units

- (a) Manuka forest on hillslope (68%)
- (b) Totara shrubland on hillslope (25%)
- (c) Manuka-*Dracophyllum* sp. shrubland on hillslope (7%)

Landform/geology

North-western part - hillslopes underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies), and colluvium and landslide deposits of basaltic boulders; south-eastern part - hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a relatively large area of secondary forest and shrubland on the western boundary of Tangihua ED. Manuka forest (a) dominates the site, with frequent totara and occasional kahikatea. Unit (a) manuka shrubland is also locally abundant, occurring with occasional kohuhu, mamangi, tanekaha and ti kouka. Totara (a) is common, with frequent manuka and occasional kahikatea, puriri, kauri, mamangi and kohuhu. The remaining vegetation is a small area of manuka-*Dracophyllum* sp. shrubland (c).

Fauna

Not surveyed, although NI brown kiwi (Nationally Vulnerable) have been recorded within the Queen Elizabeth II Open Space Covenant portion of this site (L. Forester pers. comm.).

Significance

The site is representative for one ecological unit: (b) totara shrubland on hillslope. It is known to support one threatened bird species, and it may provide a linkage between the Kaihu Forest to the north and a large exotic/indigenous tract to the south-west. The site also offers riparian buffering for tributaries of the Kaihu River. A small part of Nathan Road Shrubland (16.6 ha) is Queen Elizabeth II Open Space Covenant.



P07/007 Nathan Road Shrubland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

KAIHU SCENIC RESERVE AND SURROUNDS

Survey no. P07/008
Survey date 22 August 1994
Grid reference P07 814010
Area 167.8 ha
Altitude 188-376 m asl

Ecological units

- (a) Taraire forest on hillslope (60%)
- (b) Mapou forest on hillslope (40%)

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site adjoins pine plantation within the Maropiu Forest. It is dominated by taraire forest (a), with frequent tawa and occasional puka, kohekohe, puriri and rimu. Northern rata, kahikatea, and miro occur occasionally as emergent species. The rest of the canopy is defined by mapou forest (b), with frequent kohekohe and occasional mahoe, mamaku, karaka, puriri and *Olearia* sp.

Significant flora

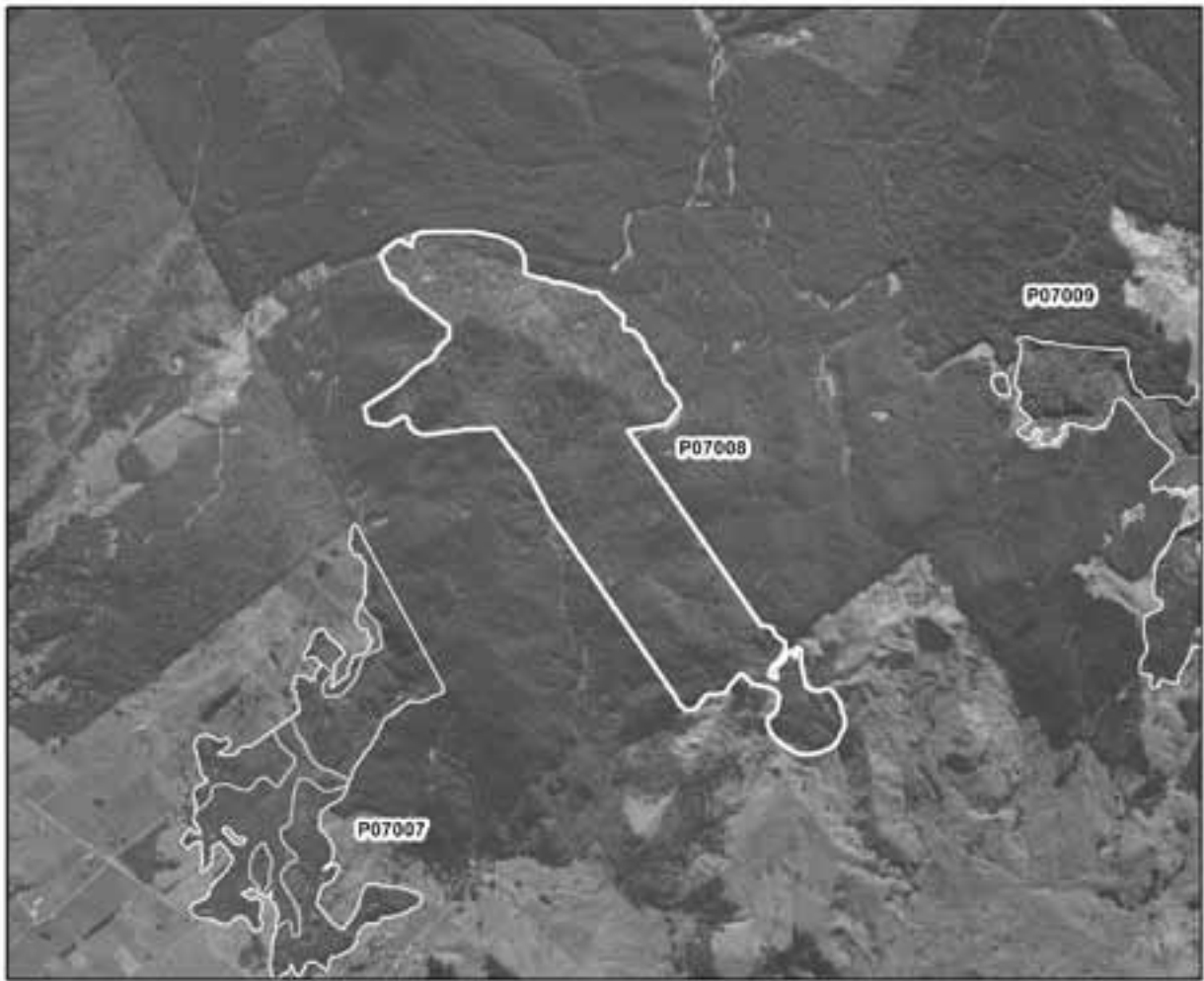
Northern rata (regionally significant) was recorded during this survey.

Fauna

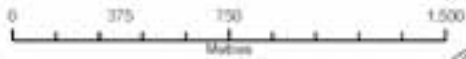
No fauna survey was carried out, although there are historical records of grey warbler, silvereye, NI fantail and tui (recorded in 1978, SSBI P07/H025). Longfin eel (Gradual Decline), koaro (regionally significant), and Cran's bully have been recorded in the Awakino Stream, slightly upstream of the site (NIWA 2009a).

Significance

This site is contiguous with Kaihu Forest to the north, providing corridor habitat (via pine plantation) and refuge for indigenous fauna during the logging of adjacent pine plantation. Unit (a) taraire forest on hillslope includes frequent emergent podocarps; unit (b) mapou forest is unrecorded elsewhere in Tangihua ED and should be considered representative of its type. The site exhibits a relatively diverse canopy and understorey, as well as reasonable regeneration, and provides habitat for one regionally significant plant species. It also provides riparian buffering for the Awakino Stream, which is utilised by one threatened and one regionally significant fish species. Stock incursions are evident on the forest margins (SSBI P07/H025). 116.1 ha are protected as a DOC-administered scenic reserve.



P07/008 Kaihu Scenic Reserve and Surrounds



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

OKAHARAU BUSH

Survey no.	P07/011
Survey date	19 August 1994 and 2003-04
Grid reference	P07 840077
Area	27.1 ha
Altitude	100-400 m asl

Ecological units

- (a) Taraire forest on steep hillslope (90%)
- (b) Kowhai forest on steep cliff (10%)
- (c) Kohekohe-mahoe-taraire forest on moderate to steep hillslope (<1%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

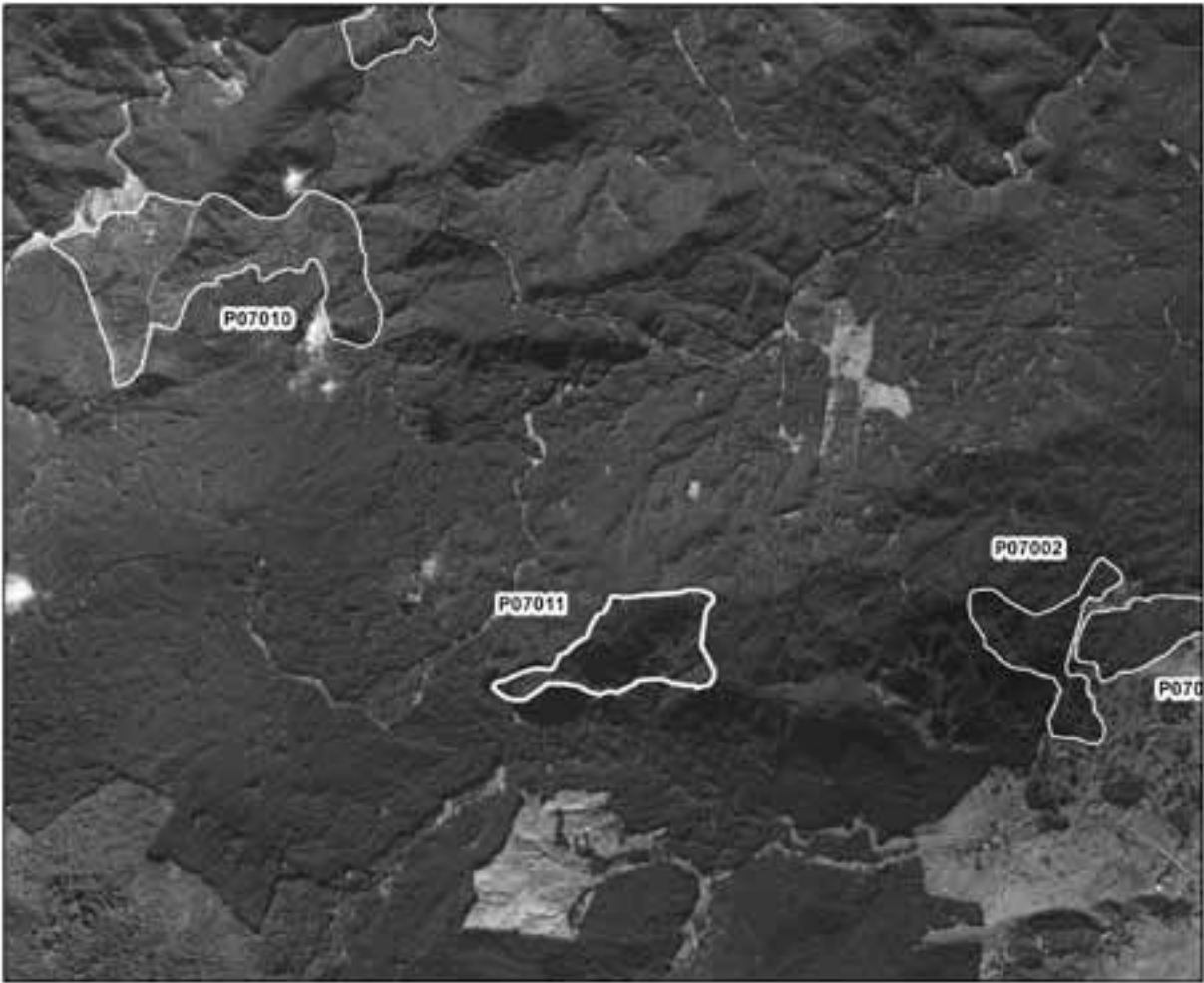
Ohakarau Bush comprises a small, well-buffered remnant of broadleaved forest located adjacent to the north-east edge of Kaihu State Forest within the Opouteke Forest pine plantation. It was most recently surveyed by Wildland Consultants (2004). The site is dominated by taraire forest (a) with frequent tawa and kohekohe, and occasional kowhai, karaka, mahoe, puka, mapou and houhere. On the upper cliff face, kowhai (b) is common with puka occasional in the canopy. Frequent groundcover species include rengarenga lily, *Gabnia* sp. and *Hebe* sp. A very small area of hillslope is defined by kohekohe-mahoe-taraire forest (c), with frequent kawakawa and occasional titoki, tawa, kahikatea, pate and karaka.

Fauna

NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), grey warbler, silvereye, NI fantail, tui, kingfisher, and Australasian harrier were recorded in 1986 (SSBI P07/H002). A later survey in 1992 recorded the presence of NI tomtit (regionally significant), kukupa (regionally significant), shining cuckoo, kingfisher, grey warbler, silvereye, tui, and kauri snail (SSBI P07/H002). A vegetation survey conducted by Wildland Consultants (2004) did not record any significant fauna species.

Significance

The steep cliff face adds topographical diversity to this site and may be a botanically interesting niche habitat. Associations of kowhai and rengarenga lily are uncommon in Tangihua ED, and therefore type (b) should be considered as a representative ecological unit. Ecological unit (c) kohekohe-mahoe-taraire forest on moderate to steep hillslope is also uncommon and representative of its type. There are records of two threatened fauna species and one regionally significant bird species, and the site may act as a potential refuge for indigenous fauna (particularly kiwi) during logging. A survey in 1986 (SSBI P07/H002) recorded heavy

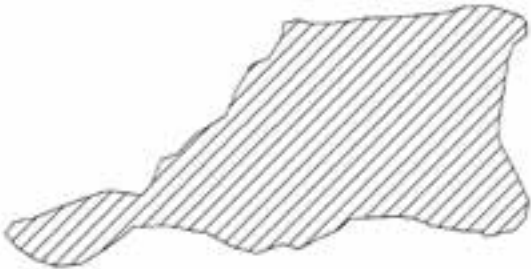


P07/011 Okaharau Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

browse by goats and possums and livestock were also present. A follow-up survey of this site is recommended to determine further values and to ascertain whether threatened fauna recorded previously are still present.

MASSEY ROAD REMNANT

Survey no. P07/013
Survey date 22 August 1994 and 3 February 2009
Grid reference P07 873011
Area 1.3 ha
Altitude 50 m asl

Ecological units

(a) Houhere-nikau-pukatea forest on alluvium (100%)

Landform/geology

Valley floor on Holocene alluvium.

Vegetation

The site comprises a very small area of alluvial forest along the Kairara Stream represented by common houhere, nikau and pukatea (a). Frequent species include kowhai and *Passiflora tetrandra*, with occasional kahikatea, miro, kohuhu, ti kouka, totara and *Coprosma robusta* × *C. propinqua*. Kiekie are supplejack are dominant in the understorey.

Significant flora

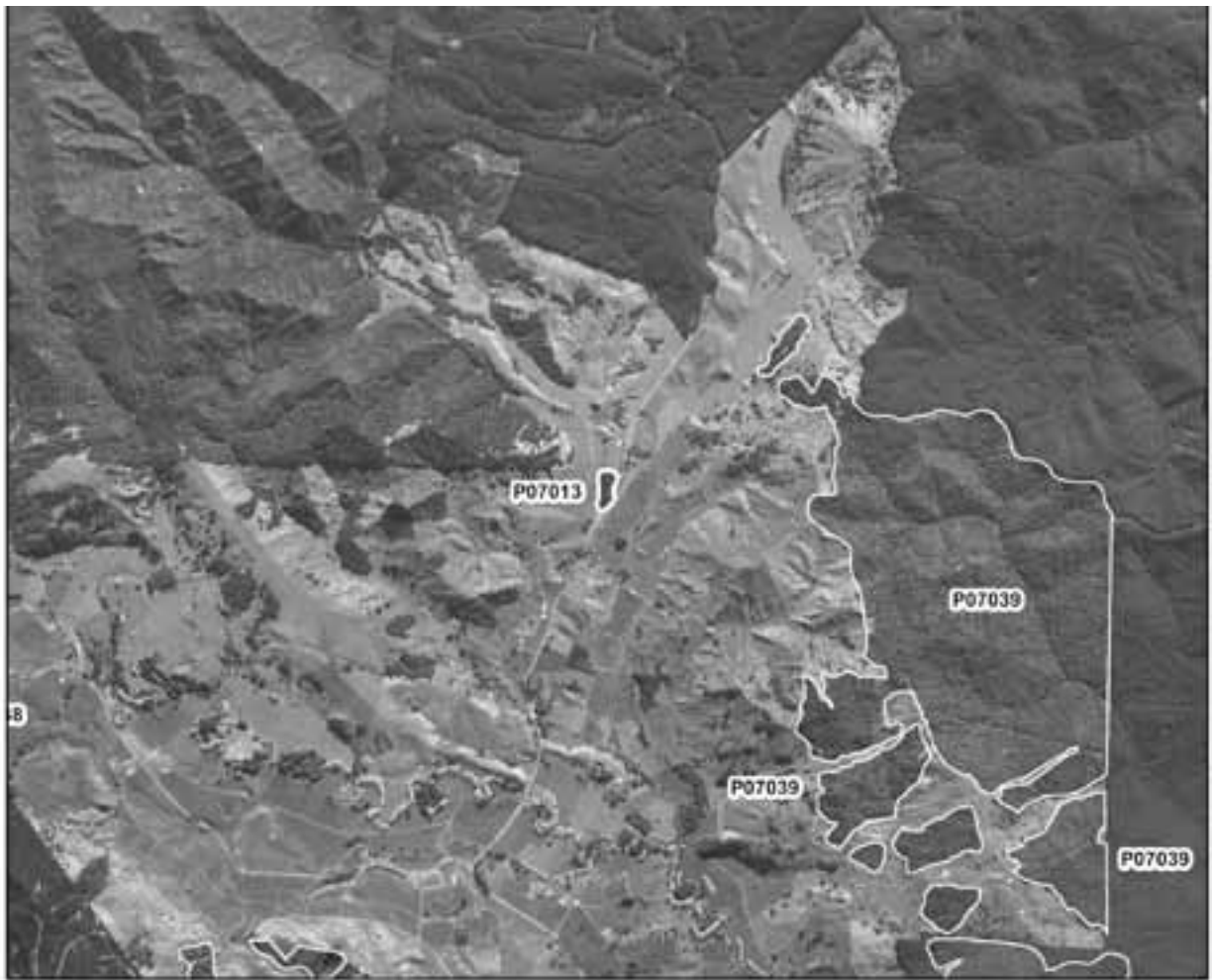
Passiflora tetrandra (regionally significant) was recorded during this survey (1994).

Fauna

Not surveyed.

Significance

The site contains one regionally significant plant species and is representative for one ecological unit: (a) houhere-nikau-pukatea forest on alluvium, as it is the only example of its type in Tangihua ED, despite being very small. The site is fenced but livestock are still able to access the understorey. Moderate possum browse on pukatea was also noted in 2009.



P07/013 Massey Road Remnant



Aerial photography flown 2002

PAKOTAI SCENIC RESERVE

Survey no.	P07/014
Survey date	4 August 1994
Grid reference	P07 886094
Area	18.5 ha
Altitude	100-270 m asl

Ecological units

- (a) Taraire-towai forest on moderate hillslope (60%)
- (b) Taraire forest on moderate hillslope (20%)
- (c) Puriri-taraire-totara forest on moderate hillslope (15%)
- (d) Kohekohe-puriri forest on moderate hillslope (5%)

Landform/geology

Hillslopes underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex) in the west and by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex) in the east.

Vegetation

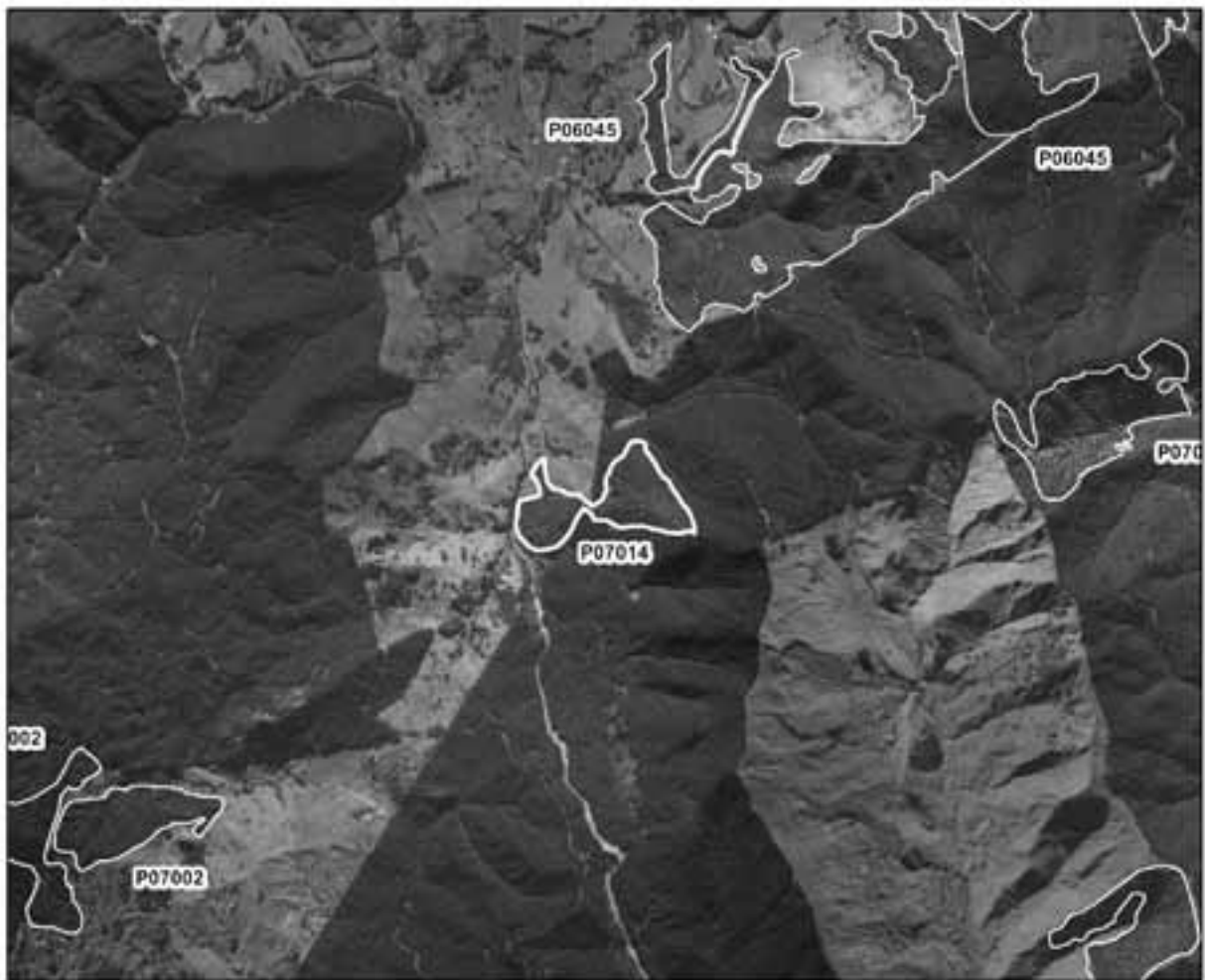
The small remnant of podocarp-broadleaved forest is dominated by taraire-towai forest (a), with frequent totara, kahikatea and rewarewa. Occasional species include miro, tanekaha, tawa, and emergent rimu, kauri and totara. Taraire (b) is a common canopy species, occurring with frequent puriri and occasional tawa, rewarewa and pukatea. Taraire is also co-dominant with puriri and totara (c), with frequent kohekohe and rewarewa, and occasional kowhai. A remaining small hillslope area is defined by kohekohe-puriri forest (d), with frequent taraire, and occasional rewarewa and kowhai.

Fauna

Historical records of NI brown kiwi (Nationally Vulnerable), grey warbler, silvereve, NI fantail, tui, kingfisher, welcome swallow, Australasian harrier, and morepork (recorded in 1978, SSBI P07/H003). The land snail Punctidae sp. 225 (Range Restricted) is also known from the site (Brook 2002).

Significance

The Pakotai Scenic Reserve is a diverse kauri-podocarp-broadleaved remnant which contains a few very large kauri and podocarps. It is representative for one ecological unit: (d) kohekohe-puriri forest on moderate hillslope, the only example of its type recorded in Tangihua ED. There are past records of one threatened bird species and the site supports a threatened land snail species. The site is currently well-buffered by pine plantation and may form a refuge for indigenous fauna during logging. The area was fenced when it was surveyed in 1985, but cattle sign was evident, along with goat and possum browse (SSBI P07/H003). 5.5 ha are currently protected as a DOC-administered scenic reserve and 1.9 ha lie within a scenic reserve administered by WDC.

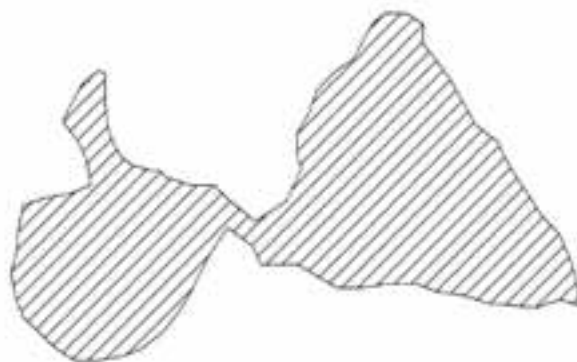


P07/014 Pakotai Scenic Reserve



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

SHARP ROAD BUSH

Survey no.	P07/015
Survey date	4 August 1994 and 2003-04
Grid reference	P07 910097
Area	29.2 ha
Altitude	100-320 m asl

Ecological units

- (a) Kohekohe-mamaku-taraire forest on hillslope (80%)
- (b) Taraire forest on hillslope (15%)
- (c) Exotic grassland on hillslope (5%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

Sharp Road Bush comprises a small, well-buffered remnant of cut-over tall forest and secondary broadleaved forest located within the boundary of the Opouteke Forest pine plantation. It was most recently surveyed by Wildland Consultants (2004). Most of the site is characterised by kohekohe-mamaku-taraire forest (a), with frequent rewarewa, nikau, and mamangi, and occasional puriri, totara, tawa, kahikatea, rimu, kauri and kawaka. Taraire forest (b) is locally common, occurring with frequent rewarewa and occasional puriri, kahikatea and tawa. A small clearing is dominated by exotic grasses (c) and weeds.

Significant flora

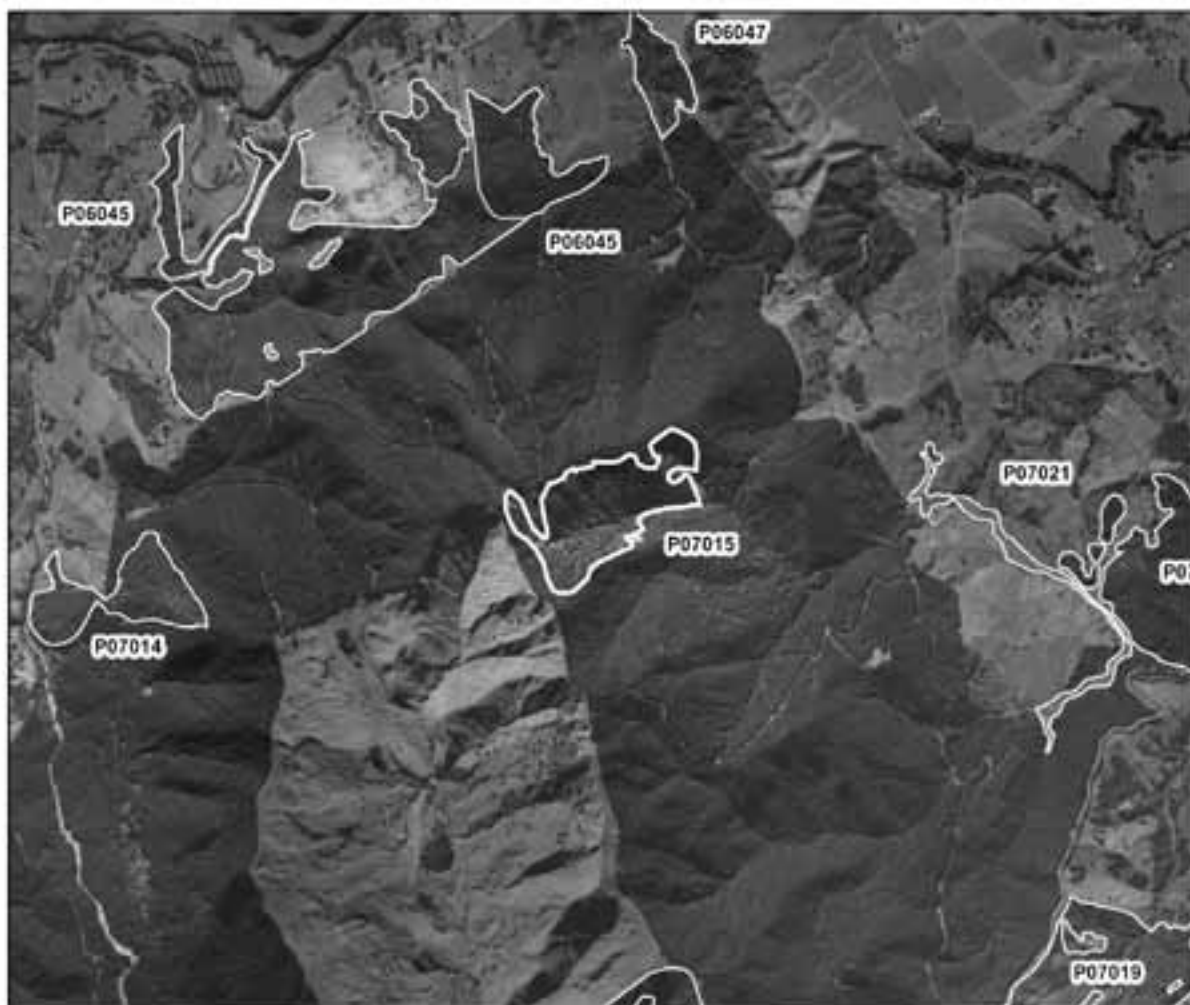
Kawaka (Naturally Uncommon) was recorded during the 2004 survey.

Fauna

Kauri snail (Gradual Decline) and kukupa (regionally significant) were recently recorded (Wildlands 2004).

Significance

Sharp Road Bush is representative for (a) kohekohe-mamaku-taraire forest on hillslope, which dominates the site and is the only example of its type within Tangihua ED. The site supports one threatened plant species and one threatened fauna species. It is contiguous with a larger area of similar vegetation on a ridgetop to the east, and it would provide a useful refuge for indigenous fauna during the logging of adjacent pine plantation.



P07/015 Sharp Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

BOUNDARY SWAMP

Survey no. P07/018
Survey date 4 August 1994
Grid reference P07 928075
Area 1.5 ha
Altitude 40 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Gully bounded by hillslopes of Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises a small wetland bordering the southern boundary of Karaka Road Shrubland (P07/019), and is dominated by raupo (a) with occasional *Juncus* sp.

Fauna

Historical records of at least six spotless crane (Relict) and two marsh crane (Relict) recorded during a survey in 1978 (SSBI P07/H039).




Significance

The site is significant because of its intactness and the fact that wetlands are now an uncommon habitat type in this ED and throughout Northland. Those remaining are at risk from clearance, stock grazing and trampling, and fertiliser run-off. The swamp is stream fed year round and has a stable surface water level. There are historical records for two threatened bird species from this site, although additional survey is recommended to determine the site's current fauna diversity. Fencing would improve regeneration and enhance habitat values.



P07/018 Boundary Swamp



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

KARAKA ROAD SHRUBLAND

Survey no. P07/019
Survey date 4 August 1994
Grid reference P07 930075
Area 70 ha
Altitude 40-100 m asl

Ecological units

(a) Kanuka/manuka-totara shrubland on moderate hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

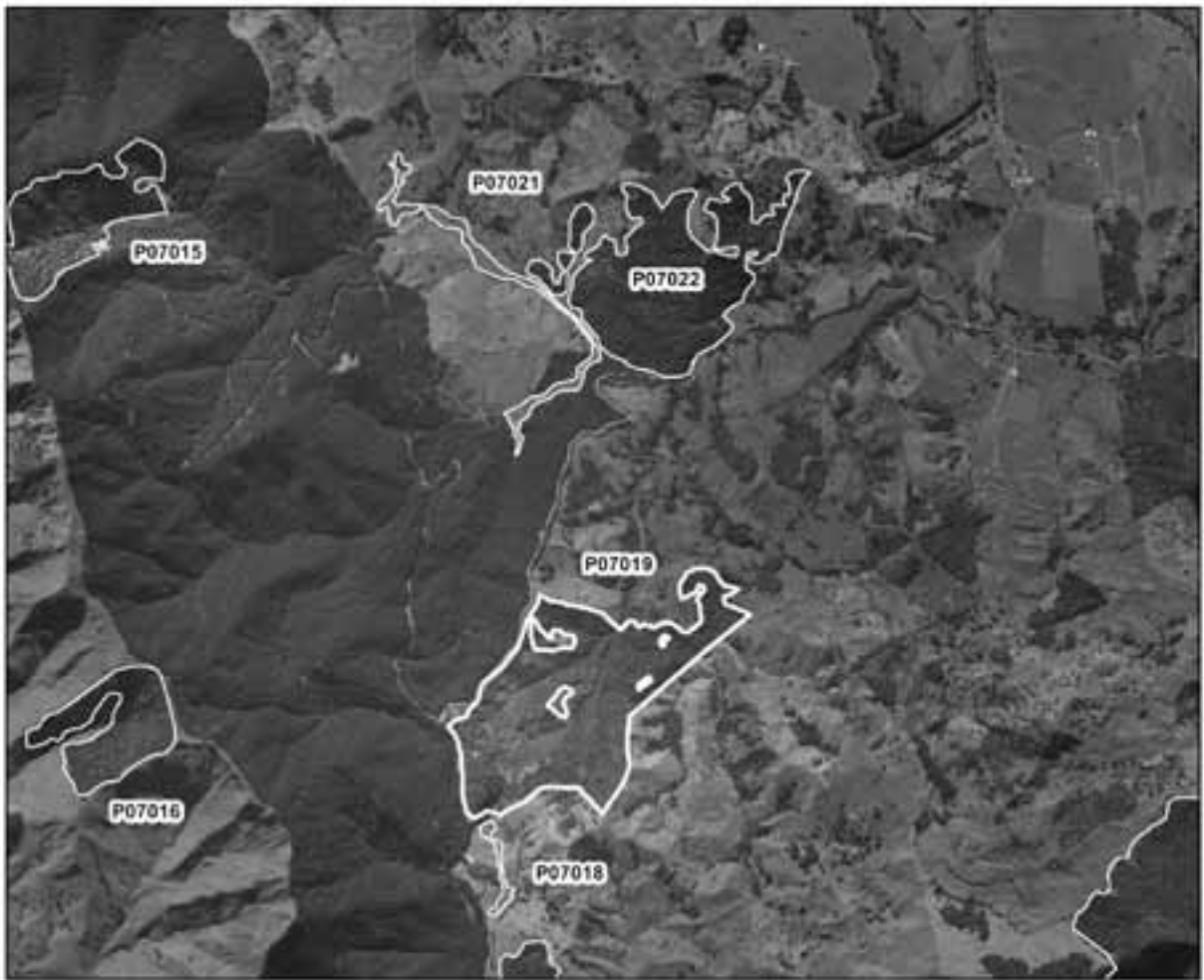
The site comprises a small area of shrubland adjoining pine plantation. The canopy is characterised by advanced kanuka, manuka and totara (a) with occasional puriri and kahikatea. The pockets of secondary forest were not identified in this survey.

Fauna

The land snail *Amborhytida forsythi* (Gradual Decline) has been recorded at this site (Brook 2002).

Significance

The site contains a relatively large area of shrubland, an uncommon vegetation type in Tangihua ED which provides potential habitat for threatened plants and animals such as orchids and lizards. The site also supports one threatened land snail species. A small part of the site (3.64 ha) lies within Queen Elizabeth II Open Space Covenant.

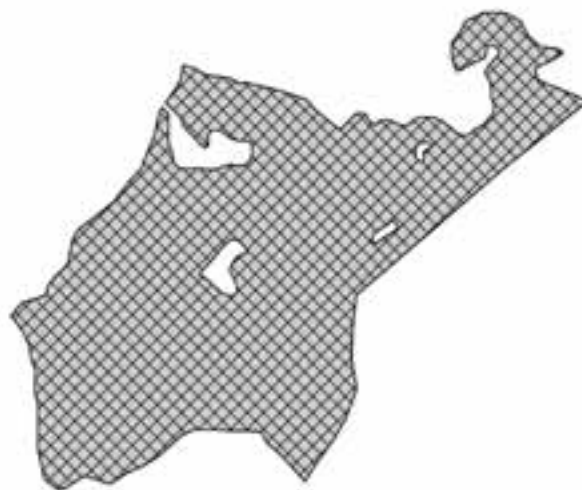


P07/019 Karaka Road Shrubland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

KARAKA ROAD RAUPO WETLAND

Survey no. P07/021
Survey date 4 August 1994
Grid reference P07 929088
Area 8.2 ha (0.5 ha shrubland, 7.7 ha wetland)
Altitude 60 m asl

Ecological units

- (a) Raupo reedland in swamp (95%)
- (b) Manuka-totara-pine shrubland on alluvium (5%)

Landform/geology

Valley floor wetland on Holocene alluvium; and hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site encompassed two small wetlands to the west of Karaka Road. The site is dominated by raupo reedland (a), while on the periphery, manuka-totara-pine shrubland (b) is locally common.

Fauna

Not surveyed.

Significance

The site is significant due to its relatively large size and the fact that wetlands are a diminishing and rare habitat type regionally and nationally. Raupo wetlands provide potential habitat for threatened birds such as Australasian bittern, NI fernbird, spotless crane and banded rail. Follow-up survey is recommended.



P07/021 Karaka Road Raupo Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

MANGAKAHIA RIVER BUSH

Survey no.	P07/023
Survey date	17 October 1994
Grid reference	P07 044022
Area	19.5 ha
Altitude	13-101 m asl

Ecological units

- (a) Taraire forest on hillslope
- (b) Tanekaha-totara forest on hillslope

Landform/geology

Hillslope underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

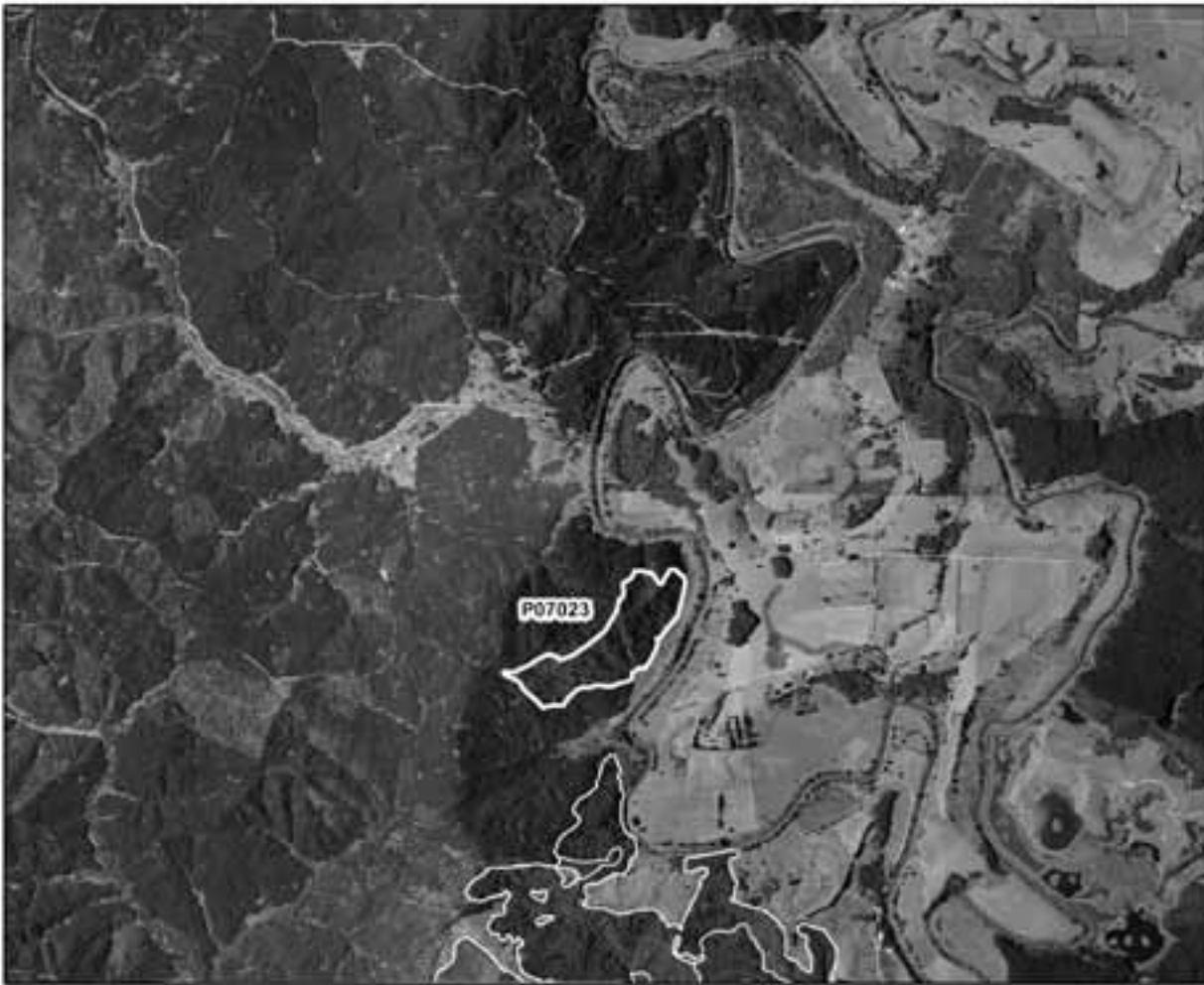
The site comprises a mature, partly cut-over tall podocarp-broadleaved forest bordering the lower reaches of the Mangakahia River, on the south-east boundary of Tangihua ED. Taraire forest (a) occurs with frequent tawa and occasional kahikatea, pukatea, rewarewa, tanekaha, towai, and emergent totara. The rest of the forest is characterised by co-dominant tanekaha and totara (b), with frequent kanuka and taraire, and occasional kauri, karaka, kohekohe and rimu.

Fauna

Historical records of NI brown kiwi (Nationally Vulnerable), grey warbler, NI fantail, silvereye and tui (recorded in 1978, SSBI P07/H018).

Significance

Mangakahia River Bush is part of a large indigenous/exotic forest tract in the south-east of Tangihua ED and may provide refuge for indigenous fauna during the logging of adjacent pine plantation. There is a historical record of one threatened bird species. Kiwi may still utilise the site given that it is within c.200 m of the northern tip of Paerata Scenic Reserve (P07/055), an area which contains low (and possibly declining) numbers of kiwi. 13.7 ha is Queen Elizabeth II Open Space Covenant, three hectares of which fall outside Tangihua ED.



P07/023 Mangakahia River Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

HOUTO CONE FOREST

Survey no.	P07/034
Survey date	19 October 1999
Grid reference	P07 995025
Area	19.5 ha
Altitude	120-377 m asl

Ecological units

- (a) Karaka-kohekohe-puriri forest on steep upper hillslope (40%)
- (b) Puriri-taraire forest on steep hillslope (30%)
- (c) Kohekohe-puriri-taraire forest on steep upper hillslope (30%)

Landform/geology

Steep hill underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site encompasses broadleaved forest on the slopes of the volcanic Houto Cone. On the northern side of the cone a discontinuous canopy of karaka, kohekohe and puriri (a) occurs with occasional taraire, tawa and rewarewa. Puriri and taraire (b) are also co-dominant on the northern slopes, with frequent kohekohe and occasional tawa and kahikatea. In the south, near the top of the cone and on the lower slopes, kohekohe, puriri and taraire (c) are common. Occasional kowhai, mamaku, nikau and karaka occur on the upper slopes, while occasional tawa, nikau, karaka, rewarewa and puka are present on the lower slopes. On the eastern upper slope unit (a) karaka-kohekohe-puriri forest occurs with occasional taraire, nikau, kowhai, mamaku and tawa.

Significant flora

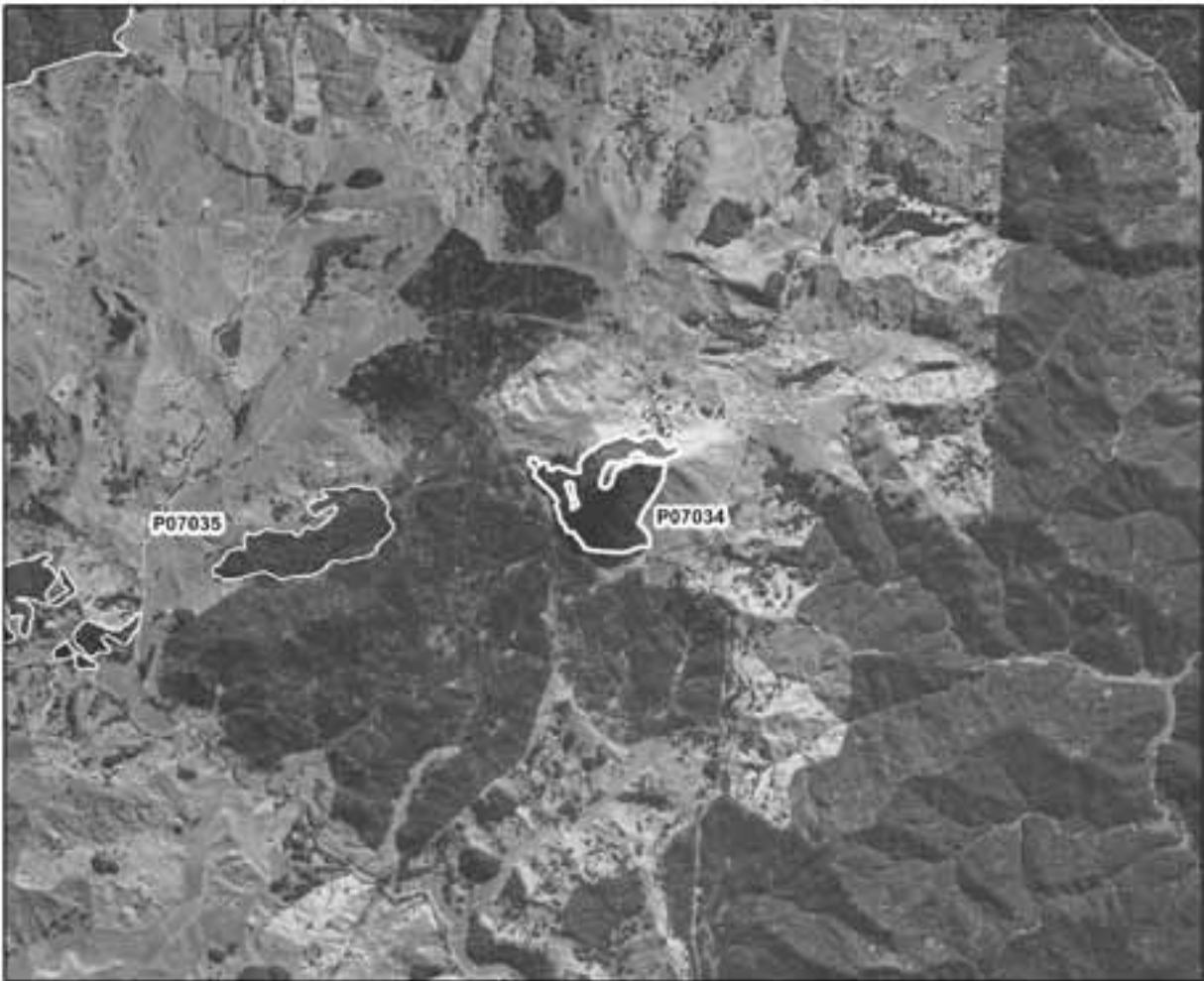
Pellaea falcata (Relict), *Olearia albida* (regionally significant), *Hebe ligustrifolia* (regionally significant), *Passiflora tetrandra* (regionally significant) and carmine rata (regionally significant) recorded in 1997 (SSBI P07/H015).

Fauna

Historical records of NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), kukupa (regionally significant), Australasian harrier and common forest birds (SSBI P07/H015). The land snail *Amborhytida forsythi* (Gradual Decline) is known from the site (Brook 2002).

Significance

Houto Cone Forest is a prominent landmark in the area and contains records of three threatened fauna species, one threatened plant species and four regionally significant plant species. The site is representative for two ecological units: (a) and (c). An Australian species of orchid (*Dendrobium kingianum*) had been planted in forks in a number of trees at the summit (L. Forester pers. comm.).



P07/034 Houto Cone Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

NORTH HOUTO FOREST

Survey no.	P07/036
Survey date	19 October 1998
Grid reference	P07 960055
Area	558 ha (three remnants)
Altitude	61-452 m asl

Ecological units

- (a) Puriri-taraire forest on moderate and steep hillslope
- (b) Totara forest on stream terrace
- (c) Kahikatea forest on gentle hillslope
- (d) Puriri-taraire-tawa forest on steep hillslope
- (e) Puriri-taraire-towai forest on steep hillslope
- (f) Taraire-pukatea forest on steep hillslope
- (g) Kahikatea-totara forest on steep hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The northern block of Houto Forest occupies an isolated and dissected hill, and is predominantly a broadleaved forest remnant that has been cut-over. There is, however, a significant amount of old-growth canopy trees remaining, exemplified by the stag-headed totara, rimu, puriri and northern rata. The sub-canopy comprises mainly pole taraire and kohekohe with occasional miro, totara and rimu. Puriri-taraire forest (a) appears to be the dominant forest type at this site, occurring in the eastern, middle, and southern areas of the forest. Frequent species include tawa, rewarewa, kohekohe and kowhai. Occasional species include rimu (sometimes emergent), kahikatea (sometimes emergent), matai, puka, kohekohe, northern rata, rewarewa, pukatea, nikau, mamaku, karaka, totara and kowhai. Totara forest (b) is common on stream terraces in the east, occurring with frequent mamaku and occasional titoki, houhere, pate, karaka, nikau, kohekohe, mapou, mahoe, ti kouka, puriri, hinau and pigeonwood. In the south-east an area of dominant kahikatea (c) occurs with frequent puriri and occasional taraire, rimu, rewarewa, mamaku, nikau, totara and houhere. Puriri-taraire-tawa forest (d) characterises the southern hillslope, occurring with occasional puka, nikau, kohekohe, pukatea and rewarewa. In the south-west puriri, taraire, and towai (e) are locally common, with frequent tawa and pukatea, and occasional kahikatea, mamaku, nikau, kohekohe and northern rata. Taraire-pukatea forest (f) is also common on the south-western slopes, with frequent puriri and occasional tawa, puka, rewarewa, nikau and kohekohe. The remaining canopy component in this area of the site comprises common kahikatea and totara (g) with frequent taraire and occasional nikau, rewarewa, mamaku, towai, rimu and kanuka/manuka.



P07/036 North Houto Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

Significant flora

Regionally significant: *Corokia cotoneaster* (AK 167603), *Dracophyllum traversii*, carmine rata, *Epilobium nummulariifolium* (AK 168650), gully tree fern, *Hypolepis lactea*, *Myriophyllum triphyllum* (AK 168060), northern rata, *Olearia albida*, raukawa, *Passiflora tetrandra*, tawari, *Uncinia distans*, *Urtica incisa* and wharariki. All species without herbarium records are listed in SSBI P07/H009 (1985-2000).

Fauna

1998 records of kukupa (regionally significant), shining cuckoo, morepork, kingfisher, grey warbler, NI fantail and tui (SSBI P07/H009). There is also a 1992 record of NI brown kiwi (Nationally Vulnerable) and a 2000 record of kauri snail (Gradual Decline) (SSBI P07/H009).

Significance

North Houto Forest supports two threatened fauna species and 15 regionally significant plant species. The site contains old-growth forest, which is rare in Tangihua ED, and may be important as part of a habitat network for mobile species such as kukupa, providing a linkage between natural areas in the south-west and north-east. It is representative for four ecological units: (b), (d), (e) and (f). It also provides riparian buffering and upper-catchment for several small streams, including the Ruahia Stream and Parakao Stream. Most of the site is protected: 530.1 ha are in Northland Conservation Park land while the Houto Local Purpose (Quarry) Reserve (WDC-administered) comprises 3.2 ha. Land clearances and stock grazing have affected the forest margins, and stock incursions into the forest have been a continual problem in the forest for many years because of poor fencing (SSBI P07/H009).

SOUTH HOUTO FOREST AND MAUNGARU RANGE

Survey no.	P07/037
Survey date	1998, 1999 and 2000
Grid reference	P07 955005 (four remnants)
Area	783.2 ha (Small adjustments were made to the site boundary based on the 2006 aerial photography)
Altitude	60-374 m asl

Ecological units

- (a) Kanuka/manuka-taraire forest on steep hillslope
- (b) Kanuka/manuka-puriri-taraire forest on steep hillslope
- (c) Kahikatea-puriri-taraire forest on moderate hillslope
- (d) Puriri-taraire forest on moderate and steep hillslope
- (e) Kanuka/manuka-puriri forest on steep hillslope
- (f) Kohekohe-puriri-taraire forest on steep hillslope
- (g) Totara forest on steep hillslope
- (h) Puriri-taraire-totara forest on steep hillslope

- (i) Kahikatea forest in gully and on moderate hillslope
- (j) Taraire forest in steep gully
- (k) Kahikatea-totara forest on moderate hillslope
- (l) Puriri forest on steep hillslope
- (m) Mamaku-puriri-taraire forest on steep hillslope
- (n) Puriri-taraire-tawa forest on steep hillslope
- (o) Kauri forest on moderate hillslope
- (p) Taraire-tawa forest on ridge

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

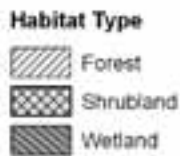
Houto Forest, including Maungaru Range, lies to the south of Tangihua ED and comprises one of the District's largest remaining contiguous areas of indigenous forest.

Northern End

Kanuka/manuka-taraire forest (a) occurs in the north-east with frequent kohekohe and occasional puriri, tawa, puka and rewarewa. In the north kanuka/ manuka-puriri-taraire forest (b) occurs with frequent kohekohe and occasional tawa, matai, nikau and emergent rimu. Kahikatea-puriri-taraire forest (c) is also locally common in the north-east, with occasional totara, kohekohe, nikau, puka, towai, and emergent rimu. Puriri and taraire (d) are co-dominant in several areas in the north, north-east, and north-west. Occasional species include kahikatea, pukatea, kohekohe, puka, tawa, matai, northern rata, kanuka/manuka, rewarewa, mamaku, houhere, mahoe, mamangi and nikau. An area in the north-west includes frequent kohekohe and tawa, while kowhai and rewarewa become frequent closer to the ridge. Other vegetation types in the north-east include kanuka/manuka-puriri forest (e) with frequent taraire and occasional rewarewa, kohekohe and nikau, and kohekohe-puriri-taraire forest (f) with occasional nikau, karaka, tawa and rewarewa. Forest type (f) also occurs in the north-west with frequent kowhai and occasional karaka, rewarewa, tawa, nikau, mamaku, totara, and kahikatea on the edges. Totara forest (g) is common in the north-west, occurring with frequent kahikatea and occasional mamaku, lancewood, towai, matai, nikau, puriri and kanuka/manuka. Puriri-taraire-totara forest (h) is another common forest type in the north-west, where it occurs with occasional nikau, pukatea, karaka, rewarewa, puka, kohekohe, tawa, mamaku and kanuka/manuka. In a gully in the north-west kahikatea forest (i) occurs in a small area with frequent rewarewa. Forest type (i) also occurs in another area in the north-west, with occasional rewarewa and emergent kauri and rimu. Gullies in the north-west are dominated by taraire forest (j), with frequent towai and rewarewa, and occasional kahikatea, kauri, pukatea, kohekohe, rimu, tawa and kohekohe. Remaining areas in the north-west include a small area of kahikatea-totara forest (k) with occasional kauri and kanuka/manuka, and a small area of puriri forest (l) with frequent rewarewa and occasional taraire, tawa, mamaku, matai and kohekohe.



P07/037 South Houto Forest and Maungaru Range



Aerial photography from 2002

Southern End

Unit (d) puriri-taraire forest occurs in the south and south-east with frequent kohekohe and a range of occasional species including tawa, nikau, rewarewa, mamaku and kanuka/manuka. Unit (f) kohekohe-puriri-taraire forest occurs on the lower slopes in the south-western end with occasional totara, mamaku, nikau, tawa and rewarewa. Unit (j) taraire forest occurs in the south-western end in a gully with frequent kohekohe and occasional puriri, karaka, puka, nikau, kahikatea and mamaku. Mamaku-puriri-taraire forest (m) is locally common on steep hillslope in the south, while on the top peak in the south-west, puriri-taraire-tawa forest (n) occurs with frequent kohekohe and occasional rewarewa and karaka. A small kauri ricker grove (o) occurs in the south with occasional rewarewa, and towards a ridge, taraire and tawa (p) are co-dominant, with occasional northern rata, nikau, mamaku and emergent rimu.

Significant flora

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

Fauna

Historical records (1978) of NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), tui, silvereye and NI fantail (SSBI P07/H017). Kukupa, shining cuckoo, silvereye, Australasian harrier, welcome swallow, and white-faced heron were recorded in the present survey. The land snail *Amborhytida forsythi* (Gradual Decline) is known from the site (Brook 2002).

Significance

A large forested area, prominent in the landscape, which may support at least two threatened fauna species. The forest also provides habitat for one regionally significant plant species, although a thorough survey is likely to yield a number of threatened and regionally significant species. It contains four representative ecological units: (b), (e), (f) and (m). Houto Forest provides riparian buffering and upper catchment protection for many small streams, including tributaries of the Tangowahine and Kirikopuni Streams. Approximately 50% of the site is protected: 375 ha are within Northland Conservation Park land (DOC-administered), 34.2 ha designated as a Queen Elizabeth II Open Space Covenant, and 1.23 ha of Marginal Strip (Tangowahine Stream Marginal Strip Nos.2 & 3, DOC-administered). Browsed totara and dieback on puriri were noted. A follow-up survey would be desirable to assess further ecological values. The site is currently utilised by trampers.

MAUNGARU TRIG FOREST

Survey no.	P07/038
Survey date	22 March 1993
Grid reference	P07 985965 (five remnants)
Area	219.7 ha (Small adjustments were made to the 1993 site boundary based on the 2006 aerial photography)
Altitude	80-418 m asl

Ecological units

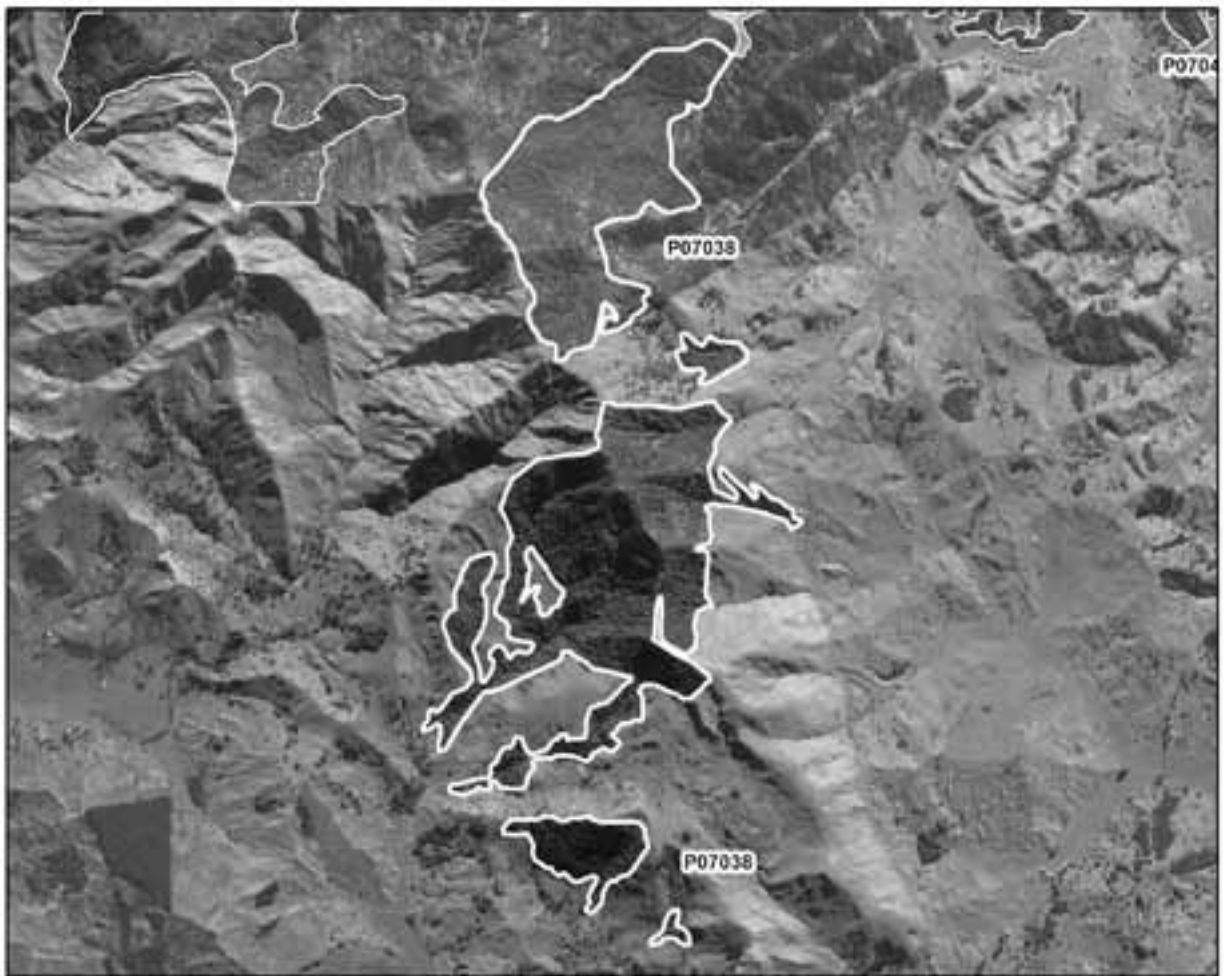
- (a) Puriri-taraire forest on steep upper face
- (b) Kahikatea-totara forest on steep slope
- (c) Puriri-totara forest on moderate slope
- (d) Puriri-taraire-totara forest on moderate slope
- (e) Kahikatea forest on moderate slope
- (f) Towai forest on steep slope
- (g) Taraire forest on steep slope
- (h) Kohekohe-puriri-taraire forest on steep slope
- (i) Kohekohe forest in gully

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex); north-eastern tip underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site is located at the south-eastern tip of Houto Forest (P07/037) and comprises a relatively large forested remnant on steep, dissected hillslope. Puriri and taraire (a) are common in the canopy in the north-west of the site, occurring with frequent kohekohe and tawa, and occasional nikau, mamaku and pampas. Kahikatea-totara forest (b) occurs in the north with occasional puriri, while in the north-east puriri-totara forest (c) is common, with frequent kahikatea and occasional rewarewa. Lower slopes in the same area are characterised by puriri-taraire-totara forest (d) with occasional puka, rimu, tawa, mamaku, northern rata and kahikatea, and kahikatea forest (e) with occasional rimu, nikau, puriri, puka and pukatea. To the west, towai forest (f) is prevalent on steep slopes below the ridgeline, occurring with frequent rewarewa, mamaku, and occasional large emergent rimu. In south-eastern areas, taraire forest (g) is common, with frequent puriri and kohekohe, and occasional tawa, mamaku, nikau and karaka. Kohekohe-puriri-taraire forest (h) also occurs in the south-west of the site, with occasional rimu, nikau, northern rata, karaka, mamaku, tawa, puriri, puka and pukatea, while steep gullies nearby are occupied by kohekohe forest (i).



P07/038 Maungaru Trig Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Significant flora

Asplenium gracillimum (regionally significant), black maire (regionally significant), carmine rata (regionally significant), *Coprosma tenuicaulis* (regionally significant), *Geranium solanderi* “coarse hairs” (regionally significant), kotukutuku (regionally significant) and *Hebe flavida* (regionally significant) were recorded in 2000 (SSBI P07/H023).

Fauna

NI brown kiwi (Nationally Vulnerable) were reported in 1978 by local residents (SSBI P07/H023), and droppings were recorded in 1992 (SSBI P07/H023*1). Kukupa (regionally significant), Australiasian harrier, tui, grey warbler, silverye and NI fantail were recorded in 1978 (SSBI P07/H023). Kukupa, shining cuckoo, morepork, grey warbler and NI fantail were recorded in 1992. There is also a 1992 record of copper skink (SSBI P07/H023*1).

Significance

Maunagaru Trig Forest contains a diverse range of forest types and displays a strong altitudinal sequence, its vegetation being most similar to the higher altitude plateau forests of western Northland, but it also has links to the rugged Tangihua Forest (Q07/111) 8 km to the south (SSBI P07/H023). It is representative for at least one ecological unit: (i) kohekohe forest in gully, the only of example of its type to be recorded in Tangihua ED. The site supports seven regionally significant plant taxa, and there are records of one threatened bird species. A Queen Elizabeth II Open Space Covenant covers 26.7 ha of the site. A year 2000 survey of the covenanted property at the southern end of the site recorded extensive grazing by goats on the lower slopes of the block, although the understorey still appeared to retain most of its original flora and should regenerate well. A mob of goats was recorded during this survey but has subsequently been culled. The close proximity of other forest blocks will provide a good source of seed and fauna (SSBI P07/H023). A survey in 1992 recorded high numbers of possums and grazing of the understorey by goats and cattle (SSBI P07/H023*1).

WAIMATA SCENIC RESERVE AND SURROUNDS

Survey no.	P07/039
Survey date	2 November 1998
Grid reference	P07 890990 (eight remnants)
Area	267.9 ha (Small adjustments were made to the 1998 site boundary based on the 2006 aerial photography)
Altitude	60-120 m asl

Ecological units

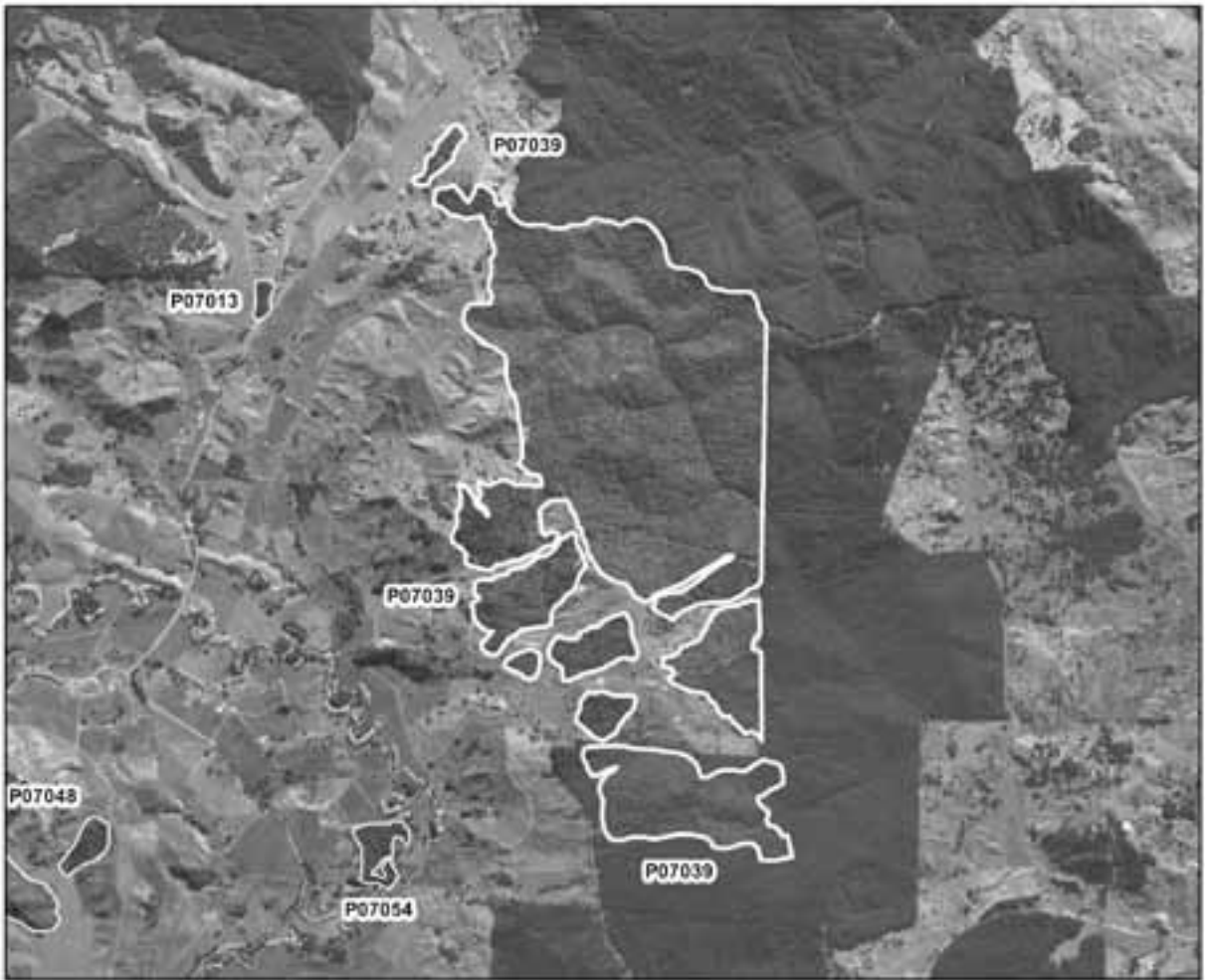
- (a) Kahikatea-totara forest on gentle hillslope
- (b) Kahikatea-taraire forest on moderate hillslope
- (c) Kahikatea forest on moderate hillslope
- (d) Kanuka/manuka forest on moderate hillslope
- (e) Kahikatea-taraire-totara forest on moderate hillslope
- (f) Totara-puriri forest on moderate hillslope
- (g) Kahikatea-puriri-taraire forest on moderate hillslope
- (h) Taraire forest on moderate hillslope
- (i) Totara forest on moderate hillslope
- (j) Taraire-towai forest on ridge
- (k) Kanuka/manuka-totara forest on moderate hillslope
- (l) Totara-towai forest in gully
- (m) Towai forest on ridge
- (n) Kanuka/manuka-towai forest on moderate hillslope
- (o) Mamangi-totara forest on ridge
- (p) Kahikatea-towai forest on moderate hillslope
- (q) Kahikatea-totara-towai forest in gully

Landform/geology

Steep hill country underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

The site comprises several areas of podocarp-dominated forest on hillslopes and features a range of forest types. The eastern side of the site adjoins the Avoca Forest pine plantation, and the remaining sides are surrounded by pasture. In the south-west alongside the vehicle track kahikatea and totara (a) are co-dominant with frequent rewarewa, towai and pukatea, and occasional nikau, puriri, pukatea, rewarewa, pukatea, taraire, rimu and mamangi. In the most northern stand-alone remnant in the south-west, kahikatea and taraire (b) occur with frequent totara and occasional kauri, nikau, rimu, pukatea, rewarewa, towai, puriri and kanuka/manuka. A small grove of kahikatea forest (c) also occurs here with occasional totara. Kanuka/manuka forest (d) also occurs in this remnant with frequent rimu and totara. Occasional species include



P07/039 Waimata Scenic Reserve and Surrounds



Aerial photography from 2002

rewarewa and kahikatea. In the small remnant just south of this kahikatea, taraire and totara (e) are common with frequent rewarewa and occasional emergent kauri, nikau, rimu and pukatea.

In the southernmost remnant on the hilltop abundant totara occurs with common puriri (f) and occasional kanuka/manuka. On the western side of this remnant kahikatea, puriri and taraire are co-dominant (g). Totara and rewarewa are frequent with occasional pukatea, nikau, tanekaha and mamaku, rimu and matai. Also in the west of this remnant common taraire (h) occurs with frequent towai and occasional rimu, rewarewa, kahikatea, kauri, puka, nikau and totara.

Abundant totara (i) with frequent kahikatea and occasional puriri and kanuka/manuka occurs on the western side of the main remnant. Taraire and towai (j) are co-dominant here also with frequent rewarewa and occasional puka, rimu, nikau, kahikatea and emergent kauri. Unit (a) kahikatea and totara forest and unit (h) taraire forest also occurs here. On the north-western side of the main remnant totara and kanuka/manuka (k) are common. Tanekaha is frequent with occasional mamaku, towai, and mamangi. In a gully here totara and towai (l) occur with frequent tanekaha and occasional kanuka/manuka, mamaku, taraire, puka and rewarewa. Abundant towai (m) occurs on the north-eastern side with frequent emergent rewarewa and occasional rimu, kahikatea, totara, taraire and kanuka/manuka. Around the middle of the main remnant, unit (h) taraire forest occurs with frequent rewarewa. Occasional species include puka, mamaku, karaka, puriri, nikau, northern rata, kahikatea, and emergent rimu. In the northern end of the main remnant kanuka/manuka and towai (n) occur with frequent tanekaha and mamangi and occasional totara, mamaku, ti kouka, and emergent rimu. Abundant mamangi with common totara (o) also occurs here. Tanekaha is frequent with occasional kahikatea, nikau, rewarewa, kohuhu, kanuka/manuka and emergent kauri. Kahikatea and towai (p) also occur here with frequent totara and rewarewa. Taraire, emergent rimu and kauri, nikau, tanekaha, puka and mamaku occur occasionally. In a gully also in this area, kahikatea, totara and towai (q) occur. Rewarewa is frequent with occasional nikau, tanekaha, puka, tawa, puriri and mamaku. Unit (c) kahikatea forest, unit (h) taraire forest, and unit (i) totara forest occur in the small remnant just south of the main forest, on the eastern side.

Significant flora

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

Fauna

Kukupa (regionally significant), shining cuckoo, NI fantail, welcome swallow, NZ kingfisher, Australasian harrier, spur-winged plover and paradise shelduck were recorded during this survey. Historical records (1978) of NI brown kiwi (Nationally Vulnerable), although a 1992 kiwi call survey did not record the presence of kiwi (SSBI P07/H024).

Significance

The site is relatively large and contains a range of vegetation types. It is likely to contain several representative forest types, not specifically identified in the 1998 survey. However, types (n) and (o) are the only examples of their type in Tangihua ED and should be considered representative. Forested areas are known to support at least one regionally significant plant species. The site also provides riparian and upper catchment protection for the Avoca Stream and its tributaries. Over half of the site (150.2 ha) is formally protected as the Waimata Settlement Scenic Reserve (DOC-administered). A 1978 survey noted stock damage in unfenced areas (SSBI P07/H024). *Elaeagnus* is locally scattered on the road margins (Wildland Consultants 2004).

AVOCA ROAD KAURI REMNANT

Survey no.	P07/040
Survey date	20 April 1999
Grid reference	P07 881954
Area	5.7 ha
Altitude	18-75 m asl

Ecological units

- (a) Kauri forest on gentle hillslope (60%)
- (b) Kahikatea-totara forest on moderate hillslope (40%)

Landform/geology

Hillslope underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

The site comprises a small, isolated remnant of kauri-podocarp forest surrounded by pasture. Mature kauri (a) are emergent over occasional totara and kahikatea near the top of the hillslope. The remainder of the remnant consists of co-dominant kahikatea and totara forest (b) with occasional taraire, matai, kauri, rimu and pukatea.

Fauna

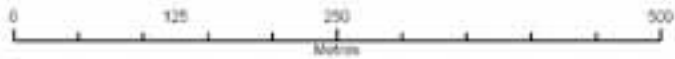
Not surveyed, but Australasian harrier was recorded during this survey.

Significance

Despite its size, Avoca Road Kauri Remnant is significant because it contains a representative example of (a) low altitude mature kauri forest, which is very rare in Tangihua ED. Most of the site (4.3 ha) is Queen Elizabeth II Open Space Covenant.



P07/040 Avoca Road Kauri Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Rowri 2002

MAMARANUI FARM SETTLEMENT SCENIC RESERVE AND SURROUNDS

Survey no.	P07/041
Survey date	2 November 1998
Grid reference	P07 833955 (eight remnants)
Area	330.5 ha (323.5 ha forest, 7 ha shrubland) (Small adjustments were made to the 1998 site boundary based on the 2006 aerial photography)
Altitude	20-299 m asl

Ecological units

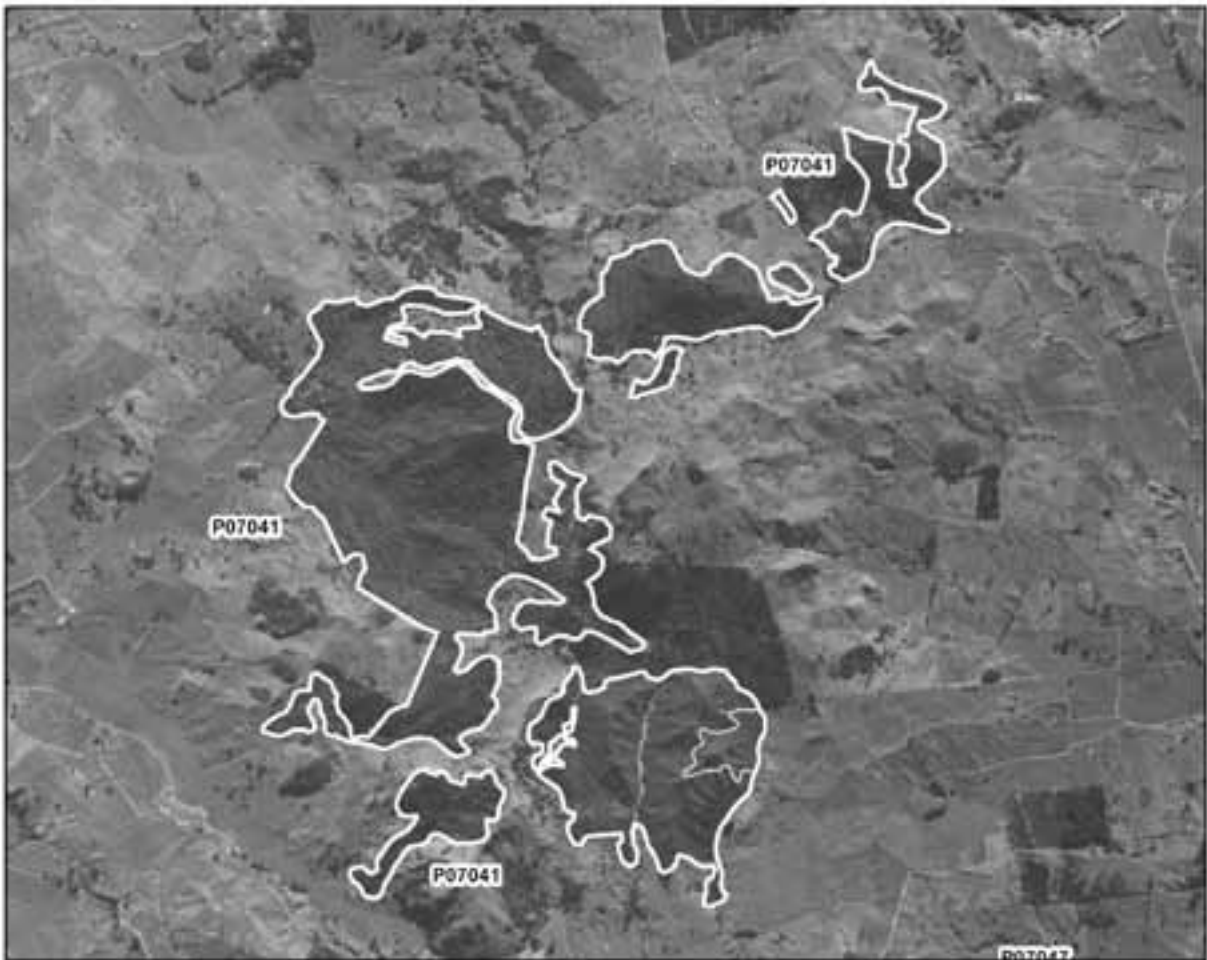
- (a) Kahikatea-totara forest on hillslope
- (b) Puriri-taraire forest on hillslope
- (c) Kauri-totara forest on hillslope
- (d) Kahikatea-totara-towai forest on hillslope
- (e) Kahikatea-towai forest on hillslope
- (f) Taraire forest on hillslope
- (g) Kohekohe-puriri-taraire forest on hillslope
- (h) Kahikatea-taraire forest on hillslope
- (i) Kowhai-puriri forest on hillslope
- (j) Totara forest on alluvium
- (k) Kahikatea forest on hillslope
- (l) Nikau-puriri-taraire forest on hillslope
- (m) Rewarewa-taraire-totara forest on hillslope
- (n) Kahikatea-puriri-totara forest on hillslope
- (o) Tanekaha forest on gentle hillslope
- (p) Kahikatea-kauri-totara forest on hillslope
- (q) Kanuka/manuka forest on gentle hillslope
- (r) Totara-puriri forest on steep ridge
- (s) Tanekaha-totara forest on hillslope
- (t) Towai forest on hillslope
- (u) Totara-towai forest on hillslope
- (v) Manuka shrubland on hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex) in the north and Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex) in the south.

Vegetation

The site encompasses diverse podocarp-broadleaved forest within Mamaranui Scenic Reserve and adjacent forest remnants centred on Pukewharariki Trig.



P07/041 Mamaranui Farm Settlement Scenic Reserve and Surrounds



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Northern Portion of Forest Tract

On north-western mid-slopes kahikatea and totara forest (a) occurs with frequent taraire and occasional pukatea, kowhai, puriri, rewarewa, tawa, nikau and kohekohe. On the lower slopes to the east, puriri and taraire forest (b) occurs with frequent kohekohe and rewarewa. Also present are kahikatea, totara, kowhai, nikau and mamaku. Unit (b) puriri-taraire forest continues westwards, but in this area totara is frequent and kahikatea, rewarewa, tawa, kohekohe, pukatea and kowhai occur occasionally in the canopy. Further east, the forest type changes to kauri-totara forest (c), with occasional rimu and rewarewa, and kahikatea are also present.

Adjacent to Hackett Road, at the eastern end of the remnant, there is kahikatea, totara and towai (d) with frequent mamaku and occasional taraire, rewarewa, tanekaha, houhere, wheki and pigeonwood. On hillslopes to the west of here, the forest consists mostly of kahikatea and towai (e) with frequent totara and occasional pukatea, rewarewa, miro, taraire, rimu, kowhai, tawa, mamaku, ti kouka, nikau and pate. Continuing westwards, dominant taraire (f) occurs with occasional pukatea, tawa, kohekohe, rimu, towai, puriri, rewarewa, nikau and puka. Further west, kohekohe, puriri and taraire are co-dominant (g) with frequent rewarewa and occasional tawa, kowhai, titoki, totara, ti kouka, mahoe, pate, mamaku and puka.

Further west again, kahikatea and taraire (h) are common with occasional puriri, totara, rimu, mamaku, nikau and puka. On the upper slopes near the top, a small area of kowhai and puriri (i) occurs. Kahikatea, rewarewa, totara, karaka, taraire and mamaku are also present. Downslope from here, unit (f) taraire forest occurs. Occasional rewarewa, kohekohe, pukatea, mamaku and puka are also present. Totara forest (j) occurs on stream terraces with occasional kahikatea, rewarewa, tanekaha, taraire, tawa, houhere, mamaku, ti kouka and nikau. West of here, above the stream, kahikatea forest (k) is dominant. Pukatea is frequent with occasional totara, towai, houhere, lancewood and putaputaweta. Continuing westwards, unit (k) kahikatea forest and unit (a) totara forest occur. Houhere is also present in the canopy. Further west, unit (f) taraire forest occurs. Associated canopy species include frequent rewarewa and occasional kahikatea, miro, tawa, nikau, mamaku, puka, pukatea and emergent northern rata, rimu and kauri. At the junction of the two large tracts of forest, unit (k) kahikatea forest and unit (a) totara forest occur with occasional rimu, rewarewa, towai, tanekaha, nikau, mamaku and lancewood.

Central Portion of Forest Tract

(l) On the north-facing hillslope to the north-west of Pukewharariki Trig, nikau, puriri and taraire are associated. There are gaps in the canopy which also contains occasional pukatea, kahikatea, rewarewa, northern rata, rimu, tawa, mamaku, puka, pine, and totara on the edge. West of here, unit (f) taraire forest occurs. Rewarewa is frequent with occasional puriri, totara, pukatea, kahikatea, rimu, nikau and mamaku. Downslope from unit (f) rewarewa, taraire and totara (m) occur with frequent kahikatea and nikau and occasional puriri and mamaku. Continuing westwards, the forest changes to kahikatea, puriri and totara (n) with frequent nikau and occasional taraire, kohekohe, kowhai, puka and mamaku. Around

Pukewharariki Trig tanekaha forest (o) occurs with frequent rewarewa, puriri, nikau and totara at the edges. Kahikatea, kohuhu, ti kouka, putaputaweta, indigenous broom, mahoe, houhere, and lancewood are all occasional. North-west of the trig on the western side of the remnant, there is common kahikatea, kauri and totara (p). Rimu occurs frequently and with occasional ti kouka. South of here on the western edge of the remnant, unit (k) kahikatea forest occurs. Rewarewa is frequent with occasional puriri, pukatea, puka, mamaku, rimu, totara and nikau. Upslope from here, unit (b) puriri-taraire forest occurs. Kohekohe is frequent with occasional tawa, pukatea, totara, mamaku, nikau and puka. On the lower slopes, dominant kanuka/manuka forest (q) occurs with occasional emergent kauri. Higher up on a steep ridge totara forest (r) is dominant and puriri common. Also present are rewarewa, pukatea, kohekohe and puka. South of here, totara and tanekaha (s) are common with occasional kanuka, manuka, kahikatea, rewarewa, mamaku and nikau. Eastwards, unit (a) kahikatea-totara forest occurs with occasional puriri, rimu, kauri, kanuka, manuka, rewarewa and puka. Between the central and southern portions of the forest tract, unit (a) kahikatea-totara forest occurs.

Southern Portion of Forest Tract

On the eastern side towai forest (t) occurs with occasional totara, manuka, and emergent pine. West from here on a moderate west-facing hillslope, totara and towai (u) occur with occasional rewarewa, ti kouka and mamaku. The shrubland area consists of low-growing manuka (v). On the north-western side of the remnant, unit (j) totara forest occurs with frequent manuka and occasional tanekaha, towai, rimu, ti kouka and kohuhu. On the south-western slopes unit (a), kahikatea-totara occurs with frequent totara and occasional ti kouka and puriri, and emergent kauri.

Significant flora

Daucus glochidiatus (Nationally Critical), *Brachyglottis kirkii* (Declining), kawaka (Naturally Uncommon). Regionally significant: *Azolla filiculoides*, *Collospermum microspermum*, *Coprosma crassifolia*, *C. rigida*, *Geranium solanderi* “course hairs” and *Olearia albida* (all recorded in 2003, SSBI P07/H027). Unconfirmed records of *Libertia grandifolia* and *Neomyrtus pedunculata* (both regionally significant) (SSBI P07/H027).

Fauna

NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), silveryeye, grey warbler, NI fantail, kingfisher, and welcome swallow were recorded during a survey in 1978 (SSBI P07/H027). Kukupa, NI fantail, Australasian harrier and paradise shelduck were recorded in an ecological survey in 2003, along with kauri snail (Gradual Decline) (SSBI P07/H027). No kiwi were recorded during this survey. The land snail Punctidae sp. 159 (Range Restricted) is also known from the site (Brook 2002).

Significance

This scenic reserve supports two threatened fauna species, three threatened plant species, and five confirmed and two unconfirmed regionally significant plant taxa, and has historic records of NI brown kiwi. The site has a high number of vegetation types and contains a rare and representative altitudinal forest sequence from alluvial flats graduating to steep hillslope. The site is representative for at least ten ecological units: (c), (e), (i), (j), (k), (l), (m), (n), (p) and (v). Type (i) has only been recorded from this site in Tangihua ED. Riparian and upper catchment buffering is provided for several small streams. This site also has high landscape values, being clearly visible from State Highway 12. Approximately 30% of the site is formally protected: 28.9 ha are in Queen Elizabeth II Open Space Covenants and 89.9 ha are in the Mamaranui Farm Settlement Scenic Reserve (DOC-administered). A 2003 ecological survey of this site commented that the area was largely weed-free, which can be attributed to the area being surrounded by clean, well-managed pasture. Possums were abundant and pig sign was recorded in one small area. There are also past records of goats (SSBI P07/H027).

PUKEHUIA ROAD REMNANTS

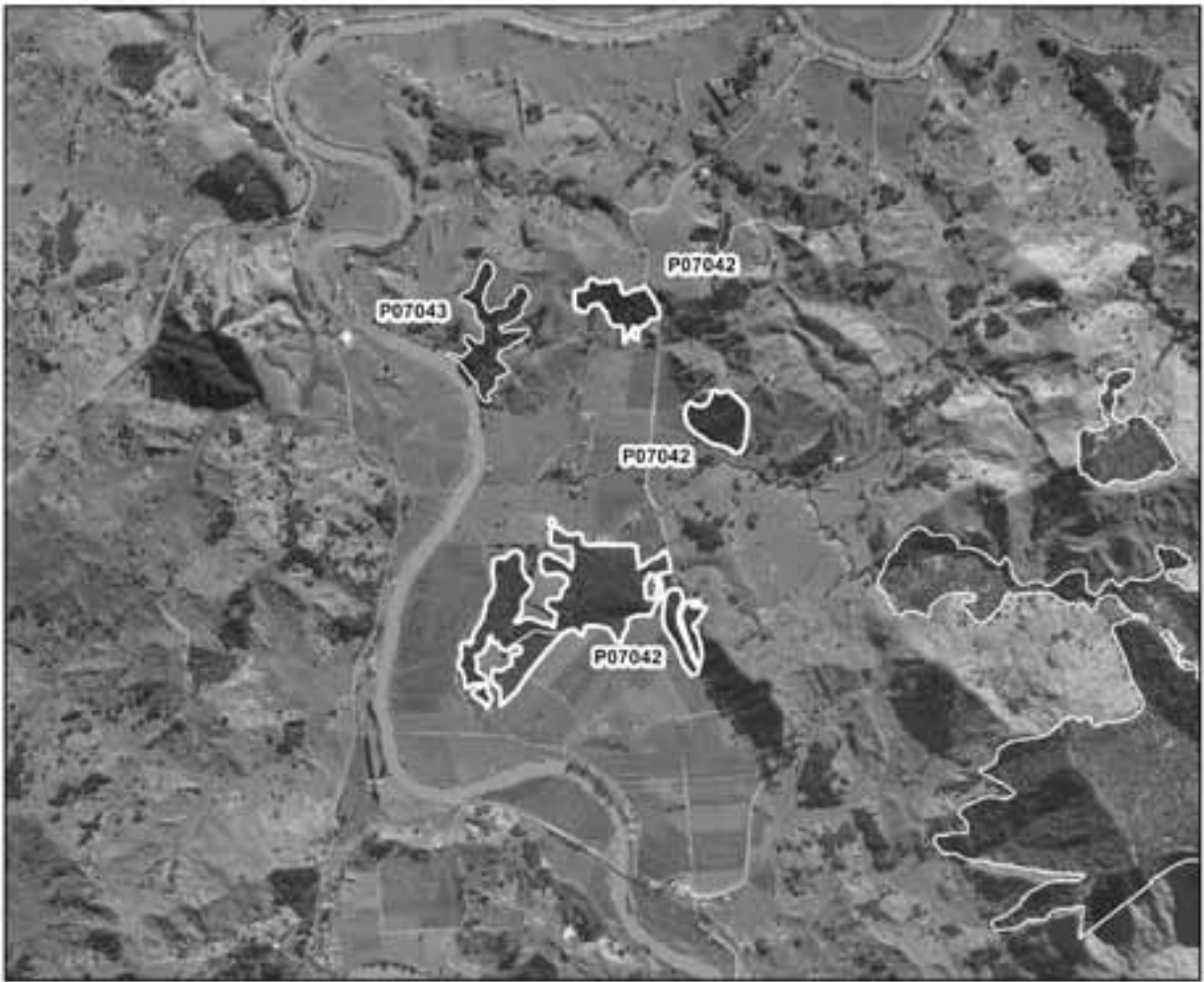
Survey no.	P07/042
Survey date	29 July 1996 and 2 February 2009
Grid reference	P07 036936 (five remnants)
Area	46.9 ha (42.9 ha forest, 4 ha shrubland) (This site has been adjusted to fit with 2006 aerial photography. The main change was the addition of two small remnants located to the north of the original site)
Altitude	5-50 m asl

Ecological units

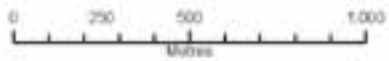
- (a) Manuka-ti kouka-*Coprosma propinqua* shrubland on alluvium (10%)
- (b) Manuka shrubland on alluvium (5%)
- (c) Totara-tanekaha forest on hillslope (< 3%)
- (d) Rimu-kanuka/manuka-totara forest on hilltop (20%)
- (e) Totara-kanuka/manuka forest on hillslope (10%)
- (f) Taraire forest on moderate to steep hillslope (10%)
- (g) Manuka shrubland on hillslope (< 3%)
- (h) Kanuka/manuka shrubland on hillslope (15%)
- (i) Kahikatea-kanuka/manuka-totara forest on hillslope (10%)
- (j) Kanuka/manuka-totara forest on hillslope (10%)
- (k) Totara-taraire forest on hillslope (< 3%)
- (l) Totara-puriri forest on hillslope (< 3%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).



P07/042 Pukehuia Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

Vegetation

The site comprises five remnants consisting of mixed indigenous shrub associations and regenerating podocarp-broadleaved forest surrounded by pasture. The smaller remnants to the east and north of the original site were surveyed by Wildland Consultants (2009). The swamp shrubland area west of the road is dominated by manuka with common ti kouka and *Coprosma propinqua* (a). *Coprosma tenuicaulis* is frequent with occasional raupo and *Juncus* sp. (b). The other swamp shrubland area consists of low manuka (b) (≤ 3 m high) with occasional emergent kahikatea and ti kouka.

At the northern end of the eastern forest remnant, there is common tanekaha and totara (c). Kanuka and manuka occur frequently with occasional ti kouka. On the hilltop of this remnant emergent rimu is abundant, and totara and kanuka/manuka (d) are common with occasional rewarewa, kauri and ti kouka. This remnant also contains totara and kanuka/manuka (e), with occasional rimu and kahikatea. Taraire (f) is also common here, with frequent towai and occasional totara, kahikatea, tawa and mamaku.

The eastern shrubland area consists of low manuka (g) (≤ 2 m high) on hillslope. Totara and kahikatea are emergent. The western shrubland hillslope area is made up of kanuka/manuka shrubland (h) up to six metres in height. Totara is a frequent emergent. The toeslope of this shrubland also consists of unit (h) kanuka/manuka shrubland with frequent ti kouka and occasional emergent puriri and kahikatea. The forest area contiguous with the shrubland is partly made up of kahikatea, kanuka/manuka and totara (i), with occasional puriri, while the remainder of the area comprises kanuka/manuka and totara (j) with occasional rimu and kahikatea.

A small area east of Pukehuia Road contains totara forest with frequent taraire (k) and occasional emergent kahikatea, rimu, tanekaha and pukatea. North of the main remnant is a botanically diverse area of totara forest with frequent puriri (l) and occasional taraire, and emergent kauri, kahikatea and rimu.

Significant flora

Coprosma tenuicaulis (regionally significant) was recorded during this survey.

Fauna

Grey warbler, silvereye, tui, NI fantail and kingfisher were recorded in 1978. A subsequent survey in 1988 recorded grey warbler, NI fantail, kingfisher and shining cuckoo. Australasian harrier was recorded in 1999 (SSBI P07/H046). Low numbers of NI brown kiwi (Nationally Vulnerable) were probably present in 1988 (SSBI P07/H046).

Significance

The Pukehuia Road Remnants encompass a mosaic of habitats, including alluvial shrubland, which is a rare vegetation type in Tangihua ED and Northland. The site is representative for at least seven ecological units:

(a), (b), (c), (d), (e), (h) and (i). The site features a good diversity of plant species and contains one regionally significant plant species. Kiwi may be present, although an up-to-date survey is recommended. 12.6 ha are formally protected in Queen Elizabeth II Open Space Covenants.

WILSON ROAD FOREST REMNANT

Survey no. P07/043
Survey date 20 May 1999
Grid reference P07 030946
Area 8.8 ha
Altitude 16-50 m asl

Ecological units

- (a) Kauri forest on gentle hillslope (20%)
- (b) Kauri-taraire-totara forest on hillslope (25%)
- (c) Kanuka/manuka-totara forest on hillslope (30%)
- (d) Tanekaha-totara-towai forest on hillslope (25%)

Landform/geology

Hillslopes underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

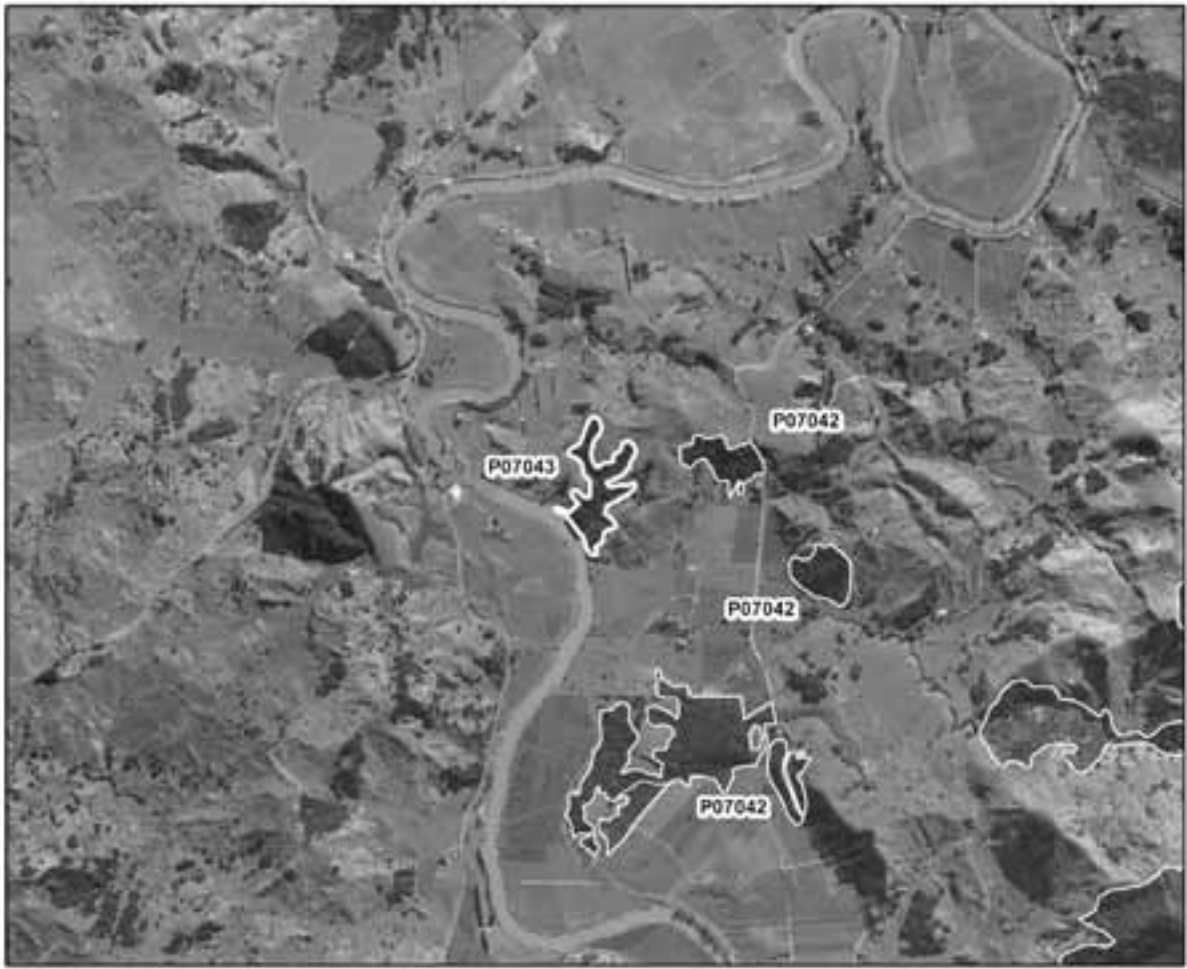
The site comprises a small forest remnant on the true left bank of the Wairoa River. The northern area of the remnant is made up of kauri forest (a) (mainly rickers with some semi-mature trees) with occasional tanekaha and rimu. Towards the river's edge the forest changes to kauri, taraire and totara (b). Occasional species include kowhai, puriri, ti kouka and puka. On the southern side of the stream tributary there is co-dominant kanuka/manuka and totara (c) with occasional puriri, tanekaha and ti kouka. In the remaining area, tanekaha-totara-towai forest (d) occurs with occasional kowhai, ti kouka, kanuka and manuka.

Fauna

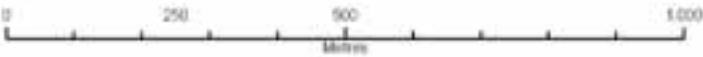
Black shag (Naturally Uncommon), white-faced heron and Australasian harrier were recorded during this survey.

Significance

The site supports one threatened bird species and contains kauri forest, which is an uncommon vegetation type in Tangihua ED. It is representative for two ecological units: (a) and (b). A small part of the site (1.6 ha) is Queen Elizabeth II Open Space Covenant.



P07/043 Wilson Road Forest Remnant



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

MAPUNA ROAD REMNANTS

Survey no.	P07/044
Survey date	20 May 1999
Grid reference	P07 012889 (seven remnants)
Area	6.2 ha
Altitude	1-7 m asl

Ecological units

- (a) Kahikatea forest in marsh
- (b) Ti kouka-*Coprosma propinqua*-kahikatea forest in marsh
- (c) Nikau forest in marsh

Landform/geology

Valley floor on Holocene alluvium.

Vegetation

The site comprises riverine marsh associations with seven small alluvial forest remnants near the Wairoa River. The two westernmost remnants consist entirely of young kahikatea forest (a). Moving eastwards, the next remnant comprises unit (a) kahikatea forest, but with frequent pukatea and occasional rewarewa and nikau in the canopy. The next remnant also contains unit (a) kahikatea forest, but with frequent ti kouka and *Coprosma propinqua*. The northernmost remnant partly comprises forest of co-dominant ti kouka, *Coprosma propinqua* and kahikatea (b). Nikau is frequent with occasional pukatea, pampas and raupo. The remainder of this remnant consists of c.8 m tall nikau forest (c). Kahikatea is frequent and pukatea and puriri occasional. Crack willow is common at the river's edge.

Fauna

Black shag (Naturally Uncommon), Australasian harrier and white-faced heron were recorded during this survey.

Significance

The site supports one threatened bird species and contains marsh association which are rare in Tangihua ED and throughout Northland. Ecological units (b) and (c) are the only records of their types in Tangihua ED; however, due to the fact that the remnant was being grazed at the time of survey, none of the ecological units can be considered representative. Fencing would significantly enhance the site's ecological values.

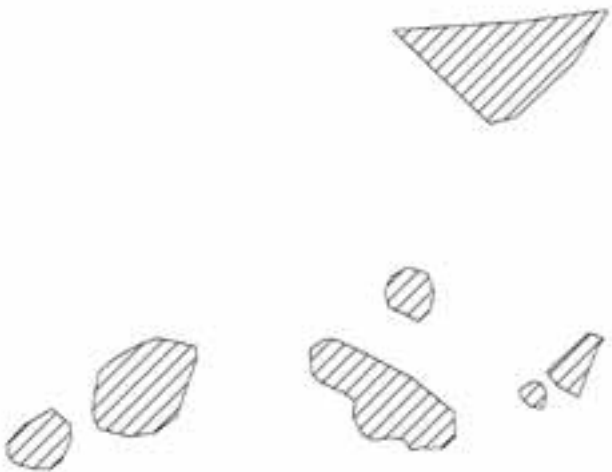


P07/044 Mapuna Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

WAIHUE ROAD SHRUBLAND AND FOREST REMNANT

Survey no.	P07/047
Survey date	15 June 2000, 9 February 2009
Grid reference	P07 857914 (three remnants)
Area	318.9 ha (237 ha forest, 73.8 ha shrubland, 8.1 ha wetland)
Altitude	20-115 m asl

Ecological units

- (a) Kanuka/manuka-totara forest on hillslope
- (b) Kahikatea-totara forest on hillslope
- (c) Kanuka/manuka-tanekaha-totara forest on hillslope
- (d) Kauri-tanekaha forest on hillslope
- (e) Kanuka/manuka-pine-totara forest on hillslope
- (f) Kanuka/manuka forest on hillslope
- (g) Ti kouka-kanuka/manuka shrubland on hillslope
- (h) Manuka shrubland on hillslope
- (i) Kahikatea forest in gully
- (j) Kanuka/manuka-kahikatea-totara shrubland on hillslope
- (k) Kanuka/manuka-totara shrubland on hillslope
- (l) Kahikatea forest on hillslope
- (m) Kahikatea-taraire forest on hillslope
- (n) Raupo-manuka reedland in swamp
- (o) Manuka-totara shrubland on hillslope

Landform/geology

Hill country of Cretaceous sandstone and mudstone (Mangakahia Complex), with a small area of melange (undifferentiated Mangakahia & Motatau Complex lithologies) in the north, and overlain by Pleistocene consolidated dune sand in the south.

Vegetation

At the north-eastern corner of the largest remnant, kanuka/manuka and totara (a) occurs with frequent mamaku. West of here, kahikatea and totara (b) are co-dominant with frequent puriri. West of the wetland alongside Waihue Road, there is common kanuka/manuka, tanekaha and totara (c). Rimu is frequent with occasional ti kouka. South-west of here kauri and tanekaha (d) occur with frequent rimu and totara, and occasional kanuka and manuka. Further south, kanuka, manuka, totara and emergent pine (e) are common. Occasional species are ti kouka and mamaku. At the southern end of the large remnant, kanuka/manuka forest (f) occurs. Totara is frequent with occasional ti kouka, mamaku, pampas and emergent pine.



P07/047 Waihue Road Shrubland and Forest Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

In the centre of the shrubland area on the west side of the remnant, ti kouka-kanuka/manuka shrubland (g) is present with frequent totara, and occasional pampas and emergent kahikatea and rimu. Most of the remaining shrubland area consists of low growing manuka (h). The small forest outcrop on the west side of the shrubland consists of kahikatea (j). Kanuka, manuka, totara and ti kouka are frequent with occasional taraire, titoki, pukatea and nikau. Raupo and harakeke are present on the margins. North of here, there is tall shrubland made up predominantly of, kanuka/manuka, kahikatea and totara (j). Also present are frequent mamaku and occasional ti kouka. The northern edge of the shrubland features kanuka/manuka and totara (k).

The small separate remnant to the north is kahikatea forest (l), with frequent totara and rimu, and occasional kauri, tanekaha and pukatea. In the remaining remnant, the northern shrubland area consists mainly of unit (h) manuka shrubland on hillslope, with occasional ti kouka and occasional emergent totara and puriri. In the forest area of the large remnant, the central part consists of mostly kahikatea and taraire forest (m). Rimu, pukatea and nikau are frequent while puriri is scattered. The southern part of the site is dominated by kahikatea with common totara (b). Rimu and tanekaha occur frequently with occasional rewarewa, manuka, ti kouka and nikau.

A survey in 2009 (Wildland Consultants) recorded a small wetland on the eastern edge of the large forest remnant, adjacent to Waihue Road. It is dominated by raupo reedland (n), which grades into manuka-totara shrubland (o) on hillslope (contiguous with the Waihue Road Remnant).

Fauna

Australasian harrier was recorded during this survey.

Significance

The site comprises a relatively large remnant within a highly modified area adjacent to Awakino Flaxmill Swamp. Over half the site comprises shrubland, which is an important ecosystem for forest succession and can provide important habitat for threatened plants and animals. Raupo reedland may provide potential habitat for threatened species such as NI fernbird and spotless crane. The site contains a representative example of a freshwater wetland-terrestrial forest ecotone, which includes five ecological units: (g), (o), (g), (j) and (p). It also provides buffering and upper catchment protection for a number of small streams. Further survey is required to establish the full significance of this site.

TONGARIRO FOREST REMNANTS

Survey no.	P07/048
Survey date	16 June 2000
Grid reference	P07 853984 (11 remnants)
Area	81.9 ha (68.7 ha forest, 13.2 ha shrubland) (Small adjustments were made to the 2000 site boundary based on the 2006 aerial photography)
Altitude	20-387 m asl

Ecological units

- (a) Taraire forest on alluvium
- (b) Totara-taraire forest on hillslope
- (c) Puriri forest on hillslope
- (d) Puriri-totara forest on hillslope
- (e) Kahikatea-totara forest on hillslope
- (f) Taraire forest on hillslope
- (g) Totara forest on hillslope
- (h) Kohekohe-taraire-totara forest on hillslope
- (i) Kanuka/manuka shrubland on hillslope
- (j) Kanuka/manuka-totara-towai forest on alluvium
- (k) Mahoe-taraire forest on alluvium
- (l) Puriri-taraire forest on hillslope
- (m) Kahikatea-taraire forest on alluvium

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex) in the west, and by Cretaceous sandstone or mudstone (Mangakahia Complex) in the east (i.e., the shrublands).

Vegetation

The site comprises several remnants of indigenous forest and shrubland within the Maropiu Forest (pine plantation). The northern remnant partly consists of taraire riverine forest (a). Nikau is frequent with occasional puriri, titoki, rewarewa, kohekohe, mahoe, and puka. The remaining forest is totara-dominated with taraire common (b). Puriri, kohekohe and nikau are frequent with occasional houhere, putaputaweta, rewarewa, pukatea and mamaku.

In the remnant south of unit (b), the forest type is puriri (c) with frequent totara and taraire. Occasional species include titoki, kahikatea, karaka, kohuhu, pigeonwood, nikau, ti kouka and mamaku. This remnant also contains dominant puriri and common totara (d), while occasional species include kohekohe, houhere, kahikatea, rewarewa, taraire, northern rata, mamaku and puka. In the remnant east of here, kahikatea-totara forest (e) occurs with occasional rewarewa, houhere and mamaku. This remnant also contains dominant taraire (f) with frequent kanuka, manuka, mamaku and nikau. Occasional species include kohekohe, kahikatea and puka.

In the remnant to the east of here, the lower western slopes consist of kohekohe and taraire forest (g). Rewarewa, kahikatea, and mamaku are also present. The eastern slopes of this remnant comprise unit (f) taraire forest with frequent kohekohe and occasional mamaku. Further east, unit (f) taraire forest on hillslope occurs at the southern end. Frequently occurring species include puriri and kohekohe while kahikatea, rewarewa, mamaku, nikau and totara occur occasionally.

Towards the north of this remnant there is kohekohe, taraire, and totara forest (h). Kahikatea is frequent and kowhai, karaka, lancewood, nikau and mamaku are scattered throughout. The northern end of the remnant contains unit (g) totara forest on hillslopes, with frequent kahikatea and occasional puriri and taraire. The two shrubland remnants to the east of here consist of kanuka/manuka (i).

The southern remnant contains an area of riverine forest adjacent to Waimata Road. It partly consists of kanuka/manuka, totara, and towai (j) with frequent nikau, mamaku, mahoe and *Acacia* sp. Occasional species include kowhai, rewarewa, pigeonwood, kohuhu, ti ngahere and puriri. The eastern part of the riverine forest consists of mostly mahoe and taraire (k). Kohekohe, kahikatea, and pate are frequent, with occasional pukatea, totara, wineberry, rewarewa, putaputaweta, nikau, towai, rimu and mamaku. On the hillslopes above the riverine forest, unit (d) puriri-totara forest occurs again. Totara and kohekohe are frequent with occasional titoki, karaka, taraire, kowhai, mamaku, mangeao, rewarewa and tanekaha. The highest point of this remnant is covered in unit (g) totara forest on hillslope, with occasional karaka.

East of this point there is puriri-taraire forest (l) on a steep hillslope. Pukatea and kohekohe are frequent, and totara, nikau, mamaku, and emergent rewarewa are present in low numbers. Further east there is kahikatea-taraire forest (m) with frequent totara. Also present are miro, pukatea, kohekohe, lancewood and kohuhu.

Significant flora

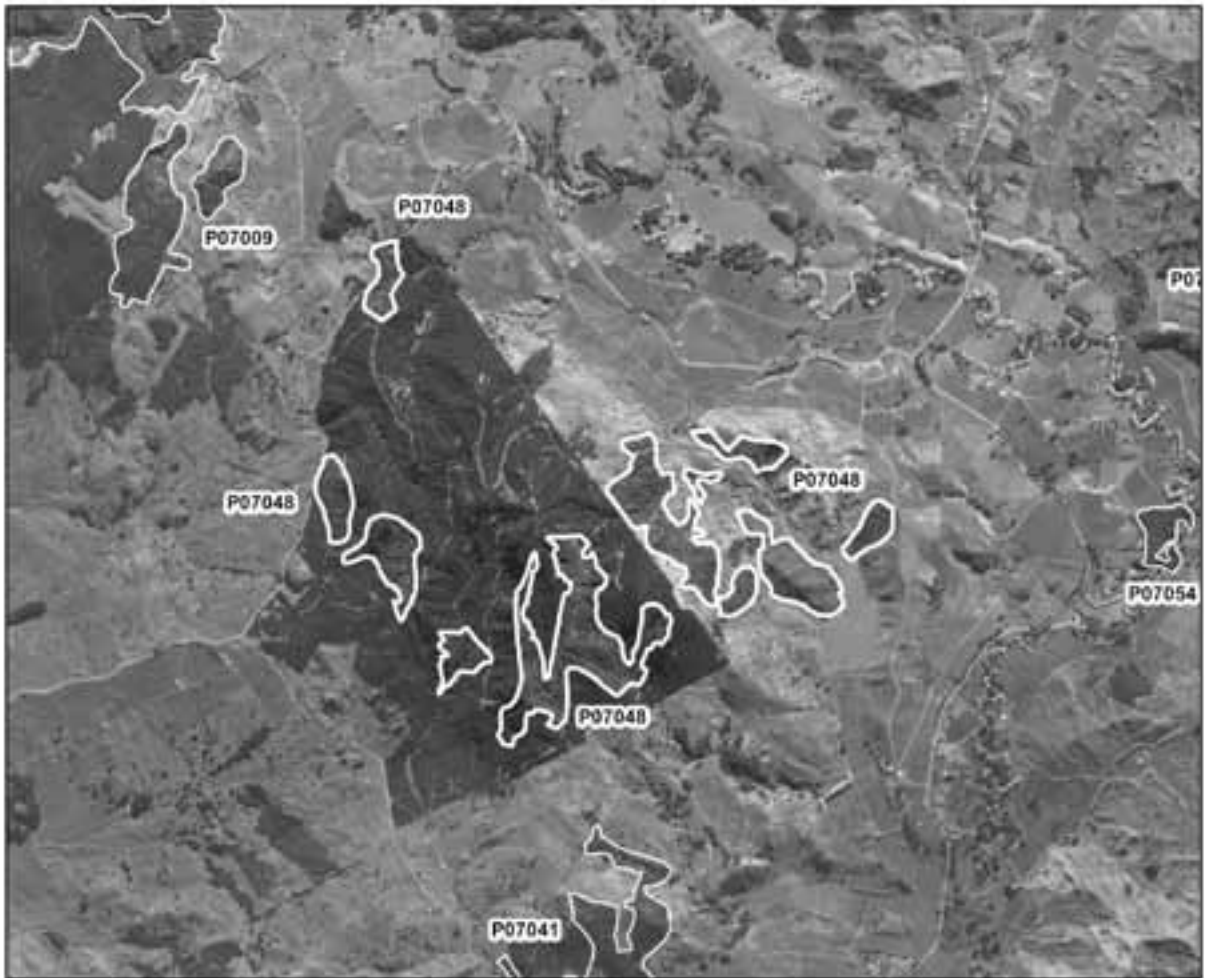
Northern rata (regionally significant) was recorded during this survey.

Fauna

Kukupa (regionally significant), NI fantail, silvereve, and Australasian harrier were recorded during this survey.

Significance

The site provides habitat for one regionally significant plant species, and is likely to provide refugia for forest species during the logging of adjoining pine forest. The site is representative for five ecological units: (a), (h), (j), (k) and (m). Alluvial forest is considered a rare habitat type in Tangihua ED and Northland. 0.9 ha of the site is protected in the Kairara Conservation Area (DOC-administered).



P07/048 Tongariro Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Brown 2002

AVOCA FOREST REMNANTS

Survey no. P07/050
Survey date 19 June 2000
Grid reference P07 929977
Area 6.9 ha (four remnants)
Altitude 0-60 m asl

Ecological units

- (a) Kowhai-taraire forest on hillslope (70%)
- (b) Kahikatea-totara forest on hillslope (15%)
- (c) Totara forest on hillslope (15%)

Landform/geology

Hillslope on Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group).

Vegetation

This site comprises an isolated podocarp-broadleaved forest remnant and three small, peripheral remnants. Kowhai-taraire forest (a) dominates the south-facing slope, while totara is frequent on the edges, and puriri and karaka occur occasionally. The remaining forest on the southern slope is defined by kahikatea and totara (b) with occasional karaka. The northern part of the remnant is dominated by totara forest (c), with occasional rimu and kahikatea.

Fauna

Kukupa (regionally significant) was recorded during this survey.

Significance

Despite its size and relative isolation, the site is significant because it contains a representative example of unit (a) kowhai-taraire forest, a rare forest type in Tangihua ED (recorded only once). It also contains coarse-grained bioclastic limestone, which is a very rare landform in Tangihua ED and Northland (F. Brook, pers.comm.). The forest provides food requirements to support kukupa, especially if pest control is carried out.

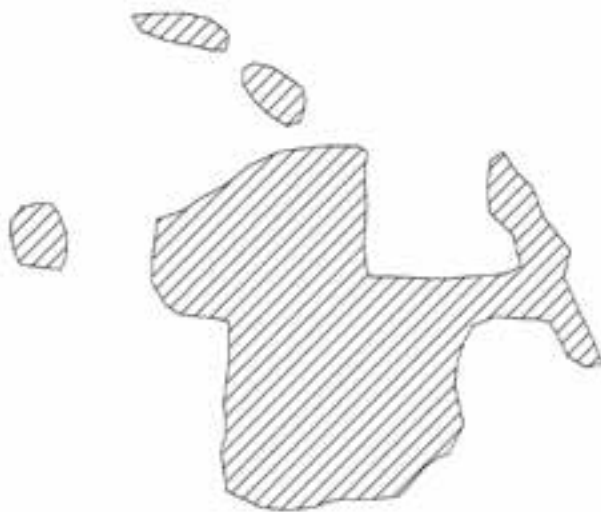


P07/050 Avoca Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

TARAIRE SCENIC RESERVE

Survey no. P07/054
Survey date 2 November 1998
Grid reference P07 878986
Area 4.6 ha
Altitude 36-40 m asl

Ecological units

(a) Taraire-totara-kahikatea forest on alluvium (100%)

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terrace.

Vegetation

The site comprises a very small alluvial remnant bordering the Awakino River. The remnant is characterised by co-dominant taraire, totara, and emergent kahikatea (a), with frequent puriri. A range of occasional species is present, including pukatea, kowhai, nikau, mahoe, *Passiflora tetrandra*, titoki, turepo, ti kouka, rewarewa, miro, mamaku, mapou and kanuka/manuka.

Significant flora

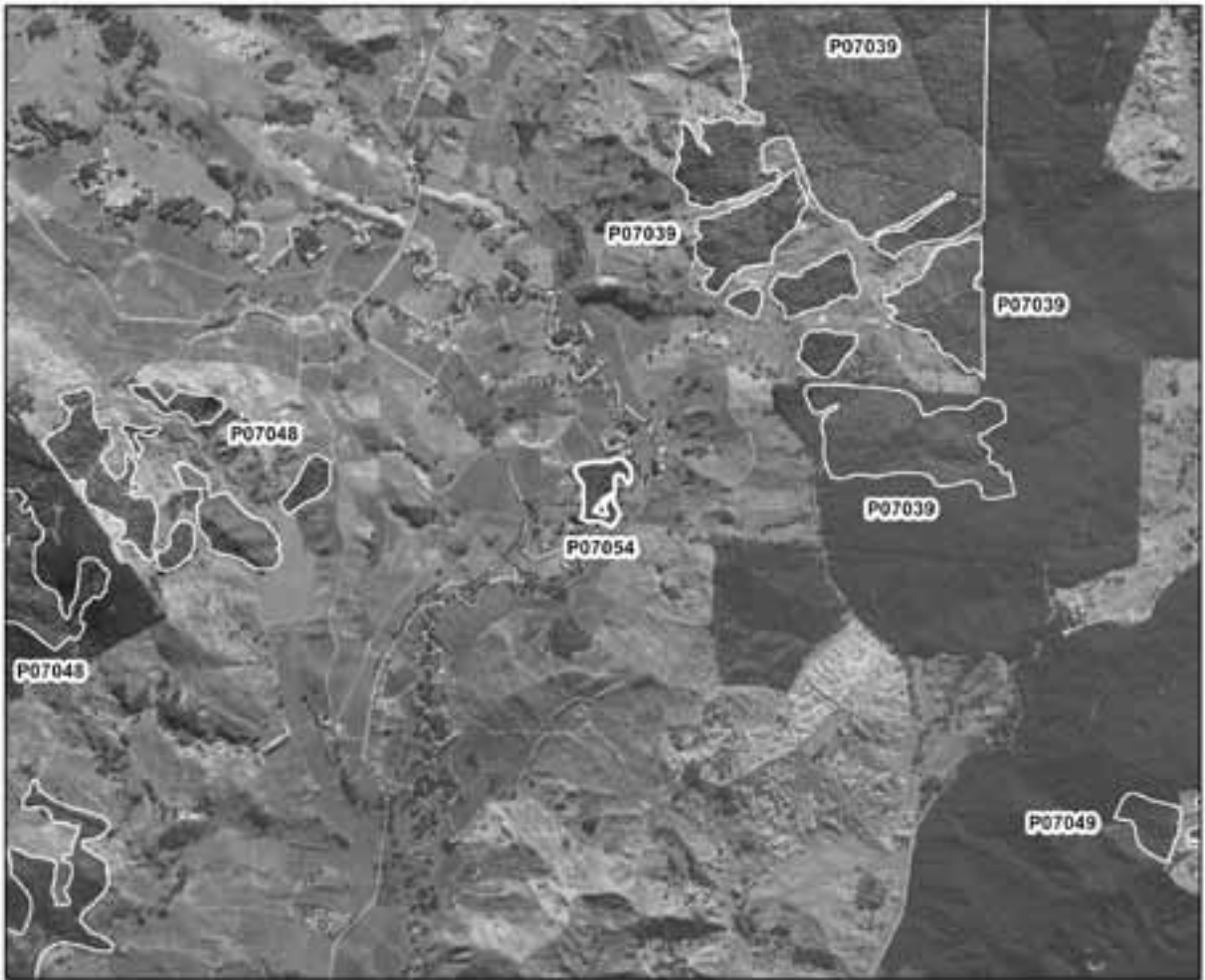
Passiflora tetrandra (regionally significant) was recorded during this survey.

Fauna

Not surveyed.

Significance

Taraire Scenic Reserve contains alluvial forest, which is a greatly diminished vegetation type in Tangihua ED and in Northland, and is therefore representative for (a) taraire-totara-kahikatea forest on alluvium. The site contains one regionally significant plant species, and is also fenced to exclude stock. The site is large relative to the amount of alluvial forest remaining in Tangihua ED. Approximately 50% of the site is formally protected as a DOC-administered Scenic Reserve. Taraire is a staple food of kukupa, and given the site's proximity to larger areas such as Waimata Scenic Reserve (P07/039), it is likely to receive significant use by kukupa (regionally significant) (R. Pierce, pers. comm.).



P07/054 Taraira Scenic Reserve



Aerial photography from 2002

PAERATA WILDLIFE MANAGEMENT RESERVE

Survey no.	P07/055
Survey date	15 August 1996
Grid reference	P07 045000
Area	208.2 ha (153.1 ha forest, 55.1 ha shrubland)
Altitude	36-100 m asl

Ecological units

- (a) Exotic grassland on hillslope
- (b) Manuka-kanuka shrubland on hillslope
- (c) Hall's totara forest on hillslope
- (d) Raupo reedland in swamp

Landform/geology

Hill country underlain by Cretaceous sandstone and mudstone (Punakitere Sandstone, Whangai Formation, Mangakahia Complex).

Vegetation

The reserve comprises a complex mosaic of exotic grassland (a), manuka-kanuka shrubland (b) with frequent Hall's totara and occasional rimu, tanekaha, and puriri; and regenerating podocarp-broadleaved forest. Hall's totara forest (c) is dominant with occasional kohekohe, kahikatea, tanekaha, ti kouka and putaputaweta. Some areas in the reserve contain dense understorey vegetation, and the two main valleys in the reserve are swampy and remain damp for all but brief periods in late summer. Several areas of raupo reedland (d) occur in these valleys (Potter 1990), but were not able to be mapped as part of this survey.

Fauna

A study by Potter (1990) on the movements of NI brown kiwi (Nationally Vulnerable) recorded a relatively high density of birds (approximately one bird per 2.5 ha). It was estimated then that the Paerata Wildlife Management Reserve supported c.80-90 kiwi. Kiwi have been monitored here by annual call count listening since the early 1990s. Call counts and kiwi numbers plummeted to low levels by the late 1990s and by 2007 and 2008 very few birds were being detected (Miller and Pierce 1995; Pierce 2008).

Significance

Paerata Wildlife Management Reserve is one of the few reserves specifically created for NI brown kiwi. However, apart from some dog control advocacy, no predator management has been implemented to protect kiwi at Paerata, hence their decline is not surprising. Most of the site is formally protected: 189.9 ha are in the Paerata Government Purpose Wildlife Reserve while 6.1 ha are under a Queen Elizabeth II Open Space Covenant. The site contains freshwater wetlands, which now comprise only c.0.5% of Tangihua ED (MfE 2004). These wetlands would



P07/055 Paerata Wildlife Management Reserve



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

provide potential habitat for NI fernbird (Declining) and spotless crane (Relict), as well as other indigenous waterbirds. The site is representative for three ecological units: (b), (c) and (d). Paerata has been grazed continually by cattle since the 1940s and harbours possums and feral goats. Introduced mammalian predators recorded at the site include feral cats, stoats, ferrets, and ship rats (Potter 1990). Further survey work is required before the site's full significance can be determined.

ATCHINSON'S BUSH

Survey no. Q06/001
Survey date 5 September 1994
Grid reference Q06 105252
Area 838.7 ha (eight remnants)
(Adjustments were made to the 1994 site boundary based on the 2006 aerial photography. The main change was the addition of two remnants to the south)
Altitude 100-300 m asl

Ecological units

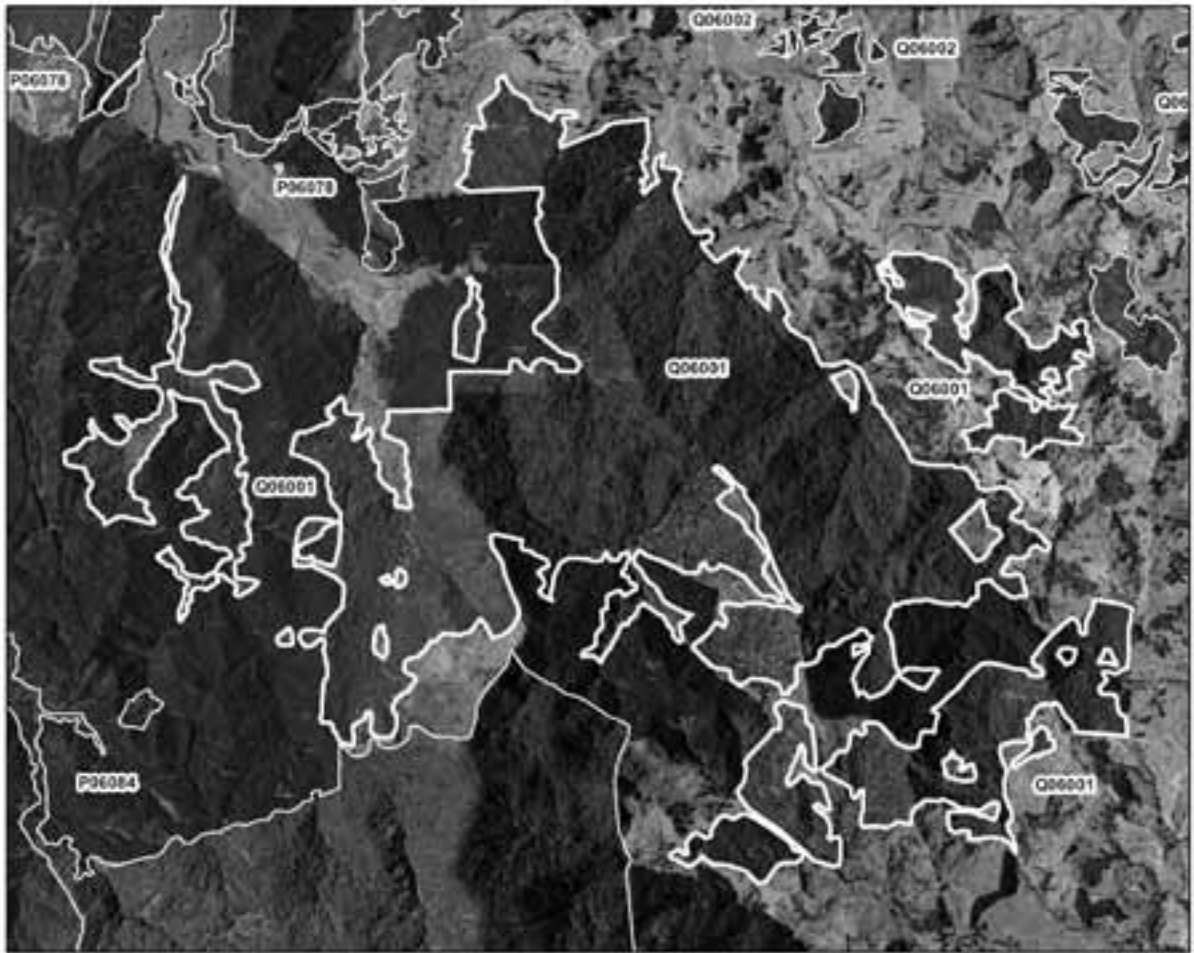
- (a) Taraire forest on hillslope
- (b) Towai-totara forest on hillslope
- (c) Kahikatea-taraire forest on flat-undulating land

Landform/geology

Steep hill country underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex) in the east and Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex) in the west.

Vegetation

The site comprises a large area of predominantly cut-over tall podocarp-broadleaved forest. Hillslopes are cloaked with taraire forest (a), with frequent towai, totara, tawa and rewarewa. Kahikatea dominates in poorly drained sites. Recently disturbed ridges are occupied by totara with rimu and manuka. Towai is abundant on moderate to steep hillslopes, with commonly occurring totara (b), and frequent kahikatea, kauri and tanekaha. Kahikatea and taraire (c) are co-dominant on flatter terrain. Frequent species in this unit include totara, manuka, kanuka, rimu and tanekaha, while northern rata is emergent. Sub-canopy and understorey species recorded include kohekohe, nikau, *Muehlenbeckia australis*, pate and *Coprosma rhamnoides*. The two additional remnants to the south were not surveyed, but interpretation of aerial photography indicates they support similar forest types to those present in the surveyed remnants.



Q06/001 Atchinson's Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Significant flora

Northern rata (regionally significant) was recorded in 1987 (SSBI P06/H054).

Fauna

NI brown kiwi (Nationally Vulnerable), kauri snail (Gradual Decline), kukupa (regionally significant), grey warbler, silvereye, NI fantail, tui, kingfisher and Australasian harrier were recorded in 1987 (SSBI P06/H054). NI tomtit (regionally significant) is known to be present within the wider area but was not recorded during the 1994 PNAP survey of this site.

Significance

The site is large, botanically diverse, and has notable conservation values. The area is also very close to the Riponui Scenic Reserve, which is part of the Whangarei Kiwi Sanctuary and the present site provides an important corridor for kiwi to move between the Boulder Bed Stream Bush/Riponui Scenic Reserve area and other forested areas to the west and north, e.g. Motatau Forest. There are records of two threatened fauna species, one regionally significant bird species, and one regionally significant plant species. The forested areas cover some of the highest altitudinal features of the local landscape and form one of the largest contiguous forested areas in Tangihua ED. The site is representative for three ecological units: (a), (b) and (c). Riparian buffering and upper catchment protection is provided for several streams. 257.9 ha of the site are formally protected within the Motatau Scenic Reserve (DOC-administered). It is thought that pigs occasionally move through the area but they are quickly hunted out. Goats have been eradicated from the area, but possums are likely to be having adverse impacts on palatable species (SSBI P06/H054).

BOULDER BED STREAM BUSH

Survey no.	Q06/004
Survey date	6 September 1994
Grid reference	Q06 134265
Area	449 ha (19 remnants) (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	100-270 m asl

Ecological units

- (a) Taraire forest on hillslope
- (b) Towai forest on hillslope
- (c) Kahikatea-totara forest on hillslope
- (d) Totara forest on hillslope
- (e) Taraire-towai forest on hillslope
- (f) Manuka forest on hillslope

Landform/geology

Mangakahia Group (Mata, Cretaceous), sedimentary hill country. Concretionary micaceous sandstone with carbonaceous material. The soil is well-drained to moderately well-drained Waoitira clay loam.

Vegetation

The site comprises a moderate-sized, but highly fragmented cut-over tall forest and secondary forest remnant of hill country forest types. It is situated on the eastern boundary of Tangihua ED and contains small areas of pine and eucalyptus plantation forest. Taraire forest (a) occurs with frequent rewarewa and towai, and occasional tawa, pukatea, tanekaha, and emergent rimu, kahikatea, kauri and northern rata. Towai forest (b) occurs with frequent tanekaha and rewarewa, and occasional taraire, rimu and kahikatea. Kahikatea and totara (c) are co-dominant, with occasional pukatea, tanekaha, rewarewa, rimu and towai. Totara forest (d) is present, with frequent towai, kanuka and kahikatea, and occasional puriri, tanekaha and rewarewa. In other areas, taraire and towai (e) are common in the canopy, while tawa and rewarewa are frequent. Occasional species include emergent puriri, kauri, totara and northern rata. A remaining area of forest is defined by abundant manuka (f), frequent totara and kohekohe, and occasional rewarewa, tawa, nikau and kauri.

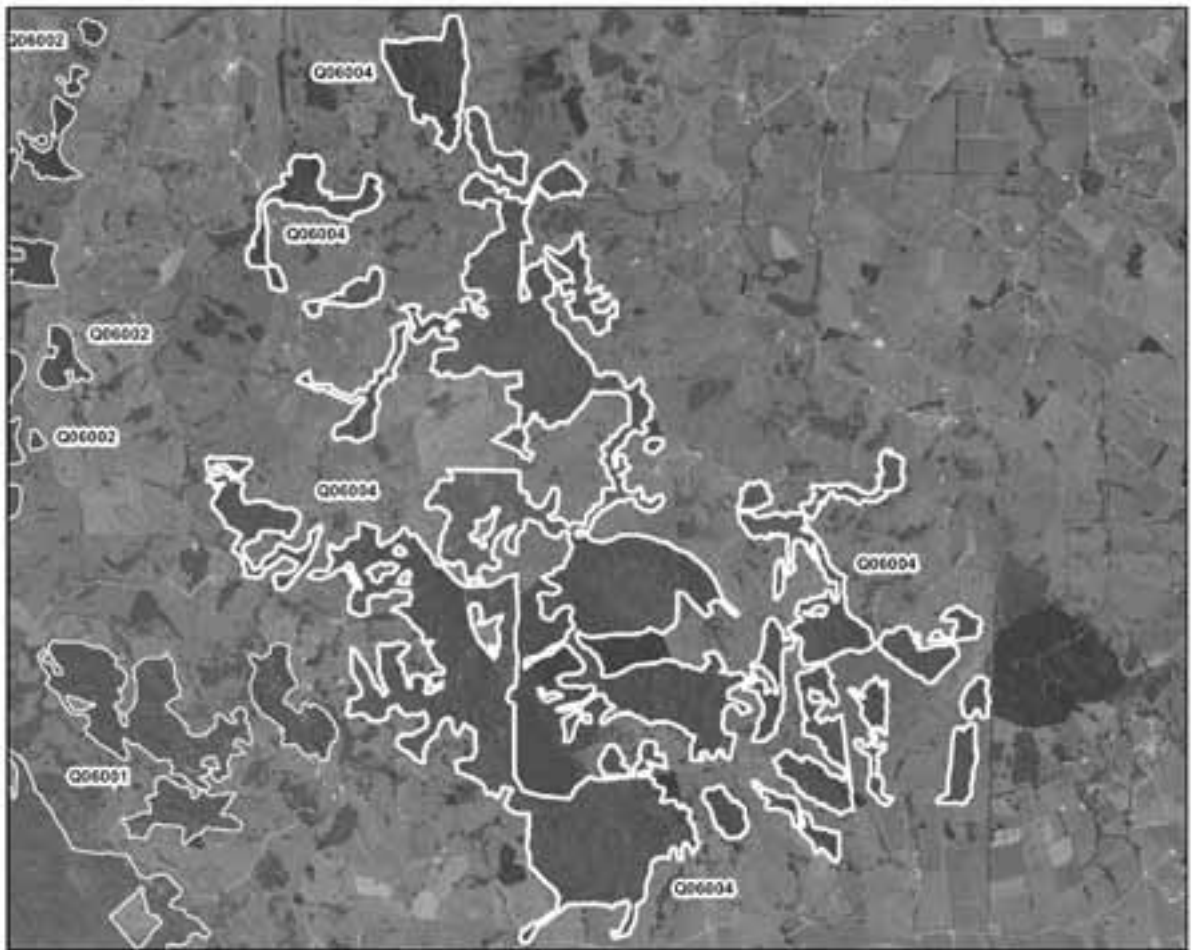
The site also includes the Riponui Scenic Reserve, an area of formerly logged and grazed podocarp-broadleaved forest. Taraire is commonly occurring in deeper gully soils and there is good regeneration of podocarps, especially totara and Hall's totara, on the lower slopes and spur crests. Occasional tall remnant podocarps (rimu) still remain (SSBI Q06/R06/H014).

Significant flora

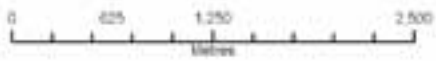
Northern rata (regionally significant) was recorded during the present survey. *Blechnum fluviatile* (regionally significant), *Coprosma rigida* (regionally significant), *C. rotundifolia* (regionally significant) and black maire (regionally significant) were recorded during a survey in 1995 (SSBI Q06/R06/H127).

Fauna

NI brown kiwi (Nationally Vulnerable), NI tomtit (regionally Significant) and kukupa (regionally significant) were recorded in 1995 (SSBI Q06/R06/H014). A single NI kaka (Nationally Vulnerable) was recorded in Riponui Scenic Reserve in c.1997-98 (P. Graham, DOC, pers. comm.). Copper skink was recorded in Riponui Scenic Reserve in 1998 and 2001 (DOC Bioweb 2009). Past records of morepork, grey warbler, NI fantail, silveryeye and tui. Kiwi call counts at a single station near Marlow Road have declined significantly since 1995. Calling rates averaged c.14-20/hour in the late 1990s compared with c.10-13/hour in the late 1990s, with many instances of dog-killed birds (Pierce 2008, P Graham pers. comm.).



Q06/004 Boulder Bed Stream Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

Significance

This site contains one of the highest densities of NI brown kiwi in Northland, which has resulted in many years of scientific research in this area to identify the key components of kiwi decline in Northland. The formally protected 43.9 ha Riponui Scenic Reserve (DOC-administered) is also currently part of the nationally designated Whangarei Kiwi Sanctuary for the management and recovery of kiwi. The site's vegetation has been severely compromised by felling, burning, grazing, and possum browse, and as such is unlikely to be representative for any ecological units. Despite its degraded habitat values, the site supports one threatened bird species, one regionally significant bird species, and five regionally significant plant species. The site is likely to form part of a habitat network for mobile species such as kukupa (regionally significant) and NI kaka (Nationally Vulnerable) by providing a linkage between natural areas to the east and larger remnants to the west (e.g. Atchinson's Bush, Q06/001). Livestock in particular have been disrupting natural regeneration at the site (SSBI Q06/R06/H014). The site provides riparian functions and buffering for a significant part of the Boulder Bed Stream. An additional 0.9 ha is protected within a WDC-administered scenic reserve.

APONGA SETTLEMENT SCENIC RESERVE

Survey no.	Q06/179
Survey date	7 December 1998
Grid reference	Q06 144205 (two remnants)
Area	72.5 ha
Altitude	130-365 m asl

Ecological units

- (a) Kohekohe-taraire forest on steep hillslope and in gully
- (b) Totara-rewarewa forest on steep hillslope
- (c) Totara forest on moderate hillslope
- (d) Kohekohe-mamaku forest on steep hillslope
- (e) Taraire forest on steep hillslope
- (f) Totara-titoki forest on steep hillslope
- (g) Mangeao-titoki-totara forest on steep hillslope
- (h) Taraire-tawa forest on steep hillslope
- (i) Tawa forest on steep hillslope
- (j) Puriri-totara forest on steep hillslope
- (k) Tanekaha forest on steep hillslope
- (l) Kanuka/manuka-rimu forest on moderate hillslope
- (m) Kauri-tanekaha forest on moderate hillslope
- (n) Rimu-tanekaha forest on moderate hillslope
- (o) Kahikatea forest on gentle hillslope
- (p) Kahikatea-taraire forest on moderate hillslope

- (q) Kauri-rimu forest on moderate hillslope
- (r) Kanuka/manuka-totara forest on gentle hillslope
- (s) Kauri ricker forest on gentle hillslope
- (t) Kanuka/manuka forest on moderate hillslope
- (u) Rimu-kanuka/manuka-tanekaha forest on moderate hillslope

Landform/geology

Knoll of Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex); hillslopes to north-east underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises a small remnant of secondary podocarp-broadleaved forest occupying steep hillslopes, located close to the eastern boundary of Tangihua ED. Rarewarewa is included in the reserve; areas to the north and east are not included.

In the central areas, kohekohe and taraire (a) are common on steep hillslopes, while occasional species include rewarewa, nikau, mamaku, karaka, tawa and totara. Unit (a) also occurs in a gully with frequent karaka and occasional rewarewa, puka, tawa, nikau and mamaku. Totara and rewarewa (b) also occur commonly on steep slopes, with occasional karaka, tawa, kohekohe, mamaku and rewarewa. Totara (c) is common at the top of gentle hillslopes, occurring with frequent rimu and occasional nikau, rewarewa and puriri. Kohekohe and mamaku forest (d) dominates an open canopy on steep hillslope with frequent karaka and nikau, and occasional puriri, rewarewa and tawa. Taraire forest (e) is locally abundant on steep slopes, occurring with frequent kohekohe and rewarewa, and occasional karaka, nikau, puriri and emergent kahikatea.

On the western side of the site, along edges of steep slopes, unit (c) totara forest occurs with occasional mamaku, rewarewa and taraire. Totara and titoki forest (f) is common in steeper areas, occurring with occasional mamaku, mangeao, kohekohe, puriri and rewarewa. Mangeao, titoki, and totara (g) are co-dominant in one forest type, with frequent kohekohe and occasional karaka, mamaku and nikau. Just to the east, unit (e) taraire forest is abundant, with frequent karaka and titoki, and occasional mangeao, rewarewa, nikau and totara. Unit (c) totara forest is also locally abundant, occurring with occasional kahikatea, titoki and nikau. Forest on steep west-facing slopes also contains co-dominant taraire and tawa (h), with frequent mangeao and occasional titoki, rewarewa, totara, kohekohe, totara and karaka. Steep slopes to the east of unit (h) are characterised by tawa forest (i), occurring with occasional taraire, karaka, kahikatea, puriri, kohekohe and nikau. The top of the slope in this area contains unit (a) kohekohe-taraire forest with frequent karaka and rewarewa, and occasional tawa, totara, mamaku, nikau and mangeao. Puriri and totara (j) are co-dominant in forest at the highest point of the site, occurring with occasional kahikatea, taraire, titoki, karaka and kohekohe.

Forested areas on moderate slopes in the far east of the site (not included

in the reserve) contain abundant tanekaha (k), frequent kauri and totara, and occasional rewarewa and rimu. Just to the south of here, kanuka/manuka and rimu (l) are common, with frequent totara and occasional kahikatea, pukatea, tanekaha, mamaku and kauri. To the west, on adjacent hillslope, kauri and tanekaha (m) occur commonly with occasional rimu. Further south, rimu and tanekaha (n) are co-dominant in the canopy, with frequent kanuka/manuka and occasional kauri, rewarewa and totara. Further west, gentle slopes are dominated by kahikatea forest (o), with frequent pukatea and occasional totara, kanuka/manuka and rewarewa. East of here, emergent kahikatea is co-dominant with taraire (p), occurring with occasional pukatea, karaka, kauri, rewarewa, lancewood, rimu and totara. To the south, emergent kauri is locally abundant with common rimu (q) and occasional tanekaha and totara. Gentle hills in the west of this area of the site are characterised by common kanuka/manuka and totara (r), with frequent kahikatea and occasional rimu, tanekaha, taraire and rewarewa.

The northern part of the site (not included in the reserve) contains kauri ricker (s), which dominates gentle hillslope and occurs with frequent tanekaha and occasional totara. To the west, kanuka/manuka (t) is dominant with occasional totara. Further west, emergent rimu is co-dominant with kanuka/manuka and tanekaha (u), while totara is frequent with occasional rewarewa and emergent kauri. Also in this area, unit (j) puriri-totara forest is present with occasional kanuka/manuka, rewarewa and kahikatea.

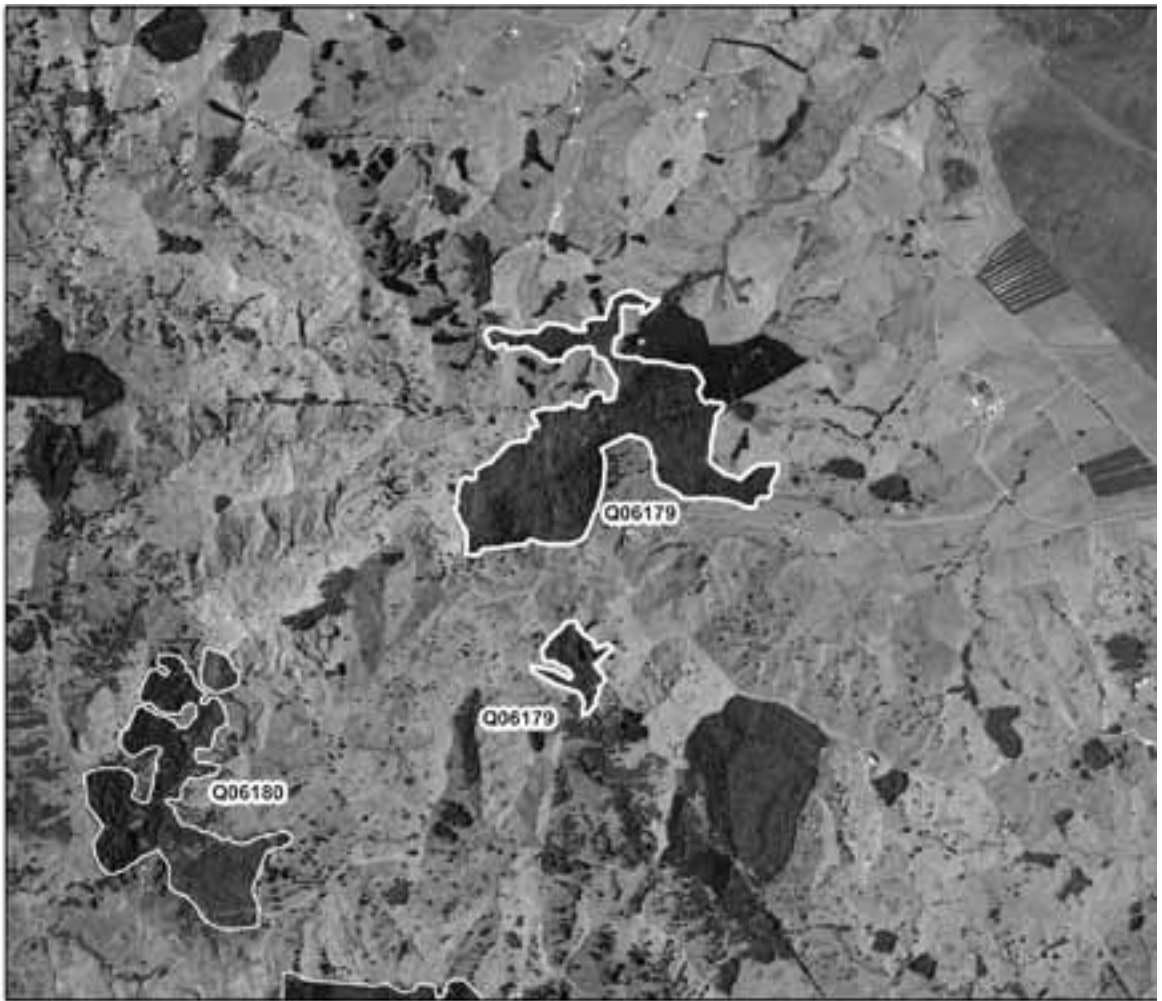
Fauna

NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), Australasian harrier, spur-winged plover, kingfisher, tui, grey warbler and fantail have been recorded at the site (SSBI Q06/R06/H064). NI kaka (Nationally Vulnerable) have been recorded on two occasions, one on 13 June 1999 (P. Graham, DOC, pers. comm.) and one in May c.2001 (H. Robertson pers. comm.). Ornate skink (Gradual Decline) was recorded in 1998 (SSBI Q06/R06/H064) and copper skink was recorded in 2001 (DOC Bioweb 2009). From the mid 1990s to 2008, call counts at one Rarewarewa kiwi listening station have remained consistently at 5.3-8.5 calls per hour and trends at two other more recent stations (Rarewarewa North Side and Hodges Bush⁶) are consistent with that of the first (P. Graham, DOC, pers. comm.). Two colonies of giraffe weevils (New Zealand's longest beetle) were recorded in 1995 (SSBI Q06/R06/H064).

Significance

The site contains a diverse range of forest types, including an area of tawa-dominated forest, which is relatively rare in Tangihua ED and throughout Northland. It is representative for 12 ecological units: (a), (b), (d), (f), (g), (h), (i), (k), (l), (q), (t) and (u). The site supports three threatened fauna species, and a fourth species (NI kaka) visits the site. The site is critically important for NI brown kiwi; Rarewarewa is part of the Whangarei Kiwi Sanctuary (P. Graham, DOC, pers.comm.).

⁶ Hodge's Bush is in Whangarei ED, very near to the eastern boundary of Tangihua ED.



Q06/179 Aponga Settlement Scenic Reserve



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photographs from 2002

It is also part of a habitat network for NI brown kiwi, kukupa and NI kaka and other mobile species, providing linkages between forest remnants to the north and south and potentially further afield. 30.7 ha are formally protected within the Aponga Settlement Scenic Reserve (DOC-administered), which is fenced to exclude stock. A further 2.2 ha lie within a WDC-administered scenic reserve. A past survey recorded heavy possum browse (1978, SSBI Q06/R06/H064).

PURUA SCENIC RESERVE

Survey no. Q06/180
Survey date 15 December 1998
Grid reference Q06 135177 (four remnants)
Area 145.3 ha
(Small adjustments were made to the original 1998 boundary of this site to fit with 2006 aerial photography. Four small remnants in the north of the site have been merged into one area)
Altitude 118-181 m asl

Ecological units

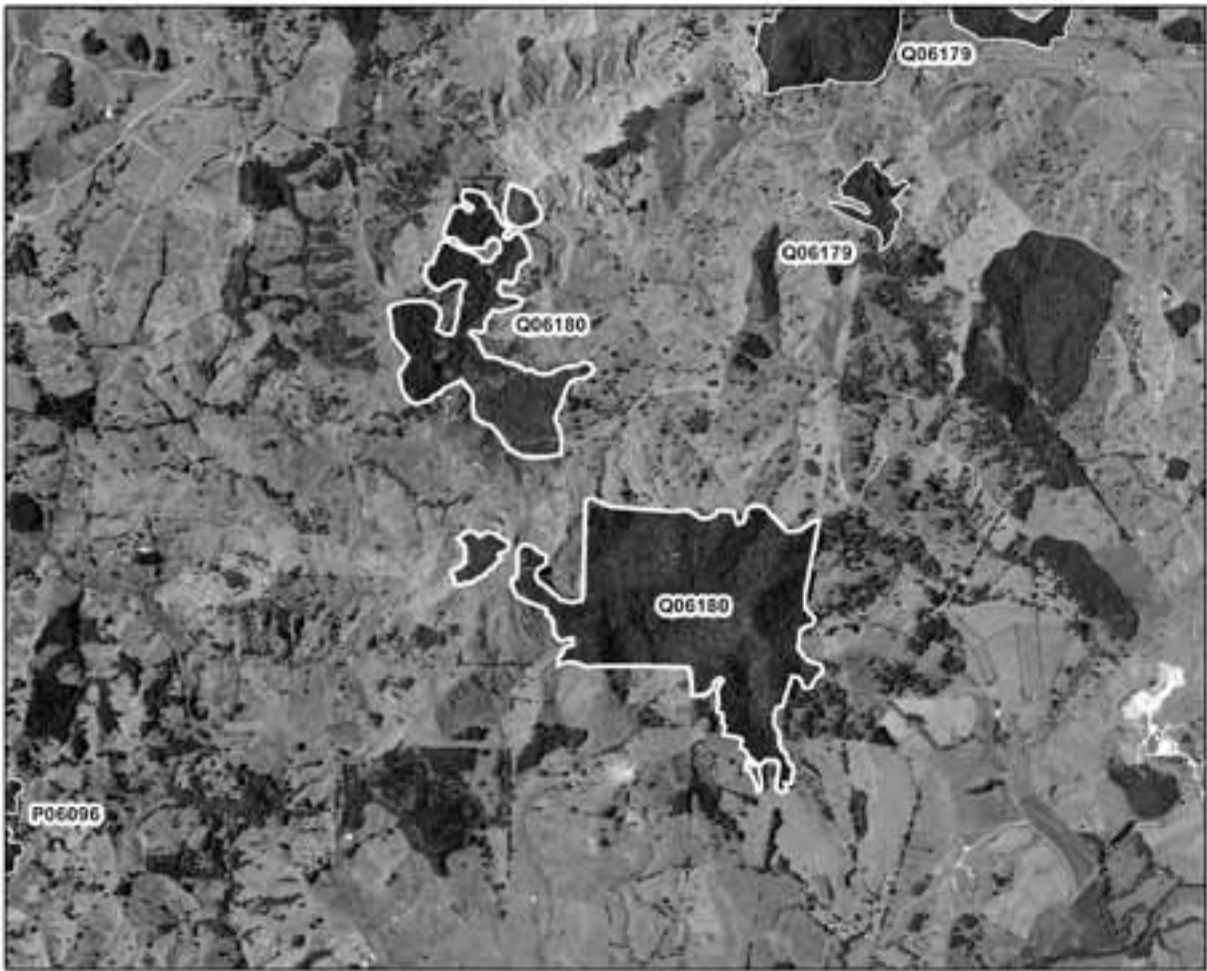
- (a) Taraire forest on steep hillslope
- (b) Kahikatea-pukatea forest in gully and on hillslope
- (c) Taraire-pukatea forest in gully
- (d) Totara-kahikatea forest on moderate hillslope
- (e) Totara-kowhai forest on hillslope
- (f) Kohekohe-rewarewa forest on steep hillslope
- (g) Taraire-rewarewa forest on steep hillslope
- (h) Totara forest on steep hillslope
- (i) Taraire-kohekohe forest on moderate hillslope
- (j) Karaka-taraire-rewarewa forest on steep hillslope
- (k) Taraire-rewarewa-puriri forest on steep hillslope
- (l) Karaka-kowhai forest on hill top

Landform/geology

Steep hill of Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex); hillslopes and gullies to NW underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).




Vegetation

Purua Scenic Reserve comprises a 110 ha volcanic cone with very similar topography and vegetation to Aponga Settlement Scenic Reserve (Q06/179). However, this site is more heavily vegetated and wetter on the western side. The site contains one main remnant and four smaller remnants to the north-east.



Q06/180 Purua Scenic Reserve



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography from 2002

The north-west part of the main remnant is dominated by taraire forest (a), with rewarewa, tawa, karaka, puriri, pukatea and mangeao all occasional in the canopy. Kahikatea-pukatea (b) is locally common in some gullies and gentle slopes, with occasional totara confined to the remnant margins, while taraire, kohekohe, mahoe, rewarewa, nikau and mamaku occur as occasional canopy species. Other gullies in this part of the site are characterised by taraire-pukatea forest (c), with occasional totara, puriri, rewarewa, nikau, karaka, mamaku and kohekohe.

Totara-kahikatea forest (d) is the dominant vegetation type in the smaller remnants to the north-east, where it occurs with occasional rewarewa, taraire, matai, puriri, rimu, pukatea, nikau, lancewood and emergent kauri. Totara and kowhai (e) are co-dominant in a small, unfenced remnant adjacent to Irvine Road. Puriri is frequent in this vegetation type, with occasional karaka, nikau, kohekohe and rewarewa.

On the eastern side of the reserve, kohekohe-rewarewa forest (f) occurs on steep hills, with occasional taraire, karaka, mamaku, nikau and tawa, while in other hilly areas taraire and rewarewa (g) are co-dominant, with occasional karaka, kohekohe, kahikatea and nikau.

The western side of the main remnant is characterised by unit (a) taraire forest and unit (h) totara forest on steep hillslopes. Within these types there are occasional scattered karaka, tawa, mamaku, matai, puriri, kahikatea, kowhai and rewarewa. Other steep areas are characterised by taraire-kohekohe forest (i) with frequent rewarewa, tawa and totara, with occasional nikau, mamaku, kahikatea, pukatea and karaka; and karaka-taraire-rewarewa forest (j), occurring with occasional nikau, mamaku and puriri.

The canopy on the southern slopes is a mosaic of vegetation types (d) totara-kahikatea forest, (i) taraire-kohekohe forest, (k) taraire-rewarewa-puriri forest, together with unusual associations such as karaka-kowhai forest (l). Ground cover in the forest patches varied from minimal in one patch that was grazed until the late 1990s, to heavily overgrown with parataniwha, kiekie, supplejack and ferns in damp gullies and faces.

Significant flora

Coprosma crassifolia (regionally significant) (AK 292412) and *Stellaria parviflora* (regionally significant) (AK 291117), and *Asplenium gracillum* (regionally significant), *Geranium solanderi* “coarse hairs” (regionally significant) and kaikomako (regionally significant) were recorded in 2004 (SSBI Q06/H066).

Fauna

NI brown kiwi (Nationally Vulnerable) is present (SSBI Q06/H066) and kukupa (regionally significant) and tui were recorded during this survey. From the mid 1990s to 2007 kiwi call counts at the North Purua listening station were consistently high with an average of c.10-13 calls/hour in the late 1990s and c.11-18 calls in the mid 2000s, but numbers at this station (and a second more recently established station) crashed in 2008 (Pierce

2008), apparently as a result of dog-kills on kiwi (seven marked birds were found dead and it is assumed many more also fell victim to wandering dogs) (P. Graham pers. comm.). NI tomtit (regionally significant) was recorded in 1994 (SSBI Q06/H066).

Significance

Purua Scenic Reserve is critically important for NI brown kiwi and is included in an adaptive management study for the species which began in 1994. The aim of the study is to determine and experimentally manage, as part of the Whangarei Kiwi Sanctuary programme, the introduced mammals that are the main threats to kiwi. Between 1994 and 2001, predator trapping, pest poisoning, and Operation Nest Egg resulted in recovery of the kiwi population, whereas kiwi numbers declined in non-treatment sites (Robertson & Fraser 2009). Since 2001, predator trapping - especially targeting stoats - has been carried out in the reserve and in the farmland in between. The site also provides habitat for one regionally significant bird species, five regionally significant plant species, and contains forest associations that are rare in Tangihua ED. The site is representative for nine ecological units: (b), (c), (e), (f), (g), (i), (j), (k) and (l). The site has been identified as a key area for conservation management in Northland (Conning 2001). 10.9 ha are in Queen Elizabeth II Open Space Covenants, while 71 ha are protected within the Purua Scenic Reserve (DOC-administered) and 1.4 ha lie within a scenic reserve administered by WDC.

MARLOW ROAD BUSH

Survey no.	Q06/181
Survey date	12 August 1987
Grid reference	Q06 108263
Area	14 ha
Altitude	93-165 m asl

Ecological units

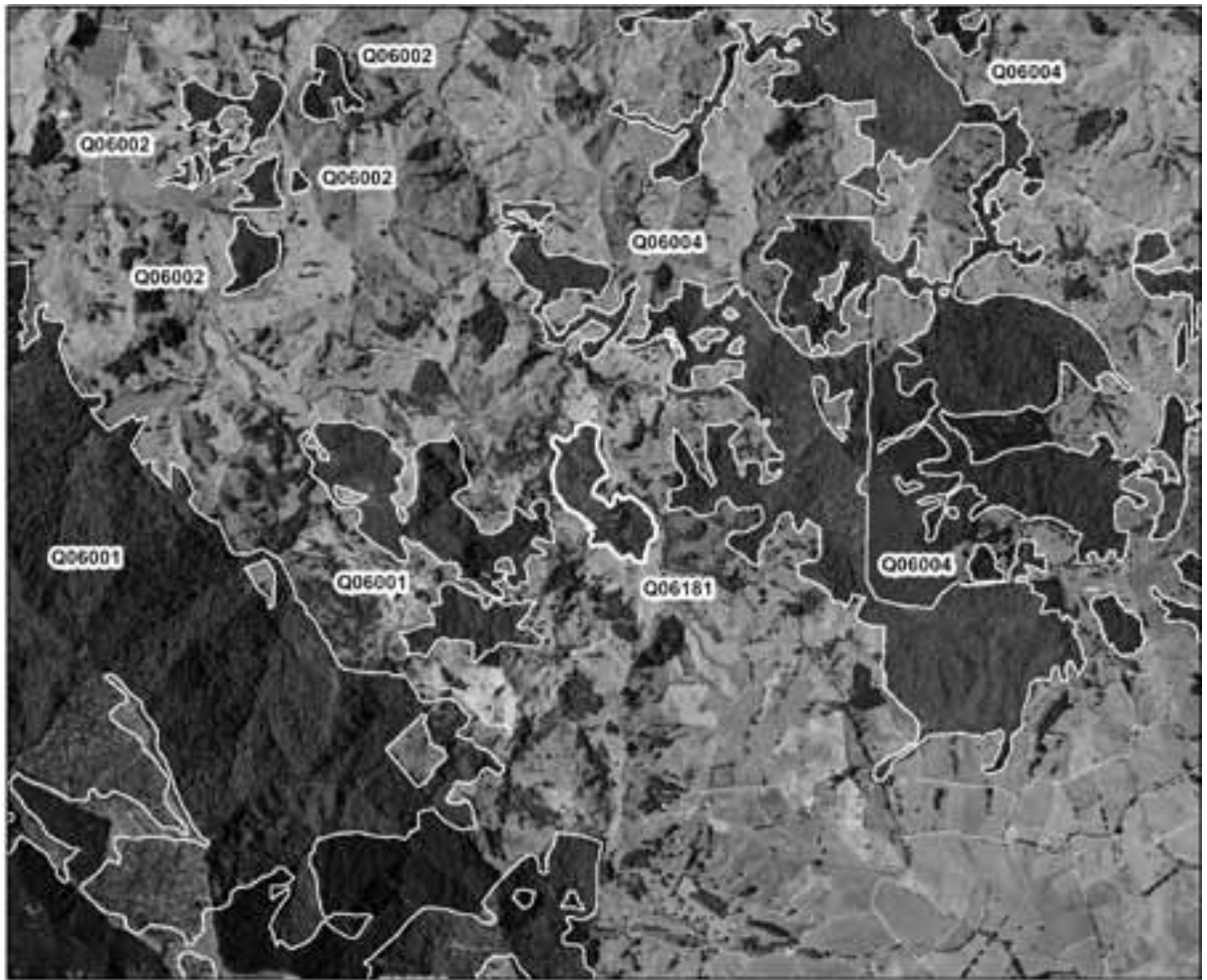
(a) Kauri-totara-towai-taraire forest on hillslope

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site is small yet botanically diverse, comprising a kauri-podocarp-broadleaved forest remnant surrounded by pasture. Kauri-totara-towai-taraire forest (a) dominates the canopy, while kanuka, kahikatea, rimu, rewarewa and mamaku are frequent emergent species. Kohekohe, nikau, tanekaha, mapou, pate, totara and treeferns are present in the sub-canopy, while the understorey includes *Coprosma rhamnoides*, *Alseuosmia* sp., hangehange and turepo.



Q06/181 Marlow Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Fauna

Kukupa (regionally significant), grey warbler, silvereye, fantail, kingfisher, welcome swallow and paradise shelduck were recorded during a survey in 1987 (SSBI Q06/R06/H009).

Significance

Despite its small size, the site's diversity and proximity to other indigenous areas (e.g. Q06/002 and Q06/004) would make it an important part of a habitat network for species such as NI brown kiwi and kukupa. In particular, kiwi are likely to use Marlow Road Bush as a wildlife corridor between Riponui and Motutui (SSBI Q06/R06/H009). Kiwi have not been recorded in this site, although one bird wearing a radio transmitter has been detected c.800 m to the north-east in Boulder Bed Stream Bush (Q06/004) (P. Graham, DOC, pers. comm.). The site is representative for one ecological unit: (a). At the time of survey, the site was heavily grazed by cattle and sheep, and it was also used as a car dumping area along the road. Given it is on private farmland, it is under threat from further clearance (SSBI Q06/R06/H009), which may lead to the site being downgraded to Level 2 status.

TANGIHUA FOREST

Survey no.	Q07/111
Survey date	27 October 1998
Grid reference	Q07 120920 (13 remnants)
Area	3,931 ha (3,909.2 ha forest, 21.8 ha shrubland) (Small adjustments were made to the 1998 site boundary based on the 2006 aerial photography)
Altitude	60-627 m asl

Ecological units

- (a) Puriri-kowhai-totara forest on steep face
- (b) Taraire-puriri forest on steep face and in gully
- (c) Towai-mamaku forest on moderate hillslope
- (d) Kahikatea forest on moderate to steep hillslopes
- (e) Towai forest in steep hillslope
- (f) Taraire-nikau-puriri forest on steep upper hillslope
- (g) Totara-puriri forest on steep lower hillslope
- (h) Kanuka/manuka-totara forest on ridge
- (i) Towai-tanekaha forest on steep upper hillslope
- (j) Tawa forest on steep face
- (k) Kauri ricker forest on steep face
- (l) Rimu-tanekaha forest on ridge
- (m) Manuka shrubland on hillslope
- (n) Taraire forest on steep hillslope
- (o) Towai-taraire forest on hillslope

- (p) Taraire-totara-towai forest in gully
- (q) Totara-taraire forest on hillslope
- (r) Taraire-kahikatea forest in gully
- (s) Kahikatea-taraire-totara forest in gully

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex). The dominant rock type is very fine to medium grained crystalline basalt and dolerite with minor blocks of sandstone, mudstone, and limestone. A few small bodies of intrusive granodiorite and gabbro are present.

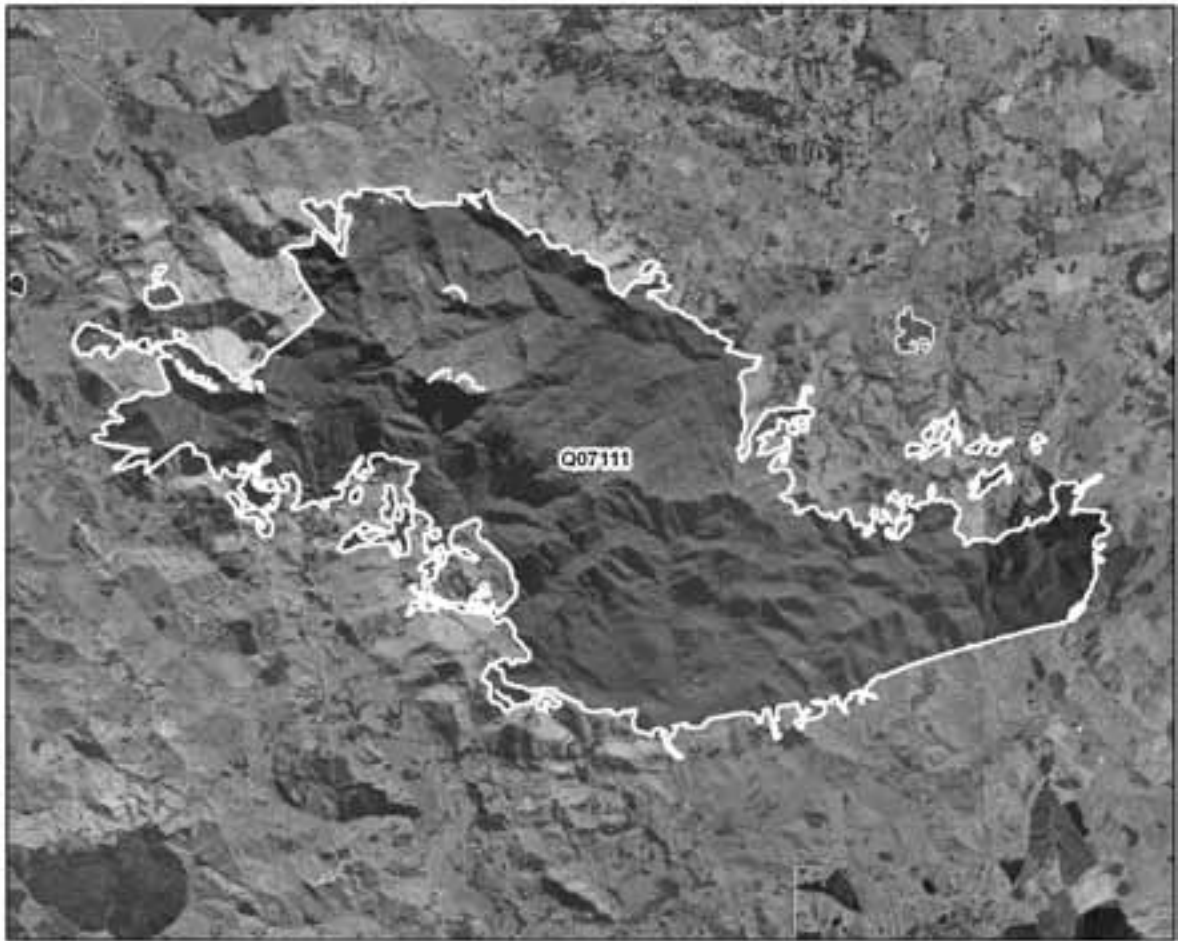
Vegetation

Tangihua Forest range lies between Whangarei and Dargaville and comprises a large area of public conservation land administered by DOC, with private land around the periphery. The country is gently rolling to very steep, with bluffs and rock faces in some parts. The main rugged ridge runs for c.13 km to the south-east. The site comprises cut-over mixed podocarp-broadleaved forest with areas of regenerating manuka shrubland. Vegetation types are strongly influenced by altitude and physiography.

Along the northern border, between the Tangihua and Waihoa streams catchments, puriri-kowhai-totara forest (a) occurs with frequent nikau and karaka, and occasional kohekohe, miro, taraire, ti kouka and tawa. Steep gullies are characterised by abundant taraire and common puriri (b) with frequent tawa and totara, and occasional rewarewa, karaka and kahikatea. South of here, unit (b) occurs on a steep face with frequent tawa and rewarewa. Occasional species include karaka, nikau, mamaku, ti kouka, kohekohe and puka.

In the south-west of the site, moderate hillslopes are occupied by towai-mamaku forest (c) with occasional kowhai and emergent totara and rewarewa. West of here, kahikatea (d) dominates moderate to steep slopes, with frequent towai and occasional rimu, kauri, rewarewa, totara and nikau. To the south-west, near Omana Road, towai (e) is abundant. Frequent species are taraire and rewarewa, and occasional species are rimu, puriri, kahikatea and mamaku. The far west of the site is characterised by unit (b) taraire-puriri forest, with frequent rewarewa and tawa, and occasional pukatea, kohekohe, puka, kowhai, mamaku, nikau, kanuka and towai. Taraire is abundant on steep faces with common nikau and puriri (f), while rewarewa is frequent with occasional puka, karaka and northern rata.

In the north-east, within the Tangihua Stream catchment, co-dominant totara and puriri (g) occur on steep lower hillslopes with frequent karaka and kowhai, and occasional kohekohe, pukatea, ti kouka, matai, rimu, nikau, tawa, puka and kanuka/manuka. On the next ridge to the east, kanuka/manuka-totara forest (h) occurs with frequent puriri and ti kouka, and occasional kowhai and tanekaha. Steep upper slopes in this area are characterised by towai and tanekaha (i) with frequent totara and



Q07/111 Tangihua Forest

Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

rewarewa, and occasional rimu, kauri and miro. To the south-east of here, tawa-dominated forest (j) occurs on steep faces with frequent puriri, taraire and rewarewa, and occasional mamaku, nikau and puka. Slightly to the west, a dense stand of kauri ricker (k) occurs on a steep face (which includes three mature trees). Remaining vegetation types in the Tangihua Stream catchment include rimu-tanekaha forest (l) with frequent totara and kanuka/manuka, and occasional miro, kauri and northern rata; and manuka shrubland (m).

In the eastern region of the Tangihua Forest range, taraire (n) is abundant in the upper catchment of the Kaitaringa Stream. Frequent species include puriri, karaka, kahikatea and totara. Along the northern boundary of the site's eastern arm, there are numerous small forest remnants on the foothills, either side of O'Carroll Road. Towai and taraire (o) are co-dominant in a small gully remnant north of O'Carroll Road, occurring with frequent totara and occasional puriri. Taraire-totara-towai forest (p) characterises a small gully remnant to the south of O'Carroll Road. Rimu is frequent with occasional lancewood and kauri. Just to the west, totara and taraire (q) are co-dominant, occurring with frequent puriri and towai, and occasional lancewood and kahikatea. East of here, taraire-kahikatea forest (r) occurs in a gully with frequent puriri, karaka and totara. Further east, another small gully contains kahikatea-taraire-totara forest (s), with occasional puriri and karaka. Mangeao is common at higher altitudes (> 560 m asl) (L. Forester pers. comm.).

Significant flora

Brachyglottis kirkii (Declining) (Cameron 1992), kawaka (Naturally Uncommon), *Myosotis spathulata* var. *spathulata* (Naturally Uncommon) (AK 7514), *Plectranthus parviflorus* (Coloniser). Regionally significant: *Coprosma rigida*, *Dracophyllum sinclairii* (AK 200563, AK 167603, and AK 170908), *D. traversii* (AK 200572), kotukutuku, *Griselinia littoralis* (AK 200571), *Grammitis billardierei* (AK170910, AK 218874, and AK 200570), *G. pseudociliata* (AK 168168 and AK 200569), horopito, *Hypolepis lactea*, *H. rufobarbata* (recorded in 1985, AK 174514 and AK 174553), kaikomako, northern rata, *Lobelia angulata*, raukawa, *Libertia grandiflora*, maire tawake (AK 277230), carmine rata (AK 200573), *Olearia albida*, *Rubus squarrosus*, tawari, *Urtica incisa* and wharariki. All non-referenced species were recorded in Willetts (1985).

Fauna

NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), NI tomtit (regionally significant), grey warbler, silvereye, tui, kingfisher, welcome swallow, Australasian harrier, shining cuckoo, NI fantail, paradise shelduck and morepork have been recorded from Tangihua Forest (recorded 1988-1996, SSBI Q07/R07/H020). Five species of land snail are known from the site: kauri snail (Gradual Decline), *Amborhytida dunniae* (Gradual Decline), *Amborhytida forsythi* (Gradual Decline), Punctidae sp. 159 (Range Restricted) (Brook 2002), and the non-threatened species *Liarea hochsteteri* (SSBI Q07/R07/H020). A survey of the Waihoa Ecological Area (Willetts 1985) recorded grey duck (Nationally Critical) and NI kaka (Nationally Vulnerable), while single red-crowned

parakeets (Relict) were recorded on two occasions in 1991-92 (R. Pierce pers. comm.). There was a report of NI brown kiwi from the south-west corner in c.2004-05 (P. Anderson pers. comm.). Longfin eel (Gradual Decline), koura (Gradual Decline), shortjaw kokopu (Sparse), banded kokopu (regionally significant), and Cran's Bully were recorded in a survey of the Pikiwahine Stream (southern end of the range) in 2005 (SSBI Q07/R07/H020). These species, together with and torrentfish, were also recorded in the Tangihua Stream, in the north-west of the site (SSBI Q07/R07/H020).

Significance

Tangihua Forest is a prominent volcanic range which dominates the local landscape, being visible from both Whangarei and Dargaville. It is the largest forest block in central Northland, making it a significant refuge for indigenous wildlife. Forested areas provide habitat for three threatened plant species and 22 regionally significant plant species. Tangihua Forest is representative for at least five ecological units: (a), (c), (f), (i) and (j). The site supports a range of threatened terrestrial and aquatic fauna species, including records of four bird species, two freshwater fish, four land snails, and one freshwater invertebrate. The site also provides habitat for three regionally significant fauna species. Tangihua Forest has been heavily logged and disturbed in the past, and it has also been subjected to browsing by possums, goats, and cattle with damage by pigs also a concern. A Forest Service survey carried out in the mid-1980s recorded severe possum browse on the vegetation, with many dead emergent trees present, notably northern rata. Extensive dieback of puriri crowns was also evident. Some shrub and understorey tiers were sparse in places, which was attributed to goats and cattle. However, some parts of the forest are recovering and regenerating well (SSBI Q07/R07/H020). Approximately 80% of the site is formerly protected: 3,177.6 ha are within DOC-administered Northland Conservation Park land and 0.03 ha is in the Tangihua Access Conservation Area (DOC-administered). Additional survey is required to update the site's ecological values, including the abundance of threatened species and the impacts of browsing animals and pigs.

4.2 LEVEL 2 SITES

The following were assessed to be Level 2 sites. These are listed in Table C, and described and mapped in the following sections.

TABLE C: LIST OF LEVEL 2 SITES.

SITE NAME	SURVEY NO.	GRID REF.
Pokapu Road Wetland	P05/115	P05 997413
Te Ruakokopu Stream Bush	P06/005	P06 876297
Ferguson Forest	P06/006	P06 867325
Orakau Road Forest Remnants	P06/009	P06 905344
Mataraua Road Bush Remnants	P06/028	P06 755236
Mangakahia Tributary Bush	P06/029	P06 768234
Forks Bush	P06/031	P06 775220
Henly Bush	P06/033	P06 821240
Waiokumurau Road Bush	P06/040	P06 777189
Gammons Road Remnant	P06/042	P06 821252
Opouteke Road Forest Remnants	P06/045	P06 895107
Pukehorepa Bush Remnant	P06/049	P06 847194
Kakekake Stream Forest Remnants	P06/055	P06 895175
Te Kahukuri Stream Bush	P06/056	P06 912170
Pine (Awarau South) Swamp	P06/057	P06 870228
Whangaiti Stream Shrubland	P06/058	P06 996130
Mangu Road Bush	P06/071	P06 993377
Taikirau Railway Wetland	P06/087	P06 073346
Drake Road Remnants	P06/096	P06 099172
Piraunui Stream Bush	P06/097	P06 830108
Mangakahia River Scenic Reserve	P06/098	P06 833210
Otaenga Bush	P06/100	P06 835213
Callaghan Road Bush	P06/101	P06 090325
Motatau Road Raupo Wetland	P06/102	P06 055331
Paraha Road Wetland	P06/112	P06 976352
Orakau Road Wetland	P06/113	P06 921347
Mangakahia Road Wetland	P06/114	P06 862258
Adams Road Wetland	P06/115	P06 855249
Tangowahine Valley Road Remnants	P07/002	P07 860080
Kirikopuni Valley Road Wetland	P07/004	P07 995994
Kairara Bush	P07/009	P07 830005
Kaikoura Road Bush	P07/010	P07 821097
Haast Road Bush	P07/012	P07 860058
Murray Road Bush	P07/016	P07 913074
Sommerville and Karaka Road Riparian Forest	P07/017	P07 927060
Karaka Road Bush	P07/022	P07 935094
Kirikoponui Valley Bush	P07/035	P07 973020
Pukupu Bush	P07/045	P07 017986
Tangowahine Scenic Reserve	P07/046	P07 983900
Avoca South Road Remnants	P07/049	P07 916966
Otiria Stream Remnants	P07/051	P07 000905

SITE NAME	SURVEY NO.	GRID REF.
Tangowahine-Settlement Roads Remnants	P07/052	P07 965883
Tangowahine Remnants	P07/053	P07 974937
Inkster Road Remnants	Q06/002	Q06 105295
Maromaku Forest Remnants	Q06/182	Q06 120345
Tangihua Road Bush	Q07/109	Q07 154936

POKAPU ROAD WETLAND

Survey no. P05/115
Survey date 17 April 2009
Grid reference P05 997413 (two remnants)
Area 2.1 ha
Altitude 39 m asl

Ecological units

(a) Raupo-harakeke-ti kouka reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

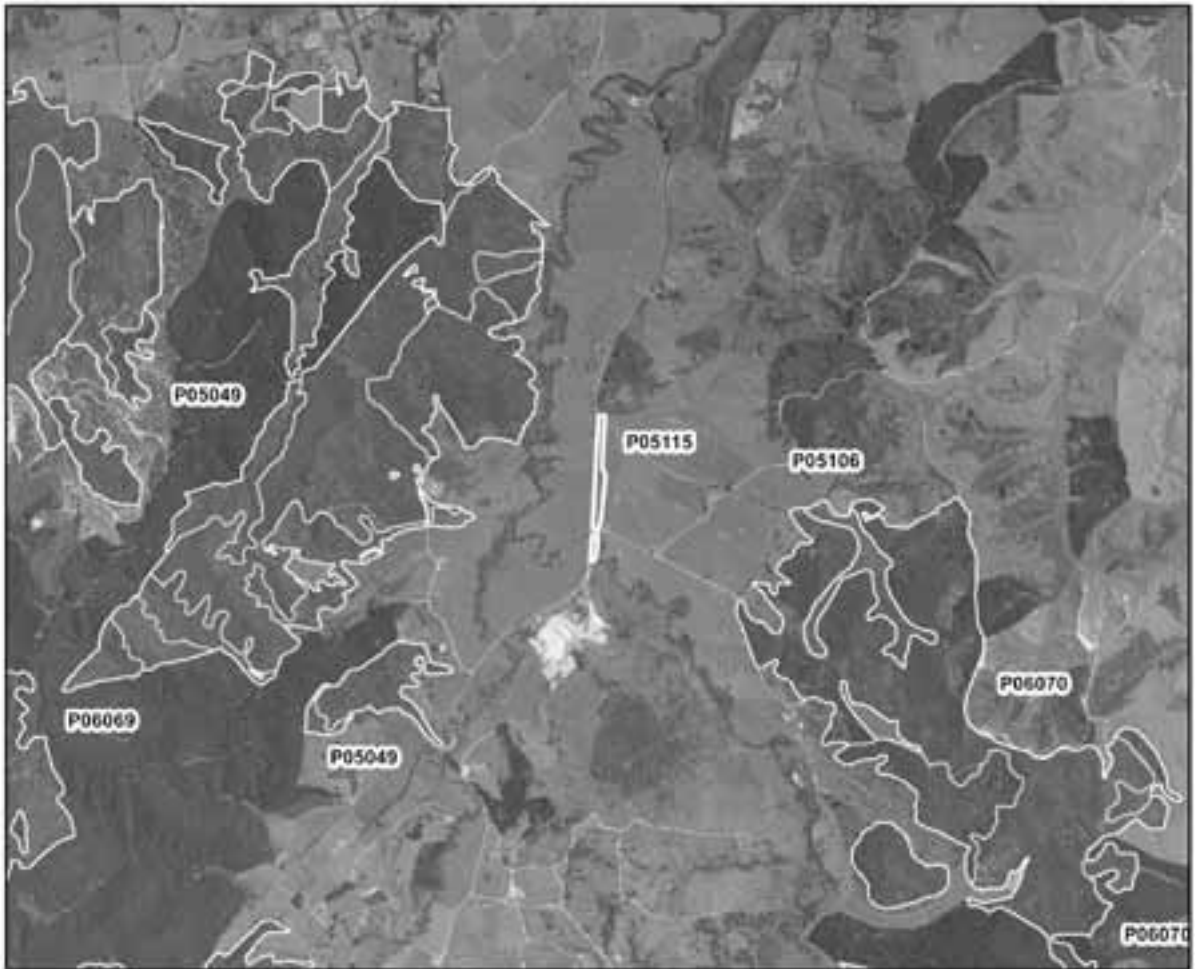
This long, narrow wetland has been artificially induced by the retention of water between Pokapu Road and a railway line (which runs parallel to the road). The dominant vegetation type is raupo-harakeke-ti kouka reedland (a) with other species such as totara, mahoe, *Coprosma propinqua*, mapou, *Cyperus ustulatus*, titoki, swamp millet and *Carex* sp. scattered throughout.

Fauna

Not surveyed.




Significance

Although the site is very narrow, it is protected from stock by virtue of its location between the road and railway line. It also contains raupo-harakeke-ti kouka reedland, an uncommon vegetation type in Tangihua ED. Weed species include Japanese honeysuckle and Chinese privet. The site's size, shape and isolation preclude it from attaining Level 1 status.



P05/115 Pokapu Road Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

TE RUAOKOKOPU STREAM BUSH

Survey no.	P06/005
Survey date	18 July 1994
Grid reference	P06 876297
Area	12.213 ha (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	140-220 m asl

Ecological units

- (a) Kahikatea-totara forest on gentle hillslope (50%)
- (b) Taraire-totara forest on moderate hillslope (45%)
- (c) Rimu forest on moderate hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small remnant containing three different types of secondary forest. Approximately half of the site is co-dominant kahikatea and totara forest (a) with frequent kauri and occasional rimu, matai, rewarewa and taraire. Taraire-totara forest (b) is also abundant, occurring with frequent towai, puriri, kahikatea and rewarewa. Occasional species include pukatea, tanekaha and puka. Rimu forest (c) is locally common in a small area with occasional totara.

Fauna

Koura (Gradual Decline), common bully, shortfin eel, and an unidentified eel species have been recorded in the Te Ruakokopu Stream, downstream of the site (NIWA 2009a).

Significance

The site contains an interesting mix of secondary forest types, including the only example of rimu forest in Tangihua ED, however, this is too small to be considered representative of its type. Its location between large natural areas (e.g. P06/003 and P06/013) may provide linkages for mobile species such as kukupa. Riparian buffering is provided to a section of the Te Ruakokopu Stream, which provides habitat for a threatened freshwater invertebrate (koura).



P06/005 Te Ruakokopu Stream Bush



Aerial photography from 2002

FERGUSON FOREST

Survey no. P06/006
Survey date 18 July 1994
Grid reference P06 867325
Area 5.6 ha
Altitude 120-160 m asl

Ecological units

(a) Totara forest on hillslope (100%)

Landform/geology

Hillslope underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

Ferguson Forest comprises a small remnant of secondary and lightly cut-over tall podocarp-broadleaved forest on gently rolling hill country. It is largely surrounded by pasture. Totara forest (a) dominates the site, with frequent kahikatea and tanekaha, and occasional towai, rewarewa, rimu, northern rata and emergent kauri.

Significant flora

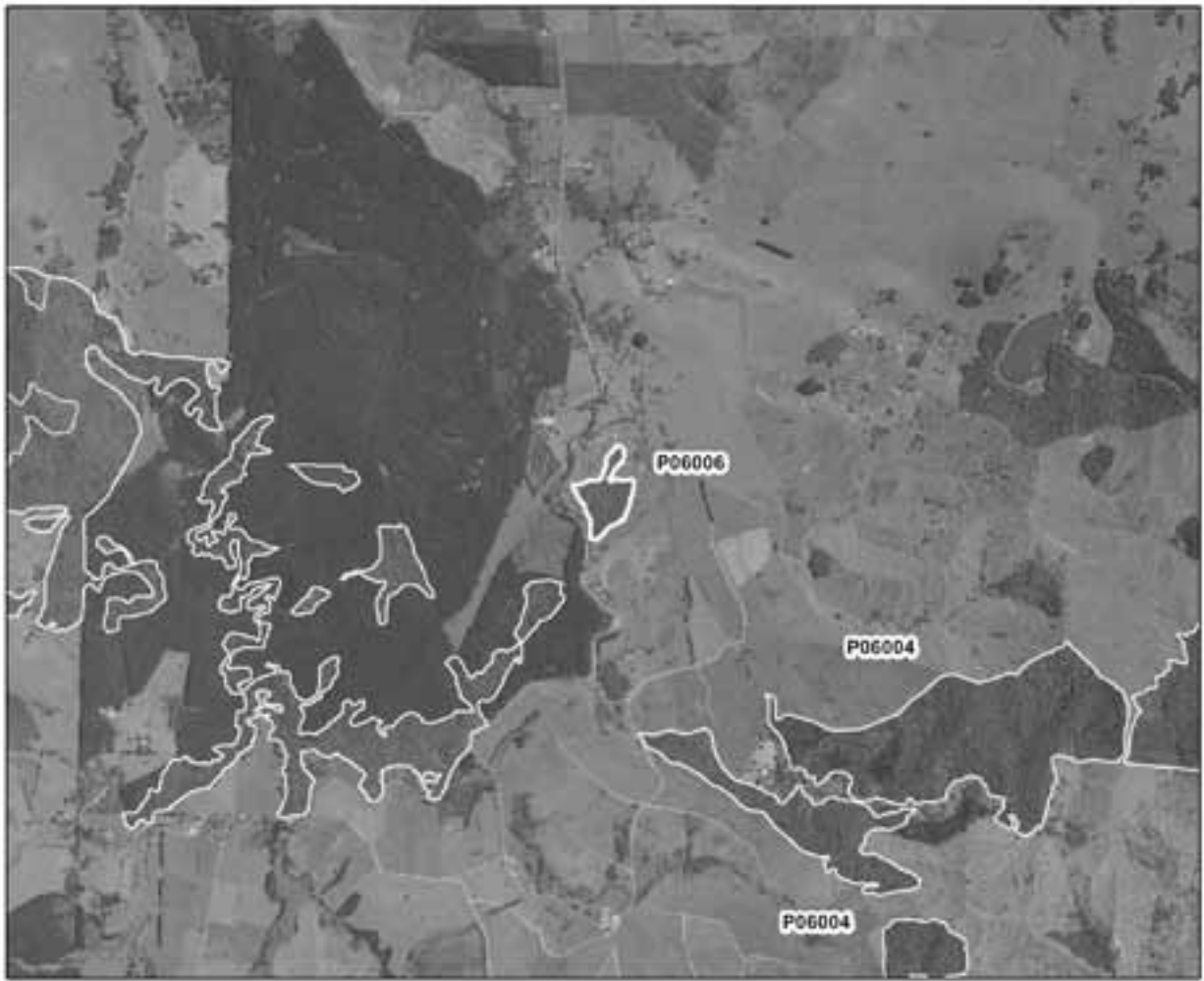
Northern rata (regionally significant) was recorded during this survey.

Fauna

Grey warbler, NI fantail and kingfisher were recorded in 1987 (SSBI P06/H022).

Significance

The site provides habitat for one regionally significant plant species and may form part of a linkage between larger forest blocks to the east and west. However, the site is relatively small and supports a forest type common in the Northland region. It is therefore assigned Level 2 status.



P06/006 Ferguson Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Brown 2006

ORAKAU ROAD FOREST REMNANTS

Survey no.	P06/009
Survey date	14 July 1994
Grid reference	P06 905344 (two remnants)
Area	21.6 ha
Altitude	140-220 m asl

Ecological units

- (a) Taraire forest on moderate hillslope (80%)
- (b) Tanekaha-totara-towai forest on moderate hillslope (15%)
- (c) Kahikatea forest on toeslope (5%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Formation, Mangakahia Complex).

Vegetation

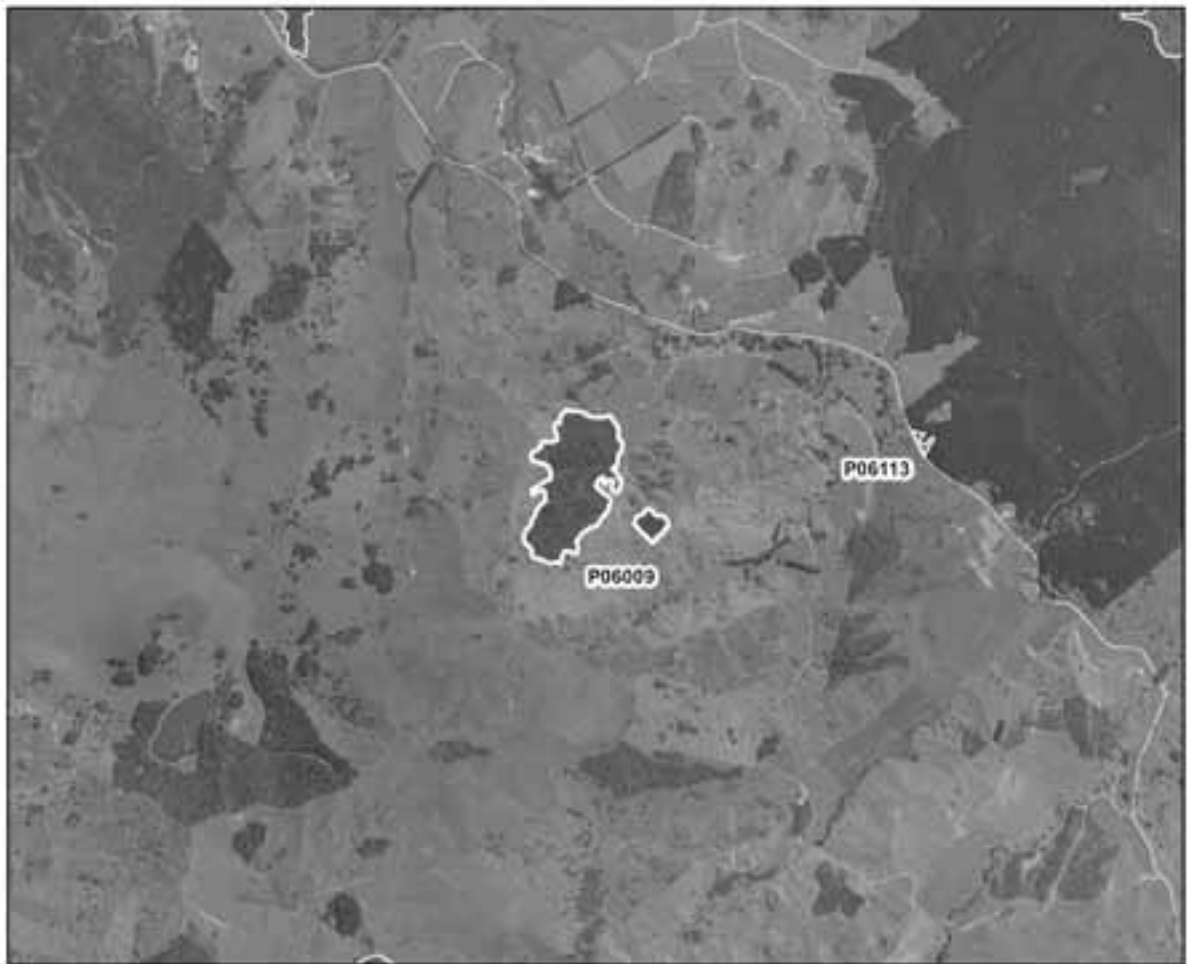
The site consists of two small cut-over tall forest and secondary forest remnants surrounded by pasture. Taraire forest (a) dominates the site, with frequent puriri, tawa, rewarewa, tanekaha, and occasional miro, rimu, and emergent kauri and totara. Remaining hillslope areas are defined by tanekaha-totara-towai forest (b) with frequent rewarewa, while kahikatea forest (c) is locally common on the toeslope.

Fauna

Terrestrial fauna not surveyed. Koura (Gradual Decline) and shortfin eel have been recorded in a tributary of the Punakitere River upstream of this site (NIWA 2009a).

Significance




The site is a low-lying forest with common forest types which provides partial riparian protection for a tributary of the Punakitere River, as well as being a potential stepping stone between larger forests.



P06/009 Orakau Road Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

MATARAU ROAD BUSH REMNANTS

Survey no. P06/028
Survey date 12 August 1994
Grid reference P06 755236 (two remnants)
Area 8.5 ha
Altitude 270-330 m asl

Ecological units

(a) Kahikatea-taraire-towai forest on gentle hillslope (100%)

Landform/geology

Hillslopes underlain by melange (undifferentiated Mangakahia & Motatau Complex lithologies) and landslide debris of basaltic boulders.

Vegetation

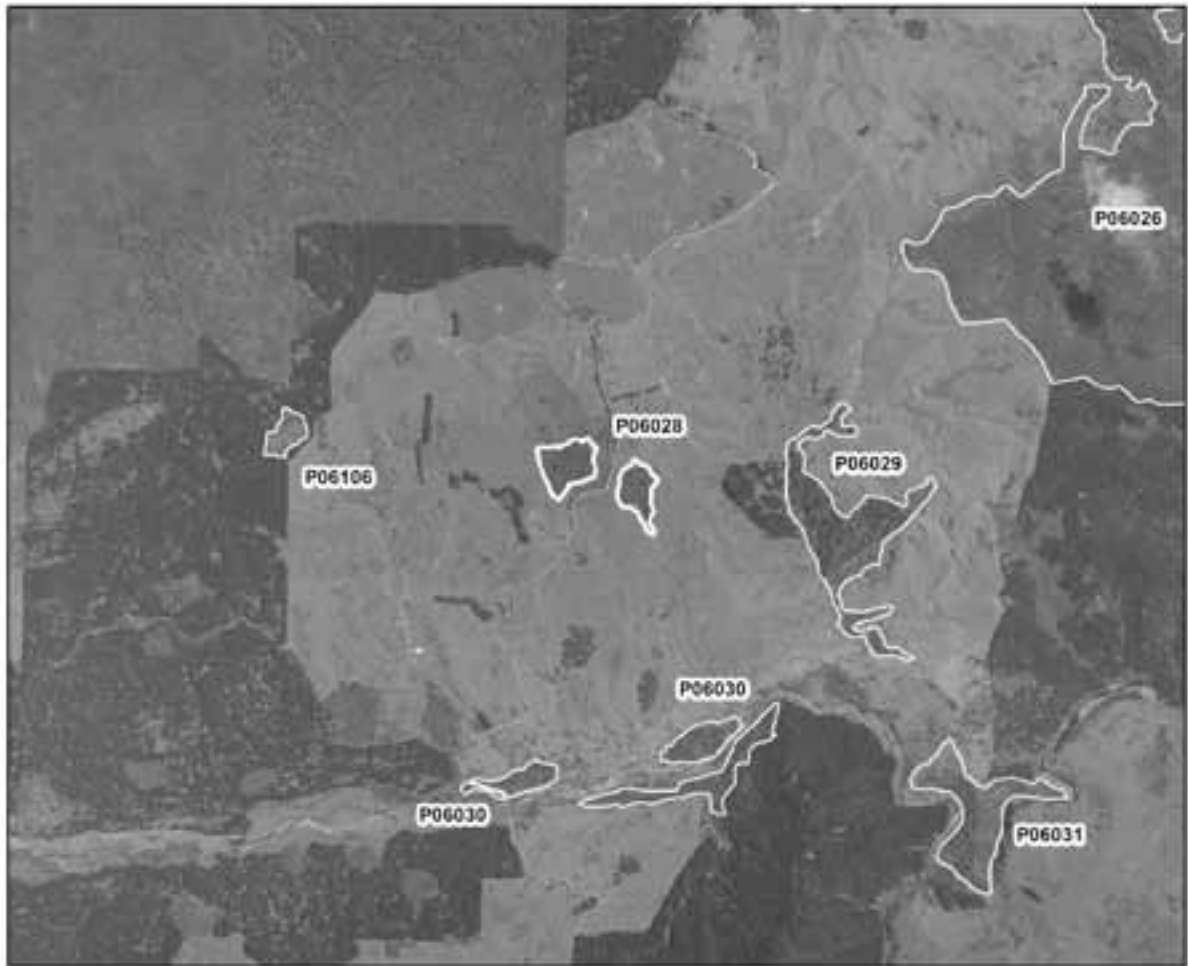
The site comprises two small secondary forest remnants outlying from Mataraua Forest. Kahikatea-taraire-towai forest (a) is dominant, with frequent rewarewa and occasional kohuhu and pukatea.

Fauna

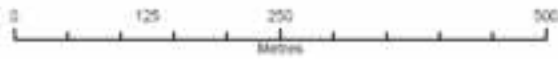
Not surveyed.

Significance

The site comprises two small secondary forest remnants which may perform a role in linking the Mataraua Forest with the large indigenous/plantation forest tract to the north of the Mangakahia River. The site is near the Carter Holt Harvey-owned Opouteke indigenous block, which has high densities of kiwi (R. Pierce, pers. comm.). It is representative for (a) kahikatea-taraire-towai forest on gentle hillslope, the only example of its type recorded in Tangihua ED.

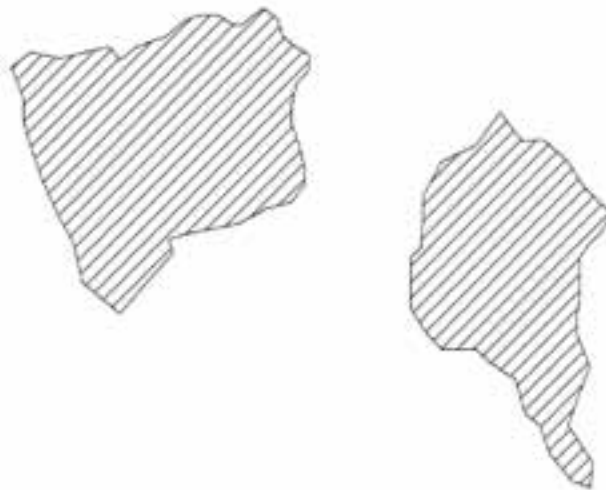


P06/028 Mataraua Road Bush Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bowen 2006

MANGAKAHIA TRIBUTARY BUSH

Survey no. P06/029
Survey date 12 August 1994
Grid reference P06 768234
Area 23.4 ha
Altitude 200-432 m asl

Ecological units

- (a) Taraire forest on steep hillslope (60%)
- (b) Mamaku-taraire forest on moderate to steep hillslope (40%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

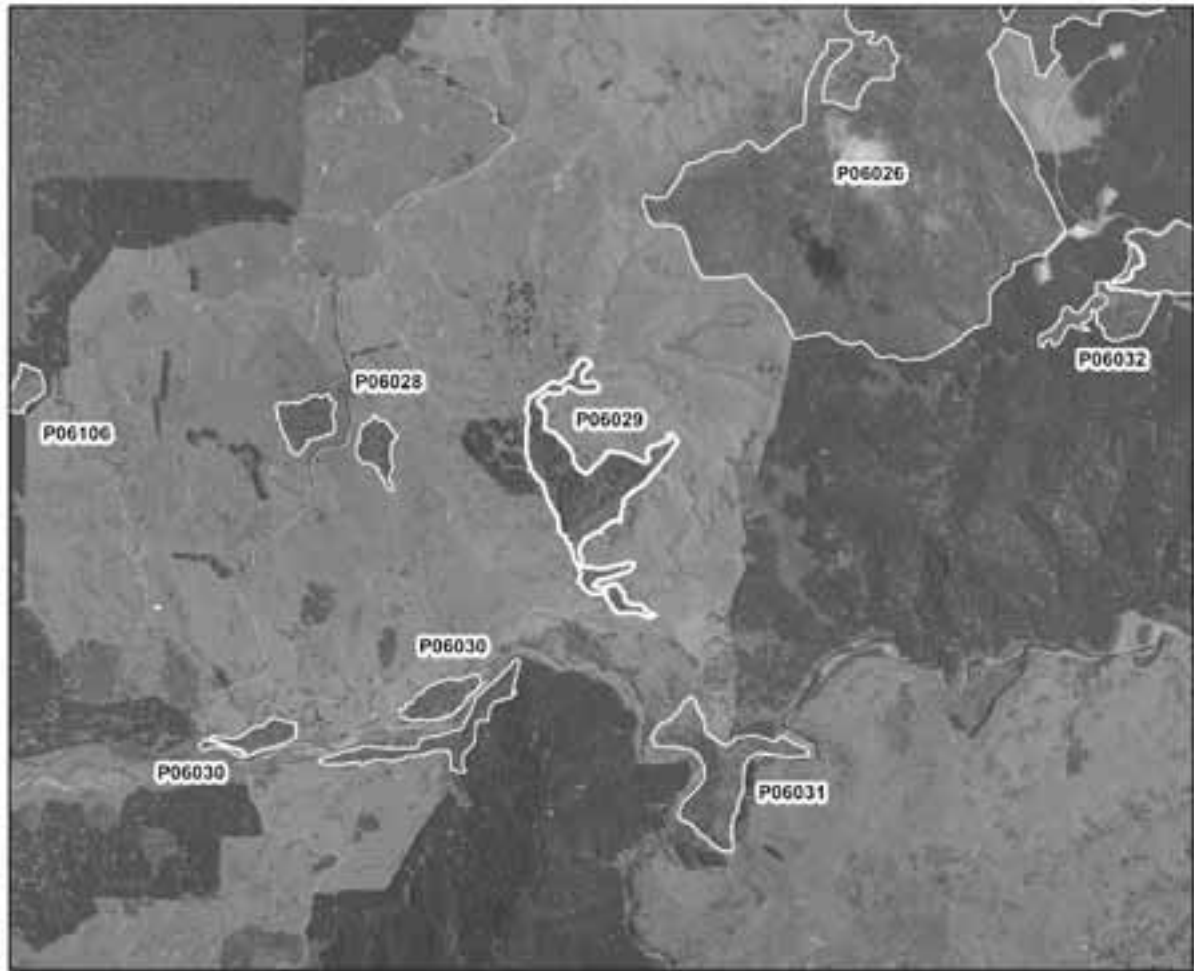
The site comprises a cut-over tall forest and secondary forest remnant occupying steep east-facing slopes and rocky cliffs. Taraire forest (a) on steep hillslope is the most common forest type, occurring with frequent tawa, rewarewa and emergent matai. Occasional species include puka, pukatea, nikau, totara and emergent kahikatea. The other vegetation unit is mamaku-taraire forest (b), occurring on moderate to steep hillslope, with frequent rewarewa and mahoe, and occasional titoki, nikau, towai and tawa.

Fauna

Not surveyed.

Significance

The site is small with forest types that are relatively common in Northland, and it also lacks buffering (it is surrounded by pasture). However, the site may act as a linkage between large forest tracts to the east (P06/026) and west (outside Tangihua ED), while also providing riparian buffering for a tributary of the Mangakahia River. It is representative for (b) mamaku-taraire forest on moderate to steep hillslope, the only example of its type recorded in Tangihua ED.



P06/029 Mangakahia Tributary Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

FORKS BUSH

Survey no. P06/031
Survey date 19 July 1994
Grid reference P06 775220
Area 15.9 ha
Altitude 150-240 m asl

Ecological units

- (a) Taraire forest on toeslope (75%)
- (b) Kauri-taraire forest on hillslope (15%)
- (c) Kowhai forest on river terrace (10%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

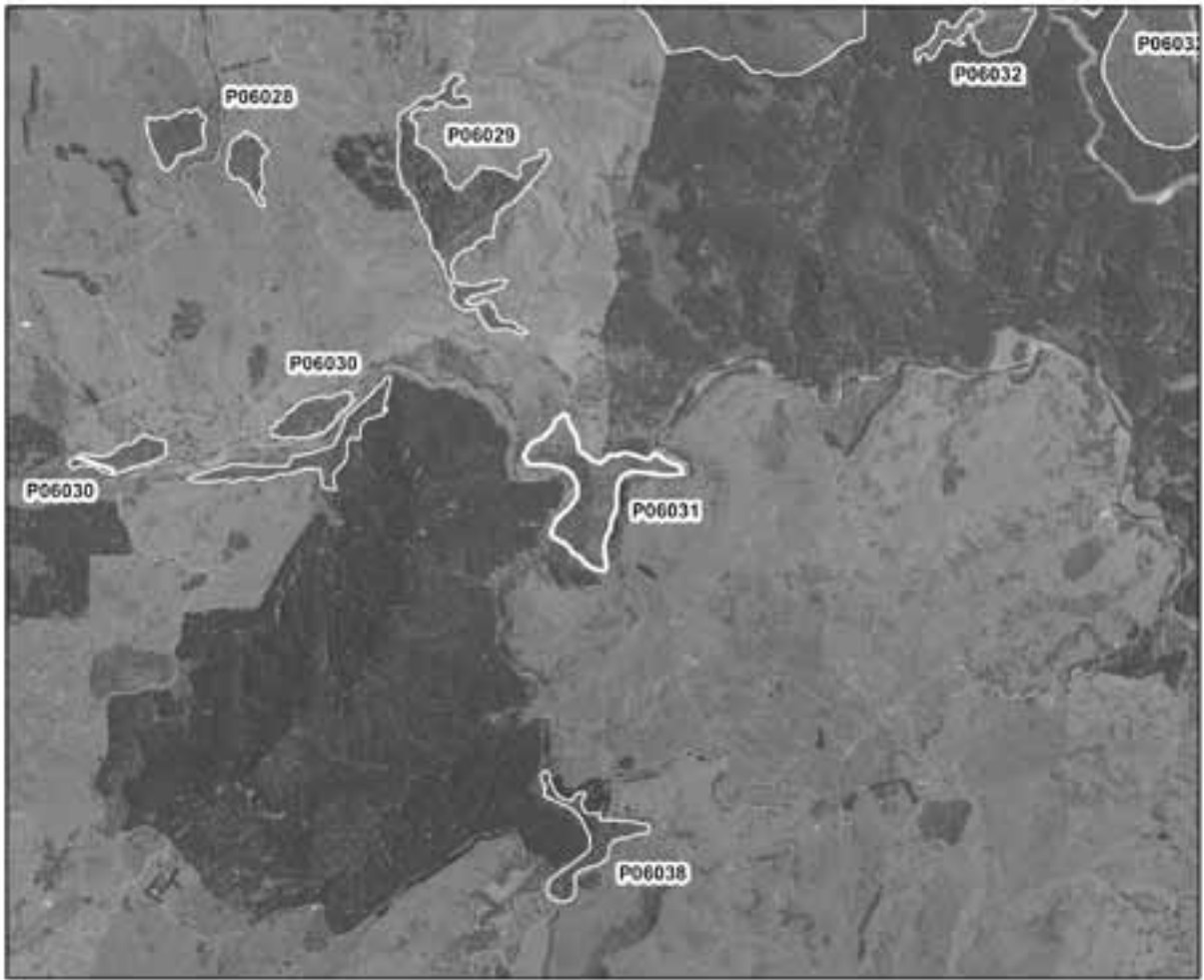
The site comprises a fragmented and largely secondary forest remnant located at the confluence of the Mangakahia River and Waiokumurau Stream. It is currently buffered by pine plantation along its western boundary and northern tip. Taraire forest (a) is common throughout the site and includes frequent towai, kahikatea, mamaku, rewarewa, and kowhai, and occasional kohuhu, tawa, rimu and nikau. The other vegetation unit occurring on hillslope is kauri-taraire forest (b), with frequent rewarewa, kahikatea, mamaku and occasional tawa. Riverine kowhai forest (c) with occasional taraire and rewarewa in the canopy is prominent on the lower slopes and terraces along the Mangakahia River and a small tributary stream.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline) and Cran's Bully have been recorded in the Mangakahia River, close to the site (NIWA 2009a).

Significance

This site is fragmented and largely secondary in nature, however, it does include a good quality example of podocarp-broadleaved forest in Tangihua ED. It contains a small but representative example of kowhai riverine forest (c), which is uncommon in the ED, but more information is required before this site can be elevated to Level 1 status. This site provides a riparian function for a part of the Mangakahia River, which supports a threatened fish species.

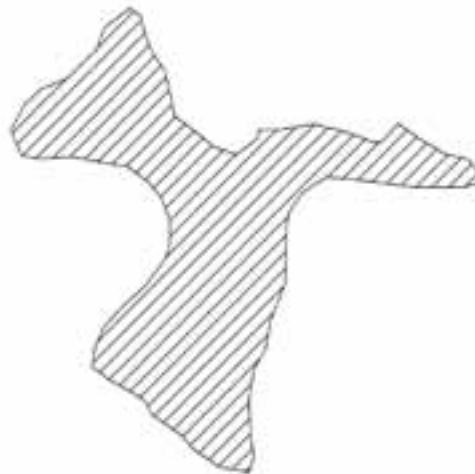


P06/031 Forks Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

HENLY BUSH

Survey no. P06/033
Survey date 18 July 1994
Grid reference P06 821240
Area 27.7 ha (23.5 ha forest, 4.2 ha shrubland)
Altitude 120-240 m asl

Ecological units

- (a) Kauri-tanekaha forest on steep hillslope (60%)
- (b) Taraire forest on moderate hillslope (20%)
- (c) Kanuka/manuka shrubland on hillslope (20%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

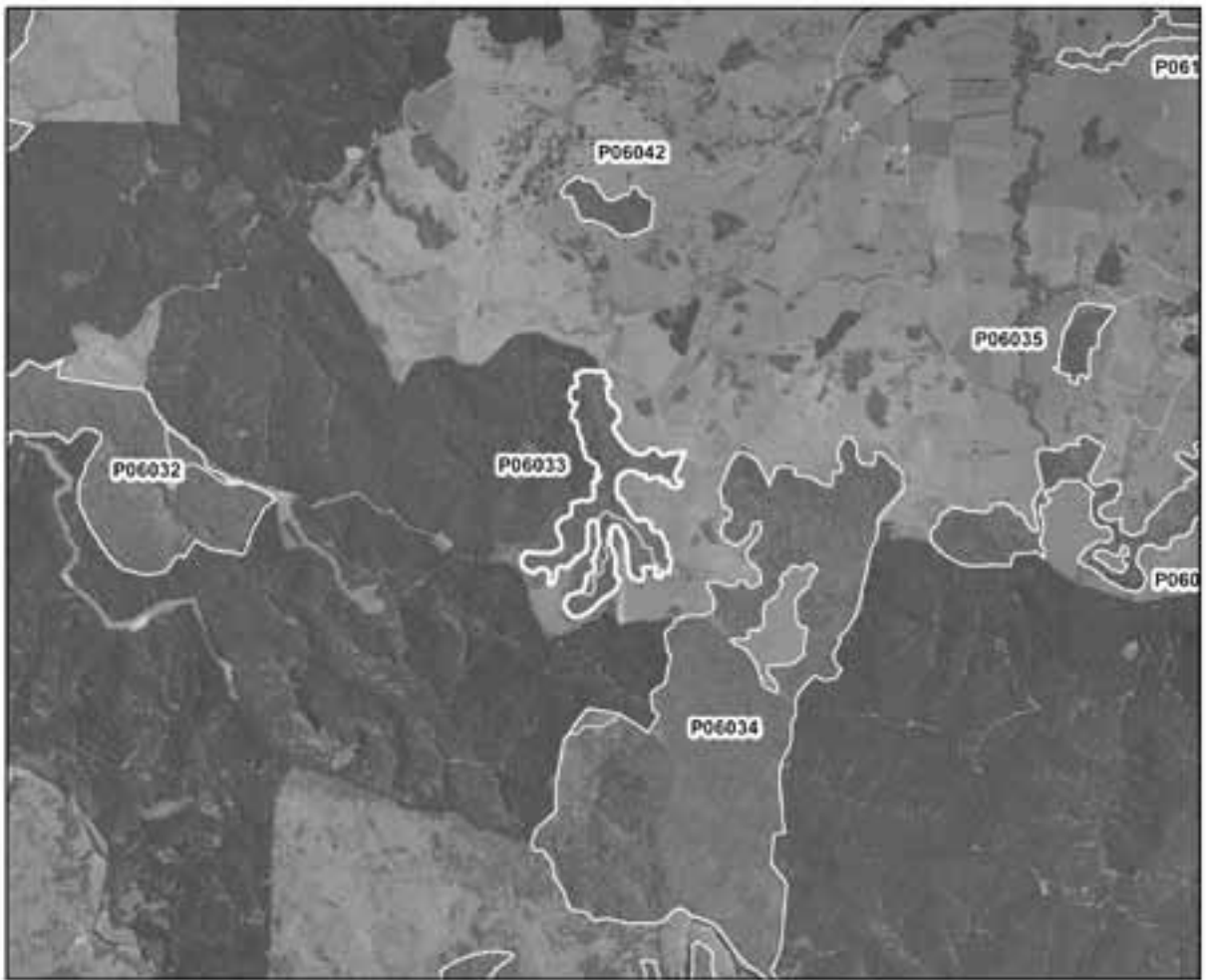
Henly Bush is a small remnant of secondary forest and peripheral shrubland in a steeply dissected gully head. It is currently buffered by pine plantation along its western edge, while pasture surrounds the rest of the site. Over half of the site is dominated by kauri-tanekaha forest (a), with frequent totara, kahikatea, rewarewa and occasional taraire. Taraire forest (b) is also common, occurring with frequent kanuka/manuka, kauri and tanekaha. Kahikatea and miro occur occasionally. Shrubland areas are characterised by locally abundant kanuka/manuka (c).

Fauna

Not surveyed.

Significance

A large proportion of this site contains secondary kauri forest. The site provides upper catchment protection and riparian cover for the Whakairo Stream, and may function as a refuge for indigenous fauna during adjacent logging operations. Further survey is recommended.



P06/033 Henly Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

WAIOKUMURAU ROAD BUSH

Survey no. P06/040
Survey date 19 July 1994
Grid reference P06 777189
Area 9.9 ha
Altitude 239-335 m asl

Ecological units

(a) Taraire-rewarewa forest on steep hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

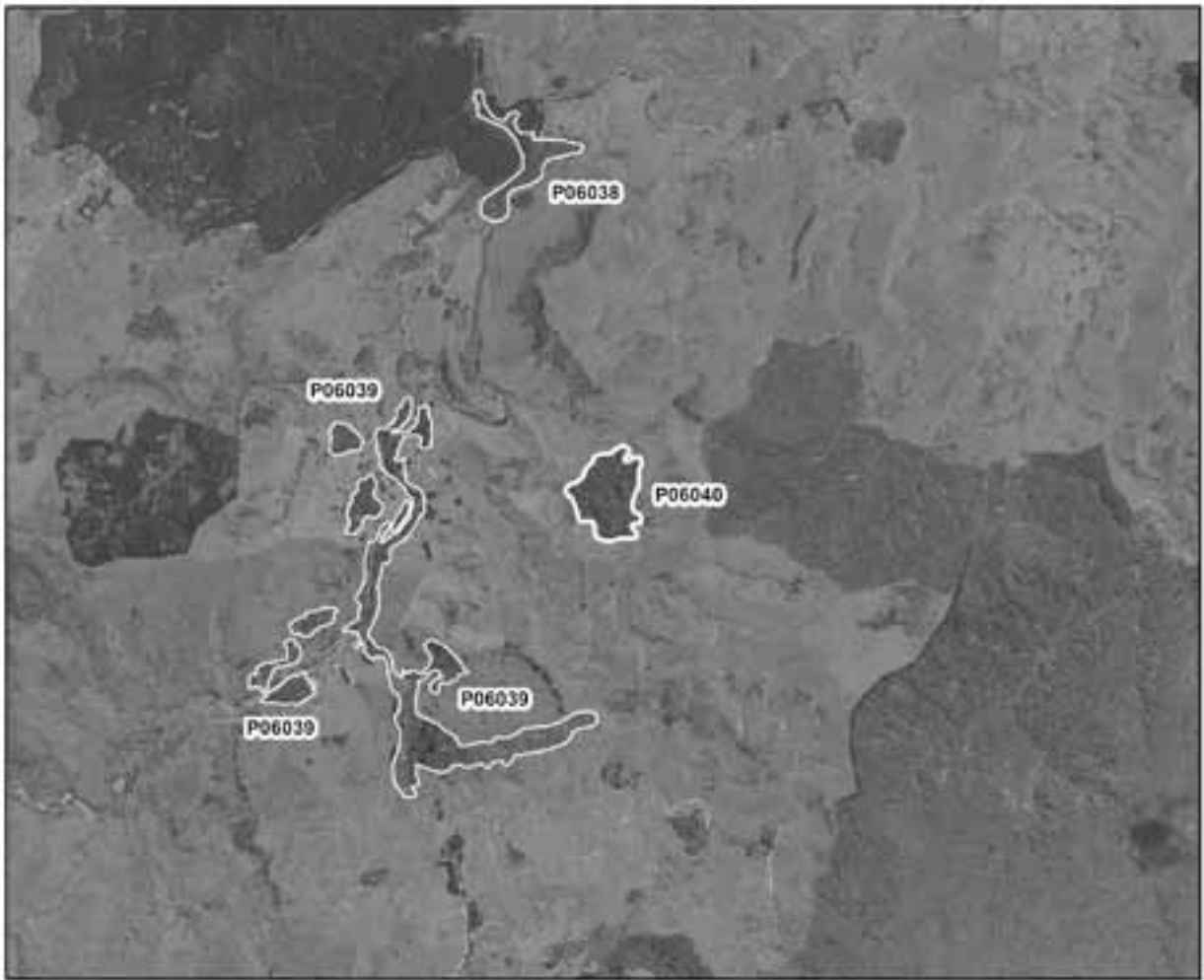
The site is small but contains a diversity of canopy species. It occupies moderate to steep south-west facing slopes dominated by taraire and rewarewa (a). Other species include frequent miro, tawa and totara, and occasional rimu and pukatea.

Fauna

Not surveyed.

Significance

The site contains a forest type that is common throughout Tangihua ED. Its proximity to the Tutamoe Range to the east may facilitate linkages with other larger natural areas west of the site, thus forming part of a habitat network for mobile species such as kukupa. Goats are widespread throughout the site and its environs.



P06/040 Waikumurau Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

GAMMONS ROAD FOREST REMNANT

Survey no. P06/042
Survey date 10 February 2009
Grid reference P06 821252
Area 6.3 ha
Altitude 136-199 m asl

Ecological units

(a) Totara-puriri forest on moderate hillslope (100%)

Landform/geology

Hillslopes underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small, hilltop remnant of cut-over tall totara-puriri (a) forest with occasional emergent kahikatea, rewarewa and northern rata. Other species include occasional kohekohe and towai.

Significant flora

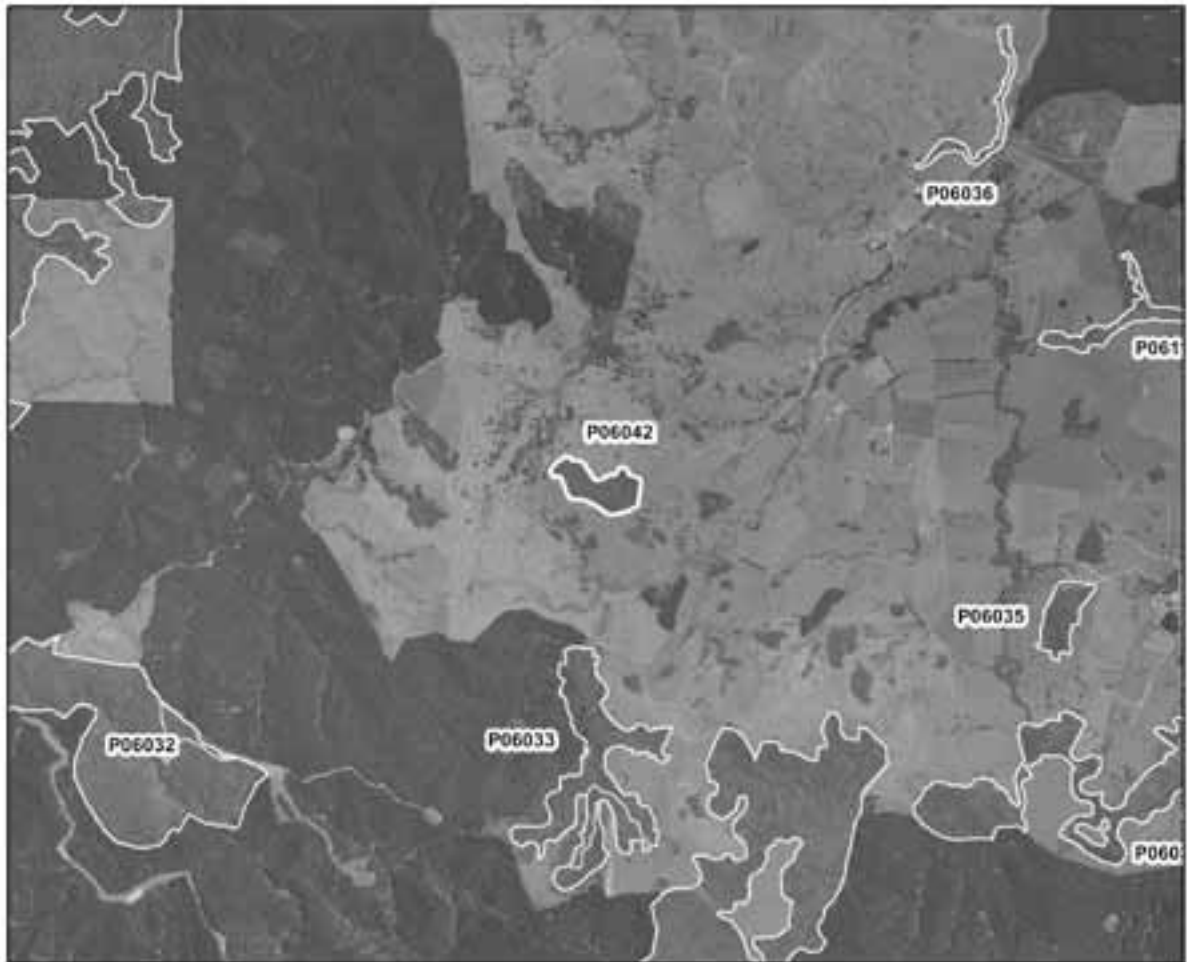
Northern rata (regionally significant) was recorded during this survey.

Fauna

Not surveyed.

Significance

Gammons Road Remnant is a small hilltop remnant defined by a common forest type within Tangihua ED. It supports one regionally significant plant species and is likely to provide a food source for kukupa. The site is fenced; stock or possum browse was not observed.

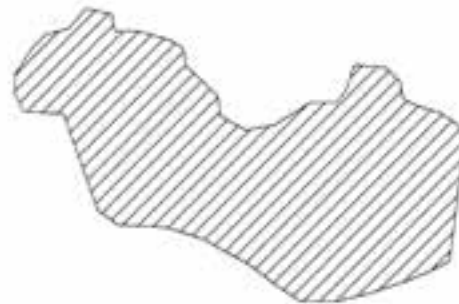


P06/042 Gammons Road Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

OPOUTEKE ROAD FOREST REMNANTS

Survey no.	P06/045
Survey date	2 August 1994
Grid reference	P06 895107 (two remnants)
Area	119.65 ha (28 ha forest, 91.7 ha shrubland) (The site has been adjusted to fit with 2006 aerial photography. The main change was the addition of a large area of shrubland to the south-west)
Altitude	60-100m asl

Ecological units

- (a) Kanuka/manuka shrubland on hillslope (75%)
- (b) Kanuka/manuka forest on hillslope (10%)
- (c) Kauri forest on hillslope (2%)
- (d) Kanuka/manuka-tanekaha-totara forest on hillslope (2%)
- (e) Taraire forest on hillslope (7%)
- (f) Totara forest on hillslope (2%)
- (g) Kahikatea forest on gentle hillslope (2%)

Landform/geology

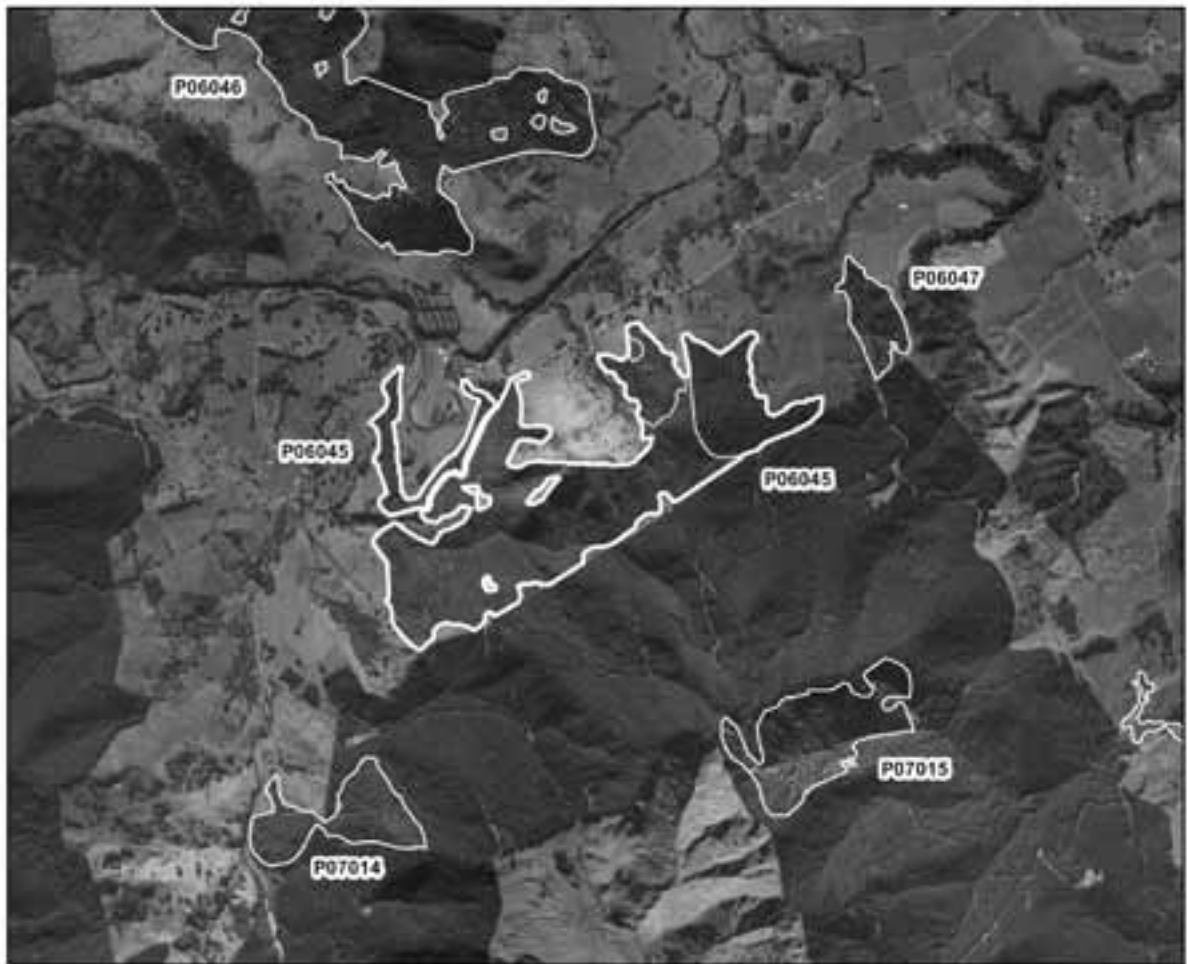
Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

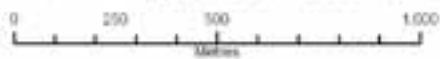
The site comprises forest and shrubland remnants near the lower reaches of the Opouteke Stream. Forested areas are characterised by several cut-over tall forest and secondary vegetation types on hillslopes. Most of the site is dominated by kanuka/manuka shrubland (a), including the small, western remnant. Kanuka/manuka forest (b) occurs in the north-east of the site, with frequent totara and occasional puriri. Secondary kauri forest (c) is prominent in a small area, occurring with frequent tanekaha and totara, and occasional rimu, towai, rewarewa and kanuka/manuka. Kanuka/manuka, tanekaha and totara forest (d) occurs in a small area, and includes occasional kahikatea, taraire and towai. Taraire forest (e) is common in two small separate areas. In the first area it occurs with frequent karaka and towai, and occasional tawa, titoki and kanuka/manuka; in the second area taraire occurs with frequent tawa, puriri, totara and rewarewa, and occasional kauri, kowhai, and kahikatea. The remainder of the site includes hillslope areas of totara forest (f) with frequent kahikatea and occasional rewarewa, puriri, and taraire; and kahikatea forest (g) with occasional rimu, totara, and pukatea.

Fauna




Terrestrial fauna not surveyed. Longfin eel (Gradual Decline) and common bully have been recorded in the Opouteke Stream upstream of the site (NIWA 2009a).



P06/045 Opouteke Road Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Significance

The site may be important as part of a habitat network for mobile species such as kukupa as well as providing refuge for NI brown kiwi during harvesting of pine plantation. It also provides riparian buffering for at least two tributaries of the Opouteke Stream, which supports one threatened fish species. Additional survey may lead to this site being upgraded to Level 1 status.

PUKEHOREPA BUSH REMNANT

Survey no.	P06/049
Survey date	19 July 1994
Grid reference	P06 847194 (three remnants)
Area	12.6 ha
Altitude	74-100 m asl

Ecological units

- (a) Taraire forest on hillslope (60%)
- (b) Totara forest on hillslope (20%)
- (c) Kanuka/manuka forest on hillslope (10%)
- (d) Kahikatea forest on hillslope (10%)

Landform/geology

Valley floor Holocene alluvium, bounded by hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small area of relatively low-lying podocarp-broadleaved forest, largely surrounded by pasture. Taraire (a) is the dominant canopy species, occurring in over half of the site, with frequent totara and rimu. Occasional species include kahikatea, pukatea, titoki, rewarewa, northern rata, tawa and kanuka/manuka. Totara forest (b) is common in some areas with frequent rimu, and occasional kahikatea and kanuka/manuka. The remaining, less frequent vegetation units include kanuka/manuka forest (c) with frequent totara and occasional kahikatea and rimu occasional, and kahikatea forest with frequent kanuka/manuka and occasional titoki.

Significant flora

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

Fauna

Terrestrial fauna not surveyed. The site includes a tributary of the Mangakahia River; this river supports longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully and grey mullet (NIWA 2009a).



P06/049 Pukehorepa Bush Remnant



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

Significance

The site is small and isolated from other areas of indigenous forest. However, given that part of its west margin abuts a large tract of pine plantation, the site may act as a refuge for species such as NI brown kiwi during pine harvesting. The site also supports one regionally significant plant species and provides riparian buffering for a tributary of the Mangakahia River. The river is utilised by a range of indigenous fish, including three threatened and one regionally significant fish species. A small part of the site (7.4 ha) is Queen Elizabeth II Open Space Covenant.

KAKEKAKE STREAM FOREST REMNANTS

Survey no . P06/055
Survey date 9 August 1994
Grid reference P06 895175
Area 31.4 ha
Altitude 20-140 m asl

Ecological units

- (a) Kanuka/manuka-totara forest on hillslope (90%)
- (b) Taraire forest on gentle hillslope (10%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

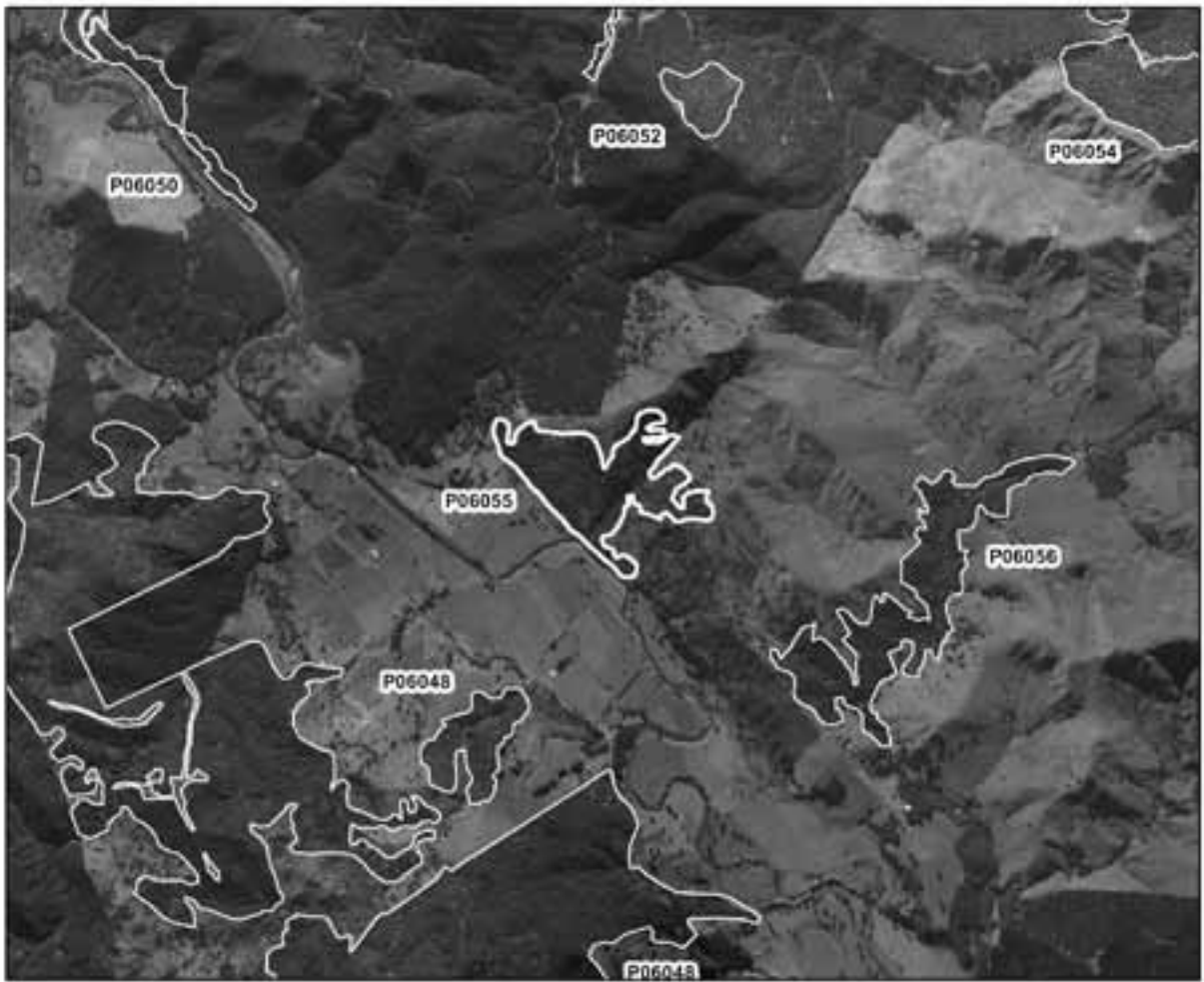
The site comprises a small forest remnant on hillslopes adjacent to the Kakekake Stream. The majority of the site is kanuka/manuka-dominant with common totara (a), frequent kahikatea and occasional puriri. The remaining vegetation is characterised by common taraire (b) with frequent tanekaha and kowhai, and occasional kauri and karaka.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully, and grey mullet have been recorded upstream of the Kakekake Stream-Mangakahia River confluence (NIWA 2009a).

Significance

This is a small, isolated site with forest types that are relatively common. It may be part of a habitat network for mobile bird species such as kukupa, which are able to move between widely separated remnants of indigenous forest in search of food. It also provides buffering to a tributary of the Mangakahia River, an important migratory pathway for a range of indigenous fish, including two threatened species and one regionally significant species.

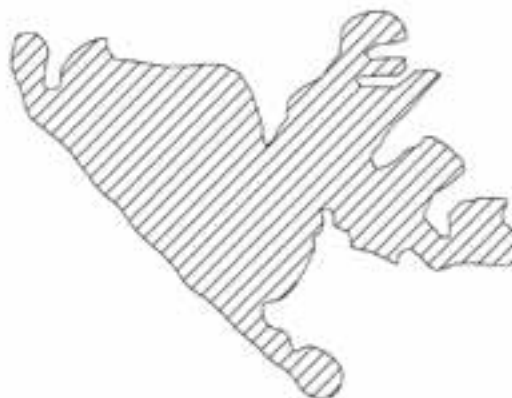


P06/055 Kakekake Stream Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bown 2002

TE KAHUKURI STREAM BUSH

Survey no. P06/056
Survey date 1 August 1994
Grid reference P06 912170
Area 42.1 ha
Altitude 20-120 m asl

Ecological units

- (a) Kanuka/manuka-totara forest on hillslope (80%)
- (b) Taraire forest on hillslope (20%)

Landform/geology

Valley floor on Holocene alluvium, bounded by steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

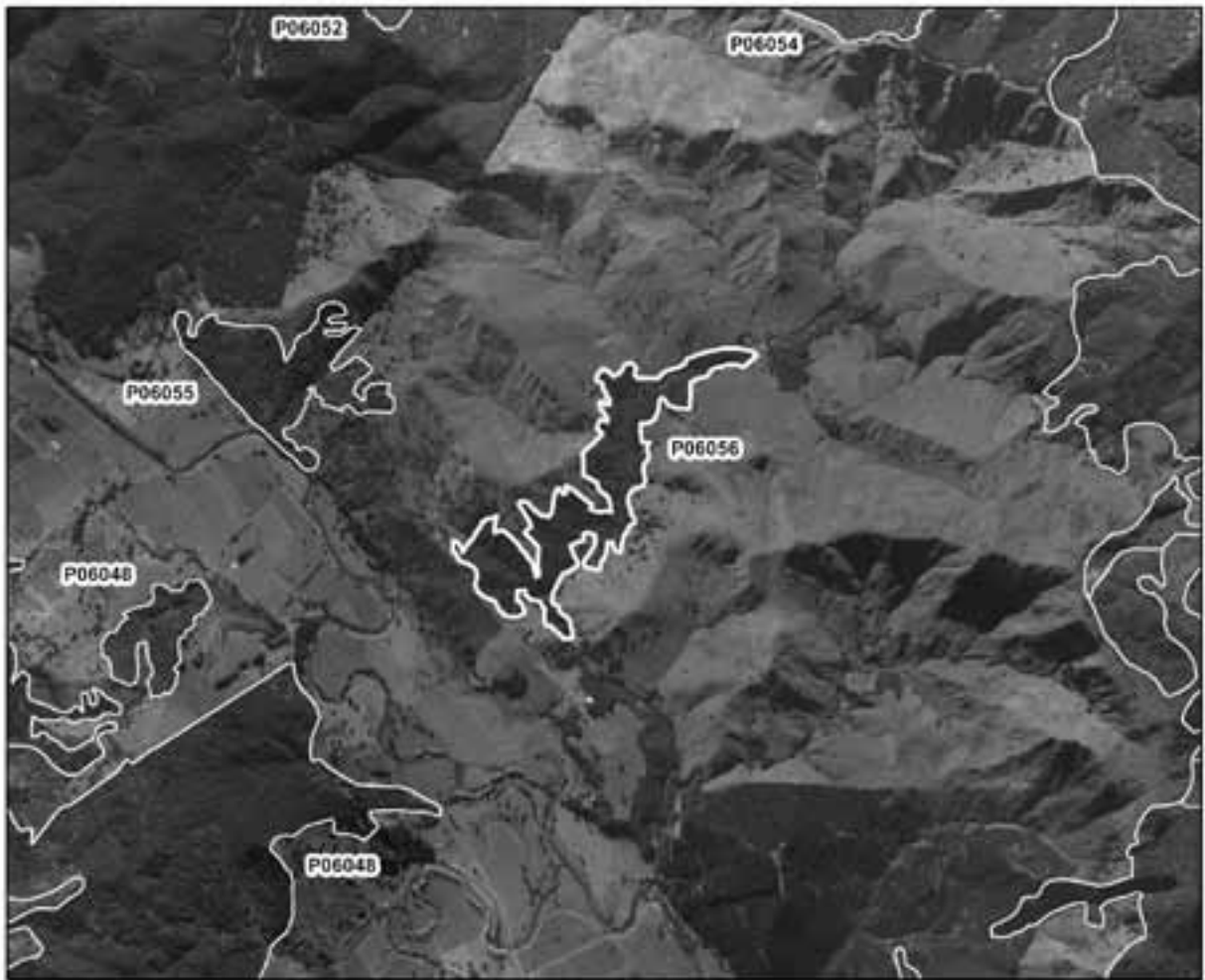
This site comprises a fragmented forest remnant flanking the Te Kahukuri Stream, and is characterised by similar forest types to that of site P06/055. Kanuka/manuka-totara forest (a) dominates most of the site, occurring on hillslope with occasional kahikatea and towai. Taraire forest (b) covers the rest of the remnant and includes frequent karaka and occasional kahikatea, titoki, tanekaha, kowhai, towai, rewarewa and emergent kauri.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully and grey mullet have been recorded upstream of the Te Kahukuri Stream-Mangakahia River confluence (NIWA 2009a).

Significance

The site is small and lacks diversity and buffering, however, it provides an important riparian function for the lower reaches of the Te Kahukuri Stream. This stream drains into the Mangakahia River, which supports at least two threatened and one regionally significant fish species. It is also contiguous with an area of pine plantation which links with Mangakahia Forest (P06/001), one of the largest areas of indigenous forest remaining in Tangihua ED.



P06/056 Te Kahukuri Stream Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

PINE (AWARAU SOUTH) SWAMP

Survey no. P06/057
Survey date 9 August 1994
Grid reference P06 870228
Area 1.4 ha
Altitude 90 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

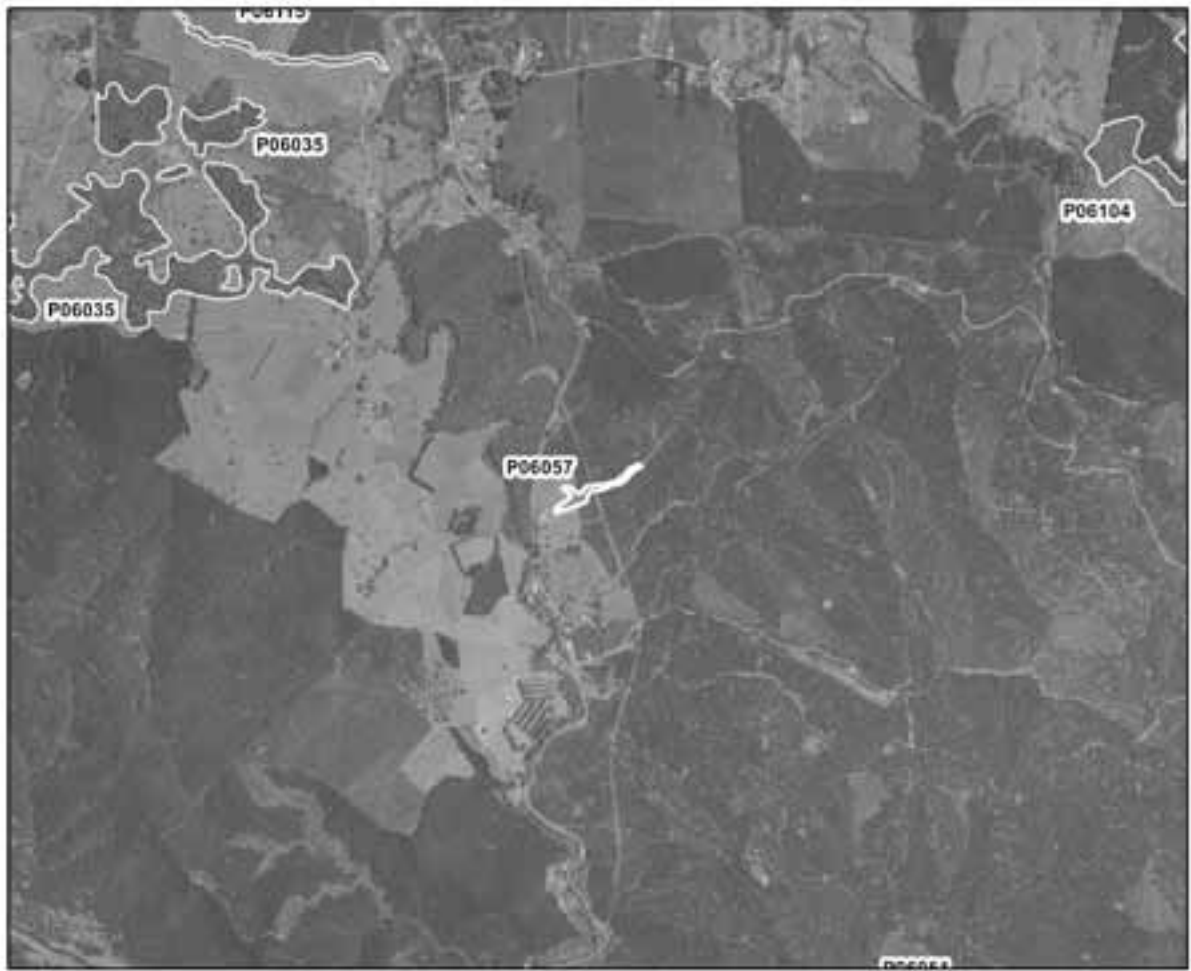
The site comprises a small raupo-dominated freshwater wetland (a) with frequent *Carex* sp. (probably *Carex secta*) and occasional wheki. It extends to the north-east where it turns into a narrow channel currently buffered by pine plantation.

Fauna

A past survey recorded spotless crane (Relict) and abundant pukeko (recorded in 1978, SSBI P06/H038).

Significance

Most natural wetlands which were formerly present in Tangihua ED have been drained or modified, and wetlands are now a nationally under-represented habitat type. The site is small, isolated, unfenced, and grazed by stock, and although there are past records of a threatened bird species, further surveys are required to determine the site's current ecological values. It is therefore ranked as a Level 2 site.

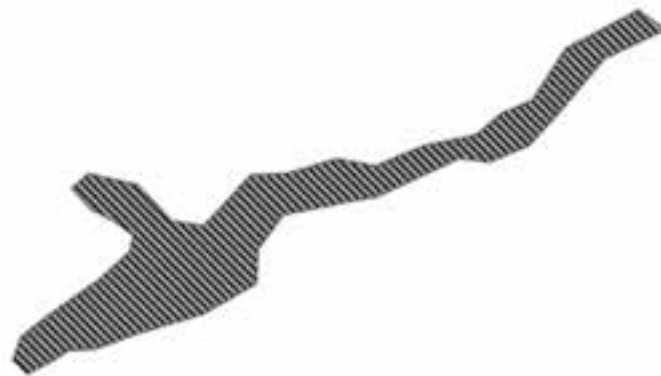


P06/057 Pine (Awarau South) Swamp



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

WHANGAITI STREAM SHRUBLAND

Survey no.	P06/058
Survey date	27 July 1994 and 10 February 2009
Grid reference	P06 996130 (three remnants)
Area	25.5 ha (Small adjustments were made to the site boundary based on the 2006 aerial photography)
Altitude	20-120 m asl

Ecological units

- (a) Manuka shrubland on hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

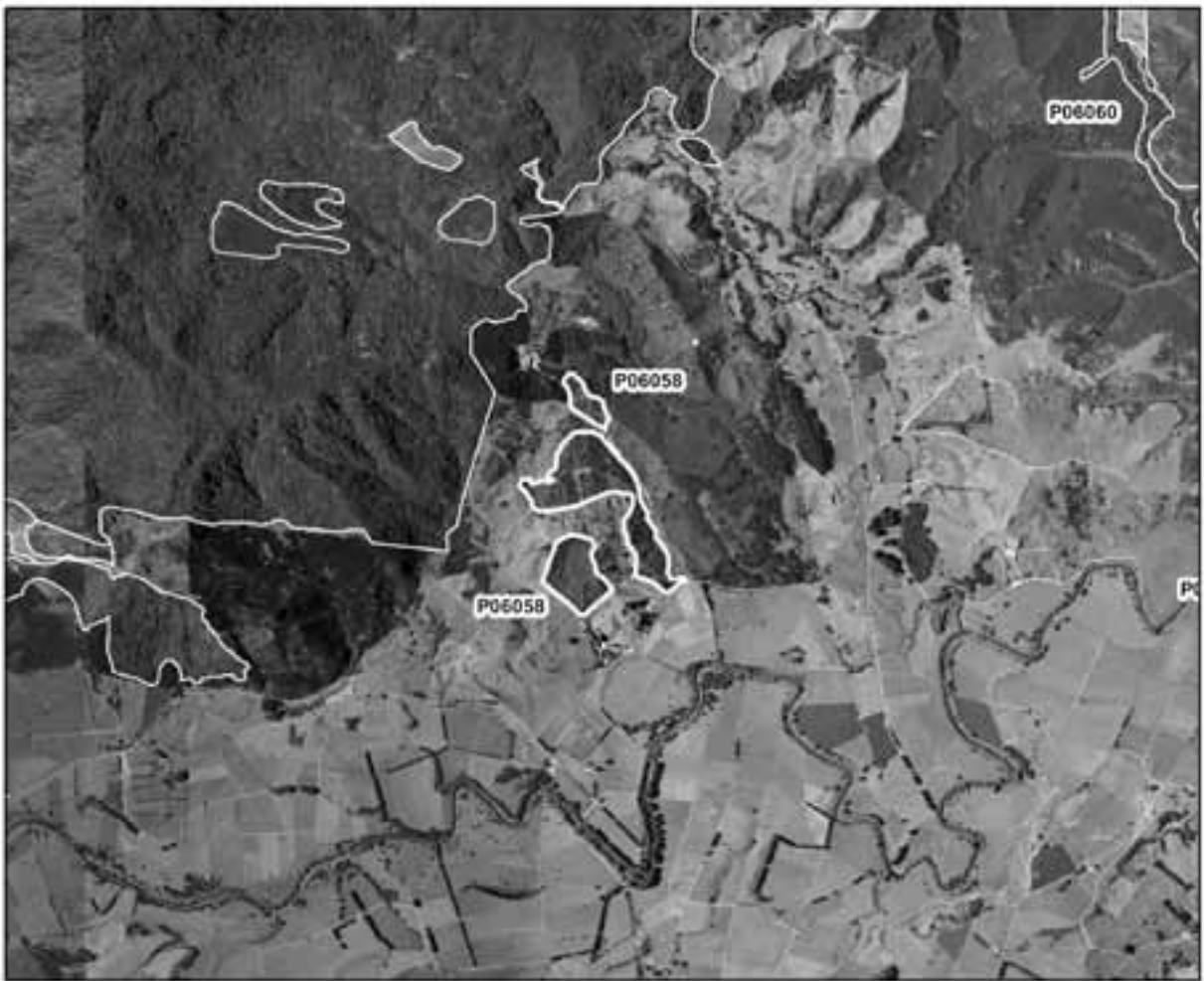
The original 1994 survey of this site described it as comprising two shrubland remnants on rolling hill country around Whangaiti Stream. Both remnants consisted of low manuka (a) with occasional ti kouka, mingimingi, mamaku, gorse and *Pinus radiata*. Access to the site was not gained in the 2009 check of this site as most of the site was obscured by pine plantation when viewed from a distance. Interpretation of aerial photography indicates that the site is comprised of three remnants.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline), lamprey (Sparse), banded kokopu (regionally significant), shortfin eel, torrentfish, inanga, Cran's bully, and grey mullet have been recorded upstream of the Whangaiti Stream-Mangakahia River confluence (NIWA 2009a).

Significance

This site provides a stepping stone between Mangakahia Forest to the west and gumlands to the east and may provide potential habitat for NI fernbird (Declining) and lizards. It also provides partial riparian buffering for the Whangaiti Stream, a tributary of the Mangakahia River. It is likely that some of the manuka shrubland has been replaced by pine plantation since 1994, although this was not able to be confirmed during the present survey.



P06/058 Whangaiti Stream Shrubland



Aerial photography from 2000

MANGU ROAD BUSH

Survey no.	P06/071
Survey date	14 May 1994
Grid reference	P06 993377 (three remnants)
Area	27.5 ha (Small adjustments were made to the 1994 site boundary based on the 2006 aerial photography)
Altitude	70-180 m asl

Ecological units

- (a) Kauri-tanekaha-towai forest on steep hillslope (30%)
- (b) Taraire forest on hillslope (30%)
- (c) Manuka forest on hillslope (25%)
- (d) Manuka-kauri forest on steep hillslope (15%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

The site encompasses forested gully remnants within the Ngati Hine Forest pine plantation. Kauri, tanekaha, and towai (a) are common, while taraire, rewarewa, puriri, manuka, mamaku and kahikatea are frequent, with occasional rimu, tawa, totara and miro. Tall taraire forest (b) is common, with frequent puriri and tawa and occasional emergent miro, northern rata, rimu and kauri. Manuka forest (c) occurs with frequent kahikatea and tanekaha, and occasional rimu. The remainder of the site is dominated by manuka with common kauri (d). Tanekaha and totara are frequent, and rimu and rewarewa occasional.

Significant flora

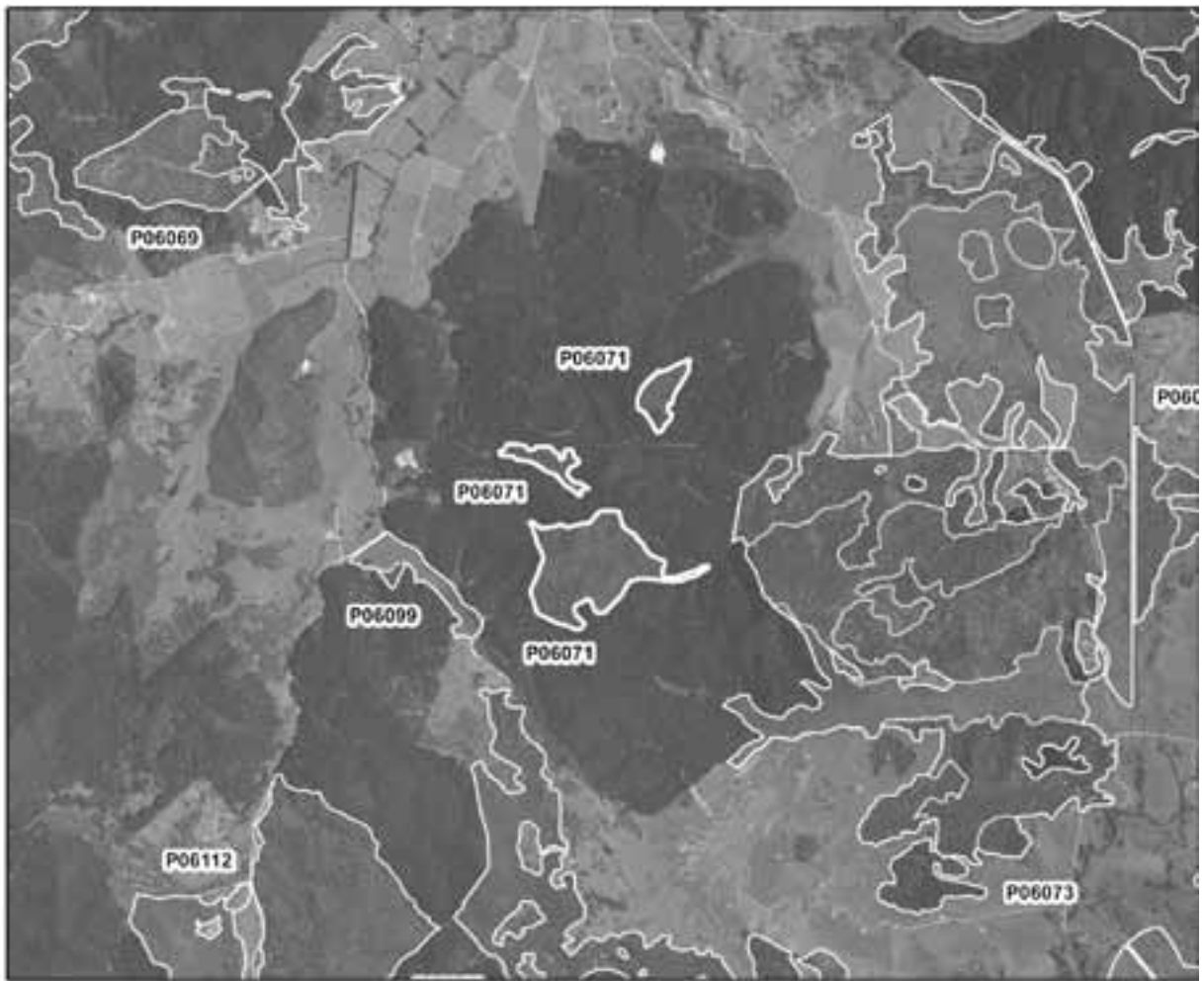
Northern rata (regionally significant) was recorded during this survey.

Fauna

Not surveyed.

Significance

The site is part of a large indigenous/exotic tract and may function as a refuge for indigenous fauna during the logging of adjoining pine forest. It is representative for one ecological unit: (d) manuka-kauri forest on steep hillslope, and it supports one regionally significant plant species.



P06/071 Mangu Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

TAIKIRAU RAILWAY WETLAND

Survey no.	P06/087
Survey date	4 September 1995
Grid reference	P06 073346 (two remnants)
Area	4.8 ha
Altitude	62 m asl

Ecological units

- (a) *Glyceria maxima*-*Juncus* sp. grassland in swamp (70%)
- (b) Raupo reedland in swamp (10%)
- (c) *Baumea articulata* sedgeland in swamp (5%)
- (d) *Azolla filiculoides* herbfield in swamp (3%)
- (e) *Eleocharis sphacelata* reedland in swamp (2%)
- (f) *Glyceria maxima* grassland in swamp (10%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site comprises a small wetland surrounded by low-lying pasture. Most of the wetland is characterised by co-dominant *Glyceria maxima* and *Juncus* sp. (a) with occasional *Carex* sp. and willow weed. The remainder of the site includes a mosaic of five locally common vegetation types: raupo reedland (b), *Baumea articulata* sedgeland (c), *Azolla filiculoides* herbfield, *Eleocharis sphacelata* reedland (e), and *Glyceria maxima* grassland (f).

Significant flora

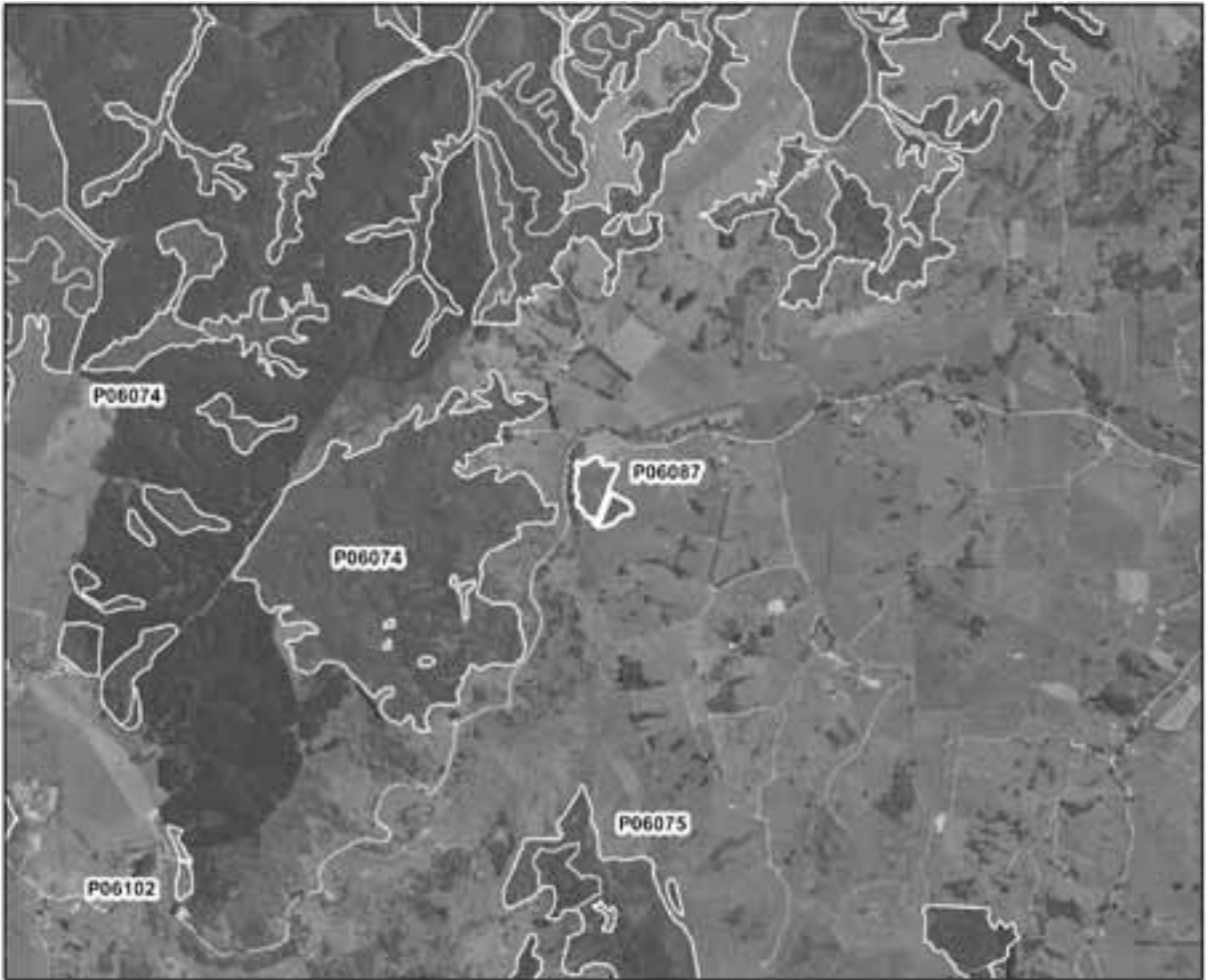
Azolla filiculoides (regionally significant) was recorded during this survey.

Fauna

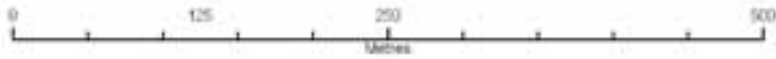
Pied stilt (Declining), spotless crane (Relict), grey teal (regionally significant), NZ shoveler (regionally significant), pukeko, black swan, pied stilt and welcome swallow were recorded at the time of survey.

Significance

The wetland has been invaded by the exotic wetland plant *Glyceria maxima*. Indigenous birds, however, will still use habitat dominated by this species. At the time of survey this wetland was supporting two threatened species, two regionally significant bird species, and one regionally significant plant species. The site is representative for one ecological unit: (d) *Azolla filiculoides* herbfield in swamp, the only example of its type recorded in Tangihua ED, although this is likely to change if *Glyceria maxima* becomes more dominant. The site lacks buffering and is bisected by the North Auckland Railway. It is assigned Level 2 status until further information is obtained.



P06/087 Taikirau Railway Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2006

DRAKE ROAD FOREST REMNANTS

Survey no.	P06/096
Survey date	15 December 1998
Grid reference	P06 099172 (six remnants)
Area	57.8 ha (The site was adjusted to fit 2006 aerial photography. The main change was the addition of three remnants to the north).
Altitude	100-240 m asl

Ecological units

- (a) Puriri-totara forest on moderate and steep hillslope
- (b) Totara forest on moderate hillslope
- (c) Kahikatea-puriri-totara forest on hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

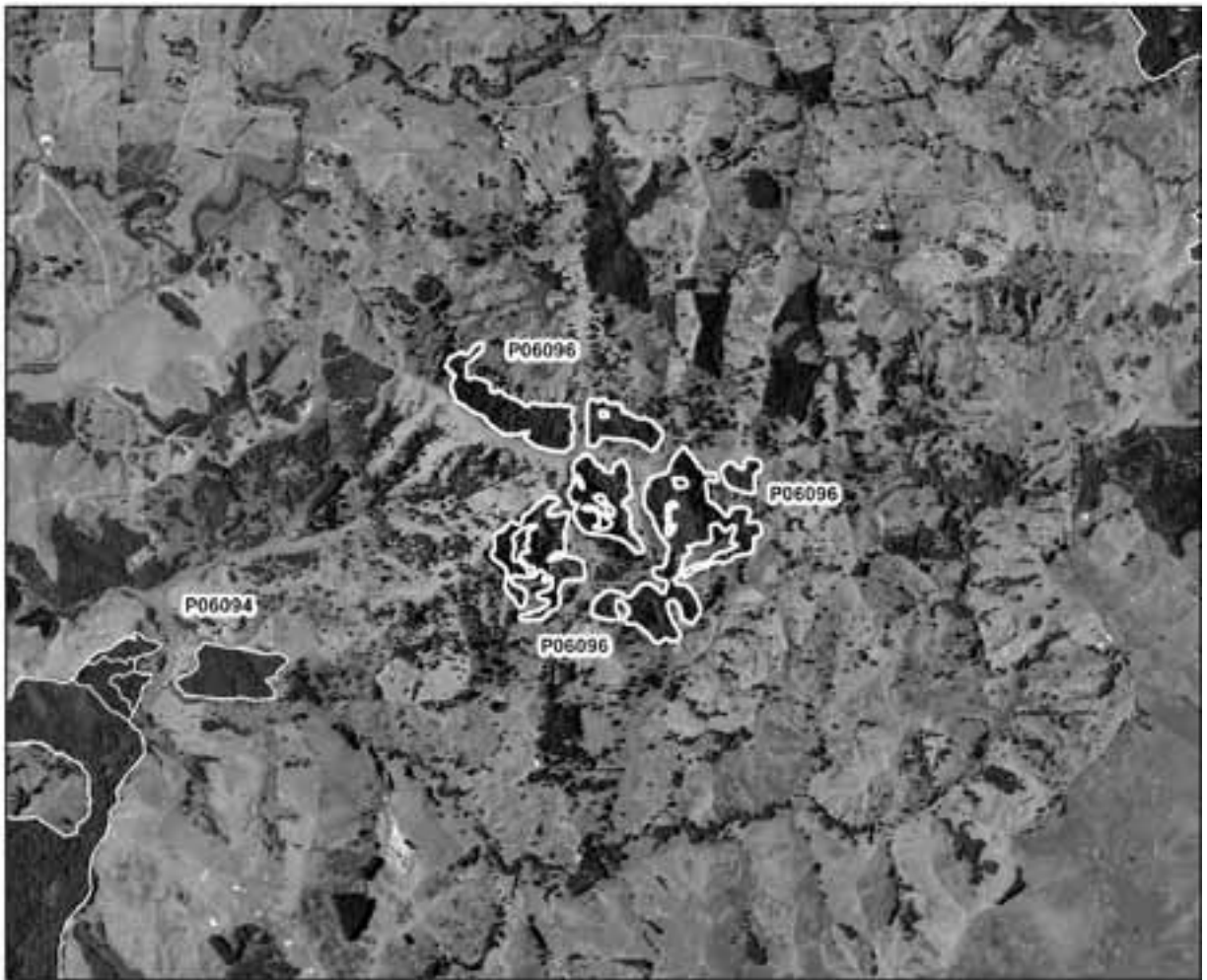
The site comprises six forest remnants to the north of Drake Road. The western remnant consists of puriri and totara forest (a) with occasional kahikatea, pukatea, karaka and nikau. The remnant to the east of this is also characterised predominantly by unit (a) puriri-totara forest. Occasional species include kahikatea, karaka, rimu and nikau. The third remnant includes three vegetation types. Totara forest (b) occurs in the southern part of the remnant, occurring with frequent towai and occasional titoki, puriri, mamaku, nikau, pukatea, tawa, kauri, rewarewa and puka. The northern part of the remnant has unit (a) puriri-totara forest on steep hillslopes with occasional titoki, karaka, mamaku, kahikatea and pukatea. The eastern portion of this remnant consists of kahikatea-puriri-totara forest (c) on hillslope with occasional towai, nikau and puka. The three additional remnants to the north were not surveyed, but interpretation of aerial photography indicates they support similar forest types to those present in the surveyed remnants.

Fauna

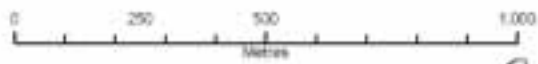
Fauna not surveyed, although shining cuckoo and grey warbler were recorded during this survey.

Significance

This site is adjacent to kiwi management populations at Purua Scenic Reserve (Q06/180) to the east and may form part of a wildlife corridor between forest remnants in the north-east and south-west. The remnants, however, are small and isolated, and contain forest types that are common throughout Tangihua ED. This site is therefore of Level 2 significance.

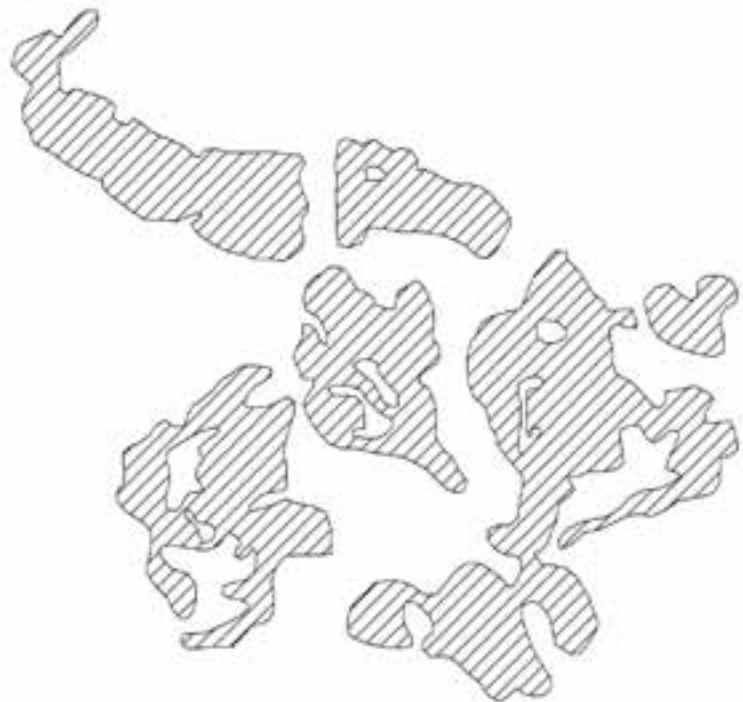


P06/096 Drake Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

PIRAUNUI STREAM BUSH

Survey no. P06/097
Survey date 2003-04
Grid reference P06 830108
Area 10.6 ha
Altitude 134-197 m asl

Ecological units

(a) Taraire-towai forest on steep hillslope

Landform/geology

Steep hillslopes underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

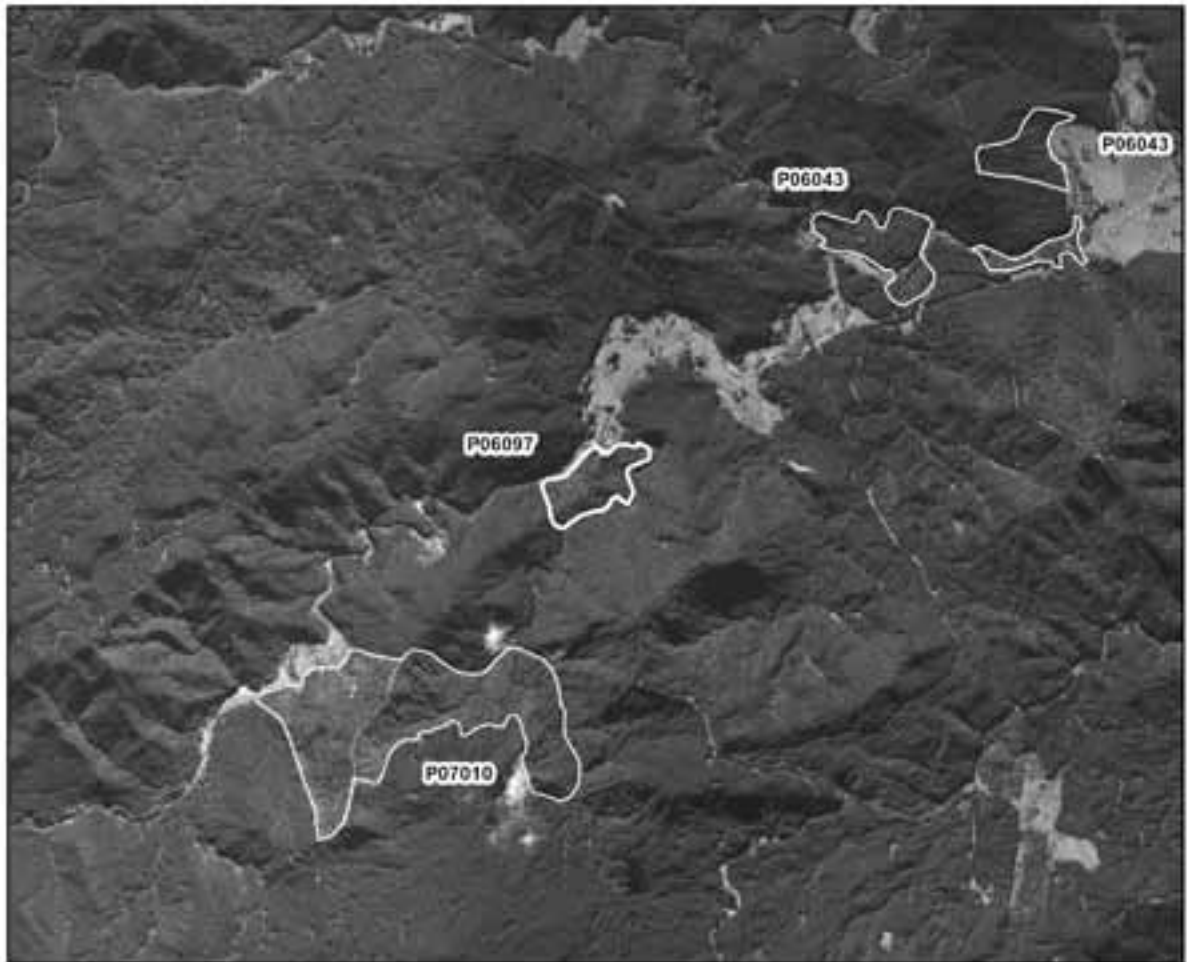
The site is situated within the Opouteke Forest pine plantation and comprises a small remnant of secondary broadleaved-podocarp forest on steep slopes bordering the Opouteke Stream. Taraire and towai (a) are common, with occasional rewarewa, kahikatea, totara, and emergent miro and kauri.

Fauna

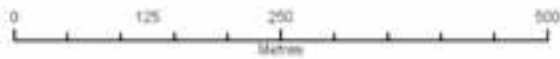
Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koura (Gradual Decline), common bully, and an unidentified eel species have been recorded close to the site in the Opouteke Stream (NIWA 2009a).

Significance

Piraunui Stream Bush provides a protective buffer to sections of the Piraunui and Opouteke streams, the latter of which supports two threatened fauna species. The site may also provide a refuge for indigenous fauna during the logging of surrounding pine forest. It also contains 1.1 ha of protected marginal strip (Opouteke Stream Marginal Strip No 1, DOC-administered). However, the site is relatively small and has not been surveyed sufficiently to determine whether it meets the criteria for Level 1 sites.



P06/097 Piraunui Stream Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002.

MANGAKAHIA RIVER SCENIC RESERVE

Survey no. P06/098
Survey date 13 March 2009
Grid reference P06 833210
Area 4.4 ha
Altitude 72-100 m asl

Ecological units

- (a) Taraire forest on gentle hillslope
- (b) Towai-kahikatea forest on hillslope

Landform/geology

Hillslope underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a small remnant of broadleaved-podocarp forest bordering the Mangakahia River. Its southern edge is currently buffered by pine plantation, while pasture adjoins the eastern and western margins. Taraire forest (a) dominates the eastern two thirds of the site, occurring with frequent kohekohe, totara and nikau, and occasional karaka, rewarewa, rimu, miro, pukatea, tawa and titoki. The remaining western third is characterised by regenerating mixed forest dominated by towai and kahikatea (b), with occasional pukatea, rewarewa, totara, nikau and mamaku.

Fauna

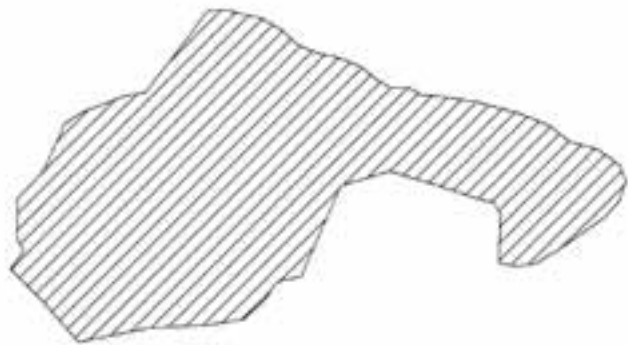
Kauri snail (Gradual Decline), kukupa (regionally significant) and NI fantail (F. Brook pers. comm.).

Significance

One threatened fauna species has been recorded from this site, and this remnant may provide a refuge for indigenous fauna during the logging of adjacent pine plantation. Most of the site (3.6 ha) is protected as a DOC-administered scenic reserve, however, it is heavily grazed and trampled by livestock, and contains a dumped vehicle and domestic rubbish. Fencing would improve the site's overall ecological values and could lead to it being assigned Level 1 status.



P06/098 Mangakahia River Scenic Reserve



Aerial photography from 2002

OTAENGA BUSH

Survey no. P06/100
Survey date 2003-04
Grid reference P06 835213
Area 5.8 ha
Altitude 68-78 m asl

Ecological units

- (a) Kahikatea forest on river terrace (50%)
- (b) Taraire-totara forest on river terrace (25%)
- (c) Poplar treeland on river terrace and gentle hillslope (25%)

Landform/geology

Hillslope underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

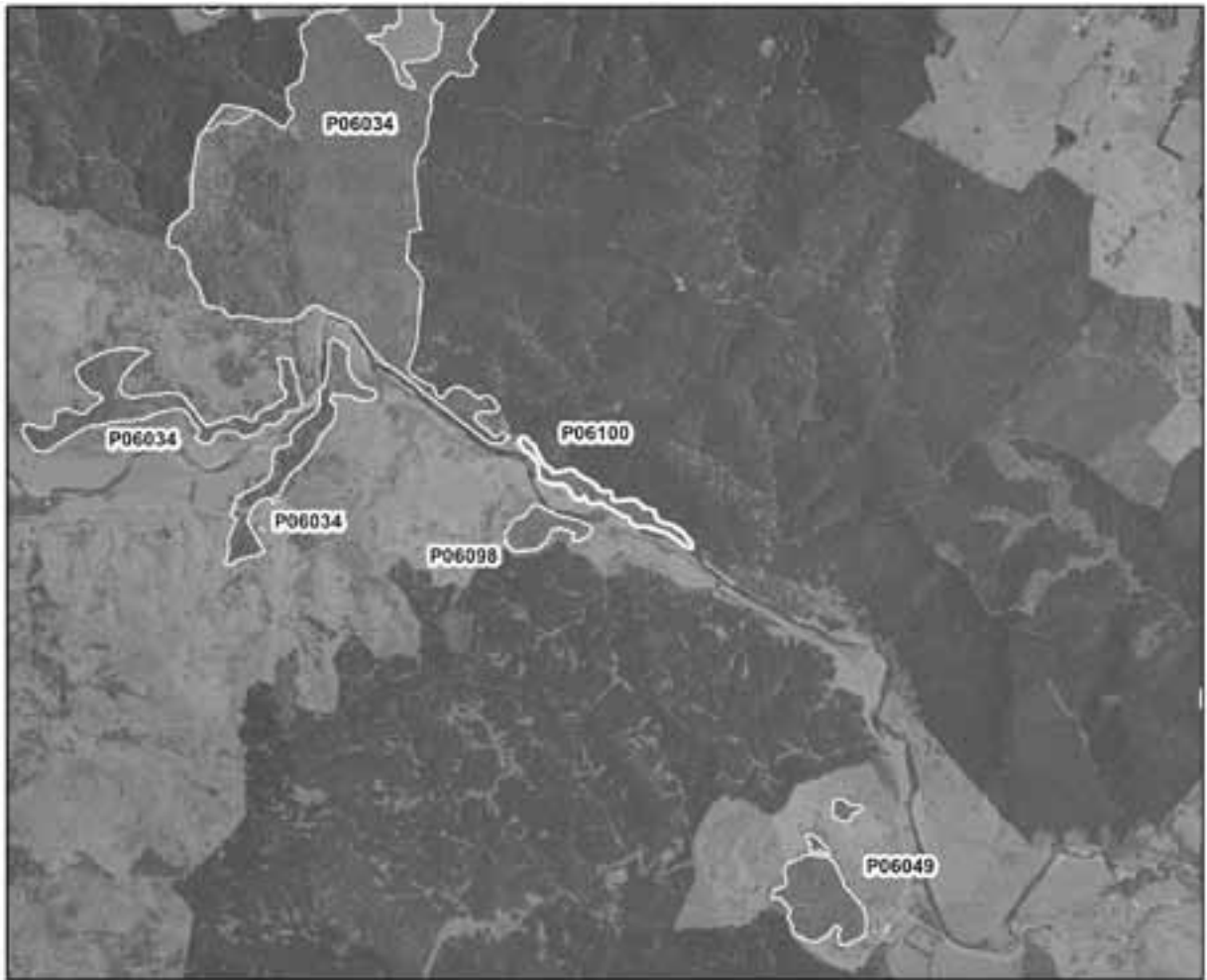
The site comprises a narrow strip of riverine forest along the Mangakahia River. Interpretation of aerial photography indicates the upstream area of the site is dominated by kahikatea (a), while the mid-section contains commonly occurring taraire and totara (b). Frequently occurring poplars (c) are emergent over an indigenous sub-canopy in the downstream section of the site. Open areas of grassland (d) occur throughout the site.

Fauna

Not surveyed.

Significance

The site is small and fragmented; however, it is well-buffered and contains riverine forest, which is a rare habitat type in Tangihua ED. It is linked with Otiwhero Bush (P06/034) by pine plantation and provides partial riparian protection for the Mangakahia River. It is not known if the site is grazed. Additional information is required to determine the site's full ecological values.

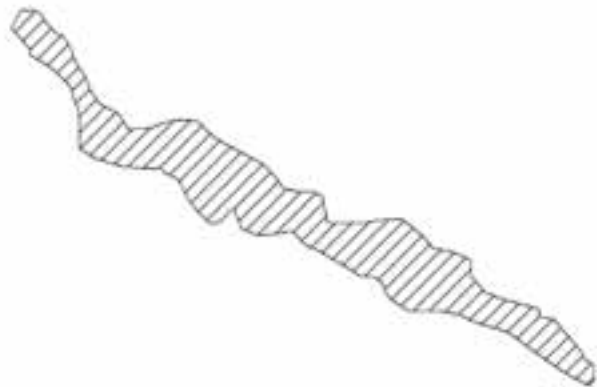


P06/100 Otaenga Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

CALLAGHAN ROAD BUSH

Survey no. P06/101
Survey date 9 February 2009
Grid reference P06 090325
Area 19.2 ha
Altitude 78-155 m asl

Ecological units

(a) Totara-puriri-kahikatea forest on moderate hillslope (100%)

Landform/geology

Hillslopes underlain by Cretaceous sandstone (Punakitere Formation, Mangakahia Complex).

Vegetation

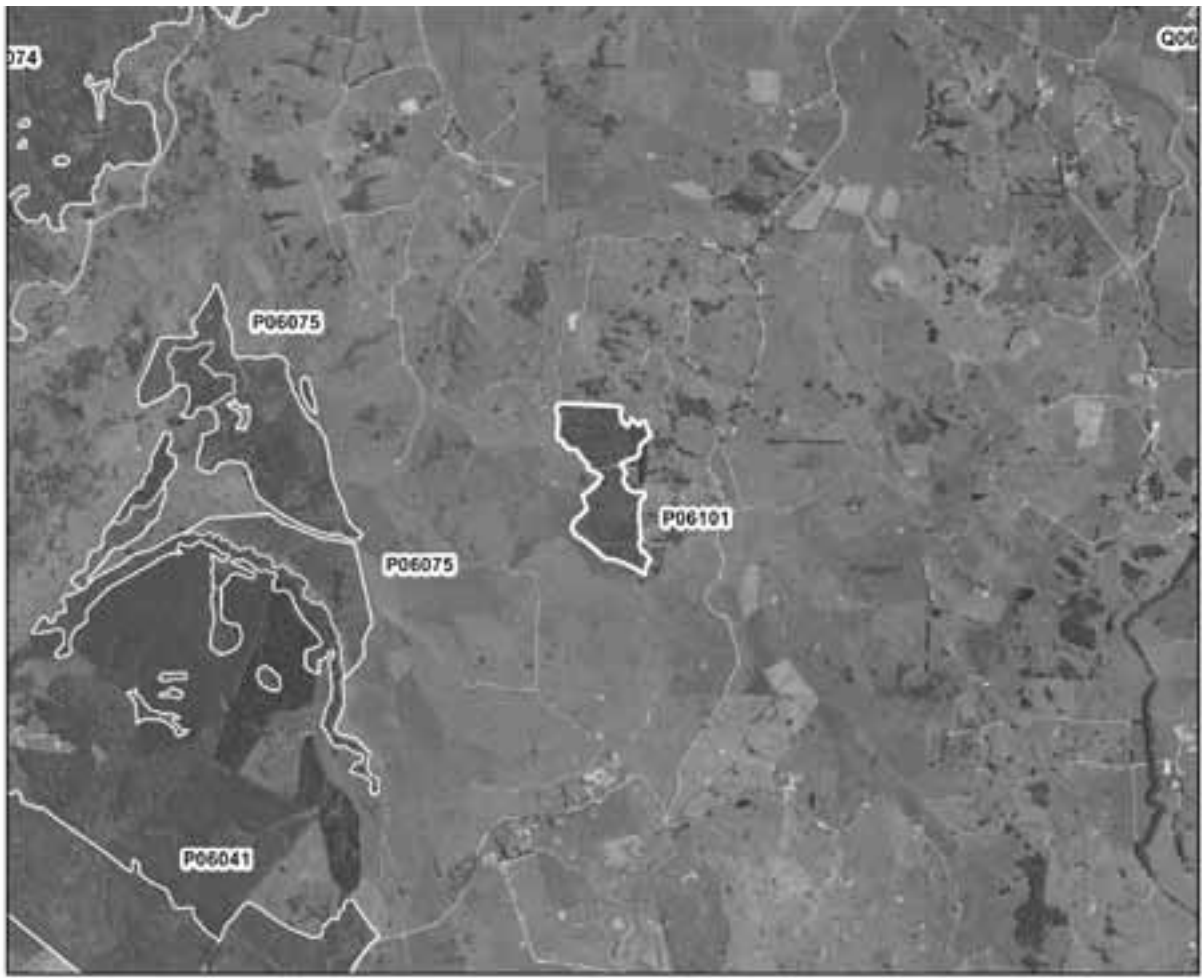
Callaghan Road Bush is a relatively small, isolated remnant comprising secondary and cut-over tall podocarp-broadleaved forest. The site is characterised by frequent emergent kahikatea over co-dominant totara and puriri (a). Towai occurs occasionally in the canopy with occasional emergent rimu and pohutukawa.

Fauna

Not surveyed.

Significance

Callaghan Road Bush contains several old-growth puriri, which provide a valuable food source for indigenous birds such as kukupa and tui. It is representative for one ecological unit: (a) totara-puriri-kahikatea forest on moderate hillslope, the only example of its type recorded in Tangihua ED. However, the site is small, has limited plant diversity, and some of its margins are likely to be grazed. It is therefore assigned Level 2 status.



P06/101 Callaghan Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2006

MOTATAU ROAD RAUPO WETLAND

Survey no. P06/102
Survey date 9 February 2009
Grid reference P06 055331 (two remnants)
Area 1.6 ha
Altitude 50 m asl

Ecological units

- (a) Raupo reedland in swamp (95%)
- (b) *Schoenoplectus tabernaemontani* reedland in swamp (5%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

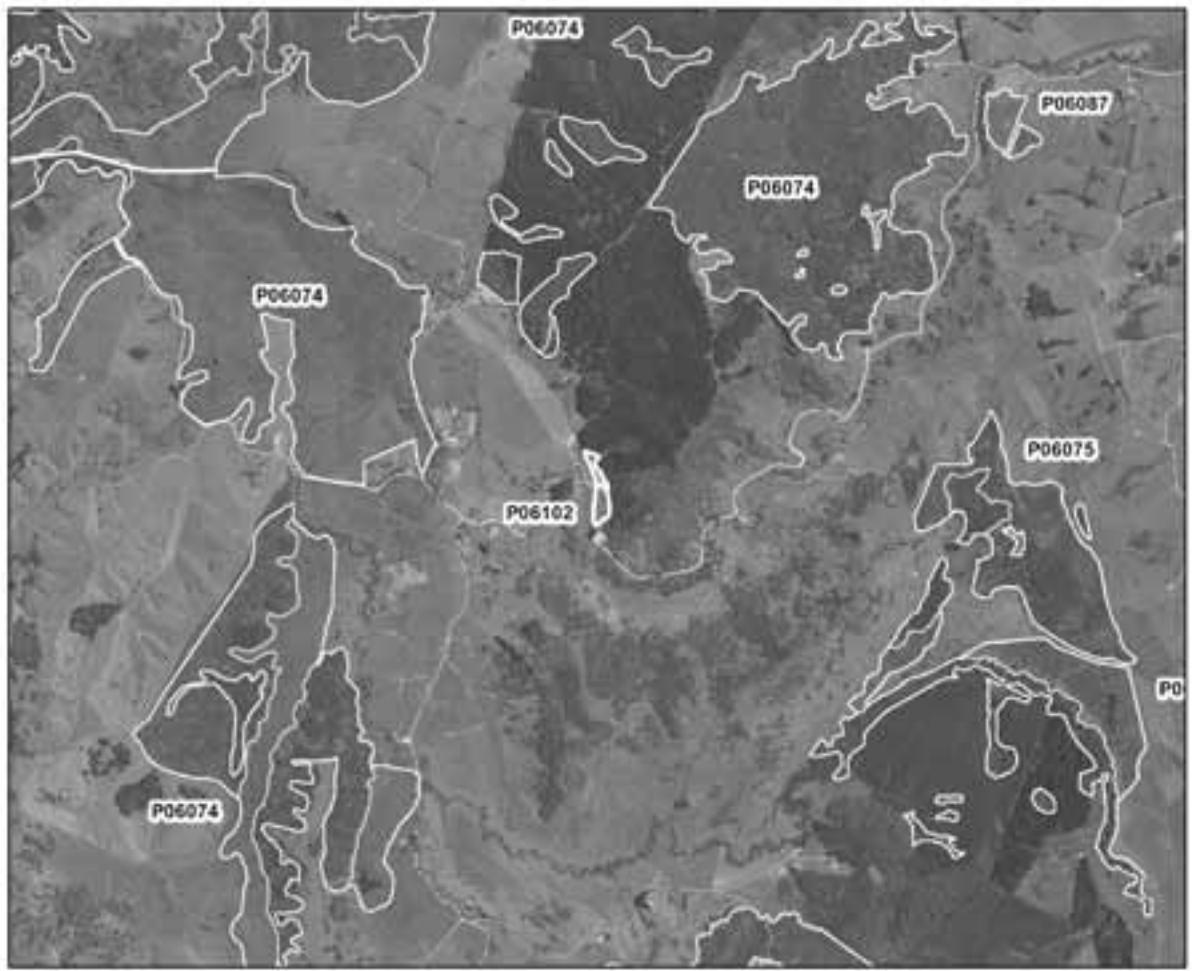
The site comprises a small wetland bordered by railway and mature pine forest, and is dissected by road. The wetland is dominated by abundant raupo (a), while *Schoenoplectus tabernaemontani* reedland (b) is locally common on the wetland's periphery.

Fauna

Spotless crane (Relict) recording was played, but no calls were heard.




Significance

Wetlands are a diminishing and rare habitat type regionally and nationally (<1% of land cover in Tanghua ED). Raupo wetlands provide potential habitat for threatened wetland birds such as Australasian bittern (Nationally Endangered), NI fernbird (Declining), spotless crane (Relict), and banded rail (Naturally Uncommon). However, this site is small, dissected, and threatened by weeds such as wilding pine, blackberry, and Chinese privet. Stoats were also observed on two occasions within the wetland. It is therefore assigned Level 2 status.



P06/102 Motatau Road Raupo Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006

PARAHA ROAD WETLAND

Survey no. P06/112
Survey date 17 April 2009
Grid reference P06 976352
Area 1 ha
Altitude 80 m asl

Ecological units

- (a) Raupo reedland in swamp (70%)
- (b) *Carex* sp.-soft rush sedgeland (30%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site comprises a raupo (a) dominant swamp, with an adjoining area of *Carex* sp. soft rush sedgeland (b). Occasional species include kahikatea, ponga, kanuka and *Coprosma rotundifolia* scattered throughout the wetland.

Significant flora

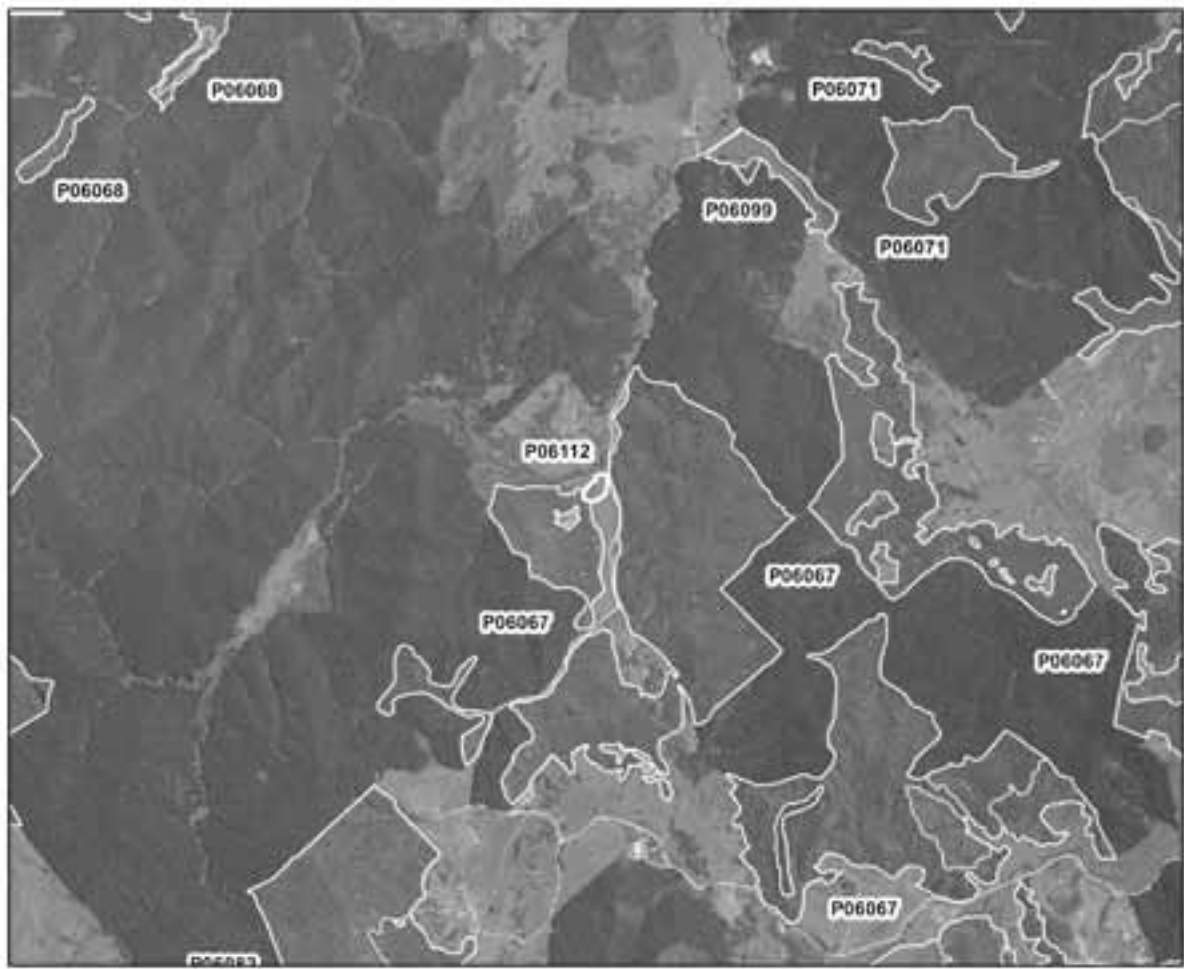
Coprosma rotundifolia (regionally significant) was recorded during this survey (NRC 2009).

Fauna

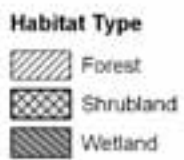
Not surveyed.

Significance

The site provides potential habitat for indigenous wetland birds and supports one regionally significant plant species. It is not known if stock have access to the site. Willow and blackberry are present. The site is accorded Level 2 status due to its small size and degraded condition.



P06/112 Paraha Road Wetland



Aerial photography from 2006

ORAKAU ROAD WETLAND

Survey no.	P06/113
Survey date	17 April 2009
Grid reference	P06 921347
Area	0.4 ha
Altitude	132 m asl

Ecological units

- (a) Raupo reedland in swamp
- (b) *Carex* sp. sedgeland in swamp
- (c) Wheki-mamaku treefernland in swamp
- (d) *Eleocharis sphacelata* reedland in swamp

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site is located between pine plantation and Orakau Road and consists of three main vegetation types: raupo reedland (a), *Carex* sp. sedgeland (b), wheki-mamaku treefernland (c), and a small area of locally common *Eleocharis sphacelata* (d). Occasional species include koromiko, bracken, manuka, *Calystegia sepium*, *Muehlenbeckia australis*, *Coprosma tenuicaulis* and *Juncus pallidus*.

Significant flora

Coprosma tenuicaulis (regionally significant) was recorded during this survey (NRC 2009).

Fauna

Not surveyed.

Significance

Orakau Road Wetland is well-buffered by pine plantation and provides habitat for one regionally significant plant species. Ecological unit (c) wheki-mamaku treefernland in swamp has only been recorded once in Tangihua ED and should therefore be considered representative of its type. The wetland, however, is small and degraded, and blackberry is present. It is therefore of Level 2 significance.



P06/113 Orakau Road Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006

MANGAKAHIA ROAD WETLAND

Survey no. P06/114
Survey date 21 April 2009
Grid reference P06 862258
Area 2.9 ha
Altitude 86-97 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

The site comprises a small wetland located amongst pine plantation. Raupo (a) is abundant, while occasional kahikatea and manuka are scattered throughout. *Coprosma rotundifolia* and wheki occur occasionally on the wetland margins.

Significant flora

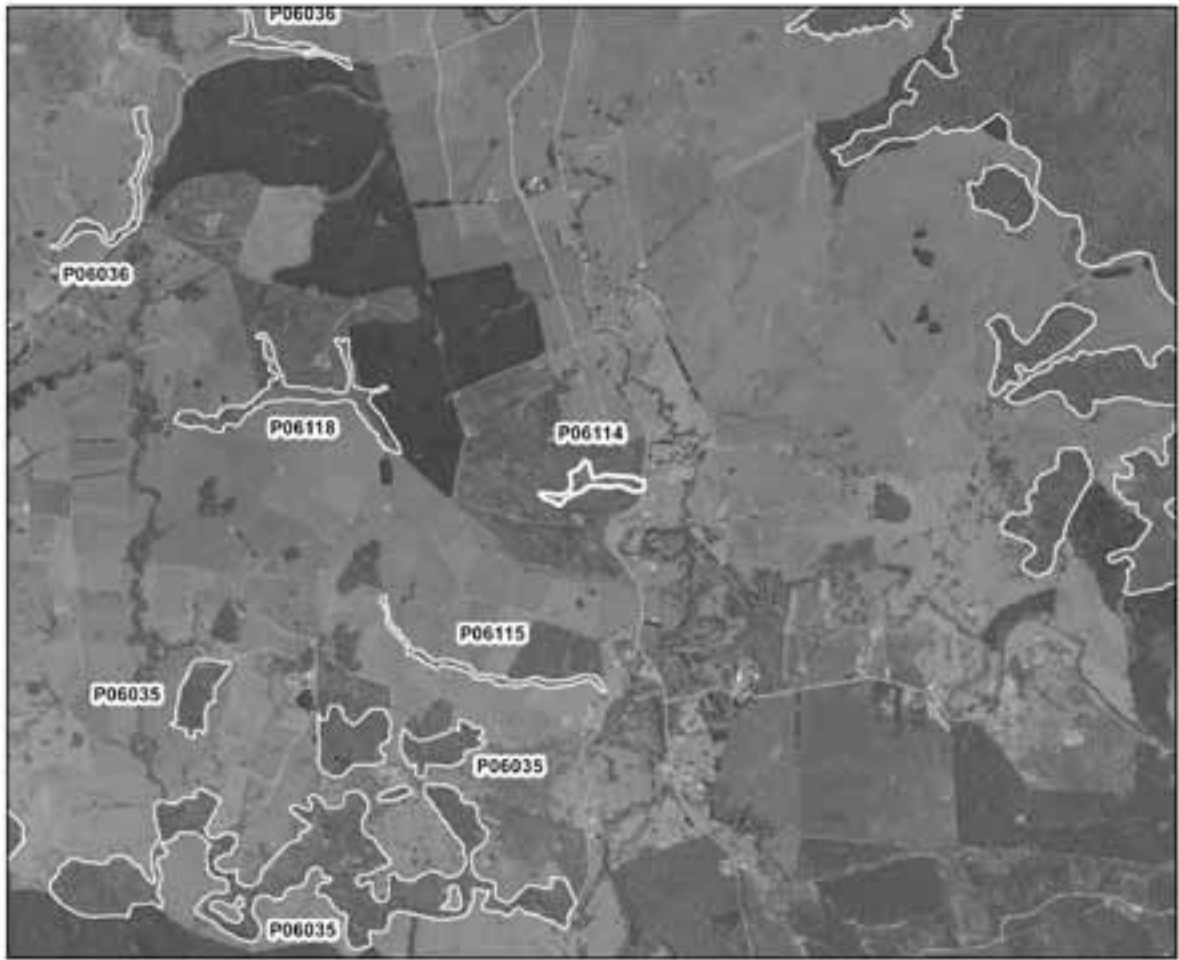
Coprosma rotundifolia (regionally significant) was recorded during this survey (NRC 2009).

Fauna

Not surveyed.




Significance

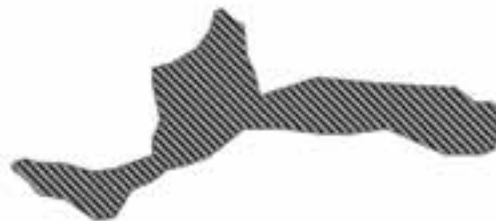
The wetland is small but provides potential habitat for indigenous wetland birds. It supports one regionally significant plant species. Mangakahia Road cuts along the bottom of the wetland and restricts the out-flow of water. Blackberry is present. It is not known if stock have access to the site. Additional survey may lead to this site attaining Level 1 status.



P06/114 Mangakahia Road Wetland



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2006.

ADAMS ROAD WETLAND

Survey no. P06/115
Survey date 13 January 2009
Grid reference P06 855249
Area 3.4 ha
Altitude 90-98 m asl

Ecological units

(a) Raupo reedland in swamp (100%)

Landform/geology

Valley floor wetland on Holocene alluvium.

Vegetation

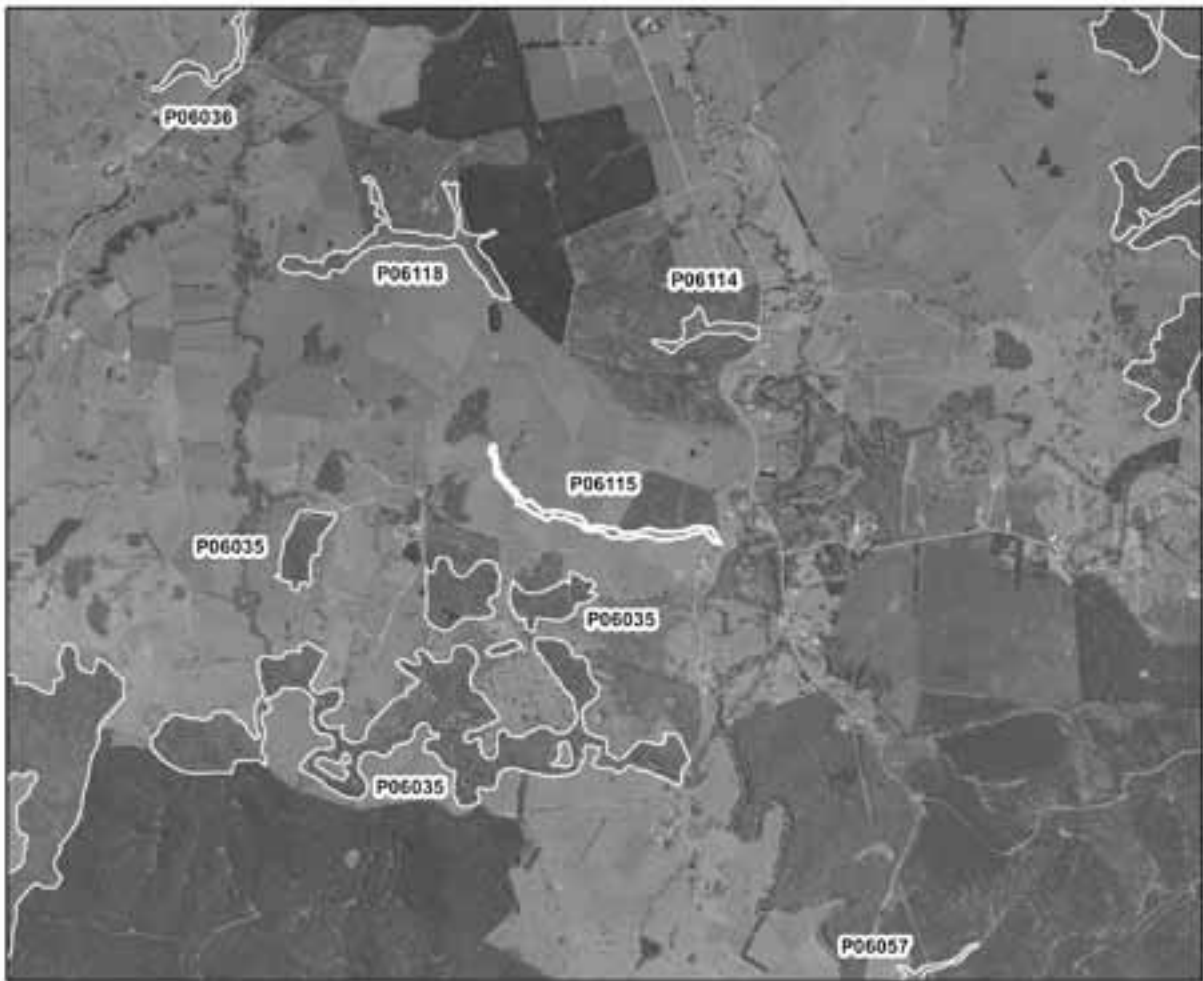
The site comprises a long, narrow raupo (a) dominant swamp with occasional wheki, ti kouka and kahikatea. The wetland stretches for approximately one kilometre, and is surrounded by pasture and a small narrow strip of regenerating bush. At the head of the catchment, 200m above the wetland, is an area of regenerating broadleaved forest (c.4 ha). Other occasional species include totara, ponga, bracken, *Calystegia sepium*, karamu, mamaku and manuka.

Fauna

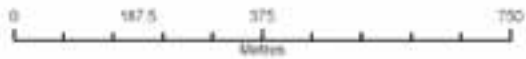
Not surveyed.

Significance

The wetland provides potential habitat for indigenous wetland species and is relatively free from weeds. However, stock are damaging the wetland, thus the site is assigned Level 2 status.



P06/115 Adams Road Wetland



Aerial photography Bawn 2000

TANGOWAHINE VALLEY ROAD REMNANTS

Survey no.	P07/002
Survey date	2003-04 and 3 February 2009
Grid reference	P07 860080 (two remnants)
Area	38.3 ha
Altitude	80-186 m asl

Ecological units

- (a) Towai forest on hillslope (80%)
- (b) Kahikatea forest on alluvium (10%)
- (c) Taraire forest on alluvium (10%)

Landform/geology

Valley floor on Holocene alluvium; bounded by hillslopes of Cretaceous sandstone and mudstone (Mangakahia Complex), and Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises one larger hillslope remnant and an alluvial remnant along the upper reaches of the Tangowahine Stream. Towai forest (a) dominates the large remnant, occurring with frequent taraire, titoki, mangeao and emergent kahikatea. Occasional subcanopy species include ponga, wheki, pigeonwood, toro, mahoe, putaputaweta and mahoe (Wildland Consultants 2004). A small stand of alluvial kahikatea forest (b) occurs with occasional taraire, totara, towai and pukatea. Further downstream, the site is characterised by alluvial taraire forest (c) with occasional rewarewa and kohekohe.

Significant flora

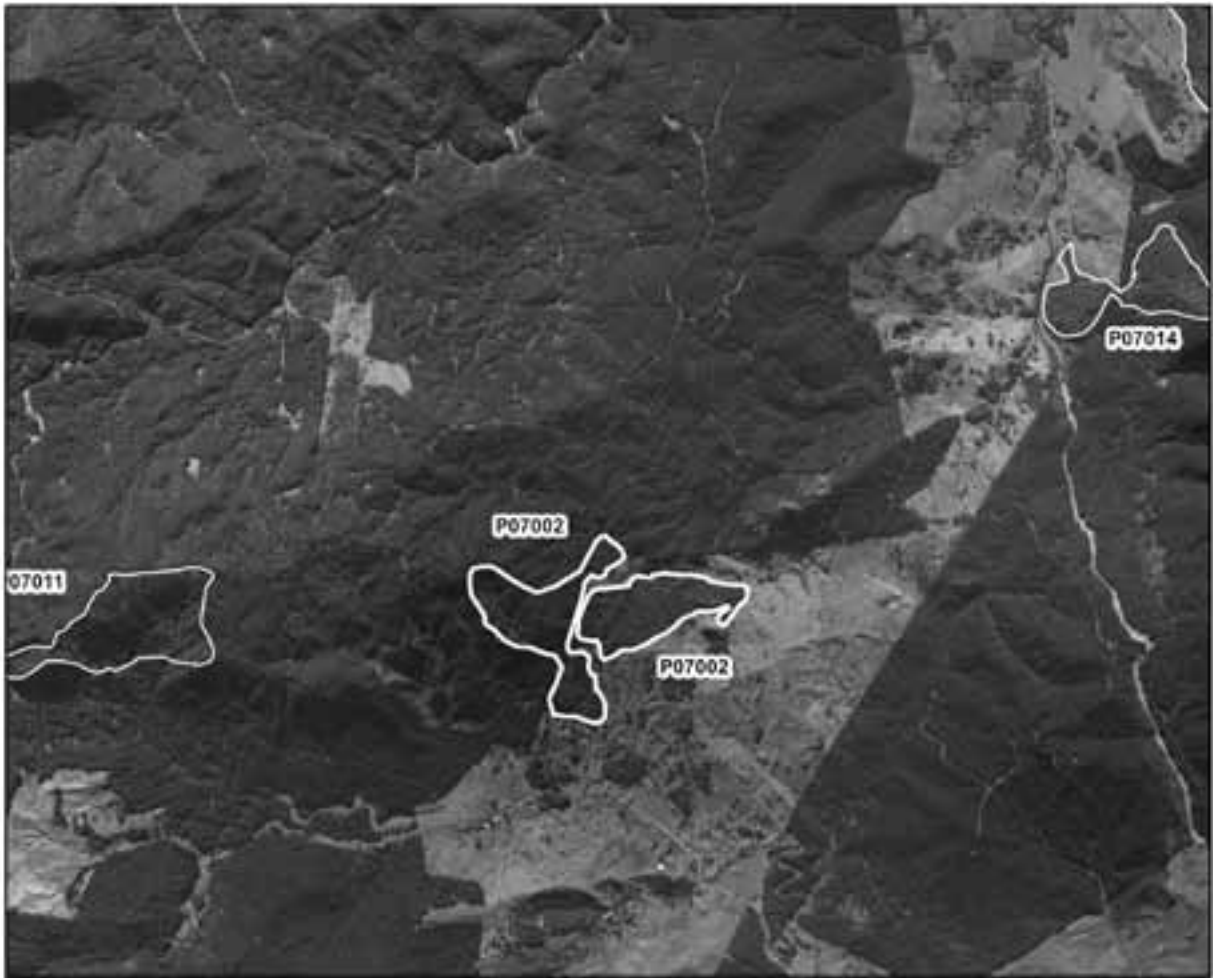
Toro (regionally significant) was recorded in 2003-04 (Wildland Consultants 2004).

Fauna

Australasian harrier, grey warbler and fantail were recorded during this survey.

Significance

The alluvial forest remnant provides partial riparian buffering for the Tangowahine Stream. Alluvial forest is a rare vegetation type in Tangihua ED. The larger, hillslope remnant contains common forest types within Tangihua ED and is currently well-buffered by mature pine plantation, although the alluvial remnants are grazed, and as a result this site has been accorded Level 2 status.

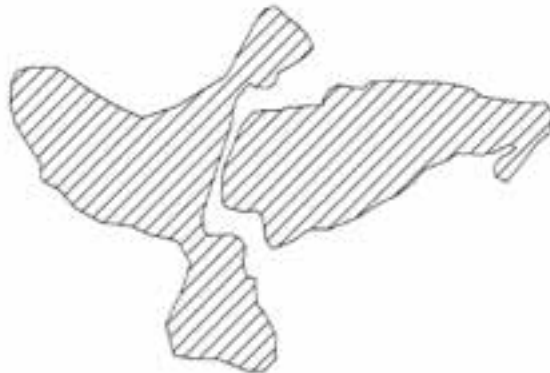


P07/002 Tangowahine Valley Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

KIRIKOPUNI VALLEY ROAD WETLAND

Survey no. P07/004
Survey date January 2009
Grid reference P07 995994
Area 5 ha
Altitude 34-39 m asl

Ecological units

- (a) *Schoenoplectus tabernaemontani* reedland in swamp (90%)
- (b) Raupo reedland in swamp (10%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

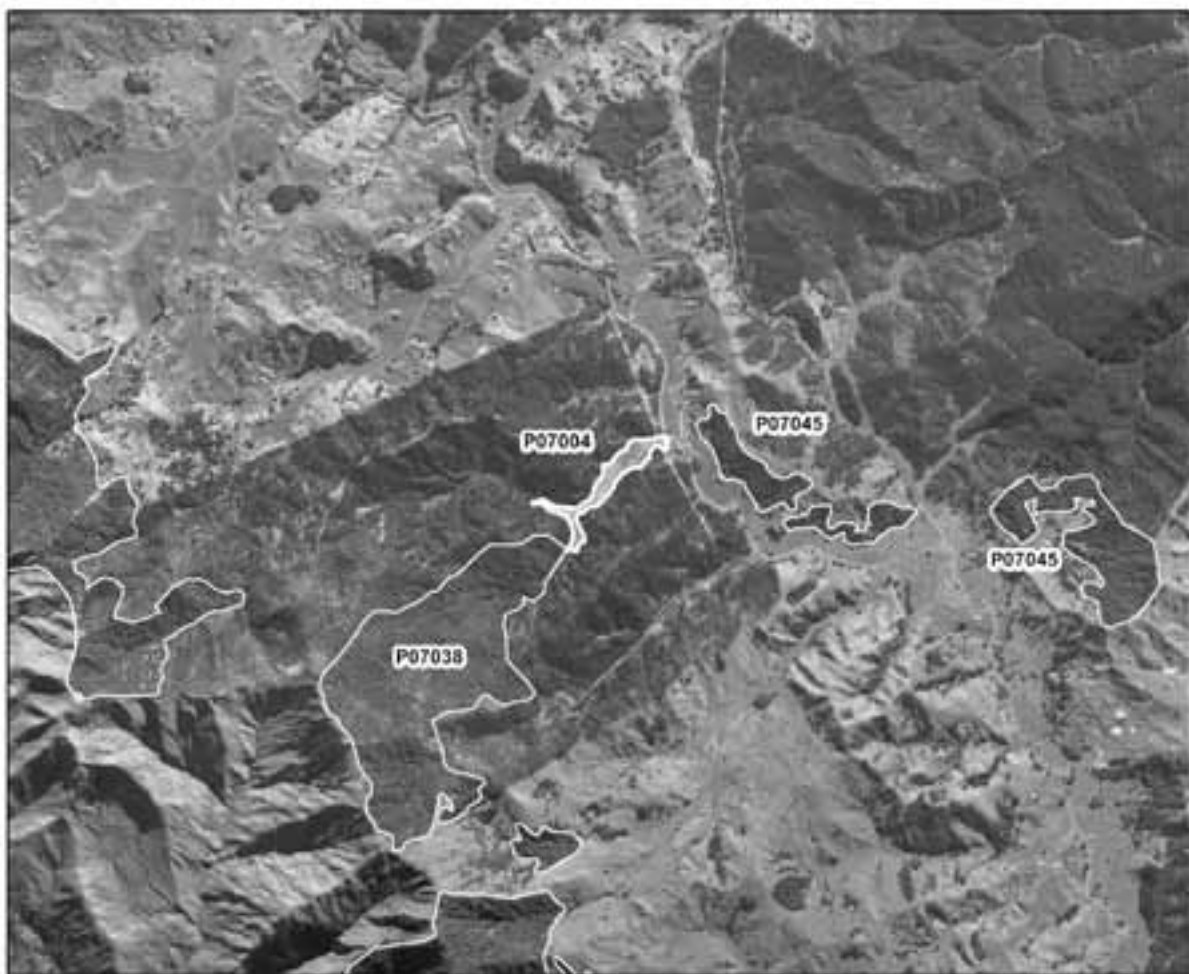
The site comprises a small wetland is situated on a valley floor between pine plantation. The wetland is dominated by abundant *Schoenoplectus tabernaemontani* (a), while raupo (b) is locally frequent nearest the road. Occasional species include wheki, *Carex virgata* and soft rush. Although the valley floor is over 100 m wide in places, the wetland is relatively narrow and appears to be no more than 30-40 m wide.

Fauna

Not surveyed.

Significance

Unit (a) *Schoenoplectus tabernaemontani* reedland has only been recorded at two sites in Tangihua ED and should therefore considered representative of its type. The wetland is narrow and isolated, but well-buffered by pine plantation and has not been affected by invasive weeds. It may provide habitat for indigenous fauna. There are drains on both sides of the valley floor near the road (bottom of the wetland), which may adversely impact water levels. Additional survey may lead to this site being assigned Level 1 status.



P07/004 Kirikopuni Valley Road Wetland



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

KAIRARA BUSH

Survey no.	P07/009
Survey date	22 August 1994
Grid reference	P07 830005 (four remnants)
Area	59.4 ha
Altitude	80-140 m asl

Ecological units

- (a) Taraire forest on hillslope
- (b) Totara forest on hillslope
- (c) Kahikatea forest on gentle hillslope

Landform/geology

Steep hill country underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex), with landslide deposits present locally.

Vegetation

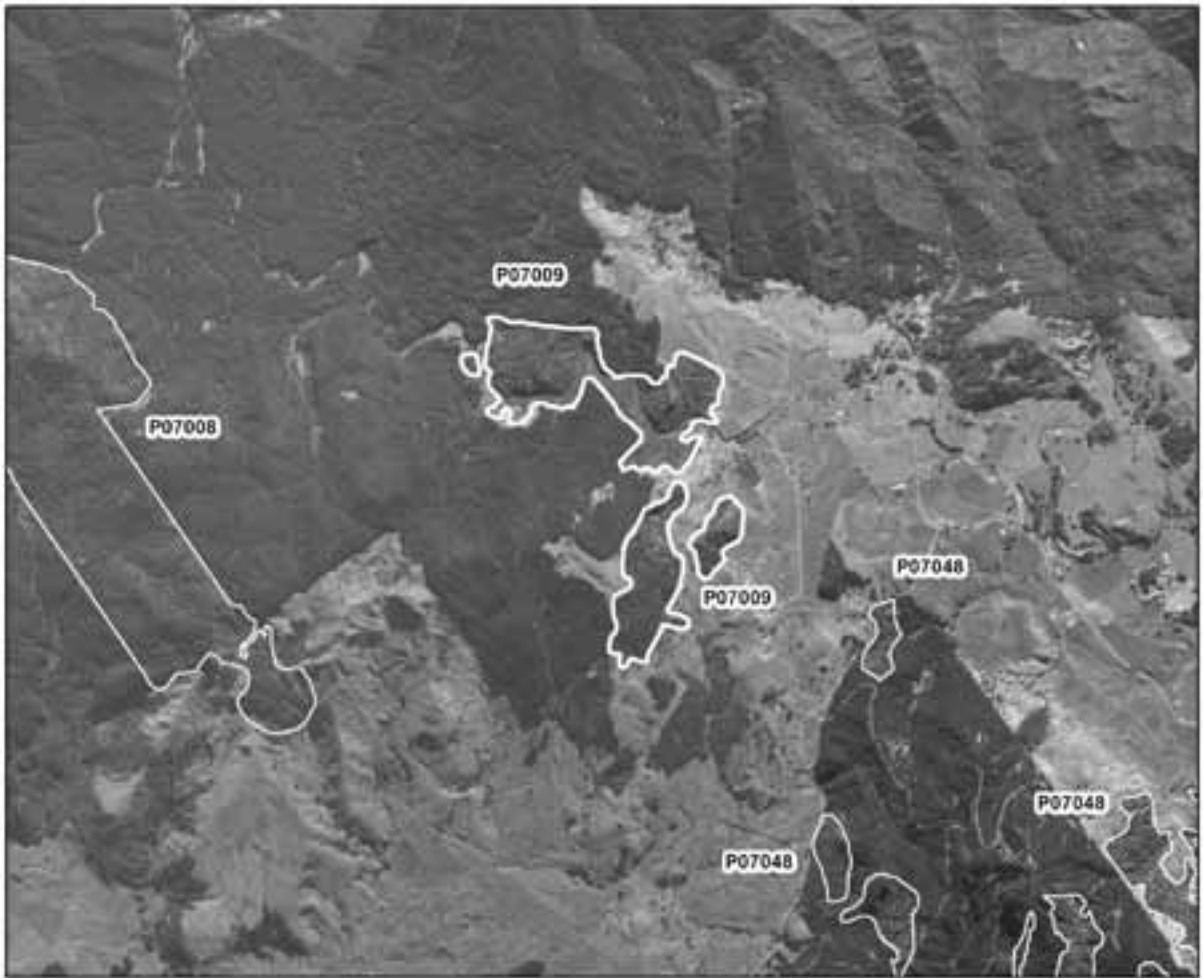
The site comprises four remnants of secondary forest, the two largest of which adjoin the Maropiu Forest pine plantation. Typical podocarp and broadleaved forest species are present, with nikau and fern species abundant in the understorey. In the north of the site taraire forest (a) occurs with frequent rewarewa and occasional puka, tawa, kahikatea and pukatea. Totara forest (b) also occurs in the north with frequent kowhai and puriri, and occasional kahikatea, titoki and taraire. Unit (a) also occurs in the south with frequent rewarewa and puriri, and occasional rimu, pukatea and kahikatea represented in the canopy. Kahikatea forest (c) is prevalent on gentle hillslopes, with frequent kauri and occasional rewarewa, matai and pukatea. Unit (b) totara forest also occurs in a smaller area with frequent kahikatea and occasional kauri.

Fauna

Terrestrial fauna not surveyed. Longfin eel (Gradual Decline), koaro (regionally significant) and Cran's bully have been recorded in the Awakino Stream, slightly upstream of the site (NIWA 2009a).

Significance

Kairara Bush probably provides corridor habitat between surrounding remnants as well as to Kaihu Forest to the north. The site acts as a protective buffer for the Awakino Stream, which is utilised by a threatened fish species and one regionally significant fish species. Some areas are grazed intermittently by domestic stock. Further information could lead to this site attaining Level 1 status.



P07/009 Kairara Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

KAIKOURA ROAD BUSH

Survey no. P07/010
Survey date 19 August 1994
Grid reference P07 821097
Area 62.9 ha
Altitude 180-367 m asl

Ecological units

- (a) Towai-taraire forest on hillslope
- (b) Kanuka/manuka-totara-towai forest on hillslope
- (c) Mamaku-towai treefernland on hillslope

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

The site comprises a remnant of secondary kauri-podocarp-broadleaved forest within the Opouteke Forest pine plantation. Towai is abundant with common taraire (a), while tawa and lancewood are frequent. Occasional species include hinau, totara, mangeao, and emergent kauri, rimu, rewarewa, miro and northern rata. Kanuka/manuka, totara and towai forest (b) is also present. Tanekaha and rewarewa are frequent with occasional emergent kauri. Remaining vegetation is characterised by co-dominant mamaku and towai (c) and frequent rewarewa.

Significant flora

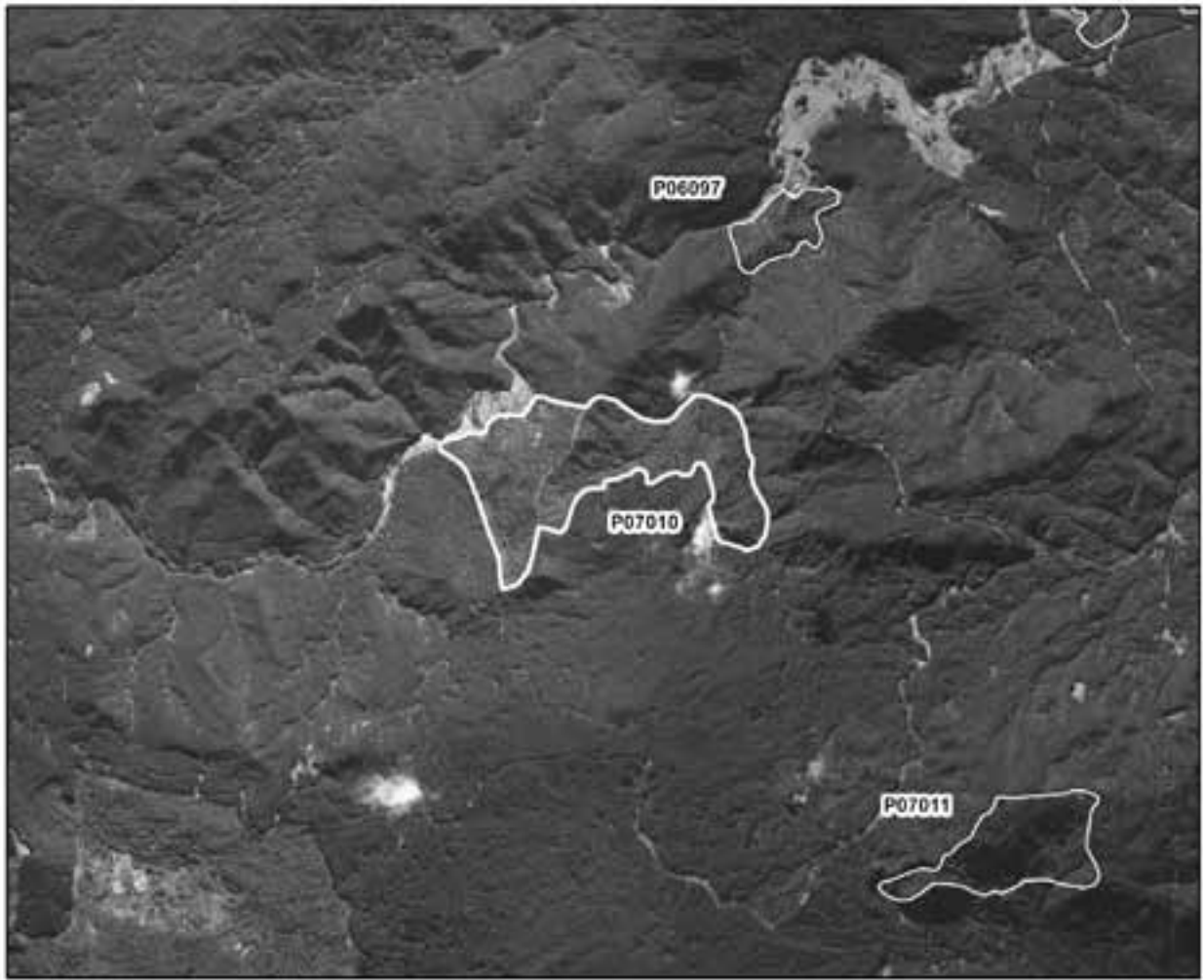
Northern rata (regionally significant) was recorded during this survey.

Fauna

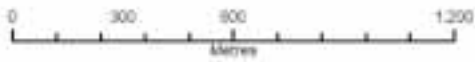
Not surveyed.




Significance

This enclave of indigenous forest within plantation forestry provides a potential refuge for indigenous fauna during logging, and corridor habitat to surrounding remnants and the large Kaihu Forest situated slightly to the south. The site is representative for one ecological unit: (b) kanuka/manuka-totara-towai forest on hillslope. It supports one regionally significant plant species and provides riparian buffering and upper catchment protection for two small streams. Further information could lead to this site attaining Level 1 status.



P07/010 Kaikoura Road Bush



- Habitat Type**
-  Forest
 -  Shrubland
 -  Wetland



Aerial photography flown 2002

HAAST ROAD BUSH

Survey no.	P07/012
Survey date	22 August 1994
Grid reference	P07 860058 (two remnants)
Area	33.3 ha (30.5 ha forest, 2.8 ha shrubland)
Altitude	112-200 m asl

Ecological units

- (a) Taraire forest on moderate hillslope (55%)
- (b) Kanuka/manuka-totara forest on moderate hillslope (30%)
- (c) Totara-kahikatea forest on moderate hillslope (5%)
- (d) Kanuka/manuka shrubland on moderate hillslope (10%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

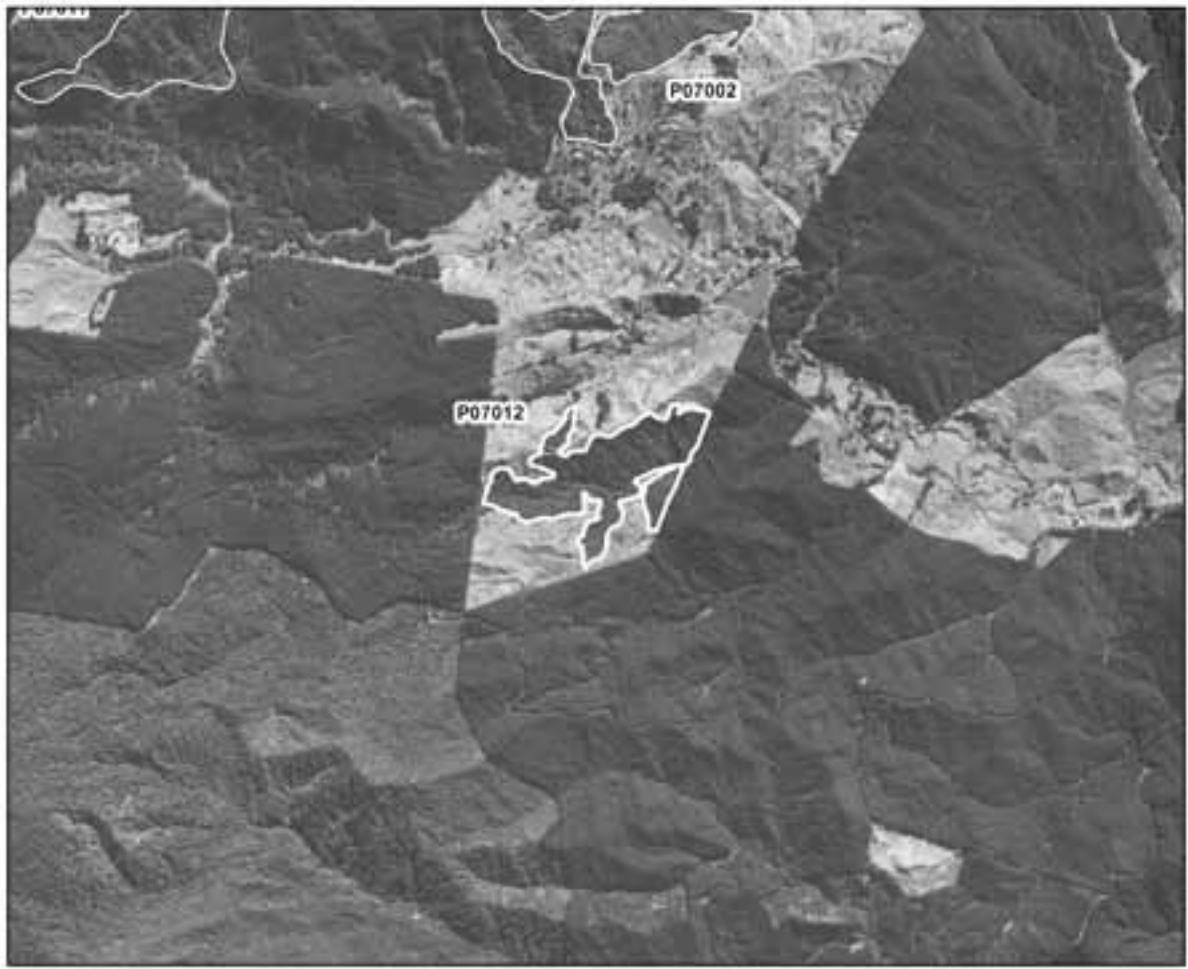
Haast Road Bush comprises two small remnants of secondary and cut-over tall forest near the eastern boundary of Tangihua ED, adjoining a large area of pine plantation. Taraire forest (a) is abundant throughout the site, occurring with frequent rewarewa and occasional tawa, pukatea, kahikatea, totara and miro. Elsewhere, kanuka/manuka and totara (b) are co-dominant, with frequent tanekaha, kahikatea, towai and mahoe, and occasional rimu, mamaku and pukatea. Totara-kahikatea forest (c) is locally common in a small area, while shrubland in the eastern end is dominated by kanuka/manuka (d), with occasional mahoe, totara and gorse.

Fauna

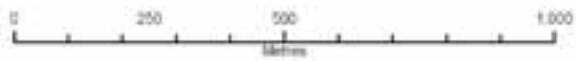
Not surveyed.

Significance

The site may form a corridor between surrounding remnants, including Kaihu Forest to the west, to which it is linked by plantation forest. Riparian buffering is provided to tributaries of the Tangowahine Stream.

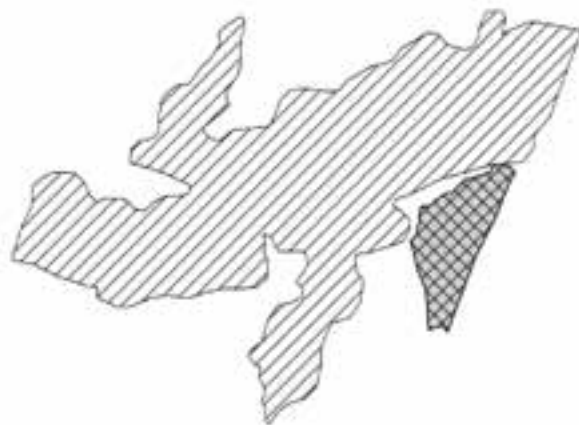


P07/012 Haast Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bowen 2002

MURRAY ROAD BUSH

Survey no. P07/016
Survey date 4 August 1994
Grid reference P07 913074
Area 20.6 ha
Altitude 128-339 m asl

Ecological units

(a) Kohekohe-puriri-taraire forest on steep hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex).

Vegetation

Murray Road Bush is a small remnant of secondary broadleaved forest adjoining the Opouteke Forest pine plantation. It comprises a broken canopy of kohekohe-puriri-taraire forest (a) with frequent nikau, and occasional tawa and towai.

Fauna

Not surveyed.

Significance

The site may provide a refuge for indigenous fauna during the logging of adjoining pine plantation. However, the forest is small and was being severely grazed at the time of survey. It is therefore assigned Level 2 significance.

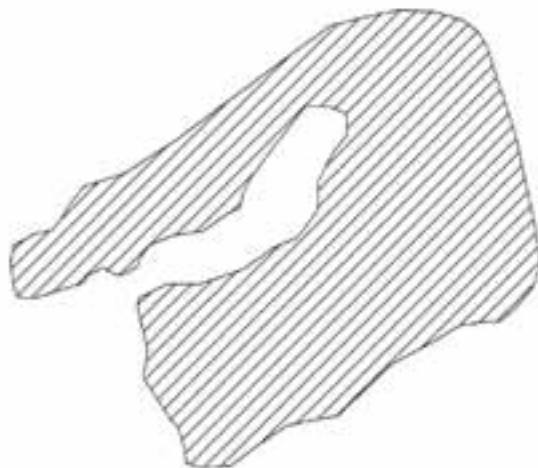


P07/016 Murray Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

SOMMERVILLE AND KARAKA ROAD RIPARIAN FOREST

Survey no.	P07/017
Survey date	4 August 1994
Grid reference	P07 927060 (three remnants)
Area	18 ha (The site has been adjusted to fit with 2006 aerial photography. The main change was the addition of a larger remnant to the east)
Altitude	60 m asl

Ecological units

- (a) Kanuka/manuka-tanekaha-totara forest on alluvium and hillslope
- (b) Puriri-taraire forest on alluvium

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces; bounded by hillslopes of Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises three small alluvial remnants bordering a tributary of the Tangowahine Stream. The first remnant is characterised by a co-dominant canopy of kanuka/manuka, tanekaha and totara (a), with frequent taraire and kahikatea, and occasional kauri, pukatea, rewarewa, matai and towai. Puriri and taraire (b) dominate forest in the second remnant, with frequent totara and tawa, and occasional rewarewa, pukatea, titoki and karaka. A small wetland is present in the very eastern end of this site, but its vegetation was not identified during this survey. The third remnant to the west occupies hillslope and was not surveyed. Interpretation of aerial photography, however, indicates that it contains a forest type similar to unit (a) kanuka/manuka-tanekaha-totara forest.

Fauna

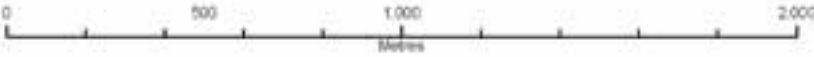
Not surveyed.

Significance

The site is representative for one ecological unit: (b) puriri-taraire forest on alluvium. Alluvial forest has been greatly reduced in extent throughout Tangihua ED. Indigenous vegetation alongside waterways is vital for riparian health and protection. Additional survey is recommended to determine the full ecological values of this site, particularly with regard to the wetland, which may provide habitat for threatened fauna. The site includes 0.42 ha of protected marginal strip (Tangowahine Stream Marginal Strip No 1, DOC-administered).



P07/017 Sommerville and Karaka Road Riparian Forest



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

KARAKA ROAD BUSH

Survey no. P07/022
Survey date 4 August 1994
Grid reference P07 935094 (three remnants)
Area 55.9 ha
Altitude 38-100 m asl

Ecological units

- (a) Totara forest on moderate hillslope
- (b) Taraire forest on moderate hillslope

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

The site comprises three remnants of cut-over tall forest and secondary forest largely surrounded by pasture. Totara forest (a) occurs with occasional pukatea, taraire and titoki, while taraire forest (b) occurs with frequent totara and occasional pukatea, miro, kahikatea, matai, towai, totara, kauri, northern rata and rimu, all of which are emergent.

Significant flora

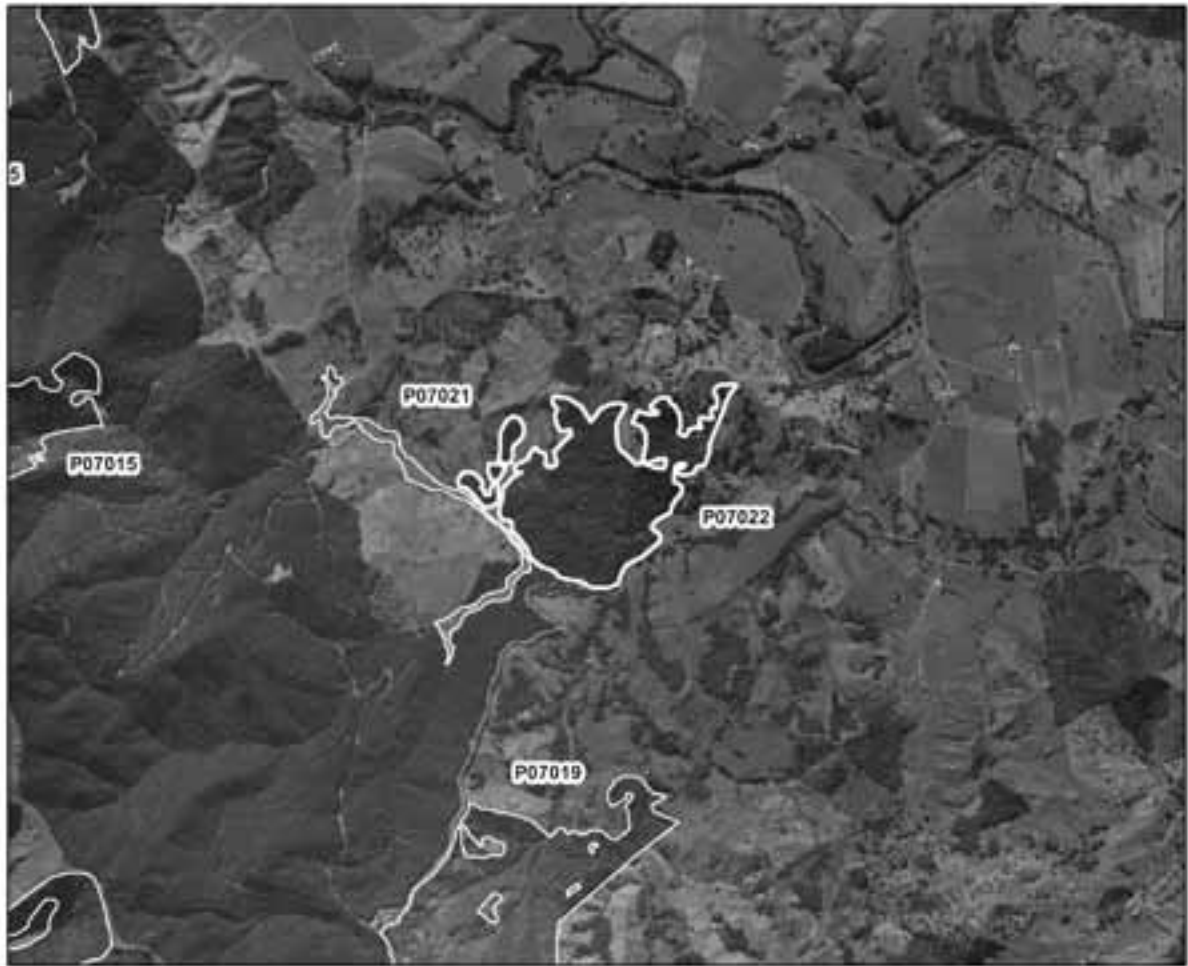
Northern rata (regionally significant) was recorded during this survey.

Fauna

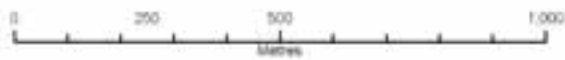
Grey warbler and tui were recorded in 1978 (SSBI P07/H005).

Significance

Karaka Road Bush is a small podocarp-broadleaved forest remnant featuring an emergent layer, and it provides habitat for one regionally significant plant species. There are past records of extensive stock and possum damage.



P07/022 Karaka Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bowen 2002

KIRIKOPONUI VALLEY BUSH

Survey no.	P07/035
Survey date	9 February 2009
Grid reference	P07 973020 (six remnants)
Area	31 ha (Five smaller remnants to the west have been added to this site)
Altitude	38-100 m asl

Ecological units

- (a) Totara forest on moderate hillslope (35%)
- (b) Kahikatea-totara forest on moderate hillslope (15%)
- (c) Taraire-totara forest on moderate hillslope (15%)
- (d) Totara-kahikatea forest on hillslope (35%)

Landform/geology

Hillslope underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

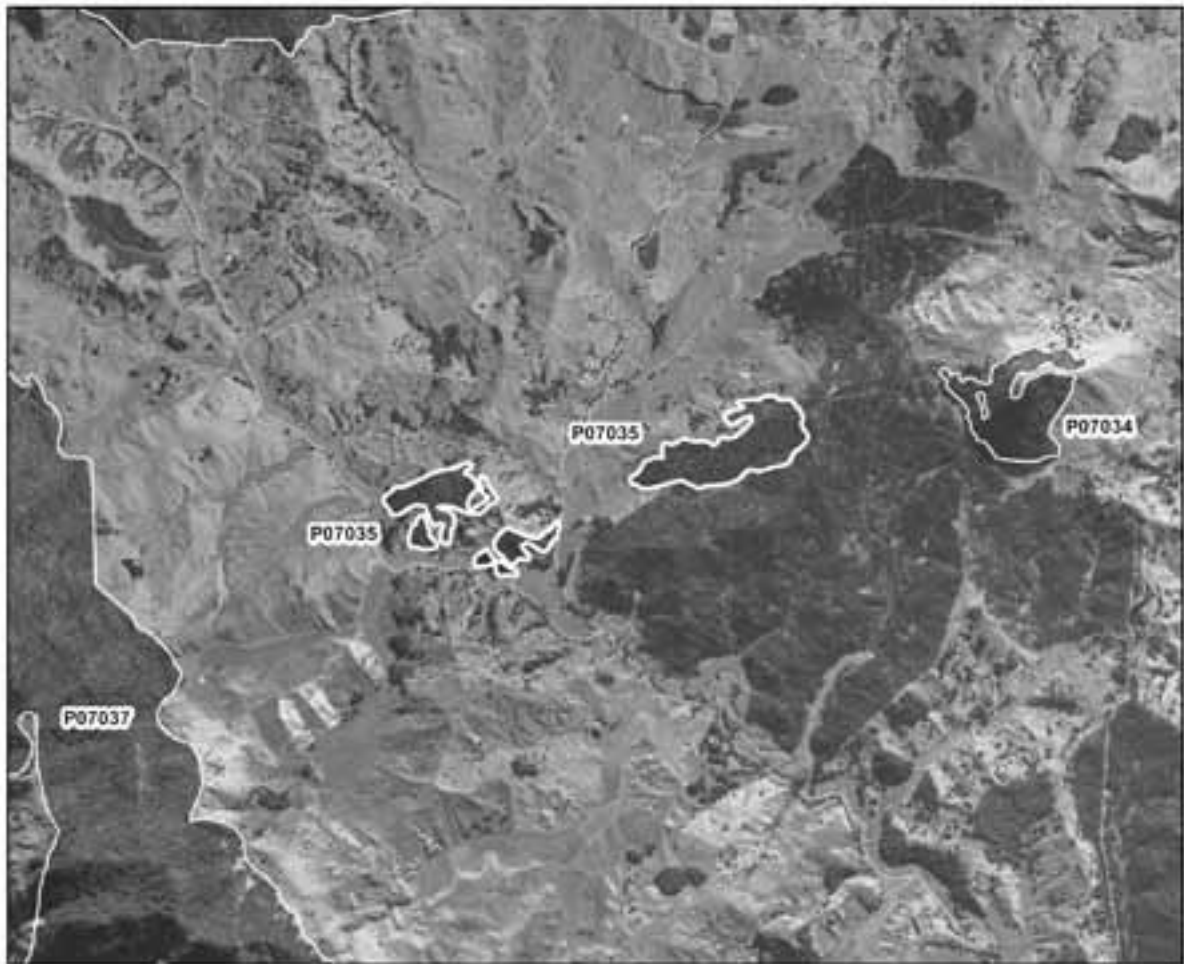
The site comprises one remnant to the east of Kirikopuni Road and five smaller remnants near the junction of Sommerville Road and Kirikopuni Road. Totara forest (a) is dominant on the western side of the eastern remnant, occurring with occasional rimu. Kahikatea and totara (b) are also common here, occurring with frequent rimu and occasional puriri, manuka, kauri, tanekaha and rimu. On the south-eastern edge taraire and totara (c) occur with frequent towai and kahikatea, and occasional nikau, rimu and manuka. The five western remnants are characterised by co-dominant totara and kahikatea (d), with occasional tanekaha, kanuka and rewarewa.

Fauna

NI brown kiwi (Nationally Vulnerable), kukupa (regionally significant), grey warbler, silvereye, NI fantail, tui and kingfisher were recorded from the eastern remnant in 1978. A subsequent survey in 1992 did not record kiwi (SSBI P07/H016).

Significance

Kirikopuni Valley Bush encompasses three small remnants containing forest types that are common in Tangihua ED and throughout Northland. The site provides partial riparian buffering for the Kirikopuni Stream and one of its tributaries. There are historical records of one threatened bird species, although an additional survey is required to determine current fauna and habitat values. Stock were able to access the remnant when surveyed in 1978 (SSBI P07/H016), and the west remnants are currently unfenced (Wildland Consultants 2009).



P07/035 Kirikoponui Valley Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

PUKUPO BUSH

Survey no.	P07/045
Survey date	20 May 1999
Grid reference	P07 017986 (three remnants)
Area	37.1 ha
Altitude	20-116 m asl

Ecological units

- (a) Kanuka/manuka-totara forest on hillslope (40%)
- (b) Kanuka/manuka forest on hillslope (10%)
- (c) Kahikatea-taraire forest on hillslope (15%)
- (d) Kahikatea-rimu-totara forest on hillslope (15%)
- (e) Totara-kanuka/manuka forest on hillslope (20%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

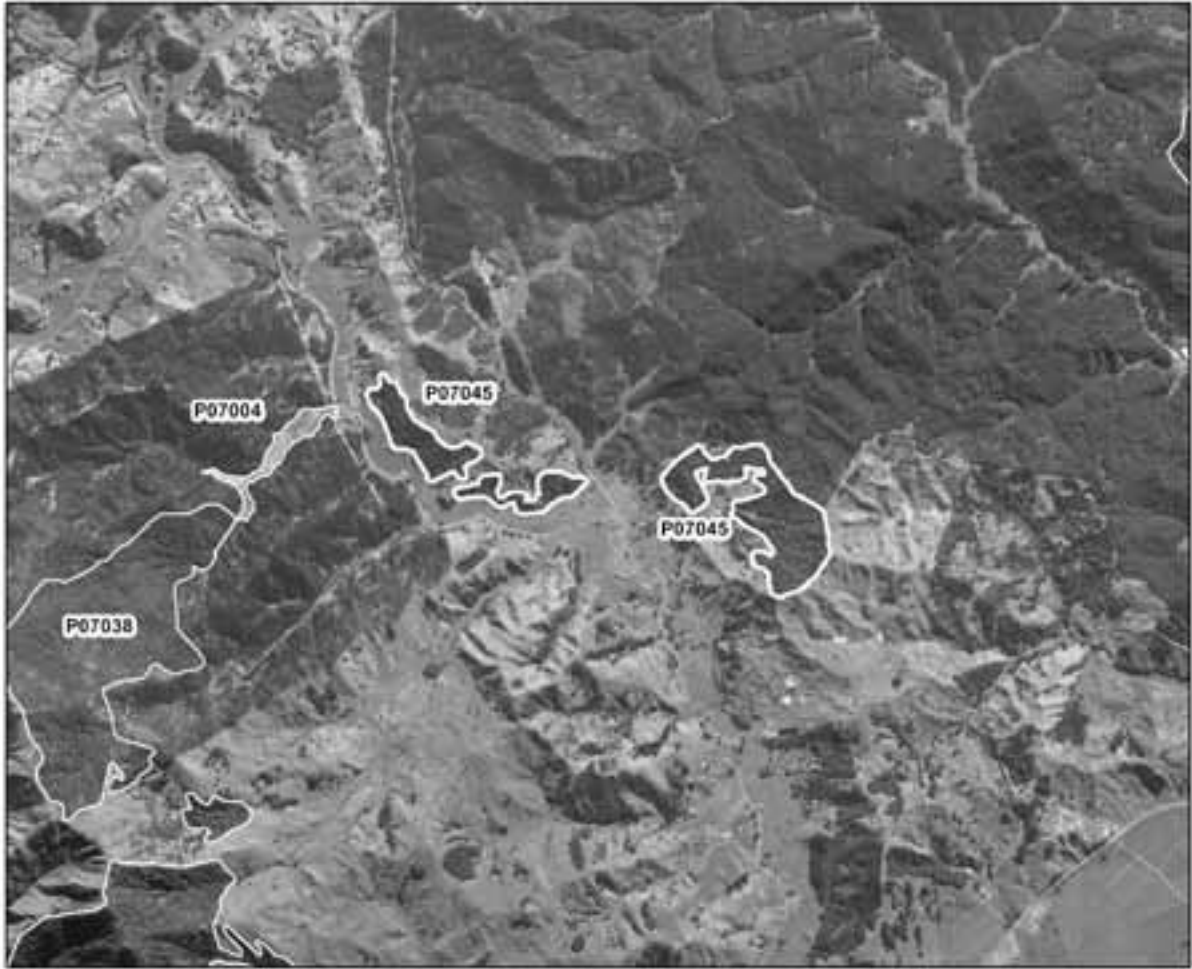
The site comprises three small remnants dominated by kanuka/manuka and podocarp forest, adjoining pine plantation to the north. In the largest remnant, to the east, the lower north-western slope consists of kanuka/manuka and totara (a) with frequent kahikatea and occasional towai, rewarewa, puriri and rimu. The upper north-western slope consists of abundant kanuka/manuka (b), while the central lower slope is dominated by kahikatea with common taraire (c). Nikau occurs frequently with occasional northern rata, rimu, puriri and puka. Below the highest point, kahikatea, rimu and totara (d) are co-dominant, with occasional kanuka/manuka and puka. Totara-kanuka/manuka forest (e) is prevalent in the southern part of the site, occurring with frequent puriri and rimu, and occasional tanekaha, kahikatea and pukatea. The two smaller remnants to the west were not surveyed, but interpretation of aerial photography indicates that they support similar forest types to that present in the main remnant.

Fauna

Black shag (Naturally Uncommon), spur-winged plover and paradise shelduck were recorded during this survey.

Significance

Pukupo Bush is representative for one ecological unit: (d) kahikatea-rimu-totara forest on hillslope. Although it has been utilised by threatened (mobile) species such as black shag, the site has not been surveyed sufficiently to determine whether it meets the criteria for Level 1 sites.

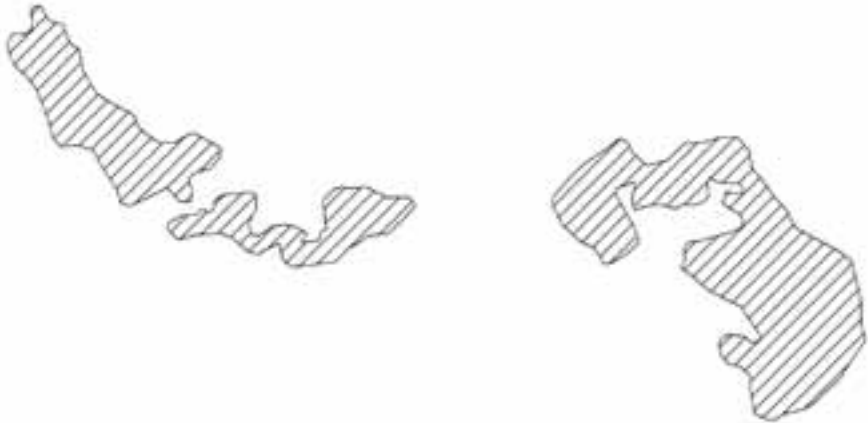


P07/045 Pukupo Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

TANGOWAHINE SCENIC RESERVE

Survey no.	P07/046
Survey date	20 May 1999
Grid reference	P07 983900 (four remnants)
Area	55.5. ha (54.8 ha forest, 0.7 ha shrubland) (The site has been adjusted to fit with 2006 aerial photography. The main change was dividing the site into four remnants)
Altitude	40-130 m asl

Ecological units

- (a) Totara forest on hillslope
- (b) Kanuka/manuka forest on hillslope
- (c) Towai forest on hillslope
- (d) Taraire forest on hillslope
- (e) Kauri forest on hillslope
- (f) Kanuka/manuka shrubland on hillslope
- (g) Kanuka/manuka-tanekaha-totara forest on hillslope
- (h) Kahikatea-puriri-taraire forest on hillslope

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

Tangowahine Scenic Reserve comprises secondary and cut-over tall forest and shrubland surrounded by pasture. The southern end of the reserve is dominated by totara (a), with occasional kahikatea, rewarewa, rimu, mamaku, ti kouka, kanuka and manuka. Abundant kanuka/manuka (b) also occurs to the south with occasional rimu, kahikatea, tanekaha, totara, ti kouka and mamaku. To the west, there is a small area of dominant towai (c) with occasional rewarewa, kahikatea, rimu and mamaku.

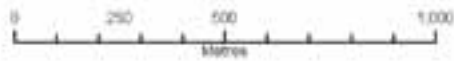
Further north, taraire forest (d) becomes dominant. Occasional species include puriri, totara, rimu, mamaku and puka. Continuing northwards, the forest changes to emergent kauri (e) with occasional tanekaha. The site includes a small shrubland area consisting of kanuka/manuka (f). Also present are frequent totara and mamangi, and occasional ti kouka and mamaku. North of the shrubland area there is co-dominant kanuka/manuka, tanekaha and totara (g) forest with frequent towai and mamaku and occasional kahikatea. The northernmost portion of the remnant consists of unit (b) kanuka/manuka forest with occasional mamaku. Pampas is frequent on the edges.

Fauna

Not surveyed.

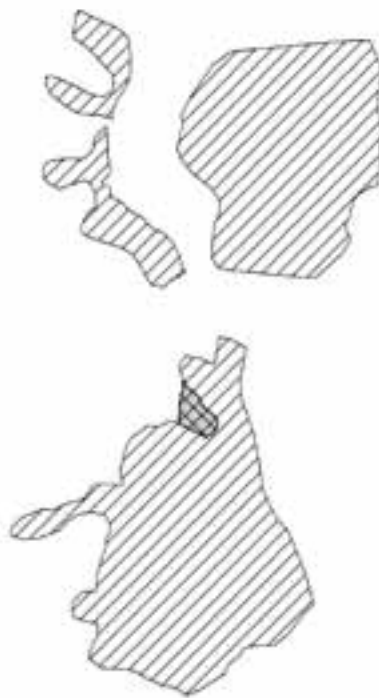


P07/046 Tangowahine Scenic Reserve



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2002

Significance

The site is a small reserve in an area that has little of the original vegetation remaining. Apart from an area of kauri forest, the forest types contained within the reserve are common throughout Tangihua ED and Northland. The site may be used by mobile species as a stepping stone between larger natural areas to the east and west. Additional survey is required before this site can be assigned Level 1 status. 22.5 ha are formally protected as a DOC-administered Scenic Reserve.

AVOCA SOUTH ROAD REMNANTS

Survey no.	P07/049
Survey date	19 June 2000 (ten remnants)
Grid reference	P07 916966
Area	73.7 ha (57.7 ha forest, 16 ha shrubland)
Altitude	20-120 m asl

Ecological units

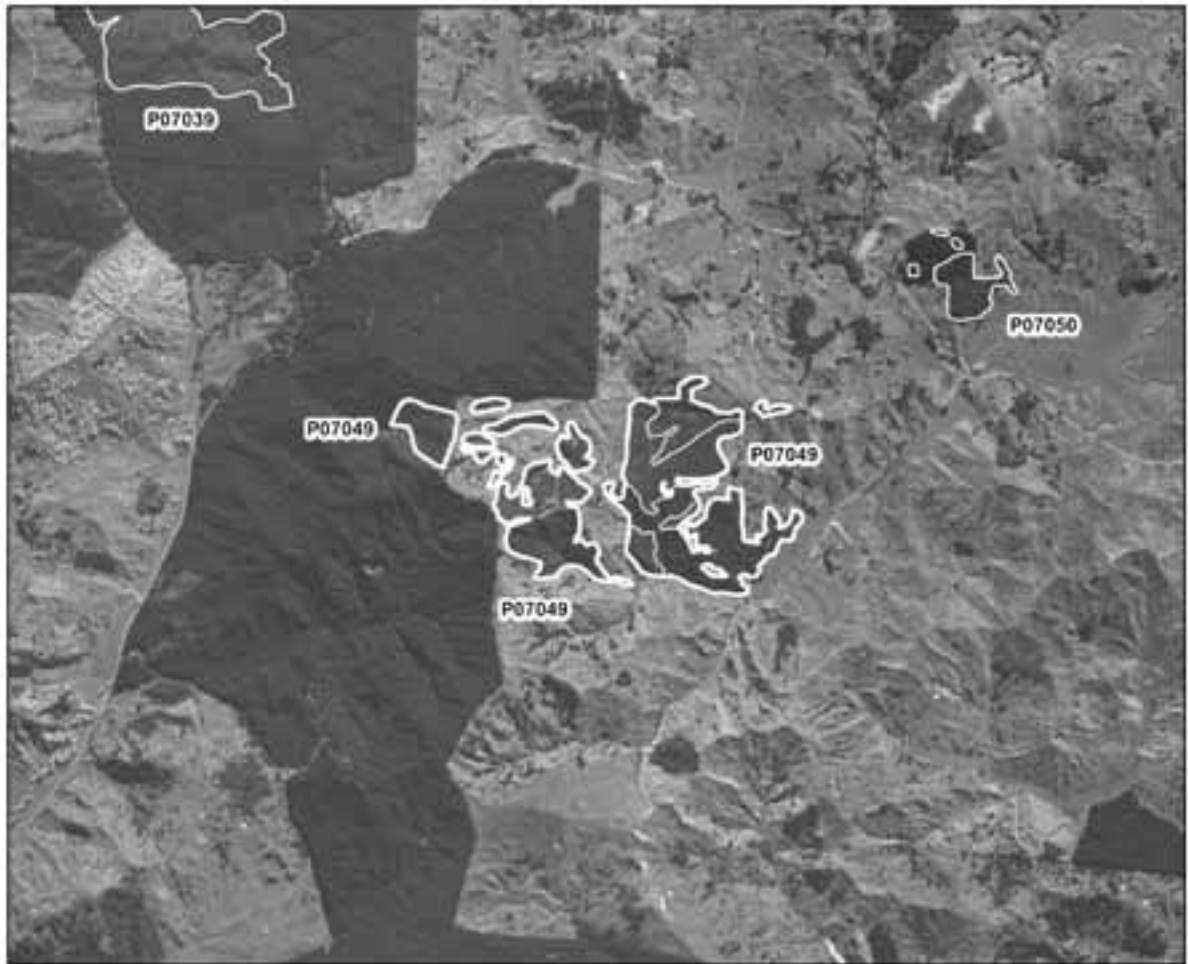
- (a) Towai forest on hillslope (20%)
- (b) Taraire-totara forest on hillslope (15%)
- (c) Kanuka/manuka-totara shrubland on hillslope (15%)
- (d) Kahikatea forest in gully (20%)
- (e) Totara forest on hillslope (20%)
- (f) Kahikatea-totara forest on hillslope (10%)

Landform/geology

Hill country underlain by Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

The site comprises a number of remnants with a mosaic of shrubland and forest areas. In the southern forested area of the large central remnant there is towai forest (a) with occasional kanuka, manuka, puriri, kahikatea, totara and tanekaha. This forested area also contains taraire-totara forest (b) with frequent puriri and occasional pukatea, rimu, rewarewa, kahikatea, ti kouka, mamaku, nikau and puka. In the eastern remnant, the shrubland area consists mostly of kanuka/manuka and totara (c) of about four metres in height. Kahikatea and *Acacia* sp. are also present. In the forested area on the southern boundary of eastern remnant there is kahikatea forest in a moderately sloped gully (d). Totara occurs occasionally. On the slopes above the gully, totara forest (e) predominates. Kanuka and manuka are frequent with occasional puriri, towai, rimu, kahikatea, taraire, mamaku and rewarewa. Higher up the slope there is kahikatea-totara forest (f). Towai is frequent, and kanuka, manuka, puriri and mamaku occur in low numbers.

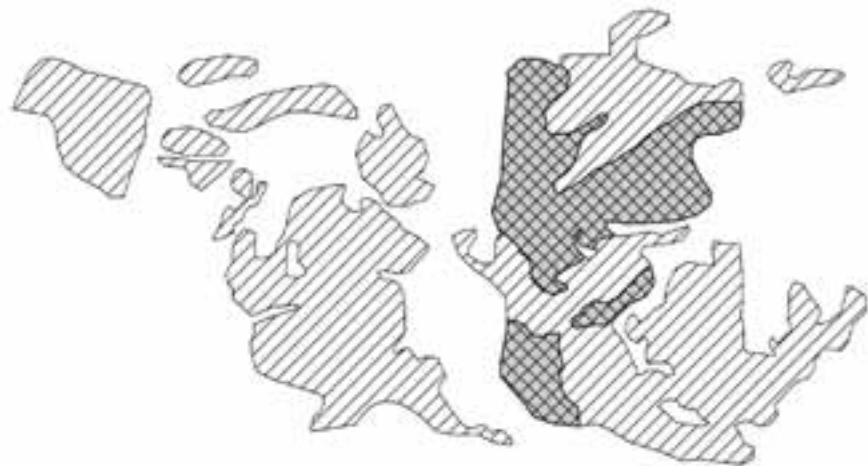


P07/049 Avoca South Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Fauna

Not surveyed, but NI fantail was noted during this survey.

Significance

This site comprises indigenous remnants surrounded by pine forest and pasture, which may form part of a habitat network for mobile bird species such as kukupa. Additional survey is recommended to determine the full ecological significance of this site.

OTIRIA STREAM REMNANTS

Survey no.	P07/051
Survey date	22 June 2000
Grid reference	P07 000905 (three remnants)
Area	16.8 ha (7.4 ha forest, 9.4 ha shrubland)
Altitude	12-78 m asl

Ecological units

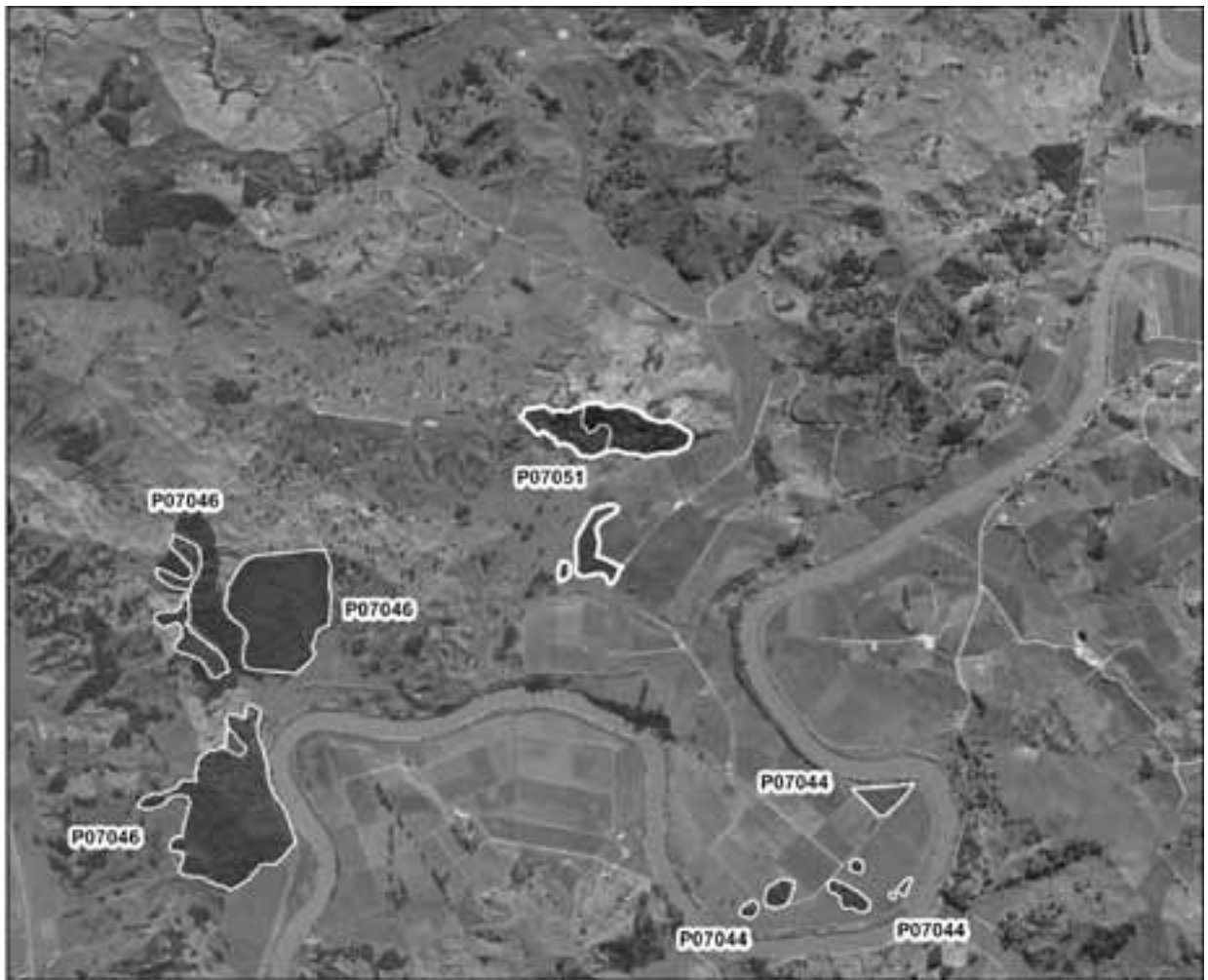
- (a) Totara forest on hillslope
- (b) Taraire forest on hillslope
- (c) Kanuka/manuka-totara shrubland on hillslope
- (d) Ti kouka-kahikatea forest on alluvium
- (e) Kanuka/manuka shrubland on hillslope
- (f) Kahikatea forest on alluvium
- (g) Ti kouka forest on alluvium

Landform/geology

Valley floor on Holocene alluvium and Pleistocene alluvial terraces; bounded by hillslope of Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

This site comprises a hillslope forest remnant and two smaller alluvial remnants. In the main northern remnant, the eastern forested part includes totara-dominated forest (a) with occasional kahikatea, kanuka, manuka, mamaku and nikau. This area also includes taraire-dominated forest (b). Totara and rimu are frequent and kowhai, rewarewa, mamaku, pukatea, nikau, puka and radiata pine are present in low numbers. The shrubland area contiguous with this forest area consists of kanuka, manuka and totara (c). Mamaku and emergent kahikatea are frequent and emergent taraire is also present. Contiguous with the shrubland area, but located on the alluvial flats, is ti kouka-kahikatea forest (d) with an open canopy. The remnant to the south-east of here consists mostly of kanuka/manuka shrubland on a gentle slope (e). Ti kouka, mamangi and totara occur frequently with occasional kohuhu, kahikatea and mamaku. This remnant also contains a small area of kahikatea forest on alluvium (f). Kanuka and manuka are frequent, while rimu, totara and ti kouka occur in low numbers.



P07/051 Otiria Stream Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

Continuing westwards, approximately half of the smallest remnant consists of ti kouka forest (g) with occasional *Coprosma propinqua*. The remaining half of this remnant consists of unit (f) kahikatea forest with frequent ti kouka.

Fauna

Not surveyed.

Significance

Even though forests on alluvium are now severely reduced in extent in Tangihua ED, the site is assigned Level 2 status due to its fragmented state and relative isolation.

TANGOWAHINE - SETTLEMENT ROADS REMNANTS

Survey no.	P07/052
Survey date	22 June 2000
Grid reference	P07 965883 (four remnants)
Area	10.6 ha
Altitude	13-42 m asl

Ecological units

- (a) Ti kouka-kahikatea forest on alluvium (20%)
- (b) Kanuka/manuka-totara forest on hillslope (20%)
- (c) Kahikatea forest on alluvium (60%)

Landform/geology

Valley floor floodplain on Holocene alluvium; bounded by hillslope of Cretaceous sandstone and mudstone (Mangakahia Complex).

Vegetation

The site comprises four small alluvial remnants and one hillslope forest remnant. The western remnant consists of ti kouka-kahikatea forest (a) on alluvium, with occasional puriri and nikau. The central hillslope remnant bordering the Wairoa River consists of kanuka/manuka and totara forest (b). Kahikatea, puriri, and mamaku occur in low numbers. The most southern remnant is dominated by kahikatea forest (c), with occasional ti kouka and nikau. The remaining remnant also consists of unit (c) kahikatea forest, occurring with occasional nikau and pukatea.

Fauna

Not surveyed.



P07/052 Tangowahine-Settlement Roads Remnants



Aerial photography Bowen 2002

Significance

The site contains alluvial forest, a rare vegetation type in Tangihua Ecological District and throughout Northland. This site is fragmented, but further information could lead to this site being upgraded to Level 1 significance. 1.7 ha are protected marginal strip (Wairoa River Marginal Strip No 1, DOC-administered).

TANGOWAHINE REMNANTS

Survey no. P07/053
Survey date 22 June 2000
Grid reference P07 974937 (two remnants)
Area 8.6 ha
Altitude 40-80 m asl

Ecological units

- (a) Kahikatea-totara forest on hillslope (60%)
- (b) Totara forest on hillslope (40%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone and mudstone (Punakitere Sandstone, Whangai Formation, Mangakahia Complex).

Vegetation

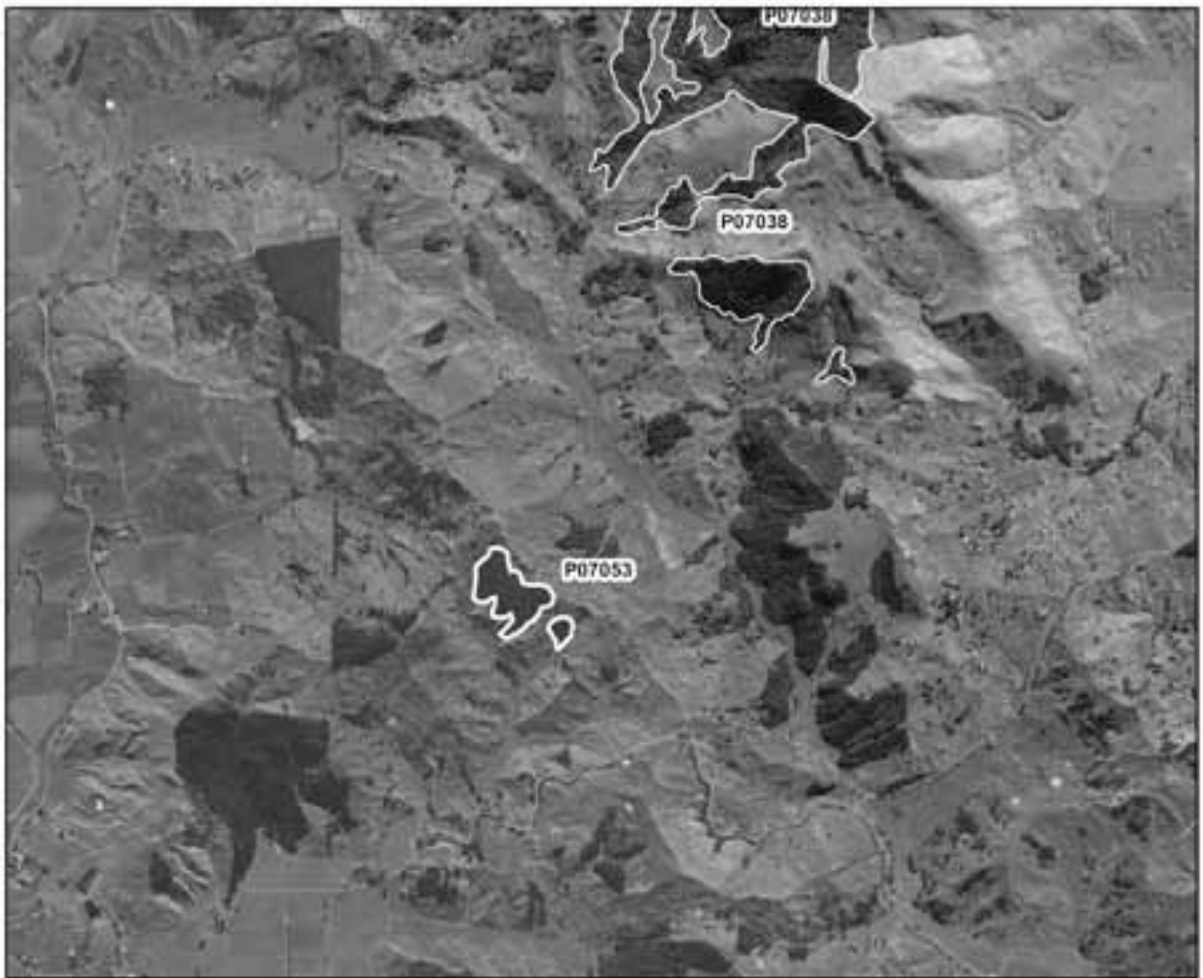
The site comprises two small, isolated forest remnants surrounded by farmland. The eastern side of the southern remnant is characterised by kahikatea-totara forest (a), with occasional puriri, rewarewa, pukatea, rimu, taraire and nikau. The western side of the southern remnant is dominated by totara forest (b), with occasional taraire, kahikatea, pukatea, matai and nikau. Unit (a) kahikatea-totara forest also occurs in the northern remnant. Frequent species include kauri and pukatea, with occasional puriri, rewarewa, nikau, ti kouka, rimu, titoki, kanuka, manuka and puka.

Fauna

Not surveyed.

Significance

The site is small, isolated, and contains forest types that are common throughout Tangihua ED. It is assigned Level 2 status.



P07/053 Tangowahine Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography from 2002

INKSTER ROAD REMANTS

Survey no. Q06/002
Survey date 6 September 1994
Grid reference Q06 105295 (12 remnants)
Area 41.2 ha
Altitude 91-175 m asl

Ecological units

- (a) Totara forest on moderate hillslope
- (b) Towai forest on moderate hillslope

Landform/geology

Hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

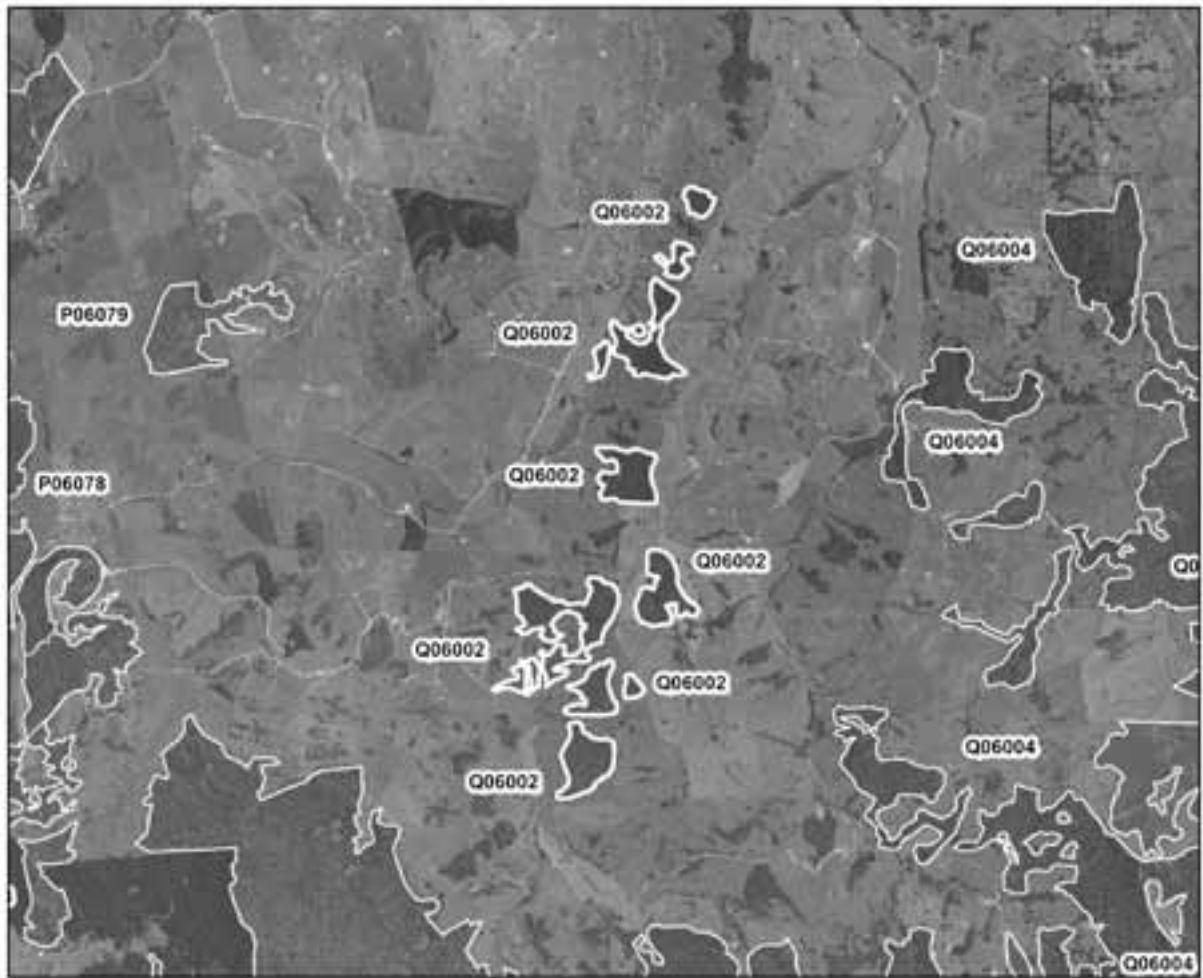
The site comprises a number of small, isolated remnants scattered along the east of Inkster Road. Cut-over tall totara forest (a) is present with occasional emergent kahikatea and rimu. Occasional manuka and kanuka occur throughout the site. The rest of the canopy is characterised by secondary towai forest (b) with frequent rewarewa and taraire, and occasional kahikatea, puriri, tanekaha, totara and kauri.

Fauna

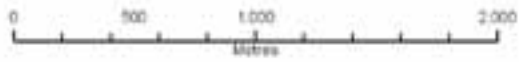
Not surveyed.

Significance

The site is likely to provide seasonal food and habitat for kukupa and common indigenous birds, although the site's isolation may reduce its potential as a habitat corridor between larger natural areas.



Q06/002 Inkster Road Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography flown 2008

MAROMAKU FOREST REMNANTS

Survey no. Q06/182
Survey date 11 February 2009
Grid reference Q06 120345 (five remnants)
Area 17.5 ha (16.5 ha forest, 1 ha shrubland)
Altitude 83-162 m asl

Ecological units

- (a) Totara forest on moderate hillslope (80%)
- (b) Kahikatea forest on toeslope and alluvium (15%)
- (b) Manuka shrubland on moderate hillslope (5%)

Landform/geology

Hillslopes and gullies underlain by Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex).

Vegetation

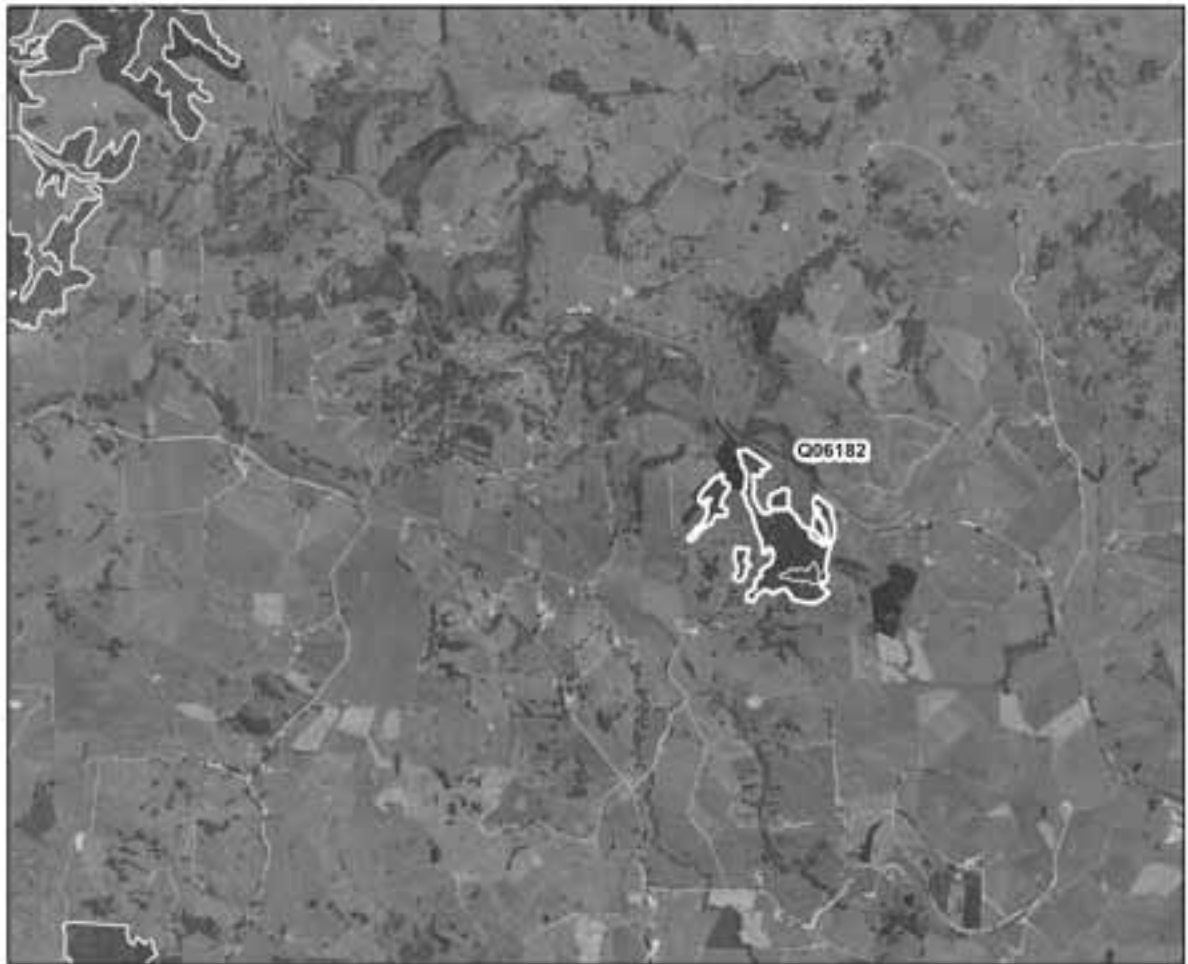
The site comprises a relatively small area of secondary podocarp forest bordering State Highway 1, which is currently partially buffered by pine plantation. Totara (a) dominates the canopy, occurring with frequent emergent kahikatea and occasional rimu, towai, rewarewa and emergent kauri. Kahikatea (b) is common on the lower slopes and continues down to alluvial flats bordering a tributary to the Ramarama Stream. Totara is frequent with occasional rimu. Low-growing manuka (c) is locally common in the south-east of the site, occurring with occasional totara.

Fauna

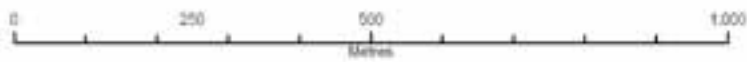
Not surveyed.

Significance

The site may form part of a habitat corridor with scattered remnants to the north-west, which in turn provide linkages with the Tarakihi Wetland and Environs (P06/076). The site is partially fenced, but is likely to be subjected to periodic grazing. It provides riparian buffering for a tributary to the Ramarama Stream. Occasional wildling pines are present.



Q06/182 Maromaku Forest Remnants



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bowen 2006

TANGIHUA ROAD BUSH

Survey no. Q07/109
Survey date 2 February 2009
Grid reference Q07 154936
Area 16.5 ha
Altitude 54-23 m asl

Ecological units

(a) Totara forest on moderate hillslope (100%)

Landform/geology

Steep hillslopes and gullies underlain by Cretaceous sandstone (Punakitere Sandstone, Mangakahia Complex).

Vegetation

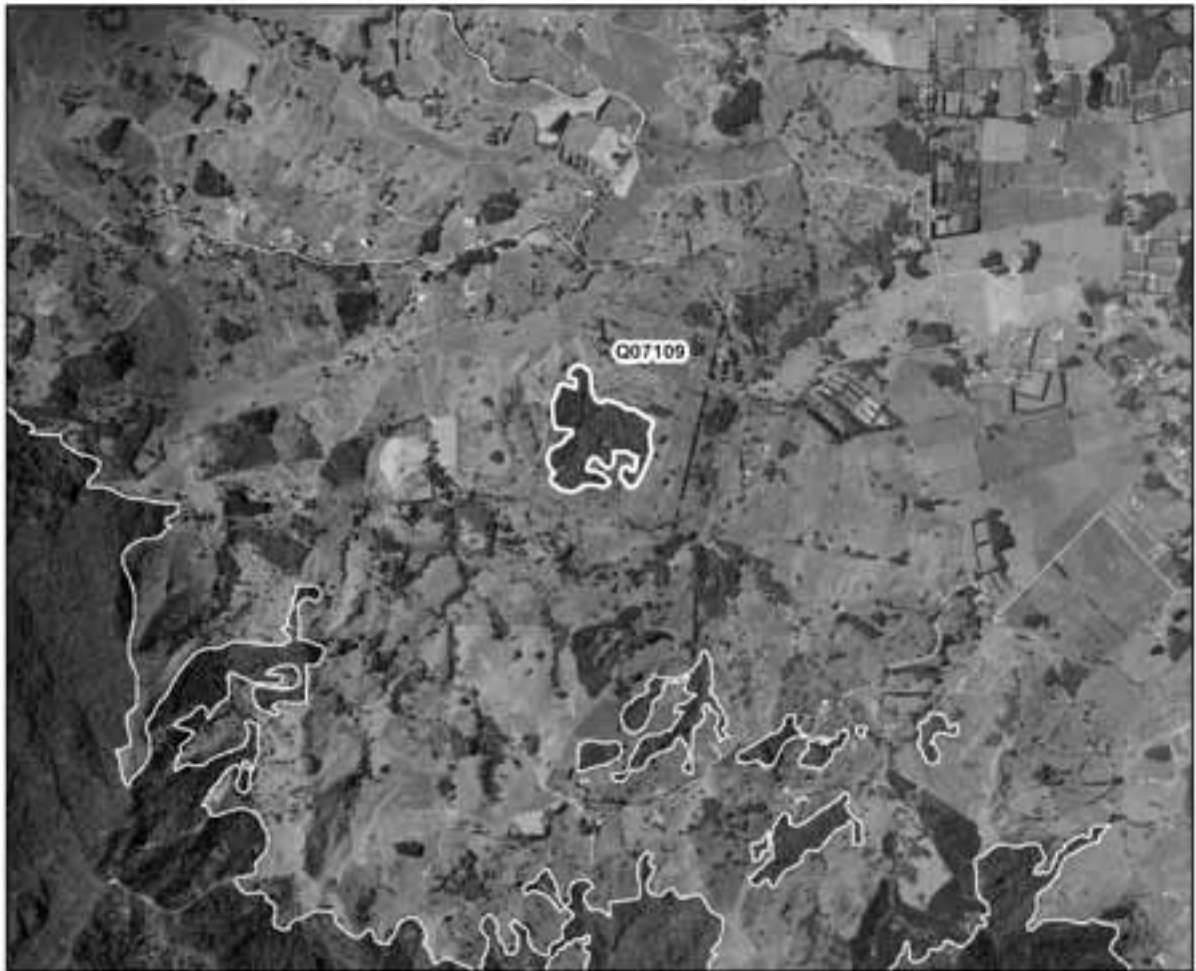
The site comprises a small podocarp-dominant remnant located on the eastern boundary of Tangihua ED. Secondary totara forest (a) is abundant throughout the site, occurring with kahikatea and occasional puriri, while kauri is an occasional emergent at the top of the slope.

Fauna

White-faced heron, Australasian harrier and pukeko were recorded during this survey.

Significance

Despite its isolation, this site may act as a stepping stone for mobile species between other sites and Tangihua Forest (Q07/111). However, the remnant is grazed, lacks floral diversity, and contains a forest type which is common throughout Northland. It is therefore accorded Level 2 status.



Q07/109 Tangihua Road Bush



Habitat Type

-  Forest
-  Shrubland
-  Wetland



Aerial photography Bvsn 2006

5. Summary and Conclusions

5.1 ANALYSIS OF EXISTING PROTECTED AREAS

5.1.1 Overview

Tangihua Ecological District covers a total extent of c.167,024 ha. The natural areas identified in this survey cover c.32,214 (19.3% of the ecological district). The natural areas comprise c.25,816 ha forest, c.5,265 ha shrubland, and c.994 ha freshwater wetland.

Approximately 30% (9,529 ha) of the natural areas identified are formally protected, which is equivalent to c.6% of the total extent of Tangihua ED. The various types of protection status by which natural areas are protected are summarised in Table 1a.

A list of ecological units recorded in Tangihua Ecological District and their current protection status is set out in Table 2 and a summary of the site evaluations is given in Table 3.

5.1.2 Ecological units protected

Approximately 30% of the identified natural areas is protected. A summary of the vegetation/habitat types with formal protection (as per Table 1) is presented in Table 1a. The patterns described below are evident:

Forest

- Of the 25,816 ha of forest and treeland identified, 9,232 ha (36%) are protected.
- Forests are protected at 41 of the 126 sites where they occur.
- Larger areas of forest and treeland at higher altitudes (i.e. above 100 m asl) are better protected than forest and treeland at lower altitudes. The largest protected area of forest is in Tangihua Forest (Q07/111), and the other protected areas of indigenous forest over 200 ha are within Mangakahia Forest and Te Tarahiorahiri (P06/001), Hikurangi Forest and Tokawhero Forest (P06/003), Motatau Forest (P06/084), William Upton Hewett Memorial Reserve (P06/095), North Houto Forest (P07/036), South Houto Forest and Maungaru Range (P07/037) and Atchinson's Bush (Q06/001).
- Forest on alluvial plains is limited in extent and very little of what remains is formally protected. Thirteen alluvial forest or treeland units have some protection, although two of these are smaller than 1 ha.

Shrubland

- Of the 5,265 ha of shrubland within natural areas, 257 ha (5%) are protected.

- Shrublands are protected at ten of the 47 sites where they occur.
- The protected shrublands are predominantly within large hill country forests.
- Shrublands on low hills or on alluvial plains are under-represented in protected areas.

Freshwater wetland

- The total area of freshwater wetlands identified was 994 ha, of which only 39 ha (4%) are protected.
- Protected ecological units within natural or semi-natural wetlands include only two sites within Tangihua ED: 17.6 ha of harakeke flaxland in William Hewett Memorial Reserve (P06/095) and 21.2 ha of raupo reedland in Awakino East Bush (P07/005).
- Freshwater wetlands in Tangihua ED are critically underprotected.

TABLE 1: PROTECTED NATURAL AREAS NETWORK IN THE TANGIHUA ECOLOGICAL DISTRICT (AREAS IN HA)

ADMINISTERED BY:		DEPARTMENT OF CONSERVATION										WHANGAREI DISTRICT COUNCIL		FAR NORTH DISTRICT COUNCIL		TOTAL AREA PROTECTED		TOTAL SITE AREA	
SITE NAME	SURVEY-NO.	PRIVATE	MS	SL	CP	GP	SR	RR	LP	SR	RR	LP	RR	RR	LP	RR	TOTAL AREA PROTECTED	TOTAL SITE AREA	
Mangakahia Forest and Te Tarahiorahiri	P06/001			1397.4				4.2									1401.6	3647.5	
Hikurangi Forest and Tokawhero Forest	P06/003					1796.5											1796.5	3481	
Te Opou Stream Forest	P06/004																0.3	157	
Huehue Forest and Maungakawakawa Forest	P06/013	62.3		11.4									0.3				73.7	1497.7	
Gannon Road Bush	P06/026				141												141	230.9	
Parker Road Riverine Association	P06/030		1.6														1.6	31.9	
Mangaraupo Stream Bush	P06/032					24.4											24.4	67.2	
Oriwhero Bush	P06/034			0.8													0.8	205.9	
Otaenga Road/Awarua Riverine Forest	P06/035												2.6				2.6	81.5	
Waikumurau Stream Riverine Forest	P06/039		1.9														1.9	39	
Opouteke Stream Reserve and Surrounds	P06/043					4.6											5.3	26.2	
Pukehorepa Bush Remnant	P06/049																	73.7	
Taikirau Wetland and Shrublands	P06/072	7.4													4		7.4	376.8	
Motatau Forest	P06/084					391.4											391.4	521.3	
Puketuria Bush	P06/094		15.2			104.5											125.9	168.8	
William Upton Hewett Memorial Reserve	P06/095	252.6	32.1														284.7	543.2	
Piraunui Stream Bush	P06/097		1.1														1.1	10.6	
Mangakahia River Scenic Reserve	P06/098					3.6											3.6	4.4	
Awakino East Bush	P07/005	3.4				26.3											29.7	378.6	
Nathan Road Shrubland	P07/007	16.6															16.6	90.5	
Kathu Scenic Reserve and Surrounds	P07/008					116.1											116.1	167.8	

ADMINISTERED BY:	SURVEY-NO.	PRIVATE		DEPARTMENT OF CONSERVATION							WHANGAREI DISTRICT COUNCIL			FAR NORTH DISTRICT COUNCIL		TOTAL SITE AREA	
		QE II	MS	SL	CP	GP	SR	RR	LP	SR	LP	RR	RR	LP	RR	TOTAL AREA PROTECTED	TOTAL SITE AREA
	P07/014		0.4				5.5								7.4	18.5	
	Sommerville and Karaka Road Riparian Forest														0.4	18	
	Karaka Road Shrubland	3.6													3.6	70	
	Mangakahi River Bush	10.8													10.8	19.5	
	North Houto Forest				530.1										533.3	558	
	South Houto Forest and Maungaru Range	32.4	1.2		375										408.6	783.2	
	Maungaru Trig Forest	26.7													26.7	219.7	
	Waimata Scenic Reserve and Surrounds						150.2								150.2	267.9	
	Avoca Road Kauri Remnant	4.3													4.3	5.7	
	Mamanui Farm Settlement	28.7					89.9								118.6	330.5	
	Scenic Reserve and Surrounds																
	Pukehuia Road Remnants	12.6													12.6	46.9	
	Wilson Road Forest Remnant	1.6													1.6	8.8	
	Tangowahine Scenic Reserve								22.5						22.5	55.5	
	Tongariro Forest Remnants			0.9											0.9	81.9	
	Tangowahine-Settlement Roads Remnants		1.7												1.7	10.6	
	Tairare Scenic Reserve									2.9					2.9	4.6	
	Paerata Wildlife Management Reserve	6.1					189.9								196	208.2	
	Atchinson's Bush								257.9						257.9	838.7	
	Boulder Bed Stream Bush								43.9						44.8	449	
	Aponga Settlement Scenic Reserve								30.7						32.9	72.5	
	Purua Scenic Reserve	10.9							71						81.9	145.3	
	Tangihua Forest			0.03	3177.6										3179.03	3931	
	Grand total (ha)	480	55.2	1410.5	4223.7	216.2	3115.6	4.2	3.2	4.3	2.6	4.3	2.6	4.3	9528.8	19950.8	

TABLE 1A: LIST OF VEGETATION/HABITAT TYPES WITHIN PROTECTED AREAS IN THE TANGIHUA ECOLOGICAL DISTRICT

SITE NAME	SURVEY NO.	VEGETATION/HABITAT TYPES WITHIN PROTECTED NATURAL AREAS
Mangakahia Forest and Te Tarahiorahiri	P06/001	Taraire-towai forest, towai-rewarewa forest, mamaku-towai forest, kauri-manuka-tanekaha forest, towai forest, kahikatea forest, taraire-puriri forest, tawa-towai forest, tawa forest, tawa-puriri forest, puriri-totara forest, kanuka-totara shrubland, kanuka-mamaku-mamangi forest, kauri-northern rata forest
Hikurangi Forest and Tokawhero Forest	P06/003	Towai forest, taraire forest, kanuka/manuka forest, totara-tanekaha forest, puriri forest, kanuka/manuka-rimu forest, kahikatea forest, taraire-puriri-towai forest, kahikatea-totara forest, totara-towai-taraire forest, kanuka-tanekaha-towai-taraire forest, taraire-towai forest, towai-kanuka/manuka shrubland
Te Opou Stream Forest	P06/004	Towai forest, taraire-towai forest
Huehue Forest and Maungakawakawa Forest	P06/013	Akeake-mamangi-manuka-tanekaha shrubland, taraire-towai forest, tanekaha-towai forest, kanuka-kauri-tanekaha forest, manuka-kowhai shrubland, manuka shrubland, kahikatea-pukatea-maire tawake forest, <i>Glyceria maxima</i> grassland, kahikatea forest, <i>Juncus pallidus</i> -manuka-swamp millet rushland, kanuka-totara forest, kahikatea-titoki-totara forest, raupo reedland in swamp
Gammon Road Bush	P06/026	Miro-towai forest, towai forest, kanuka-kauri-taraire forest, kahikatea-totara-towai forest, kanuka-kohuhu-mamaku forest
Parker Road Riverine Association	P06/030	Taraire forest, towai-taraire forest, kahikatea forest, kahikatea treeland, taraire-totara treeland, totara-kahikatea-towai treeland, northern rata-rewarewa forest, taraire-kahikatea-totara forest, makamaka-towai forest
Mangaraupo Stream Bush	P06/032	Taraire-towai forest, kahikatea-mamangi-towai forest, kanuka-towai shrubland, towai-wheki shrubland, taraire-kauri forest
Otiwhero Bush	P06/034	Towai forest, kauri-tanekaha-towai forest, taraire-puriri forest, kahikatea-totara forest, kahikatea-taraire forest, kahikatea-taraire-totara forest, totara-towai forest, raupo reedland
Otaenga Road/Awarua Riverine Forest	P06/035	Totara forest, taraire forest, kanuka/or manuka totara forest
Waikumurau Stream Riverine Forest	P06/039	Taraire-towai riverine forest, kahikatea forest
Opouteke Stream Reserve and Surrounds	P06/043	Totara forest, taraire forest, kahikatea-totara forest, taraire-towai forest, totara forest
Pukehorepa Bush Remnant	P06/049	Taraire forest, totara forest, kanuka/manuka forest, kahikatea forest
Motatau Forest	P06/084	Taraire forest, towai forest, kanuka-totara-towai forest
Puketurua Bush	P06/094	Kanuka-mamangi-tanekaha shrubland, kanuka-rimu-totara forest, kahikatea forest, kanuka-totara forest, kahikatea-totara forest, kahikatea-rimu forest, towai-tanekaha forest, kauri-rimu-totara forest, nikau-puriri-totara forest, totara forest, totara-kahikatea-matai forest, raupo- <i>Carex</i> spp. reedland
William Upton Hewett Memorial Reserve	P06/095	Harakeke flaxland, totara forest, kahikatea-kanuka/manuka forest, <i>Coprosma propinqua</i> -harakeke-ti kouka shrubland, harakeke-raupo flaxland, manuka shrubland, totara-maire tawake forest, kanuka/manuka-tanekaha shrubland, totara forest, kahikatea-totara forest, kanuka/manuka shrubland, <i>Gleichenia</i> sp.-kanuka/manuka fernland, hangehange-mahoe-mamaku shrubland, towai forest, kanuka/manuka-tanekaha forest, manuka-towai shrubland, <i>Dracophyllum lessonianum</i> -manuka-mingimingi shrubland, mamaku-totara treefernland in gully
Piraunui Stream Bush	P06/097	Taraire-towai forest
Mangakahia River Scenic Reserve	P06/098	Taraire forest, towai-kahikatea forest
Awakino East Bush	P07/005	Kahikatea-taraire forest, totara forest, kanuka/manuka-totara shrubland, totara-towai forest, kanuka/manuka shrubland, tanekaha-totara forest, kahikatea-totara forest, taraire forest, taraire-totara forest, puriri-taraire forest, raupo reedland
Nathan Road Shrubland	P07/007	Manuka shrubland, totara shrubland, manuka- <i>Dracophyllum</i> sp. shrubland
Kaihu Scenic Reserve and Surrounds	P07/008	Taraire forest, mapou forest

SITE NAME	SURVEY NO.	VEGETATION/HABITAT TYPES WITHIN PROTECTED NATURAL AREAS
Pakotai Scenic Reserve	P07/014	Taraire-towai forest, taraire forest, puriri-taraire-totara forest, kohekohe-puriri forest
Sommerville and Karaka Road Riparian Forest	P07/017	Kanuka/manuka-tanekaha-totara forest, puriri-taraire forest
Karaka Road Shrubland	P07/019	Kanuka-manuka-totara shrubland
Mangakahi River Bush	P07/023	Taraire forest, tanekaha-totara forest
North Houto Forest	P07/036	Puriri-taraire forest, totara forest, kahikatea forest, puriri-taraire-tawa forest, puriri-taraire-towai forest, taraire-pukatea forest, kahikatea-totara forest
South Houto Forest and Maungaru Range	P07/037	Kanuka/manuka-taraire forest, kanuka/manuka-puriri-taraire forest, kahikatea-puriri-taraire forest, puriri-taraire forest, kanuka/manuka-puriri forest, kohekohe-puriri-taraire forest, totara forest, puriri-taraire-totara forest, kahikatea forest, taraire forest, kahikatea-totara forest, puriri forest, mamaku-puriri-taraire forest, puriri-taraire-tawa forest, kauri forest, taraire-tawa forest
Maungaru Trig Forest	P07/038	Puriri-taraire forest, kahikatea-totara forest, puriri-totara forest, puriri-taraire-totara forest, kahikatea forest, towai forest, taraire forest, kohekohe-puriri-taraire forest, kohekohe forest
Waimata Scenic Reserve and Surrounds	P07/039	Kahikatea-totara forest, kahikatea-taraire forest, kahikatea forest, kanuka/manuka forest, kahikatea-taraire-totara forest, totara-puriri forest, kahikatea-puriri-taraire forest, taraire forest, totara forest, taraire-towai forest, kanuka/manuka-totara forest, totara-towai forest, towai forest, kanuka/manuka-towai forest, mamangi-totara forest, kahikatea-towai forest, kahikatea-totara-towai forest
Avoca Road Kauri Remnant	P07/040	Kauri forest, kahikatea-totara forest
Mamaranui Farm Settlement Scenic Reserve and Surrounds	P07/041	Kahikatea-totara forest, puriri-taraire forest, kauri-totara forest, kahikatea-totara-towai forest, kahikatea-towai forest, taraire forest, kohekohe-puriri-taraire forest, kahikatea-taraire forest, kowhai-puriri forest, totara forest, kahikatea forest, nikau-puriri-taraire forest, rewarewa-taraire-totara forest, kahikatea-puriri-totara forest, tanekaha forest, kahikatea-kauri-totara forest, kanuka/manuka forest, totara-puriri forest, tanekaha-totara forest, towai forest, totara-towai forest, manuka shrubland
Pukehuia Road Remnants	P07/042	Manuka-ti kouka- <i>Coprosma propinqua</i> shrubland, manuka shrubland, totara-tanekaha forest, rimu-kanuka/manuka-totara forest, totara-kanuka/manuka forest, taraire forest, manuka shrubland, kanuka/manuka shrubland, kahikatea-kanuka/manuka-totara forest, kanuka/manuka-totara forest, totara-taraire forest, totara-puriri forest
Wilson Road Forest Remnant	P07/043	Kauri forest, kauri-taraire-totara forest, kanuka/manuka-totara forest, tanekaha-totara-towai forest
Tangowahine Scenic Reserve	P07/046	Totara forest, kanuka/manuka forest, towai forest, taraire forest, kauri forest, kanuka/manuka shrubland, kanuka/manuka-tanekaha-totara forest, kahikatea-puriri-taraire forest
Tongariro Forest Remnants	P07/048	Taraire forest, totara-taraire forest, puriri forest, puriri-totara forest, kahikatea-totara forest, taraire forest, totara forest, kohekohe-taraire-totara forest, kanuka/manuka shrubland, kanuka/manuka-totara-towai forest, mahoe-taraire forest, puriri-taraire forest, kahikatea-taraire forest
Tangowahine-Settlement Roads Remnants	P07/052	Ti kouka-kahikatea forest, kanuka-manuka-totara forest, kahikatea forest
Taraire Scenic Reserve	P07/054	Taraire-totara-kahikatea forest
Paerata Wildlife Management Reserve	P07/055	Manuka-kanuka shrubland, Hall's totara forest, raupo reedland
Atchinson's Bush	Q06/001	Taraire forest, towai-totara forest, kahikatea-taraire forest
Boulder Bed Stream Bush	Q06/004	Taraire forest, towai forest, kahikatea-totara forest, totara forest, taraire-towai forest, manuka shrubland

SITE NAME	SURVEY NO.	VEGETATION/HABITAT TYPES WITHIN PROTECTED NATURAL AREAS
Aponga Settlement Scenic Reserve	Q06/179	Kohekohe-taraire forest, totara-rewarewa forest, totara forest, kohekohe-mamaku forest, taraire forest, totara-titoki forest, mangeo-titoki-totara forest, taraire-tawa forest, tawa forest, puriri-totara forest, tanekaha forest, kanuka/manuka-rimu forest, kauri-tanekaha forest, rimu-tanekaha forest, kahikatea forest, kahikatea-taraire forest, kauri-rimu forest, kanuka/manuka-totara forest, kauri ricker forest, kanuka/manuka forest, rimu-kanuka/manuka-tanekaha forest
Purua Scenic Reserve	Q06/180	Taraire forest, kahikatea-pukatea forest, taraire-pukatea forest, totara-kahikatea forest, totara-kowhai forest, kohekohe-rewarewa forest, taraire-rewarewa forest, totara forest, taraire-kohekohe forest, karaka-taraire-rewarewa forest, karaka-kowhai forest
Tangihua Forest	Q07/111	Puriri-kowhai-totara forest, taraire-puriri forest, towai-mamaku forest, kahikatea forest, towai forest, taraire-nikau-puriri forest, totara-puriri forest, kanuka/manuka-totara forest, towai-tanekaha forest, tawa forest, kauri ricker forest, rimu-tanekaha forest, manuka shrubland, taraire forest, towai-taraire forest, taraire-totara-towai forest, totara-taraire forest, taraire-kahikatea forest, kahikatea-taraire-totara forest

5.2 PRIORITY NATURAL AREAS FOR PROTECTION IN TANGIHUA ECOLOGICAL DISTRICT

The purpose of this section is to identify the unprotected natural areas documented in this report that best supplement the existing protected natural areas network, and to make it more fully representative of the ecological diversity and character of Tangihua Ecological District.

The natural areas of Tangihua ED comprise large areas of secondary forest in the upper hill country areas, relatively large and unmodified freshwater wetland systems, but little indigenous habitat on lower hills and lowland alluvial plains. In terms of legal protection, the upper inland hill country has a relatively high level of protection compared with other parts of the ED. Therefore the priorities for protection currently in the ED are: Freshwater wetland vegetation and habitat, especially those sites supporting natural or semi-natural wetland. The full protection of Taikirau Wetland and Shrublands (P06/072) and Tarakihi Wetland (P06/076) (both important parts of the Motatau wetland complex) is a particularly high priority.

Indigenous vegetation and habitats on alluvial plains.

Level 1 forest and shrubland remnants below 100 m altitude, which provide linkages between upland indigenous forest and lowland alluvial forest remnants.

An effective strategy to create an integrated protected natural areas network in Tangihua ED would need to consider protection of priority natural areas and ecological restoration of wildlife corridors, linkages, and buffers to promote better connectivity between inland hill country, alluvial plains and freshwater wetlands.

TABLE 2: ECOLOGICAL UNITS RECORDED IN TANGIHUA ECOLOGICAL DISTRICT AND THEIR PROTECTION STATUS.

Key: * = Level 2 site; bold PNA numbers = representative ecological units; pt = site is partially protected, but not known if ecological unit falls within the protected area; QEII = Queen Elizabeth II National Trust Open Space Covenant; SL = Stewardship Land; SR = Scenic Reserve; GP = Government Purpose Reserve; MS = Marginal Strip; LP = Local Purpose Reserve; RR = Recreation Reserve; CP = Conservation Park

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
<i>Inland Freshwater Wetland Vegetation and Habitats</i>														
Alligator weed herbfield	P07/001													
<i>Azolla filiculoides</i> herbfield	P06/087*													
<i>Baumea</i> sp. sedge/land	P06/037													
<i>Baumea articulata</i> sedge/land	P06/087*													
	P05/048													
<i>Baumea articulata-raupo</i> sedge/land	P06/066													
<i>Baumea arthropophylla-Gleichenia</i> sp.-manuka sedge/land	P06/076													
<i>Baumea</i> sp.- <i>Juncus</i> sp. sedge/land (ptLP)	P06/072 (ptLP)													
<i>Bolboschoenus fluviatilis</i> sedge/land	P07/001													
<i>Carex</i> sp. sedge/land in swamp	P05/048													
	P06/113*													
<i>Carex secia</i> sedge/land in swamp	P06/118													
<i>Carex</i> sp.-harakeke sedge/land	P06/066													
<i>Carex</i> sp.-maire tawake-raupo sedge/land													P06/069	
<i>Carex</i> sp.-soft rush sedge/land	P06/112*													
<i>Coprosma propinqua</i> shrubland	P06/066													
<i>Coprosma propinqua</i> -ti kouka shrubland	P06/072 (ptLP)													

† A: Holocene alluvium

B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)

C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)

D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)

E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)

F: Pleistocene basaltic lava flow

G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)

H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)

I: Pleistocene alluvial terraces

J: Eocene glauconitic sandstone (Ruatangata Sandstone)

K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)

L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).

M: Pleistocene consolidated dune sand

N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
<i>Eleocharis sphaacelata</i> reedland	P06/087*													
	P06/072 (pILP)													
	P06/076													
	P06/113*													
<i>Eleocharis sphaacelata-Baumea rubiginosa</i> reedland	P07/001													
<i>Eleocharis sphaacelata-raupo</i> reedland	P06/072 (pILP)													
Harakeke- <i>Baumea</i> sp. flaxland	P05/048													
	P05/106													
Harakeke flaxland	P06/076													
	P06/036													
	P06/037													
Harakeke-manuka flaxland					P06/068									
Harakeke-raupo flaxland	P06/014								P06/014					
	P06/072 (pILP)													
	P06/099													
Harakeke-ti kouka flaxland	P06/075													
Harakeke-toetoe-raupo flaxland														
<i>Glyceria maxima</i> grassland	P06/060	P06/013 (ptSL, QEII)											P06/060	
	P06/066													
	P06/087*													
<i>Glyceria maxima-Juncus</i> sp. grassland	P06/087*													

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
<i>Glyceria maxima</i> -raupo grassland	P06/060				P06/060									
<i>Juncus pallidus</i> -manuka-swamp millet rushland		P06/013 (ptSL, QEII)												
Kahikatea treeland	P06/118													
<i>Lepidosperma laterale</i> - <i>Gleichenia</i> sp. sedge/land	P07/001													
Maire tawake forest	P06/066													
Maire tawake-kahikatea forest					P06/069									
Manuka shrubland	P06/117				P05/049									
Manuka- <i>Coprosma tenuicaulis</i> -harakeke shrubland	P05/048													
Manuka-harakeke shrubland	P06/037													
Open water	P07/001													
	P05/048													
	P06/074													
Pampas tussockland	P06/060				P06/060									
Raupo reedland	P06/017	P06/034 (ptSL)	P07/005 (ptQEII, GP)		P06/069						P07/055 (ptGF, QEII)			
	P06/036		P07/018											
	P06/106	P06/013 (ptSL, QEII)			P06/010									
	P06/047													
	P06/057*													
	P06/065													

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	P06/066													
	P06/072 (ptLP)													
	P06/087*													
	P07/021		P07/021											
	P07/001													
	P06/037													
	P06/102*													
	P06/099													
	P06/112*													
	P06/113*													
	P06/114*													
	P06/115*													
	P06/119 ^{††}													
	P07/004*													
Raupo- <i>Baumea</i> sp. reedland	P05/048													
	P05/106													
	P06/118													
Raupo- <i>Baumea articulata</i> - alligator weed reedland	P07/001													
Raupo- <i>Carex</i> spp. reedland													P06/094 (ptSR,MS)	
Raupo- <i>Carex</i> sp.- <i>Baumea</i> sp. reedland	P05/048													
Raupo-cocksfoot-tall fescue- creeping buttercup reedland	P06/037													
Raupo-harakeke reedland	P07/001													
Raupo-harakeke-ti kouka reedland	P07/001													

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
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D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)
- †† Geological landform unknown

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	P05/115*													
Raupo-manuka reedland	P07/047													
Raupo-ti kouka reedland	P07/001													
<i>Schoenoplectus labernaemontani</i> reedland	P06/102*													
	P07/004*													
Swamp millet- <i>Baumea rubiginosa</i> grassland														
Ti kouka- <i>Coprosma propinqua</i> shrubland	P07/001													
Ti kouka-kahikatea forest	P07/001													
Wheki-mamaku treefernland	P06/113*													
Willow sp.- <i>Carex</i> sp. treeland (ptLP)	P06/072													
Inland Alluvial Vegetation														
<i>Azolla filiculoides</i> herbfield	P06/074													
<i>Baumea</i> sp. sedgeland	P06/074													
<i>Carex</i> sp.-raupo sedgeland	P06/074													
<i>Coprosma propinqua</i> -harakeke-ti kouka shrubland	P06/095 (ptQEL,MS)													
<i>Coprosma tenuicaulis</i> -manuka shrubland	P06/072 (ptLP)													
Harakeke flaxland	P06/079													
	P06/095 (ptQEL,MS)													
Harakeke-raupo flaxland	P06/095 (ptQEL,MS)													
Houhere-nikau-pukatea forest	P07/013													
<i>Juncus</i> sp. rushland	P06/079													

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kahikatea forest	P06/072 (ptLP)	P06/013 (ptSL, QEII)	P06/083		P06/083									
	P06/062	P06/100*		P06/011	P06/011				P06/062					
	P06/066				Q06/182*									
	P06/074													
	P07/044													
	P07/001													
	P05/048				P05/049									
	P07/051*								P07/051*					
	P07/052													
	(ptMS)*													
	P07/002*													
Kahikatea-kowhai-ti kouka forest	P06/059								P06/059					
Kahikatea-kowhai-totara forest	P06/059								P06/059					
Kahikatea-manuka forest	P06/066													
Kahikatea-kanuka/manuka forest	P06/095 (ptQEII,MS)													
Kahikatea-pukatea forest	P06/075													
	P06/073													
Kahikatea-ti kouka-harakeke swamp forest	P06/060				P06/060									
Kahikatea-totara forest	P06/075													
	P06/012													
	P06/072 (ptLP)													
Kanuka shrubland	P06/117													

† A: Holocene alluvium

B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)

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E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)

F: Pleistocene basaltic lava flow

G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)

H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)

I: Pleistocene alluvial terraces

J: Eocene glauconitic sandstone (Ruatangata Sandstone)

K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)

L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).

M: Pleistocene consolidated dune sand

N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kanuka/manuka-kowhai forest	P06/072 (ptLP)													
Kanuka/manuka-tanekaha-totara forest	P07/017 (ptMS)*	P07/017 (ptMS)*	P07/017 (ptMS)*						P07/017 (ptMS)*					
Kanuka/manuka-totara forest	P06/064		P06/011		P06/011				P06/064					
Kanuka/manuka-totara-towai forest		P07/048 (ptSL)		P07/048 (ptSL)										
Kanuka-totara forest		P06/013 (ptSL, QEII)												
Kanuka-totara-kahikatea forest					P06/010									
Kahikatea-taraire forest		P07/048 (ptSL)		P07/048 (ptSL)	P06/068									
Kahikatea-ti kouka forest					P06/069									
Kahikatea-tiroki-totara forest		P06/013 (ptSL, QEII)												
Kahikatea treeland	P06/030 (ptMS)	P06/024												
Kowhai forest	P06/059	P06/031*							P06/059					
Mahoe-taraire forest		P07/048 (ptSL)		P07/048 (ptSL)										
Maire tawake forest	P06/066													
Manuka shrubland	P06/095 (ptQEII, MS)		P07/042 (ptQEII)		P06/095 (ptQEII, MS)									
Manuka- <i>Baumea</i> sp. shrubland	P06/072 (ptLP)													
Manuka-harakeke shrubland	P07/001													

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Manuka-ti kouka- <i>Coprosmma propinqua</i> shrubland			P07/042 (ptQEII)											
Manuka-totara-pine shrubland	P07/021		P07/021											
Nikau forest	P07/044													
Northern rata-rewarewa forest	P06/030 (ptMS)													
Poplar treeland		P06/100*												
Puriri-taraire forest	P07/017 (ptMS)*		P07/017 (ptMS)*						P07/017 (ptMS)*					
Raupo reedland	P06/074													
Raupo-wheki reedland					P06/010									
Swamp millet- <i>Baumea rubiginosa</i> grassland	P06/117													
Taraire forest	P06/030 (ptMS)	P07/048 (ptSL)		P07/048 (ptSL)										
		P06/038												
		P06/061												
Taraire-totara forest	P07/002*													
		P06/100*												
Taraire-totara treeland	P06/030 (ptMS)													
Taraire-totara-kahikatea forest	P07/054 (ptSR)								P07/054 (ptSR)					
Taraire-towai forest	P06/039 (ptMS)								P06/039 (ptMS)					
Ti kouka forest	P07/051*								P07/051*					

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	P06/074													
Ti kouka-Coprosma propinqua-kahikatea forest	P07/044													
Ti kouka-kahikatea forest	P07/051*								P07/051*					
	P07/052 (ptMS)*													
Titoki-totara forest	P06/062								P06/062					
Totara-kahikatea forest	P06/053													
Totara-kahikatea-towai treeland	P06/030 (ptMS)													
Totara forest	P06/053	P07/036 (ptCP,LP)												
	P06/035 (ptRR)	P06/043 (ptSR)												
	P06/062	P07/041 (ptQEIL, SR)							P06/062					
Totara-kanuka/manuka forest	P06/093													
Totara-maire tawake forest	P06/095 (ptQEIL,MS)													
Totara-taraire forest	P06/063													
Towai forest	P05/048													
		P06/038												
Inland Hill Vegetation														

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	P06/049 (ptQEII)*	P06/045* P06/049 (ptQEII)* P07/036 (ptCP,LP) P07/037 (ptCP, QEII,MS) P07/038 (ptQEII) P07/041 (ptQEII, SR) P07/009*												
Kahikatea-kanuka/manuka-totara forest		Q06/179 (ptSR) Q07/111 (ptCP,SL) P07/042 (ptQEII)												
Kahikatea-kanuka forest		P06/017			P06/074					P06/074	P06/074	P06/074		
Kahikatea-kanuka-kowhai forest					P07/041 (ptQEII, SR)									
Kahikatea-kauri-totara forest		P07/041 (ptQEII, SR)												
Kahikatea-mamangi-towai forest		P06/032 (ptSR)												
Kahikatea-pukatea forest			Q06/180 (ptQEII, SR)											

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H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
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N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
GEOLOGICAL GROUP †														
Kahikatea-pukatea-maire tawake forest		P06/013 (ptSL, QEII)												
Kahikatea-puriri-tarairae forest		P07/037 (ptCP, QEII, MS)		P07/039 (ptSR)										
				P07/046 (ptSR)*										
Kahikatea-puriri-totara forest		P06/096*			P07/041 (ptQEII, SR)									
Kahikatea-rimu forest												P06/094 (ptSR, MS)		
Kahikatea-rimu-totara forest			P07/045*											
Kahikatea-tarairae forest		P07/041 (ptQEII, SR)	P07/045*	P07/039 (ptSR)										
		P06/034 (ptSL)	Q06/001 (ptSR)	P07/047	Q06/001 (ptSR)							P07/047		
				P07/005 (ptQEII, GP)										
Kahikatea-tarairae-totara forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
		P06/034 (ptSL)		P07/039 (ptSR)										
		Q07/111 (ptCP, SL)												
Kahikatea-tarairae-towai forest														P06/028*

†

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 F: Pleistocene basaltic lava flow
 G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
 H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
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 J: Eocene glauconitic sandstone (Ruatangata Sandstone)
 K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
 L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
 M: Pleistocene consolidated dune sand
 N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kahikatea-totara forest	P06/034 (ptSL)	P06/003 (ptSR)	P07/003	P07/005 (ptQEII, GP)	P06/092		P07/053*	P07/050				P06/094 (ptSR, MS)		Q06/004 (ptSR)
	P06/043 (ptSR)		P07/035*	P07/040 (ptQEII)	P06/095 (ptQEII, MS)									
	P06/053			P07/047										
	P07/036 (ptCP,LP)			P07/049*										
	P07/037 (ptCP, QEII,MS)													
	P07/038 (ptQEII)													
	P07/041 (ptQEII, SR)													
	P07/048 (ptSL)		P07/048 (ptSL)											
	P06/005*													
Kahikatea-totara-towai forest	P06/026 (ptCP)			P07/039 (ptSR)										
	P07/041 (ptQEII,SR)													
Kahikatea-towai forest	P07/041 (ptQEII, SR)			P07/039 (ptSR)										

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- A: Holocene alluvium
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 - G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
 - H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
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 - J: Eocene glauconitic sandstone (Ruatangata Sandstone)
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 - L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
 - M: Pleistocene consolidated dune sand
 - N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kanuka forest		P06/003 (ptSR)			P06/068					P06/067	P06/067			
Kanuka-black wattle forest					P05/049									
Kanuka-kahikatea-totara forest														
Kanuka-kauri-tanekaha forest		P06/013 (ptSL, QEII)												
Kanuka-kauri-tanekaha-totara forest		P06/050	P06/083		P06/083									
Kanuka-kauri-tanekaha forest		P06/026 (ptCP)												
Kanuka-kohuhu-mamaku forest		P06/026 (ptCP)												
Kanuka-mamangi-tanekaha shrubland												P06/094 (ptSR, MS)		
Kanuka-mamaku-mamangi forest		P06/001 (ptSL, RR)												
Kanuka/manuka forest		P06/045*	P07/045*	P07/039 (ptSR)	P06/074					P06/074	P06/074	P06/074		
	P06/049 (ptQEII)*	P06/049 (ptQEII)*		P07/046 (ptSR)*			P06/065							P07/047
		P07/041 (ptQEII, SR)		P07/047	P06/069									
					P07/041 (ptQEII, SR)									
		P06/179 (ptSR)	Q06/179 (ptSR)		P06/070						P06/070			

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H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kanuka/manuka shrubland		P06/045*	P07/042 (ptQEII)	P07/046 (ptSR)*	P06/092					P06/075				
		P07/048 (ptSL)		P07/048 (ptSL)	P06/065									
		P06/033*		P07/051*	P06/095 (ptQEII, MS)						P06/070			
				P07/005 (ptQEII, GP)	P06/070									
				P07/012*	P06/078									
			P06/083		P06/083									
					P06/069									
Kanuka/manuka-kahikatea forest					P06/070						P06/070			P07/047
Kanuka/manuka-kahikatea-totara shrubland				P07/047										
Kanuka/manuka-kahikatea-totara forest		P06/002												
Kanuka/manuka-pine-totara forest			P07/047											P07/047
Kanuka/manuka-puriri forest		P07/037 (ptCP, QEII,MS)												
Kanuka/manuka-puriri-tairare forest		P07/037 (ptCP, QEII,MS)												
Kanuka/manuka-puriri-totara forest										P06/075				
Kanuka/manuka-rimu forest		Q06/179 (ptSR)	Q06/179 (ptSR)											

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kanuka/manuka-tanekaha shrubland		P06/051										P06/095 (ptQEII, MS)		
Kanuka/manuka-tanekaha forest					P06/095 (ptQEII, MS)									
Kanuka/manuka-tanekaha-totara forest		P06/045*		P07/046 (ptSR)* P07/047									P07/047	
Kanuka/manuka-taraire forest		P07/037 (ptCP, QEII,MS)			P06/070						P06/070			
Kanuka/manuka-totara forest		P06/035 (ptRR)	P06/063	P07/039 (ptSR)	P06/092		P06/082							
		P06/048	P06/048	P07/012*	P06/078									P07/047
		P06/050	P07/052 (ptMS)*	P07/047										
		P06/055*	P07/042											
			(ptQEII)											
	P06/056*	P06/056*	P07/043 (ptQEII)											
		Q06/179 (ptSR)	P07/045*											
		Q07/111 (ptCP,SL)	Q06/179 (ptSR)											
Kanuka/manuka-totara shrubland			P07/019 (ptQEII)	P07/047			P06/082							P07/047
				P07/049*										
				P07/051*										

†

- A: Holocene alluvium
 B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
 C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
 D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
 E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
 F: Pleistocene basaltic lava flow
 G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
 H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
 I: Pleistocene alluvial terraces
 J: Eocene glauconitic sandstone (Ruatangata Sandstone)
 K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
 L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
 M: Pleistocene consolidated dune sand
 N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kanuka/manuka-towai forest				P07/005 (ptQEII, GP)										
Kanuka/manuka-towai shrubland		P06/002	P06/119 (ptQEII) ^{††}	P07/039 (ptSR)										
Kanuka/mianuka-totara-towai forest		P07/010*												
Kanuka-rimu forest		P06/003 (ptSR)												P06/094 (ptSR, MS)
Kanuka-rimu-totara forest														
Kanuka-tanekehaka-totara forest										P06/067	P06/067			
Kanuka-tanekehaka-towai-taraire forest		P06/003 (ptSR)												
Kanuka-totara forest											P06/090	P06/090	P06/094 (ptSR, MS)	
Kanuka-totara shrubland		P06/001 (ptSL,RR)												
Kanuka-totara-towai forest		P06/024 P06/084 (ptSR)												
Kanuka-towai shrubland		P06/032 (ptSR)												
Karaka-taraire-rewarewa forest		Q06/180 (ptQEII, SR)												

† A: Holocene alluvium

B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)

C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)

D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)

E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)

F: Pleistocene basaltic lava flow

G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)

H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)

I: Pleistocene alluvial terraces

J: Eocene glauconitic sandstone (Ruatangata Sandstone)

K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)

L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).

M: Pleistocene consolidated dune sand

N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

†† Geological landform unknown

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Karaka-kohekohe-puriri forest		P07/034												
Karaka-kowhai forest		Q06/180 (ptQEL, SR)												
Kauri forest		P06/045*	P07/043 (ptQEI)	P07/040 (ptQEI)										
		P06/051	P06/119 (ptQEI) ^{††}	P07/046 (ptSR) [*]										
		P07/037												
Kauri ricker		Q06/179 (ptSR)	Q06/179 (ptSR)											
		Q07/111 (ptCP,SL)												
Kauri-kanuka/manuka-tanekaha forest					P06/069									
Kauri-manuka-tanekaha forest		P06/001 (ptSL,RR)												
Kauri-northern rata forest		P06/001 (ptSL,RR)												
Kauri-rimu forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Kauri-rimu-tanekaha forest			P06/081											
Kauri-rimu-totara forest														P06/094 (ptSR, MS)
Kauri-tanekaha forest	P06/037	P06/033*		P07/047	P06/070						P06/070	P07/047		
		Q06/179 (ptSR)	Q06/179 (ptSR)											

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)
- †† Geological landform unknown

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kauri-tanekaha-kanuka forest					P06/092									
Kauri-tanekaha-towai forest		P06/034 (ptSL)			P06/071*									
Kauri-taraire forest		P06/025 P06/031*												
Kauri-taraire-totara forest			P07/043 (ptQEII)											
Kauri-totara forest		P07/041 (ptQEII, SR)												
Kauri-totara-towai forest							P06/012							
Kauri-totara-towai-taraire forest			Q06/181											
Kohekohe forest		P07/038 (ptQEII)												
Kohekohe-mahoe-taraire forest		P07/011												
Kohekohe-mamaku forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Kohekohe-mamaku-taraire forest		P07/015												
Kohekohe-puriri forest		P07/014 (ptSR)	P07/014 (ptSR)											
Kohekohe-puriri-taraire forest		P07/034 P07/037 (ptGCP, QEILMS)												
		P07/038 (ptQEII)												
		P07/041 (ptQEII,SR)												
		P07/016*												

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Kohekohe-rewarewa forest		Q06/180 (ptQEII, SR)												
Kohekohe-taraire forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Kohekohe-taraire-totara forest		P07/048 (ptSL)		P07/048 (ptSL)										
Kowhai forest		P07/011												
Kowhai-kahikatea forest			P07/003											
Kowhai-puriri forest		P07/041 (ptQEII, SR)												
Kowhai-taraire forest								P07/050						
Makamaka-towai forest														P06/030 (ptMS)
Mamaku-pate- <i>Gabrita</i> sp. treefernland					P06/010									
Mamaku-puriri-taraire forest		P07/037 (ptCP, QEII,MS)												
Mamaku-taraire forest		P06/029*												
Mamaku-titoki forest		P06/044												
Mamaku-totara treefernland					P06/095 (ptQEII, MS)									
Mamaku-towai treefernland		P06/001 (ptSL,RR)												
Mamangi-puriri-taraire forest		P07/010*												
		P06/002												

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Mamangi-totara forest				P07/039 (ptSR)										
Mangao-titoki-totara forest	Q06/179 (ptSR)	Q06/179 (ptSR)	Q06/179 (ptSR)											Q06/004 (ptSR)
Manuka forest		P06/017			P06/071*					P06/066	P06/066			
		P07/007 (ptQEII)										P07/007 (ptQEII)		
Manuka shrubland	P06/099		P07/042 (ptQEII)		P06/010					P06/066	P06/066			
	P05/106	Q07/111 (ptCP,SL)		P07/047	P06/059						P06/090	P06/090		
		P06/013 (ptSL,QEII)			P05/048						P06/072 (ptLP)	P07/047		
				P06/012	P06/012									
					P06/058*									
					P06/065									
					P06/072 (ptLP)									
					P06/074					P06/074	P06/074	P06/074		
	P06/095 (ptQEIL,MS)				P06/076									P06/076
					P06/095 (ptQEIL,MS)									
					P07/041 (ptQEIL,SR)									
					Q06/182*									

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Manuka- <i>Dracophyllum</i> sp. shrubland	P07/007 (ptQEID)											P07/007 (ptQEID)		
Manuka- <i>Hakea</i> sp. shrubland					P05/049									
Manuka- <i>Coprosma tenuicaulis</i> shrubland							P06/011							
Manuka-kanuka shrubland				P07/055 (ptGP, QEID)						P06/067	P06/067			
Manuka-kauri forest					P06/071*									
Manuka-kowhai shrubland		P06/013 (ptSL, QEID)												
Manuka-mamaku- <i>Baumea</i> sp. shrubland					P06/010									
Manuka-mamaku shrubland					P06/010					P06/066	P06/066			
Manuka-tanekaha-totara forest					P05/049									
Manuka- <i>Gileichenia</i> sp. shrubland	P06/041				P06/041									
Manuka-totara forest					P06/074					P06/074	P06/074	P06/074		
Manuka-totara shrubland				P07/047										P07/047
Manuka-totara-towai shrubland							P06/012							
Manuka-towai shrubland					P06/095 (ptQEII, MS)									
Mapou forest		P07/008 (ptSR)												
Mapou-putaputaweta-kohuhu shrubland	P06/037													
Miro-towai forest		P06/026 (ptCP)												
Nikau-puriri-taraire forest							P06/069							

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Nikau-puriri-totara forest		P07/041 (ptQEII,SR)			P07/041 (ptQEII, SR)									P06/094 (ptSR, MS)
Pine-mamaku-pate shrubland					P05/048									
Puriri forest		P06/003 (ptSR)			P06/072 (ptLP)						P06/072 (ptLP)			P06/077
		P06/077												
		P07/037 (ptCP, QEII,MS)												
		P07/048 (ptSL)		P07/048 (ptSL)										
Puriri-kowhai-totara forest		Q07/111 (ptCP,SL)												
Puriri-taraire forest		P06/002		P07/005 (ptQEII, GP)						P06/066	P06/066			
		P06/077												P06/077
		P07/034												
		P07/036 (ptCP,LP)												
		P07/037 (ptCP,QEII, MS)												
		P07/038 (ptQEID)												
†	A: Holocene alluvium													
	B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)													
	C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)													
	D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)													
	E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)													
	F: Pleistocene basaltic lava flow													
	G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)													
	H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)													
	I: Pleistocene alluvial terraces													
	J: Eocene glauconitic sandstone (Ruatangata Sandstone)													
	K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)													
	L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).													
	M: Pleistocene consolidated dune sand													
	N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)													

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Puriri-taraire-tawa forest	P07/041 (ptQEII,SR)													
	P07/048 (ptSL)			P07/048 (ptSL)										
	P07/036 (ptCP,IP)													
Puriri-taraire-totara forest	P07/037 (ptQEII, CP,MS)													
	P06/052													
	P07/014 (ptSR)		P07/014 (ptSR)											
	P07/037 (ptCP, QEII,MS)													
	P07/038 (ptQEII)													
Puriri-taraire-towai forest	P07/036 (ptCP,IP)													
Puriri-totara forest	P06/001 (ptSL,RR)		P07/038 (ptQEII)											
	P06/096*				P06/074									
	P07/048 (ptSL)			P07/048 (ptSL)										
	Q06/179 (ptSR)		Q06/179 (ptSR)											
	P06/044													
Rewarewa-tanekaha-taraire-towai forest														
Rewarewa-taraire-towai forest			P06/011		P06/011									
Rewarewa-taraire-totara forest	P07/041 (ptQEII, SR)				P07/041 (ptQEII, SR)									

- † A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Rimu forest		P06/005*												
Rimu-kahikatea-kauri forest					P06/014									
Rimu-kanuka/manuka-tanekaha forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Rimu-kanuka/manuka-totara forest			P07/042 (ptQEII)											P06/076
Rimu-rewarewa forest					P06/076									
Rimu-tanekaha forest		Q06/179 (ptSR)	Q06/179 (ptSR)		P06/069									
		Q07/111 (ptCP,SL)												
Tanekaha forest		P07/041 (ptQEII,SR)			P07/041 (ptQEII,SR)									
Tanekaha-kanuka/manuka shrubland														P06/092
Tanekaha-taraire forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Tanekaha-totara forest		P06/024		P07/023 (ptQEII)						P06/067	P06/067			
		P07/041 (ptQEII,SR)		P07/005 (ptQEII,GP)	P07/041 (ptQEII,SR)									
Tanekaha-totara-towai forest														
					P07/043 (ptQEII)									
					P06/009*									
Tanekaha-towai forest		P06/013 (ptSL,QEII)												
		P06/002	P06/011	P07/039 (ptSR)	P06/011					P06/075	P06/090	P06/090		Q06/004 (ptSR)
Taraire forest														

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B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †		A	B	C	D	E	F	G	H	I	J	K	L	M	N
			P06/003 (ptSR)	P06/081	P07/046 (ptSR)*	P05/049							P06/030 (ptMS)		
			P06/029*	P06/009*	P07/051*	P06/074					P06/074	P06/074	P06/074		
			P06/031*	Q06/001 (ptSR)	P07/005 (ptQEII, GP)	Q06/001 (ptSR)									
			P06/035 (ptRR)	P07/042 (ptQEII)	P07/012*	P06/065									
			P06/043 (ptSR)	P07/022*	P07/023 (ptQEII)	P06/071*									
			P06/044	Q06/180 (ptQEII, SR)											
			P06/045*												
		P06/049 (ptQEII)*	P06/049 (ptQEII)*												
			P06/052												
			P06/053												
			P06/055*												
		P06/056*	P06/056*												
			P06/084 (ptSR)												
			P07/011												
			P07/014 (ptSR)												
			P07/015												
			P07/037 (ptCP, QEII,MS)												

- † A: Holocene alluvium
 B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
 C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
 D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
 E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
 F: Pleistocene basaltic lava flow
 G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
 H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
 I: Pleistocene alluvial terraces
 J: Eocene glauconitic sandstone (Ruatangata Sandstone)
 K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
 L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
 M: Pleistocene consolidated dune sand
 N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Taraire-nikau-puriri forest	Q07/111 (ptCP,SL)													
Taraire-pukatea forest	P07/036 (ptCP,LP)	Q06/180 (ptQEIL, SR)												
Taraire-puriri forest	P06/001 (ptSL,RR)													
	P06/034 (ptSL)													
	Q07/111 (ptCP,SL)													
Taraire-puriri-kanuka-mamaku forest											P06/066	P06/066		
Taraire-puriri-towai forest	P06/003 (ptSR)										P06/066	P06/066		
	P06/046													
Taraire-rewarewa forest	P06/024 P06/040*	P06/083			P06/083									
	Q06/180 (ptQEIL, SR)													
Taraire-rewarewa-puriri forest	Q06/180 (ptQEIL, SR)													
Taraire-rewarewa-totara forest														
Taraire-tanekaha forest	P06/017													
Taraire-totara forest	P06/015 P06/051	P07/035*	P07/049*	P07/005 (ptQEIL, GP)										

† A: Holocene alluvium
B: Cretaceous-Paleocene ophiolitic volcanics (Tangihua Complex)
C: Cretaceous Sandstone (Punakitere Formation, Mangakahia Complex)
D: Cretaceous Sandstone & Mudstone (Mangakahia Complex)
E: Cretaceous siliceous mudstone (Whangai Formation, Mangakahia Complex)
F: Pleistocene basaltic lava flow
G: Cretaceous sandstone and siliceous mudstone (Punakitere Formation, Whangai Formation, Mangakahia Complex)
H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
L: Melange (undifferentiated Mangakahia & Motatau Complex lithologies).
M: Pleistocene consolidated dune sand
N: Concretionary micaceous sandstone with carbonaceous material (Mangakahia Group)

GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
		P06/053									P06/077			
Taraire-totara-tawa-towai-kanuka forest		P06/077			P06/069									
		P06/005*												
Taraire-totara-tawa-puriri forest					P05/048									
Taraire-totara-towai forest		Q07/111 (ptCP,SL)	P06/011		P06/011									
Taraire-tawa forest		P06/054												
		P07/037 (ptCP, QEIL,MS)												
		Q06/179 (ptSR)	Q06/179 (ptSR)											
Taraire-towai forest		P06/001 (ptSL,RR)		P06/065										Q06/004 (ptSR)
		P06/003 (ptSR)		P07/039 (ptSR)										
		P06/004 (ptLP)												
		P06/024												
		P06/032 (ptSR)												
		P06/043 (ptSR)												
		P07/014 (ptSR)	P07/014 (ptSR)		P06/076							P06/076		
		P06/097 (ptMS)*												

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Tawa forest		P06/013 (ptSL,QEII)												
		P06/001 (ptSL,RR)												
		Q06/179 (ptSR)	Q06/179 (ptSR)											
		Q07/111 (ptCP,SL)												
Tawa-puriri forest		P06/001 (ptSL,RR)												
Tawa-towai forest		P06/001 (ptSL,RR)												
Ti kouka-kanuka/manuka shrubland				P07/047										
Totara forest		P06/002	P07/022*	P07/039 (ptSR)	P06/059		P07/055*	P07/050						
		P06/043 (ptSR)	P07/035*	P07/046 (ptSR)*	P06/095 (ptQEII, MS)				P06/067	P06/067	P06/094 (ptSR,MS)			Q06/004 (ptSR)
		P06/045*	Q06/002*	P07/049*	P06/074									
		P06/046	Q06/180 (ptQEII, SR)	P07/051*	Q06/182*					P06/074	P06/074	P06/074		
	P06/049 (ptQEID)*	P06/049 (ptQEID)*	Q07/109*	P07/005 (ptQEII, GP)										
		P06/096*			P06/076									
		P07/037 (ptCP, QEII,MS)												

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H: Oligocene sandy bioclastic limestone (Whangarei Limestone, Te Kuiti Group)
I: Pleistocene alluvial terraces
J: Eocene glauconitic sandstone (Ruatangata Sandstone)
K: Oligocene micritic limestone (Mahurangi Limestone, Motatau Complex)
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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Totara forest		P07/048 (ptSL)		P07/048 (ptSL)										
		P06/006*												
		P07/009*												
		Q06/179 (ptSR)	Q06/179 (ptSR)											
Totara shrubland		Q06/180 (ptQEII,SR)												
		P07/007 (ptQEII)												P07/007 (ptQEII)
Totara-kahikatea forest		P06/053	P07/055*	P07/012*										
			Q06/180 (ptQEII, SR)											
Totara-kahikatea-kanuka forest			P06/011		P06/011									
														P06/094 (ptSR, MS)
Totara-kahikatea-matai forest														
Totara-kanuka forest		P06/104			P06/014		P06/082			P06/066	P06/066			
Totara-kanuka/manuka forest			P07/045*											
			P07/042 (ptQEII)											
Totara-kanuka-puriri-tarairi forest														
Totara-kowhai forest			Q06/180 (ptQEII, SR)								P06/066	P06/066		
Totara-mamaku forest		P06/024												

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Totara-puriri forest		P07/041 (ptQEII,SR)		P07/039 (ptSR)	P07/041 (ptQEII, SR)									
Totara-puriri-kahikatea forest		Q07/111 (ptCP,SL)	P07/042 (ptQEII)											
Totara-rimu forest		P06/042	P06/101*											
Totara-rewarewa forest		P06/015												
Totara-tanekaha forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Totara-tanekaha-manuka forest		P06/003 (ptSR)	P07/042 (ptQEII)		P05/048									
Totara-tarairé forest		P07/048 (ptSL)	P07/042 (ptQEII)	P07/048 (ptSL)										
Totara-tarairé-puriri-kanuka forest		Q07/111 (ptCP,SL)												
Totara-tarairé-puriri-rimu forest		P06/052								P06/067	P06/067			
Totara-tarairé-puriri-towai forest			P06/083		P06/083									
Totara-tarairé-towai forest											P06/066	P06/066		
Totara-tawa-rimu forest		P06/053												
Totara-titoki forest		Q06/179 (ptSR)	Q06/179 (ptSR)											
Totara-towai forest		P06/024		P07/039 (ptSR)	P07/041 (ptQEII, SR)									

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Totara-towai-tarairae forest	P06/034 (ptSL)		P07/005 (ptQEII, GP)											
	P06/104													
	P06/046													
Totara-towai-tarairae treecland	P06/003 (ptSR)													
	P06/050													
Towai forest	P06/001 (ptSL,RR)	Q06/002*	P07/039 (ptSR)	P06/095 (ptQEII, MS)										Q06/004 (ptSR)
	P06/003 (ptSR)		P07/046 (ptSR)*	P07/041 (ptQEII, SR)										
	P06/004 (ptLP)		P07/049*											
	P06/026 (ptCP)													
	P06/034 (ptSL)													
	P06/046													
	P06/084 (ptSR)													
	P07/038 (ptQEII)													
	Q07/111 (ptCP,SL)													
	P07/002*			P07/002*										

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GEOLOGICAL GROUP †	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Towai-kahikatea forest		P06/098 (ptSR)*												
Towai-kanuka/manuka shrubland		P06/003 (ptSR)												
Towai-mamaku forest		Q07/111 (ptCP,SL)												
Towai-manuka shrubland				P06/065										
Towai-rewarewa forest		P06/001 (ptSL,RR)												
Towai-tanekaha forest		Q07/111 (ptCP,SL)										P06/094 (ptSR, MS)		
Towai-taraire forest		P07/010*										P06/030 (ptMS)		
Towai-taraire-kanuka forest				P06/037										
Towai-totara forest					Q06/001 (ptSR)									Q06/001 (ptSR)
Towai-wheki shrubland		P06/032 (ptSR)												

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TABLE 3: SUMMARY OF SITE EVALUATIONS.

e.u. = ecological units, reg.sig. = regionally significant

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY*/SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Te Ahu Ahu Wetlands and Environs P05/048	Rep. site for 8 e.u.s	Forest on alluvium; Fauna: 2 threatened, Flora: 3 reg. sig.	14 e.u.s	Displays a habitat sequence from open water through to wetland and swamp forest associations; some pines present in wetland areas but are not surviving well.	Near several large wetland complexes within Tangihua ED, such as P05/049, P06/074 and P06/072; contiguous with P06/069.	404.6 ha, 1 large remnant with convoluted edges.
Uekehea Mosaic P05/049	Rep. site for 1 e.u.	Forest on alluvium; Fauna: 1 threatened.	6 e.u.s	Large area of secondary and alluvial forest, wetland and shrubland; weed infestations (gorse and black wattle).	Near P05/048 and P06/069, upper catchment and riparian protection; partially buffered by pine plantation.	263.7 ha, 1 large part and 2 small parts, linked by pine plantation.
Davis Road Swamp P05/106		Fauna not surveyed.	3 e.u.s	Not grazed.	Contiguous with P06/070; buffered by indigenous shrubland.	
Mangakahia Forest and Te Tarai o Rahiri P06/001	Rep. site for 9 e.u.s	Fauna: 5 threatened, 2 reg. sig. Flora: 2 threatened, 24 reg. sig.	14 e.u.s	Heavily logged but contains large healthy northern rata, largely intact; contains good example of high altitude forest types; upper catchments have moderate to high goat numbers; partially buffered by pine.	Near P06/002, P06/053, and P06/054; catchment and riparian protection.	3,643.3 ha, 1 large, contiguous tract and 1 peripheral part.
Kaikou Forest Mosaic P06/002	Rep. site for 3 e.u.s	Fauna: 1 threatened; 1 reg. sig; Flora: 1 reg. sig.	6 e.u.s	Displays a high degree of altitudinal variance and botanical diversity.	Near P06/001 and P06/063; catchment and riparian protection.	1,542.2ha, 1 large, contiguous tract and 4 peripheral parts.
Hikurangi Forest and Tokawhero Forest P06/003	Rep. site for 13 e.u.s	Fauna: 7 threatened, 3 reg. sig.; Flora: 1 threatened, 7 reg. sig.	13 e.u.s	Botanically diverse; includes advanced shrubland in some peripheral areas; moderate animal disturbance; past records of cattle.	Near P06/002, P06/083, and P06/104; catchment protection for three large river systems (Awarua, Kaikou and Punakitere Rivers) and riparian buffering for two streams; surrounded by pasture.	3,481 ha, 1 large, contiguous tract and 2 small parts.
Te Opou Stream Forest P06/004		Fauna: 1 reg. sig.	2 e.u.s	Goats and cattle present.	Provides a linking function between P06/013 and P06/003; some upper catchment protection and riparian cover.	157 ha, 2 large and 2 smaller parts.
Kahuwera Stream Shrubland P06/010	Rep. site for 2 e.u.s	Fauna: 2 threatened, 1 reg. sig.	7 e.u.s	Pigs present; hunters with dogs use the forest.	Contiguous with P06/037; riparian protection.	14.9 ha, 6 small, narrow parts.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY ⁱ /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Rakautao Forest P06/011	Rep. site for 5 e.u.s	Fauna: 2 threatened, 2 reg. sig.; Flora: 1 reg. sig.	7 e.u.s	Contains a range of forest and shrubland types on hillslopes, in gullies, and on alluvium, as well as large areas of wetland; exhibits altitudinal and geomorphic gradients from ridge-top/hillslope to mid-altitude alluvial flats; animal pest disturbance.	Near P06/012, riparian protection. Some overlap into Tutamoe ED.	336.9 ha, 1 large, compact part with a series of narrow, convoluted areas branching off.
Te Oi Bush P06/012	Rep. for 4 e.u.s	Forest on alluvium; Flora: 1 reg. sig.	5 e.u.s	Not grazed and relatively weed free.	Links with P06/011 through exotic/indigenous forest and shrubland, some overlap into Tutamoe ED.	311.5 ha, 1 large and 4 small parts.
Huehue Forest and Maungakawakawa Forest P06/013	Rep. site for 11 e.u.s	Forest on alluvium; Fauna: 4 threatened, 2 reg.sig.; Flora: 2 threatened, 8 reg. sig.	13 e.u.s	Weed infestation (<i>Glyceria maxima</i>).	Near P06/004 and P06/024; catchment protection for tributaries of the Punakitere River.	1,479.7 ha, 1 large and 5 small parts.
Kaikau Forest P06/014	Rep. site for 2 e.u.s	Fauna: 1 reg. sig.	5 e.u.s	Pigs are affecting understorey in northern remnant.	Riparian protection; near P06/010 and P06/037	31 ha, 4 narrow parts.
Orchid Road Podocarp Forest P06/015	Rep. site for 1 e.u.	Fauna: 1 threatened; Flora: 2 reg.sig.	2 e.u.s	Exhibits excellent podocarp regeneration.	Relatively isolated, but may provide stepping stone between P06/003 and P06/013; riparian protection; surrounded by pasture.	18 ha, 1 area.
Huehue Stream Riparian Forest and Wetland P06/017	Rep. site for 4 e.u.s	Fauna: 4 threatened; Flora: 2 reg. sig.	4 e.u.s	Contains an intact freshwater-terrestrial ecological sequence.	Near P06/103; riparian protection.	37 ha, 5 small parts.
Te Toa Bush P06/024	Rep. site for 3 e.u.s	Fauna: 2 threatened, 1 reg. sig.; Flora: 2 reg. sig.	8 e.u.s	Animal pest disturbance; utilised by hunters.	Part of an indigenous/exotic forest mosaic which links Huehue and Mataraua forests to Mangakahia and Tokawhero forests.	179.7 ha, 1 large and 6 small parts.
David Carson Kauri Grove P06/025	Rep. site for 1 e.u.	Fauna not surveyed; Flora: 1 reg. sig.	1 e.u.	Unmodified primary forest; healthy canopy.	Isolated but buffered by pine plantation.	4.7 ha, 2 small parts divided by road.
Gammon Road Bush P06/026	Rep. site for 4 e.u.s	Fauna: 2 threatened, 2 reg. sig.	5 e.u.s	Contains an excellent example of primary unmodified mid-altitude forest types; healthy canopy.	Part of a large indigenous/plantation forest tract which links forests to the north, west and east.	230.9 ha, 1 large, compact part.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY [†] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Parker Road Riverine Association P06/030	Rep. site for 6 e.u.s	Treeland on alluvium; Fauna: 2 threatened, Flora: 1 reg.sig.	9 e.u.s	Western remnants threatened by heavy grazing and trampling by cattle; goat and possum browse also evident; weed infestations present.	Riparian protection; isolated.	31.9 ha, 4 small parts.
Mangaraupo Stream Bush P06/032	Rep. site for 4 e.u.s	Fauna: 2 threatened, 2 reg. sig.; Flora: 1 threatened, 2 reg. sig.	5 e.u.s	Diverse, healthy canopy.	Part of a large indigenous/exotic tract linking P06/026, P06/033, and P06/034; riparian protection.	67.2 ha, 1 area.
Otiwhero Bush P06/034	Rep. site for 2 e.u.s	Fauna: 3 threatened.	8 e.u.s	Contains an uninterrupted altitudinal sequence from mid-catchment riverine forest up to the ridge-top and over into the adjoining catchment.	Part of an extensive indigenous/exotic tract linking several other sites; riparian protection.	205.9 ha, 1 large tract and 2 small elongated parts, separated by river.
Otaenga Road/Awarua Riverine Forest P06/035		Forest on alluvium; Fauna not surveyed; Flora: 1 reg. sig.	3 e.u.s	Possibly grazed.	Riparian protection; potential wildlife corridor.	81.5 ha, 1 large part with convoluted margins and 4 small parts.
Otaenga Swamps P06/036	Rep. site for 2 e.u.s	Fauna: 2 threatened.	2 e.u.s	Grazed.	Isolated; surrounded by pasture.	6 ha, 3 small parts.
Patutahi River System P06/037	Rep. site for 5 e.u.s	Fauna: 2 reg.sig.	8 e.u.s	Local weed infestations (pampas, tradescantia, pines).	Near P06/014 and P06/077; riparian protection.	93.4 ha, 2 long, narrow parts with convoluted edges.
Waimatenui East Road Riverine Forest P06/038	Rep. site for 2 e.u.s	Forest on alluvium.	2 e.u.s	Diverse canopy.	Riparian protection; relatively isolated.	6.6 ha, 1 area.
Waiokumurau Stream Riverine Forest P06/039	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed; Flora: 1 reg. sig.	2 e.u.s	Fragmented canopy.	Riparian protection; relatively isolated.	39 ha, 1 large part with convoluted edges and five small parts.
Horahora Road Gumland P06/041	Rep. site for 1 e.u.	Gumland; Fauna: 1 threatened.	1 e.u.	Contains a very rare habitat type in the ED; local weed infestations along roadside (pampas, gorse, Chinese privet).	Near P06/075 and P06/079.	170.8 ha, 1 compact part, divided by forestry roads.
Opouteke Stream Reserve and Surrounds P06/043	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed.	5 e.u.s	Probably not grazed, although possum browse is evident.	Part of a complex of indigenous forest and pine plantations; near P06/048 and P06/097.	26.2 ha, 3 parts.
Coronet Road Bush P06/044	Rep. site for 3 e.u.s	Fauna not surveyed; Flora: 2 threatened, 1 reg. sig.	3 e.u.s	Healthy canopy; probably not grazed.	Contiguous with Marlborough Forest Addition Stewardship Area in Tutamoe ED; surrounded by pine plantation.	38.7 ha, 2 parts linked by pine plantation.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY ⁱ /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Putaka Stream Remnants P06/046		Fauna not surveyed; Flora: 1 reg. sig.	4 e.u.s	Intact, not grazed and relatively weed free.	Part of a complex of indigenous forest and pine plantations; near P06/048; riparian protection; largely surrounded by pasture.	188.3 ha, 2 parts, 1 large and long, the other small and compact, linked by pine plantation.
Pakotai Swamp P06/047	Rep. site for 1 e.u.	Fauna not surveyed	1 e.u.	Not grazed and relatively weed free.	Isolated; lack buffering.	9.4 ha, 1 area.
Taurangakawau Stream Bush P06/048		Fauna not surveyed.	1 e.u.	Limited diversity of plant species.	Riparian protection; potential steeping stone linking large indigenous forests to the east and west; near P06/046; surrounded by pasture.	377.8 ha, 2 large parts and 1 small part.
Twin Bridges Riparian Forest P06/050	Rep. site for 3 e.u.s	Fauna not surveyed; Flora: 2 reg. sig.	3 e.u.s	Diverse, apparently healthy canopy; not grazed.	Near P06/051 and P06/098; riparian protection.	27.5 ha, 4 parts parts, separated by road and river.
Te Huia Falls Bush P06/051	Rep. site for 2 e.u.s	Fauna not surveyed; Flora: 1 reg. sig.	4 e.u.s	Contains relatively diverse riparian forest; not grazed and relatively weed free.	Part of a complex of indigenous forest and pine plantations; near P06/050; riparian protection.	39.9 ha, 1 elongated area.
Allan Road Bush P06/052	Rep. site for 2 e.u.s	Flora: 2 reg. sig.	3 e.u.s	May contain unmodified taraire forest; unlikely to be grazed.	Part of a complex of indigenous forest and pine plantations; may act as a stepping stone to larger forests such as P06/001.	7.6 ha, 1 compact area.
Omahu Stream Riverine Forest P06/053	Rep. site for 3 e.u.s		7 e.u.s	Contains a relatively dense, healthy understorey of shrubs and saplings; moderate possum browse.	Contiguous with P06/001; riparian protection.	55.4 ha, 1 large, elongated area.
Omahu Road Bush P06/054		Fauna not surveyed.	1 e.u.	Not grazed and relatively weed free.	Part of a complex of indigenous forest and pine plantations; likely to be part of a habitat network; riparian protection.	27.9 ha, 1 compact area.
Mangaroa Stream Riverine Forest and Gumland P06/059	Rep. site for 4 e.u.s	Forest on alluvium; Gumland; Fauna: 5 threatened; 1 reg. sig.; Flora: 2 threatened, 4 reg. sig.	5 e.u.s	Largest area of gumland in the ED, containing some unusual and very uncommon associations.	Contiguous with P06/060; near P06/094 and P06/095; provides riparian buffering for the entire length of the Mangaroa Stream and several of its tributaries.	790.4 ha, 1 large, contiguous tract.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY [†] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Mangaroa Wetland P06/060	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed.	4 e.u.s	Weed infestations (<i>Glyceria maxima</i> and pampas); likely to be grazed.	Contiguous with P06/059; northern end near P06/061 and P06/062; surrounded by pasture	48.5 ha, 5 parts.
Pipiwai Stream Old Growth Remnant P06/061	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed.	1 e.u.s	Contains old-growth unmodified forest; unfenced and likely to be grazed.	Near to P06/060 and P06/062, but relatively isolated from large indigenous areas.	2.4 ha. 1 small, compact area.
Pipiwai Stream Riverine Forest Remnants P06/062	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed; Flora: 2 reg. sig.	3 e.u.s	Contains old-growth forest and uncommon vegetation types and species; possibly grazed.	Near to P06/060 and P06/061, but relatively isolated from large indigenous areas.	22.3 ha, 8 small parts.
Kaikou River Bush P06/063	Rep. site for 1 e.u.	Forest on alluvium; Fauna: 1 threatened.	2 e.u.s	Goats, pigs and cattle present, although damage is minor.	Provides a linkage between P06/002 and P06/084; riparian protection.	116.2 ha, 1 area.
Kaikou Riverine Bush P06/064	Rep. site for 1 e.u.	Forest on alluvium; Fauna: 1 threatened, 1 reg. sig.	1 e.u.s	Riverine forest remnants of this size and quality are rare in Northland; vigorous understorey of divaricating shrubs despite periodic grazing.	Provides a linkage between P06/002 and P06/065; riparian protection; surrounded by pasture.	79.3 ha, 4 parts.
Kotaretahi Bush and Ngarurunui Shrublands P06/065	Rep. site for 3 e.u.s	Fauna: 3 threatened, 2 reg. sig.; Flora: 1 reg. sig.	7 e.u.s	Invasive plants present in wetland (Japanese honeysuckle and pampas).	Near P06/002, P06/003, and P06/064; riparian protection.	695.1 ha, 1 large and 4 small parts.
Te Whatianga Swamp and Environs P06/066	Rep. site for 10 e.u.s	Limestone geology; Forest on alluvium; Fauna: 5 threatened, 2 reg. sig.; Flora: 3 reg. sig.	19 e.u.s	Contains a diverse assemblage of vegetation types reflecting topography, substrate fertility, and hydrological gradients; part of an ecological complex which is of outstanding quality within the ED; extensive areas of shrubland; possibly grazed in parts.	Near to P06/067, P06/083, and P06/090; riparian protection.	391.1 ha, 2 large and 6 small parts
Patakorokoro Hill Bush P06/067	Rep. site for 1 e.u.	Limestone geology; Fauna: 2 reg. sig.	6 e.u.s	Relatively diverse canopy; scattered weed infestations.	Part of a complex of indigenous forest and pine plantations.	303.3 ha, 3 large and 3 small parts linked by pine.
Ruatoro Bush P06/068	Rep. site for 3 e.u.s	Forest on alluvium; Fauna not surveyed; Flora: 1 reg. sig.	3 e.u.s	Not grazed.	Part of a complex of indigenous forest and pine plantations; riparian protection.	17.6 ha, 3 small, narrow parts.
Totara Bush Associations P06/069	Rep. site for 5 e.u.s	Forest on alluvium; Fauna: 2 threatened, 1 reg. sig. ; Flora: 3 reg. sig.	9 e.u.s	Local Mexican devil.	Part of a complex of indigenous forest and wetlands, and pine plantations. Contiguous with P05/048, and near to P05/049 and P06/068; riparian protection.	225.7 ha, 2 large parts and 1 peripheral part.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY ⁱ /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Davis Road Bush P06/070	Rep. for 1 e.u.	Limestone geology; Fauna not surveyed; Flora: 1 reg. sig.	5 e.u.s	One of the few indigenous forest remnants in the lower end of the Taikirau Stream catchment; local gorse and prickly hakea.	Isolated; partially buffered.	153.6 ha, 1 large and 1 small part.
Taikirau Wetland and Shrublands P06/072	Rep. site for 11 e.u.s	Limestone geology; Fauna: 5 threatened, 1 reg.sig.; Flora: 5 reg. sig.	14 e.u.s	Cattle present; local weed infestations (gorse, Tasmanian blackwood and willows).	Part of the Motatau wetland complex, which is probably the largest and most significant mineralised freshwater wetland system remaining in Northland; contiguous with P06/073, and near P06/070 and P06/071.	376.8 ha, 1 large part with convoluted edges, 1 smaller part east of the railway and 3 peripheral parts.
Pokere Kahikatea Remnant P06/073	Rep. site for 1 e.u.	Forest on alluvium.	1 e.u.s	Contains some old-growth kahikatea; possibly grazed.	Isolated.	9 ha, 1 small, compact part.
Taikirau Swamp P06/074	Rep. site for 12 e.u.s	Limestone geology; Fauna: 7 threatened, 1 reg. sig.; Flora: 2 threatened, 10 reg. sig.	15 e.u.s	Diverse and relatively unmodified; contains sequential gradients from hill forest/shrubland through to swamp forest, wetland, and open water in a ponded floodplain; cattle given access during summer; marginal parts of the wetland are weedy; impoundment of water caused by willows.	Forms an important component of the Taikirau wetland complex; contiguous with P06/076 and near P06/072.	803.8 ha, 5 large and 7 small parts.
Horahora Stream Swamp Association P06/075	Rep. site for 7 e.u.s	Fauna not surveyed; Flora: 3 reg. sig.	7 e.u.s	Contains rare example of alluvial floodplain swamp forest-wetland-terrestrial forest and shrubland ecological sequence; cattle present.	Near P06/041 but relatively isolated from larger indigenous areas.	96.9 ha, 2 large and 5 small parts.
Tarakihi Wetland and Environs P06/076	Rep. site for 5 e.u.s	Fauna: 2 threatened, 1 reg. sig.; Flora: 2 reg. sig.	8 e.u.s	Representative of intermediate wetland fertility; diverse, vigorous understorey.	Catchment and riparian protection.	665.6 ha, 1 large part with convoluted edges and 9 small parts.
Hurihanga Stream Forest Remnants P06/077		Limestone geology; Fauna not surveyed; Flora: 1 reg. sig.	3 e.u.s	Fragmented.	Near P06/037; likely to form part of a habitat network; riparian protection; surrounded by pasture.	229.6 ha, 4 parts with convoluted edges.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS*	RARITY [†] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Rata Tipene Shrubland P06/078		Fauna: 2 threatened.	2 e.u.s	Previously included an area of harakeke-raupo flaxland which has now been drained.	Part of a complex of indigenous forest and pine plantations which is contiguous with Q06/001.	152.9 ha, 5 parts.
Rapa Tipene Road Harakeke Swamp P06/079	Rep. site for 1 e.u.	Fauna not surveyed.	2 e.u.s	Not grazed and relatively weed free.	Upper-most component of the Taikirau wetland chain in the Horahora Stream catchment; surrounded by rough pasture.	13 ha, 1 area.
Kiekie Bush P06/081	Rep. site for 1 e.u.	Fauna: 2 threatened, 1 reg. sig.; Flora: 1 reg. sig.	2 e.u.s	Contains old-growth taraire.	Part of a complex of indigenous forest and pine plantations; near P06/082; riparian and catchment protection.	78.6 ha, 1 elongated area.
Matawaia Bush P06/082	Rep. site for 4 e.u.s	Fauna: 2 threatened, 2 reg. sig.; Flora: 1 threatened, 3 reg. sig.	4 e.u.s	Contains some large puriri and notably large totara; diverse understorey, goats controlled in 1990s but may have since re-invaded; some possum browse.	Part of a complex of indigenous forest and pine plantations; riparian and upper catchment protection.	314.2 ha, 1 large area.
James Road Bush P06/083	Rep. site for 1 e.u.	Forest on alluvium; Fauna: 1 threatened, 1 reg. sig.; Flora: 1 reg. sig.	4 e.u.s	Contains good example of highly diverse, intact kauri-podocarp-broadleaved forest.	Riparian and upper catchment protection.	303 ha, 1 large parts and 1 small, compact part.
Motatau Forest P06/084		Fauna: 4 threatened, 2 reg. sig.; Flora: 1 reg. sig.	3 e.u.s	Forest regenerating well following removal of goats and cattle; rodents and possums controlled.	Riparian and upper catchment protection for several streams.	521.3 ha, 1 large part and 2 peripheral parts.
Puhitia Road Bush P06/090	Rep. site for 3 e.u.s	Limestone geology; Fauna: 2 threatened, 1 reg. sig.	3 e.u.s	Large, continuous area of forest.	One of the two largest indigenous forest components of an indigenous/exotic forest tract which extends from Motatau Forest north to Matawaia Road; important wildlife corridor; riparian protection.	524 ha, 1 large and 1 small part.
Worsp Road Bush P06/092	Rep. site for 5 e.u.s	Fauna: 1 threatened, 1 reg. sig.; Flora: 1 threatened.	5 e.u.s	Fenced; removal of Tasmanian blackwood is being undertaken.	Part of a complex of indigenous forest and pine plantation which links with Motatau Forest in the north and forest and shrubland areas in the south; riparian and upper catchment protection; largely surrounded by pasture.	216.6 ha, 1 large and 1 small part.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS*	RARITY [†] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Kaikou River Forest Remnants P06/093	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed, Flora: 1 reg. sig.	1 e.u.s.	Crack willow present; possibly grazed.	Partial riparian protection.	20.5 ha, 6 small parts.
Puketurua Bush P06/094	Rep. site for 10 e.u.s	Forest on alluvium; Fauna: 1 threatened, 1 reg. sig.; Flora: 1 threatened, 10 reg. sig.	12 e.u.s	Contains full sequence of physiographic features from river banks and terraces to freshwater wetlands, gully bottoms and ridges; heavy pest disturbance (possums, cattle, pigs); local weed infestations (Japanese honeysuckle).	Contiguous with P06/095 to the south.	168.8 ha, 1 part and 1 small, compact part.
William Upton Hewett Memorial Reserve P06/095	Rep. site for 15 e.u.s	Forest on alluvium; Fauna: 5 threatened, 2 reg. sig.; Flora: 10 threatened, 16 reg. sig.	18 e.u.s	Wetland largely unmodified but threatened by occasional cattle encroachment; animal pest and weed control carried out.	Contiguous with P06/094 to the north	543.2 ha, 1 large part and 5 small parts.
Mangu Road Wetland P06/099	Rep. site for 2 e.u.s	Fauna: 2 threatened; Flora: 1 reg. sig.	3 e.u.s	Local weed infestations; feral pigs present in adjacent pine plantation.	Near P06/067 and P06/071.	7.4 ha, 1 narrow area.
Tokawhero Road Remnants P06/104		Flora: 1 reg. sig.	3 e.u.s	Contains area of eucalyptus forest; well-buffered by pine; moderate possum browse; damage to indigenous vegetation from harvesting practices.	Part of a complex of indigenous forest and pine plantation; contiguous with P06/003; riparian protection.	83.5 ha, 1 large and 5 small parts.
Waiotakanga Stream Wetland P06/106	Rep. site for 1 e.u.	Fauna: 1 threatened.	1 e.u.s.	Grazed.	Isolated.	2.7 ha, 1 small, compact area.
Lovatt Road Wetland P06/117	Rep. site for 2 e.u.s	Shrubland on alluvium; Fauna: 1 threatened.	3 e.u.s	Weed-free; not grazed.	Near P06/002 and P06/064.	4.7 ha, 1 area.
Awarua Trust Farm Wetland P06/118	Rep. site for 2 e.u.s	Fauna: 2 threatened; Flora: 2 reg. sig.	3 e.u.s	Possibly grazed.	Near P06/036, P06/114 and P06115; may form part of a local wetland habitat network for spotless crane; partially buffered by pine.	9.4 ha, 1 narrow area with convoluted edges.
Moore Road Mosaic P06/119	Rep. site for 3 e.u.s	Fauna: 2 threatened, 2 reg. sig.; Flora: 1 threatened, 1 reg. sig.	4 e.u.s	Infestations of pine, Tasmanian blackwood, gorse, pampas and Mexican devil.	Near P06/002, P06/062 and P06/093.	209 ha, 1 large, compact part and 1 peripheral part.
Awakino and Flaxmill Swamps P07/001	Rep. site for 10 e.u.s	Forest and shrubland on alluvium; Fauna: 9 threatened; Flora: 1 threatened, 4 reg. sig.	14 e.u.s	Cattle and stoats present in southern part of site (Flaxmill Swamp); scattered weeds present in grazed areas of raupo reedland.	Forms a linkage between P07/005 and P07/047.	96.6 ha, 2 large parts.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY ⁱ /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Kirikopuni Road Remnant P07/003	Rep. site for 1 e.u.	Fauna: 1 reg. sig.	2 e.u.s	Possibly grazed.	Near P07/036; potential stepping stone for indigenous fauna.	5.4 ha, 1 small, compact area.
Awakino East Bush P07/005		Fauna: 1 threatened, 1 reg. sig.; Flora: 1 reg. sig.	11 e.u.s	Relatively large and diverse mosaic of indigenous forest and shrubland remnants.	Provides important buffer and linkage for Flaxmill and Awakino Swamps.	378.6 ha, 2 large and 4 smaller parts divided by road.
Nathan Road Shrubland P07/007	Rep. site for 1 e.u.	Fauna: 1 threatened.	3 e.u.s	Not grazed and weed free.	Part of a complex of indigenous forest and pine plantation; potential stepping stone to large indigenous forest tract to the south-west (outside the ED); near P07/008; mainly surrounded by pasture.	90.5 ha, 1 area with convoluted edges.
Kaihu Scenic Reserve and Surrounds P07/008	Rep. site for 1 e.u.	Flora: 1 reg. sig.	2 e.u.s	Grazed.	Part of a complex of indigenous forest and pine plantation; contiguous with Kaihu Forest to the north; near P07/007; riparian protection.	167.8 ha, 1 area.
Okaharau Bush P07/011	Rep. site for 2 e.u.s	Fauna: 2 threatened, 2 reg. sig.	3 e.u.s	Animal pest disturbance.	Contiguous with Kaihu Forest.	27.1 ha, 1 compact area.
Massey Road Remnant P07/013	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed; Flora: 1 reg. sig.	1 e.u.s.	Fenced but still subjected to occasional grazing; moderate possum browse.	Isolated from other large indigenous areas.	1.3 ha, 1 compact area.
Pakotai Scenic Reserve P07/014	Rep. for 1 e.u.	Fauna: 2 threatened.	4 e.u.s	Contains very large kauri and podocarps; moderate animal disturbance.	Relatively isolated, but part of a complex of indigenous forest and pine plantation; riparian protection.	18.5 ha, 1 area.
Sharp Road Bush P07/015	Rep. site for 1 e.u.	Fauna: 1 threatened, 1 reg. sig.; Flora: 1 threatened.	3 e.u.s	Not grazed and weed free.	Contiguous with larger area of similar vegetation to the east; well-buffered.	29.2 ha, 1 compact area.
Boundary Swamp P07/018		Fauna: 2 threatened.	1 e.u.	Not fenced.	Near P07/017 and P07/019; surrounded by pasture.	1.5 ha, 1 area.
Karaka Road Shrubland P07/019		Fauna: 1 threatened.	1 e.u.	Not grazed and weed free.	Near P07/018; part of a complex of indigenous forest and pine plantation; borders pasture.	70 ha, 1 area.
Karaka Road Raupo Wetland P07/021		Fauna not surveyed.	2 e.u.s	Minimal weed infestation.	Near P07/022; surrounded by pasture.	8.2 ha, 1 long, thin area.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS*	RARITY ⁱ /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Mangakahia River Bush P07/023		Fauna: 1 threatened.	2 e.u.s	Healthy canopy; apparently weed free.	Part of a complex of indigenous forest and pine plantation; near P07/055.	19.5 ha, 1 small, compact area.
Houto Cone Forest P07/034	Rep. site for 2 e.u.s	Fauna: 3 threatened, 1 reg. sig.; Flora: 1 threatened, 4 reg. sig.	3 e.u.s	Contains some uncommon vegetation types.	Isolated, but probably contributes to a habitat network for mobile species.	19.5 ha, 1 area.
North Houto Forest P07/036	Rep. site for 4 e.u.s	Fauna: 2 threatened, 1 reg. sig.; Flora: 15 reg. sig.	7 e.u.s	Significant amount of old-growth canopy trees remains; poor fencing allows continual incursions by cattle.	Provides linkages between indigenous areas in the south-west and north-east; riparian and catchment protection for several streams.	558 ha, 1 large, compact part and 2 peripheral parts.
South Houto Forest and Maungaru Range P07/037	Rep. site for 4 e.u.s	Fauna: 2 threatened, 1 reg. sig.; Flora: 1 reg. sig.	16 e.u.s	One of the ED's largest remaining contiguous areas of indigenous forest; highly diverse; animal pest disturbance.	Riparian and catchment protection.	783.2 ha, 1 large and three smaller parts.
Maungaru Trig Forest P07/038	Rep. site for 1 e.u.	Fauna: 1 threatened, 1 reg. sig.; Flora: 7 reg. sig.	9 e.u.s	Displays strong altitudinal sequence; goats present.	Isolated.	219.7 ha, 2 large and 3 small parts.
Waimata Scenic Reserve and Surrounds P07/039	Rep. site for 2 e.u.s	Fauna: 1 threatened, 1 reg. sig.; Flora: 1 reg. sig.	17 e.u.s	Local weed infestation.	Riparian and catchment protection.	267.9 ha, 1 large and 7 small parts.
Avoca Road Kauri Remnant P07/040	Rep. site for 1 e.u.	Fauna not surveyed.	2 e.u.s	Contains some mature kauri.	Isolated; surrounded by pasture.	5.7 ha, 1 compact area.
Mamaranui Farm Settlement Scenic Reserve and Surrounds P07/041	Rep. site for 10 e.u.s	Forest on alluvium; Fauna: 3 threatened, 1 reg. sig.; Flora: 3 threatened, 7 reg. sig. (includes 2 unconfirmed records).	22 e.u.s	Contains a rare and representative altitudinal forest sequence from alluvial flats graduating to steep hillslope; moderate animal pest disturbance; largely weed-free.	Riparian and catchment protection; stepping stone between P07/007 and P07/04.	330.5 ha, 2 large and 6 smaller parts, northern parts divided by road.
Pukehuia Road Remnants P07/042	Rep. site for 7 e.u.s	Shrubland on alluvium; Flora: 1 reg. sig.	12 e.u.s	Contains a diverse mosaic of habitat types; weed free.	Near P07/043; surrounded by pasture.	46.9 ha, 1 large and 4 smaller parts, separated by road.
Wilson Road Forest Remnant P07/043	Rep. site for 2 e.u.s	Fauna: 1 threatened.	4 e.u.s	Possibly grazed.	Near P07/042; surrounded by pasture.	8.8 ha, 1 area.
Mapuna Road Remnants P07/044		Fauna: 1 threatened.	3 e.u.s	Fragmented; grazed; weed infestation (crack willow).	Relatively isolated.	6.2 ha, 7 small parts.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS [†]	RARITY [‡] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Waihue Road Shrubland and Forest Remnant P07/047	Rep. site for 5 e.u.s		15 e.u.s	Diverse area of forest, shrubland and swamp associations within a highly modified area.	Provides riparian and catchment protection for a number of small streams; near P07/001.	318.9 ha, 1 large and 2 smaller parts, divided by roads.
Tongariro Forest Remnants P07/048	Rep. site for 5 e.u.s	Forest on alluvium; Fauna: 1 reg. sig.; Flora: 1 reg. sig.	13 e.u.s	Diverse area of hillslope and alluvial forest and shrubland; weed free.	Isolated, but probably contributes to a habitat network for mobile species.	81.9 ha, 11 small parts divided by roads.
Avoca Forest Remnants P07/050	Rep. for 1 e.u.s	Limestone geology; Fauna: 1 reg. sig.	3 e.u.s	Fenced; not grazed.	Near P07/049; relatively isolated but is likely to be used as part of a habitat network given that there is very little indigenous vegetation remaining in this part of the ED.	6.9 ha, 1 large, compact part and 3 small parts.
Taraire Scenic Reserve P07/054	Rep. site for 1 e.u.	Forest on alluvium; Fauna not surveyed; Flora: 1 reg. sig.	1 e.u.	Stock excluded.	Near P07/039; likely to provide seasonal food for kukupa.	4.6 ha, 1 compact area.
Paerata Wildlife Management Reserve P07/055	Rep. site for 3 e.u.s	Fauna: 1 threatened.	4 e.u.s	High animal pest disturbance.	Near P07/023 and Hodge's Bush (outside of Tangihua ED).	208.2 ha, 1 area with convoluted edges.
Atchinson's Bush Q06/001	Rep. site for 3 e.u.s	Fauna: 2 threatened, 2 reg. sig.; Flora: 1 reg. sig.	3 e.u.s	One of the largest contiguous forested areas in Tangihua ED; forested areas cover some of the highest altitudinal features of the local landscape; goats have been eradicated from the area; moderate possum browse still likely.	Contiguous with the Motatau Forest (P06/084) to the south-west; near P06/078 and Q06/004; riparian and catchment protection for several streams.	838.7 ha, 1 large and 7 small parts.
Boulder Bed Stream Bush Q06/004		Fauna: 1 threatened, 2 reg. sig.; Flora: 5 reg. sig.	6 e.u.s	Highly fragmented; good regeneration of podocarps, especially totara and Hall's totara, though overall the site has been adversely affected by felling, burning, grazing, and possum browse; livestock continue to inhibit regeneration in some parts.	Near Q06/001 and Q06/181; riparian protection; surrounded by pasture.	449 ha, 19 parts.
Aponga Settlement Scenic Reserve Q06/179	Rep. site for 12 e.u.s	Fauna: 3 threatened, 2 reg. sig.	21 e.u.s	Contains a diverse range of forest types; partially fenced; historical records of heavy possum browse.	Relatively isolated, but likely to be part of a habitat network for mobile species; near Q06/180; largely surrounded by pasture.	72.5 ha, 1 large and 1 small part.

LEVEL 1 SITES						
SITE NAME & SURVEY NUMBER	REPRESENT-ATIVENESS [†]	RARITY [†] /SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/ LINKAGE/ CORRIDOR	SIZE & SHAPE
Purua Scenic Reserve Q06/180	Rep. site for 9 e.u.s	Fauna: 1 threatened, 2 reg. sig.; Flora: 5 reg. sig.	11 e.u.s	Occupies volcanic cone.	Relatively isolated, but likely to be part of a habitat network for mobile species; near Q06/179.	145.3 ha, 2 large and 2 small parts.
Marlow Road Bush Q06/181	Rep. site for 1 e.u.	Fauna: 1 reg. sig.	1 e.u.	Contains kauri forest; surrounded by pasture; grazed by cattle.	Near Q06/002 and Q06/004; likely to be part of a habitat network for mobile species.	14 ha, 1 area.
99	Rep. site for 5 e.u.s	Limestone geology; Fauna: 11 threatened, 3 reg. sig.; Flora: 3 threatened, 22 reg. sig.	19 e.u.s	The largest area of contiguous indigenous forest in central Northland; largely comprises cut-over tall mixed podocarp-broadleaved forest with areas of regenerating manuka shrubland; goat control and removing cattle has allowed good regeneration in some parts.	Relatively close to the Brynderwyn Hills in Waipu ED; near P07/042 and P07/043; riparian and catchment protection for numerous streams.	3,931 ha, 1 large, contiguous tract and 12 peripheral parts.

* Note that most sites have more than one ecological unit present. This column indicates whether or not the site has been selected as being a representative site for one or more ecological units.

† The rapid quantitative method used in this survey did not include survey for rare species; in most cases species information in this column has been collated from other databases. It is likely that specific species surveys for all sites would reveal additional data on threatened and rare species, and in the case of Level 2 sites, a change in ranking.

LEVEL 2 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS ¹	RARITY ¹ / SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/INKAGE/ CORRIDOR	SIZE & SHAPE
Pokapu Road Wetland P05/115		Fauna not surveyed.	1 e.u.	Ungrazed; relatively weed free.	Near P05/048; bordered by road and railway.	2.1 ha, 2 narrow parts, dissected by road.
Te Ruakokopu Stream Bush P06/005			3 e.u.s	Healthy canopy; possibly grazed.	Relatively isolated, but may act as a linkage between P06/013 and P06/003; riparian protection.	
Ferguson Forest P06/006		Flora: 1 reg. sig.	1 e.u.	Weed free.	Linkage between larger forest blocks to the east and west.	5.6 ha, 1 area.
Orakau Road Forest Remnants P06/009		Fauna not surveyed.	3 e.u.s	Possibly grazed.	Relatively isolated, but likely to be part of a habitat network for mobile species; part surrounded by pasture.	21.6 ha, 1 large and 1 small part.
Mataraua Road Bush Remnants P06/028	Rep. for 1 e.u.s	Fauna not surveyed.	1 e.u.	Not grazed and weed free.	Relatively isolated, but likely to be part of a habitat network for mobile species; road surrounded by pasture.	8.5 ha, 2 small parts divided by road
Mangakahia Tributary Bush P06/029	Rep. for 1 e.u.s	Fauna not surveyed.	2 e.u.s	Possibly grazed.	Linkage between large forest tracts to the east (P06/026) and west (outside Tangihua ED); riparian protection; surrounded by pasture.	23.4 ha, 1 small area with convoluted edges
Forks Bush P06/031	Rep. for 1 e.u.s	Fauna not surveyed.	3 e.u.s	Fragmented.	Isolated; riparian function; well-buffered by pine plantation.	15.9 ha, 1 compact area.
Henly Bush P06/033		Fauna not surveyed.	3 e.u.s	Contains large proportion of kauri forest.	Part of a complex of indigenous forest and pine plantations; near P06/034 and P06/042; riparian protection; borders pasture.	27.7 ha, 1 area
Waiokumarau Road Bush P06/040		Fauna not surveyed.	1 e.u.	Fenced, though goats widespread.	Very close to a large area of indigenous forest outside the ED.	9.9 ha, 1 small compact area.
Gammons Road Remnant P06/042		Fauna not surveyed; Flora: 1 reg. sig.	1 e.u.	Fenced; no animal disturbance.	Near P06/033, but relatively isolated; surrounded by pasture.	6.3 ha, 1 compact area.
Opouteke Road Forest Remnants P06/045		Fauna not surveyed.	7 e.u.s	Not grazed and weed free.	Likely to be part of a habitat network for mobile species; riparian protection; partially buffered by pine plantation and shrubland.	119.7 ha, 1 large and 1 small part, divided by road.
Pukehorepa Bush Remnant P06/049		Fauna not surveyed; Flora: 1 reg. sig.	4 e.u.s	Not grazed and weed free.	Relatively isolated; largely surrounded by pasture.	12.6 ha, 3 small parts.
Kakekake Stream Forest Remnants P06/055		Fauna not surveyed	2 e.u.s	Not grazed and weed free.	Relatively isolated, but may form part of a habitat network; riparian protection; buffered by pine plantation.	31.4 ha, 1 large part with convoluted edges.

LEVEL 2 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS ⁷	RARITY [†] / SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/INKAGE/ CORRIDOR	SIZE & SHAPE
Te Kahukuri Stream Bush P06/056		Fauna not surveyed	2 e.u.s	Fragmented canopy; possibly grazed.	Relatively isolated, but may form part of a habitat network; riparian protection; surrounded by pasture.	42.1 ha, 1 area with convoluted margins.
Pine (Awarau South) Swamp P06/057		Fauna: 1 threatened	1 e.u.	Unfenced and grazed.	Isolated.	1.4 ha, 1 area.
Whangaiti Stream Shrubland P06/058		Fauna not surveyed	1 e.u.	Partially buffered.	Isolated, but may provide stepping stone between P06/001 and P06/059; partially buffered.	25.5 ha, 1 larger elongated part and two smaller parts
Mangu Road Bush P06/071	Rep. for 1 e.u.	Fauna not surveyed; Flora: 1 reg. sig.	4 e.u.s	Contains tall taraire forest.	Part of a complex of indigenous forest and pine plantations.	27.5 ha, 1 large and 2 small parts.
Taikirau Railway Wetland P06/087	Rep. for 1 e.u.	Fauna: 1 threatened, 2 reg. sig.; Flora: 1 reg. sig.	6 e.u.s	Weed infestation (<i>Glyceria maxima</i>); stock excluded.	Relatively isolated; partially buffered on west margins but mostly surrounded by pasture	4.8 ha, 2 small parts divided by railway.
Drake Road Remnants P06/096			3 e.u.s	Relatively diverse canopy.	Relatively isolated, but may form part of a wildlife corridor between forest remnants in the north-east and south-west.	57.8 ha, 6 parts.
Piraunui Stream Bush P06/097		Fauna not surveyed.	1 e.u.	Healthy canopy; not grazed; weed free.	Relatively isolated, but part of a complex of indigenous forest and pine plantations; riparian protection	10.6 ha, 1 compact area.
Mangakahia River Scenic Reserve P06/098		Fauna: 1 threatened, 1 reg. sig.	2 e.u.s	Heavily grazed and trampled by livestock.	Relatively isolated; partially buffered by pine plantation but largely borders pasture.	4.4 ha, 1 area.
Otaenga Bush P06/100		Fauna not Surveyed.	4 e.u.s	Contains exotic treeland and grassland.	Near P06/034; well-buffered by pine plantation.	5.8 ha, 1 narrow area.
Callaghan Road Bush P06/101	Rep. for 1 e.u.	Fauna not surveyed.	1 e.u.	Includes several old-growth puriri.	Isolated.	19.2 ha, 1 area.
Motatau Road Raupo Wetland P06/102	Rep. for 1 e.u.		2 e.u.s	Not grazed; weed infestations; stoats present.	Near P06/074; buffered by pine plantation.	1.6 ha, 2 small, narrow parts divided by road.
Paraha Road Wetland P06/112		Fauna not surveyed; Flora: 1 reg. sig.	2 e.u.s	Weed infestations.	Near P06/067.	1 ha, 1 area.
Orakau Road Wetland P06/113	Rep. for 1 e.u.	Fauna not surveyed; Flora: 1 reg. sig.	4 e.u.s	Weed infestations.	Isolated; buffered by pine plantation and road.	0.4 ha, 1 area.
Mangakahia Road Wetland P06/114		Fauna not surveyed; Flora: 1 reg. sig.	1 e.u.	Weed infestations.	Near P06/036, P06/115 and P06/118; may form part of a local wetland habitat network for spotless crane; well-buffered by young pine plantation.	2.9 ha, 1 area.

LEVEL 2 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS ⁷	RARITY ⁺ / SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/INKAGE/ CORRIDOR	SIZE & SHAPE
Adams Road Wetland P06/115		Fauna not surveyed.	1 e.u.	Relatively weed-free but damaged by stock.	Near P06/036, P06/114 and P06118; may form part of a local wetland habitat network for spotless crane; surrounded by pasture.	3.4 ha, 1 long, narrow area.
Tangowahine Valley Road Remnants P07/002		Forest on alluvium; Flora: 1 reg. sig.	3 e.u.s	Alluvial remnant grazed.	Forms part of a habitat network with P07/011, P07/012 and P07/014.	38.3 ha, 2 parts.
Kirikopuni Valley Road Wetland P07/004	Rep. for 1 e.u.	Fauna not surveyed.	2 e.u.s	Relatively weed-free; may be intermittently drained.	Near P07/045; well-buffered by pine plantation.	5 ha, 1 area.
Kairara Bush P07/009		Fauna not surveyed.	3 e.u.s	Healthy canopy; intermittently grazed.	Part of a complex of indigenous forest and pine plantation; near P07/008; riparian protection.	59.4 ha, 1 large and 3 smaller parts.
Kaikoura Road Bush P07/010	Rep. for 1 e.u.	Fauna not surveyed; Flora: 1 reg. sig.	3 e.u.s	Healthy canopy; not grazed.	Part of a complex of indigenous forest and pine plantation; potential wildlife corridor to surrounding indigenous remnants; riparian protection.	62.9 ha, 1 compact area.
Haast Road Bush P07/012		Fauna not surveyed.	4 e.u.s	Healthy canopy; not grazed.	Not close to other indigenous areas, but part of a complex of indigenous forest and pine plantation; riparian protection.	33.3 ha, 2 parts.
Pakotai Scenic Reserve P07/014	Rep. for 1 e.u.	Past records - Fauna: 1 threatened.	4 e.u.s	Contains very large kauri and podocarps; moderate animal disturbance.	Relatively isolated, but part of a complex of indigenous forest and pine plantation; riparian protection.	15.4 ha, 1 area.
Murray Road Bush P07/016		Fauna not surveyed.	1 e.u.s	Grazed.	Relatively isolated, but part of a complex of indigenous forest and pine plantation.	20.6 ha, 1 area.
Sommerville and Karaka Road Riparian Forest P07/017	Rep. for 1 e.u.	Forest on alluvium; Fauna not surveyed.	2 e.u.s	Possibly grazed.		
Karaka Road Bush P07/022		Flora: 1 reg. sig.	2 e.u.s	Historical stock and possum disturbance.	Near P07/018 and P07/019; surrounded by pasture.	55.9 ha, 1 large and 2 smaller parts.
Kirikoponui Valley Bush P07/035		Fauna: 1 threatened, 1 reg. sig.	4 e.u.s	West remnants unfenced.	Near P07/034; may act as stepping stone to Houto Forest and Maungaru Range (P07/037); surrounded by pasture.	31 ha, 6 parts, road separates largest part from 5 smaller parts.
Pukupo Bush P07/045	Rep. for 1 e.u.	Fauna: 1 threatened.	5 e.u.s	Possibly grazed.	Largest remnant is part of a complex of indigenous forest and pine plantation; largely surrounded by pasture.	37.1 ha, 3 parts.

LEVEL 2 SITES						
SITE NAME & SURVEY NUMBER	REPRESENTATIVENESS [†]	RARITY [†] / SPECIAL FEATURES	DIVERSITY & PATTERN	NATURALNESS	BUFFER/INKAGE/ CORRIDOR	SIZE & SHAPE
Tangowahine Scenic Reserve P07/046		Fauna not surveyed.	8 e.u.s	Local pampas.	Near P07/051; relatively isolated but is likely to be used as part of a habitat network by mobile fauna given that there is very little indigenous vegetation remaining in this part of the ED; surrounded by pasture.	55.5 ha, 2 large and 2 small parts.
Avoca South Road Remnants P07/049		Fauna not surveyed.	6 e.u.s	Local <i>Acacia</i> sp.	Near P07/050, relatively isolated but is likely to be used as part of a habitat network by mobile fauna given that there is very little indigenous vegetation remaining in this part of the ED; surrounded by pasture.	73.7 ha, 1 large and 9 smaller parts
Otiria Stream Remnants P07/051		Forest on alluvium; Fauna not surveyed.	7 e.u.s	Fragmented but weed free; possibly grazed.	Near P07/046; relatively isolated but is likely to be used as part of a habitat network given that there is very little indigenous vegetation remaining in this part of the ED; surrounded by pasture; surrounded by pasture.	16.8 ha, 3 parts.
Tangowahine-Settlement Roads Remnants P07/052		Forest on alluvium; Fauna not surveyed.	3 e.u.s	Fragmented; possibly grazed.	Isolated from other natural areas within the ED, but near a medium size tract of indigenous and plantation forest across the Wairoa River (outside the ED); surrounded by pasture.	10.6 ha, 4 parts.
Tangowahine Remnants P07/053		Fauna not surveyed.	2 e.u.s	Possibly grazed.	Isolated; surrounded by pasture.	8.6 ha, 1 large and 1 small part.
Inkster Road Remnants Q06/002		Fauna not surveyed.	2 e.u.s	Scattered remnants; possibly grazed.	Relatively isolated, though southernmost remnant is near Q06/001; surrounded by pasture.	41.2 ha, 12 parts.
Maromaku Forest Remnants Q06/182		Fauna not surveyed.	3 e.u.s	Fragmented; fenced in parts but likely to be grazed; local weed infestations (wilding pine).	Isolated; riparian protection; partial buffering by pine plantation	17.5 ha, 1 large and 4 small parts.
Tangihua Road Bush Q07/109			1 e.u.s	Grazed.	Isolated; surrounded by pasture.	16.5 ha, 1 compact area.

* Note that most sites have more than one ecological unit present. This column indicates whether or not the site has been selected as being a representative site for one or more ecological units.

† The rapid quantitative method used in this survey did not include survey for rare species; in most cases species information in this column has been collated from other databases. It is likely that specific species surveys for all sites would reveal additional data on threatened and rare species, and in the case of Level 2 sites, a change in ranking.

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8. Appendices

8.1 FIELD SURVEY FORM

PROTECTED NATURAL AREAS PROGRAMME

TANGIHUA ECOLOGICAL DISTRICT

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

ECOLOGICAL UNIT(S):

Habitat Class	Vegetation/ Habitat Structure	Landform	% of Total Area	% Percentage Canopy Cover			
				Abundant (50-100)	Common (20-50)	Frequent (5-20)	Occasional (0-5)

NATURAL AREA NAME:					PNA NO.:		
Habitat Class	Vegetation/ Habitat Structure	Landform	% of Total Area	% Percentage Canopy Cover			
				Abundant (50-100)	Common (20-50)	Frequent (5-20)	Occasional (0-5)

COMMENTS:

8.2 LETTER TO RATEPAYERS AND NEWS MEDIA ITEMS



Department of Conservation
Te Papa Atawhai

Dear Landowner,

Department of Conservation officers are currently surveying significant natural areas, e.g. bush, wetlands, gumland etc within the Far North District. This has involved mapping natural areas from roadsides or (with the permission of landowners) from other viewpoints, and recording information on their type and condition.

You may well have already talked to staff working in your area. If not, at a later stage departmental staff may ask for permission to enter your land and gather more detailed information on your property's natural areas.

Why are we doing this survey? Northland's natural areas, especially bush pockets, contribute significantly to the character and quality of the region. Many of these areas are habitat for some of our increasingly rare native wildlife.

The Resource Management Act 1991 requires District Councils to consider the natural areas they administer when preparing the District Plan. The information compiled from this survey will be given to the Far North District Council to provide them with a 'snapshot' of the distribution and condition of natural areas in the various parts of Northland at a single point in time. The information will be valuable as a reference point for assessing habitat changes over time.

Perhaps the principal value of this survey will be to provide you, the landowners, with information on the significance and makeup of the natural areas that you have preserved on your property so you can better plan the way you wish to manage these areas.

If you have any questions or concerns about the survey process, please contact your local Department of Conservation Field Centre or ring Peter Anderson, Fraser Moors or John Beachman at our Whangarei Office, telephone (09) 438 0299, fax (09) 438 9886.

If you wish to contact the Far North District Council about this aspect of the District Plan, please phone Peggy Kilberg at the Kaikohe office, telephone (09) 401 2101. Gerry Rowan, Regional Conservator

8.3 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 (Townsend *et al.* 2008). This refined system is a uniquely New Zealand-based conservation status assessment tool, which has been used to assess the conservation status of vascular plants and birds only. In the coming three years, however, it will be applied to the bats, marine mammals, frogs, reptiles, freshwater and marine fish, freshwater, marine, and terrestrial invertebrates, bryophytes, macro-algae, and fungi which are indigenous to New Zealand (Hitchmough *et al.* 2007; Townsend *et al.* 2008). In the meantime, this report has used threat categories from Molloy *et al.* (2002) to cover rankings for everything other than plants and birds, and Threatened and At Risk categories from Townsend *et al.* 2008 for plants and birds. Below is the structure diagram and Sections 3 and 7 from Molloy *et al.* (2002) to explain the categories under this system followed by the structure diagram and Sections 8, 9 and 10 from Townsend *et al.* (2008) to explain the refined classification system.

8.3.1 Classification structure - Molloy *et al.* (2002)

Below are Sections 3 and 7, taken from Molloy *et al.* (2002), to explain the new species classification system. The categories are shown in Figure 1.

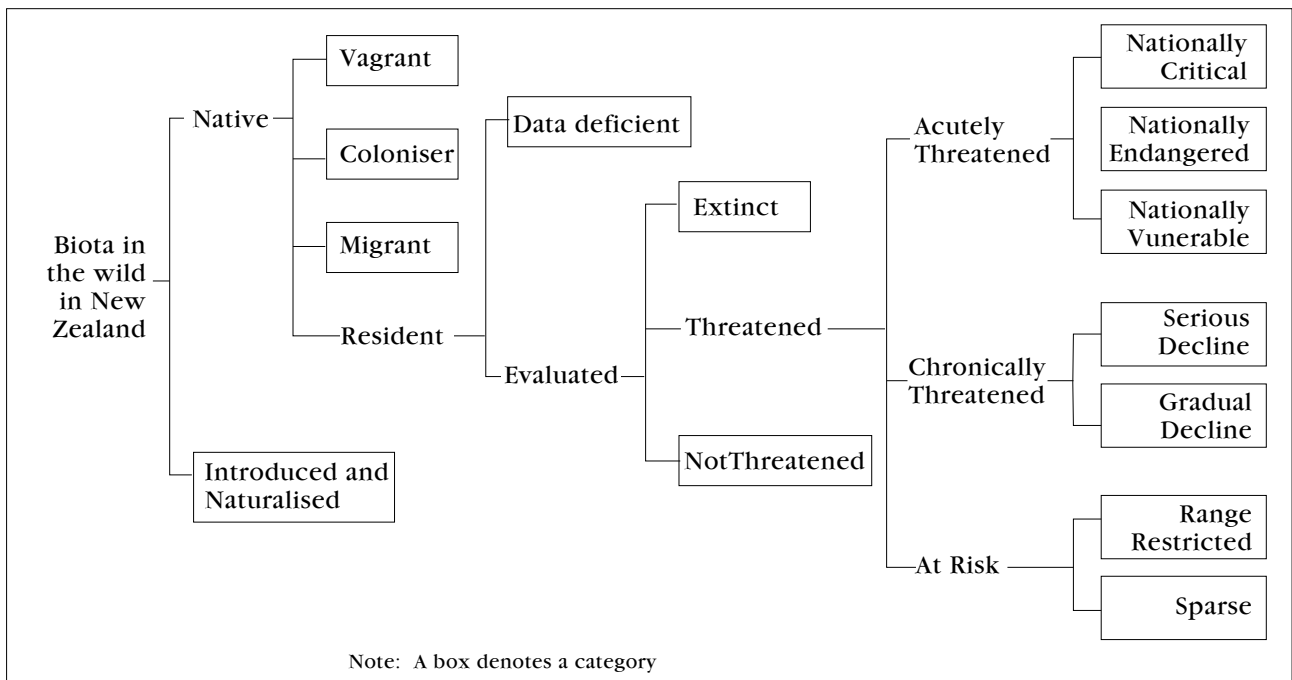


Figure 1. Structure of the New Zealand Threat Classification System

Introduced and naturalised

Introduced and Naturalised taxa are those that have become naturalised in the wild after being deliberately or accidentally introduced to New Zealand by human agency. If an Introduced and Naturalised taxon has an IUCN Red Listing in its country (or countries) of origin, the IUCN category and source of the listing are shown after the taxon's name in

the New Zealand list. Current examples of this include the cress *Lepidium hyssopifolium* and the southern bell frog (*Litoria raniformis*), both of which are listed as Endangered in Australia; and the parma wallaby (*Macropus parma*), listed as lower risk/near threatened.

Vagrant

For the purposes of this document, vagrants are taxa that are found unexpectedly and rarely in New Zealand, and whose presence in our region is naturally transitory. These are taxa that do not establish themselves beyond their point of arrival because of reproductive failure or for specific ecological reasons. Examples include the red-kneed dotterel (*Erythrogonys cinctus*) and the blue moon butterfly (*Hypolimnys bolina nerina*), both from Australia, and the spotted sawtail (*Prionurus maculatus*) from the tropical south-west Pacific Ocean. If a taxon in the Vagrant category has been listed in an IUCN Red List in its country of origin, the IUCN category and source of the listing are shown beside the taxon's name in the New Zealand list.

Coloniser

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

Migrant

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

Data deficient

The amount of information available for assessing the threat of extinction is highly variable between taxa and groups of taxa. At one extreme there are taxa such as kakapo, *Gunnera hamiltonii* and *Tecomantbe 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.

At Risk

Taxa that do not meet the criteria for Acutely Threatened or Chronically Threatened, but have either restricted ranges or small scattered subpopulations, are listed in one of two categories (Range Restricted and Sparse) that fall under the division 'At Risk'. Although these taxa are not currently in decline, their population characteristics mean a new threat could rapidly deplete their population(s). Range Restricted taxa

either occur in a small geographic area (e.g., Three Kings Islands), are restricted to a particular habitat (e.g. geothermal areas), or require very specific substrates (e.g. ultramafic rock), and for colonial breeders, have fewer than 10 subpopulations. Taxa that have naturally restricted ranges and taxa that have become restricted as a result of human activities are both included in this category. This is because both would face the same risk of extinction in the face of a new threat. The two groups are differentiated by the use of a qualifier (see Section 4). Sparse taxa have very small, widely scattered populations, e.g., New Zealand spinach (*Tetragonia tetragonoides*). As with the Range Restricted category, taxa that are either naturally sparse or have become sparse as a result of human activities are included in this category.

Not threatened

Taxa that are assessed and do not fit any of the Threatened categories are listed in the Not Threatened category.

8.3.2 Criteria for the Acutely Threatened and Chronically Threatened categories - Molloy *et al.*

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 km²).
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 km²).

Trend criteria

1. There has been a decline of > 30% in the total population or habitat area in the last 100 years.
2. There is a predicted decline of > 30% in the total population in the next 10 years due to existing threats.

B: Small to moderate population and high recent or predicted decline

A taxon is **Nationally Endangered** when available scientific evidence indicates that it fits at least one Status criterion and one Trend criterion:

Status criteria

1. The total population size is 1000–5000 mature individuals.
2. There are < 15 sub-populations and either:
 - a. 300–500 mature individuals in the largest sub-population, or
 - b. the total area of occupancy is 10–100 ha (0.1–1 km²).

Trend criteria

1. There has been a decline of > 60% in the total population or habitat area in the last 100 years.
2. There is a predicted decline of > 60% in the total population in the next 10 years due to existing threats.

Nationally Vulnerable

Small to moderate population and moderate recent or predicted decline

A taxon is **Nationally Vulnerable** when scientific evidence indicates that it fits at least one Status criterion and one Trend criterion:

Status criteria

1. The total population size is 1000–5000 mature individuals.
2. There are < 15 sub-populations and either:
 - a. 300–500 mature individuals in the largest sub-population, or
 - b. the total area of occupancy is 10–100 ha (0.1–1 km²).

Trend criteria

1. There has been a decline of 30–60% in the total population or habitat area in the last 100 years and the total population or habitat area is still in decline.
2. There is a predicted decline of 30–60% in the total population in the next 10 years due to existing threats.

Serious Decline

A. Moderate to large population and moderate to large predicted decline

A taxon is listed in **Serious Decline** when scientific evidence indicates that it fits at least one Status criterion and the Trend criterion:

Status criteria

1. The total population size is > 5000 mature individuals.
2. There are > 15 sub-populations and either:
 - a. > 500 mature individuals in the largest sub-population, or
 - b. the total area of occupancy is >100 ha (1 km²).

Trend criterion

1. There is a predicted decline of > 30% in the total population in the next 10 years due to existing threats.
- B. Small to moderate population and small to moderate predicted decline

A taxon is listed in **Serious Decline** when available scientific evidence indicates that it fits at least one Status criterion and the Trend criterion:

Status criteria

1. The total population size is < 5000 mature individuals.
2. There are < 15 sub-populations and either:
 - a. < 500 mature individuals in the largest sub-population, or
 - b. the total area of occupancy is < 100 ha (1 km²).

Trend criterion

1. There is a predicted decline of 5-30% in the total population in the next 10 years due to existing threats.

Gradual Decline

Moderate to large population and small to moderate decline.

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

Status criteria

1. The total population size is > 5000 mature individuals.
2. There are > 15 sub-populations and either:
 - a. > 500 mature individuals in the largest sub-population, or
 - b. the total area of occupancy is > 100 ha (1 km²).

Trend criterion

1. There is a predicted decline of 5-30% in the total population in the next 10 years due to existing threats, and the decline is predicted to continue beyond 10 years.

8.3.3 Threatened and At Risk categories - Townsend *et al.* (2008)

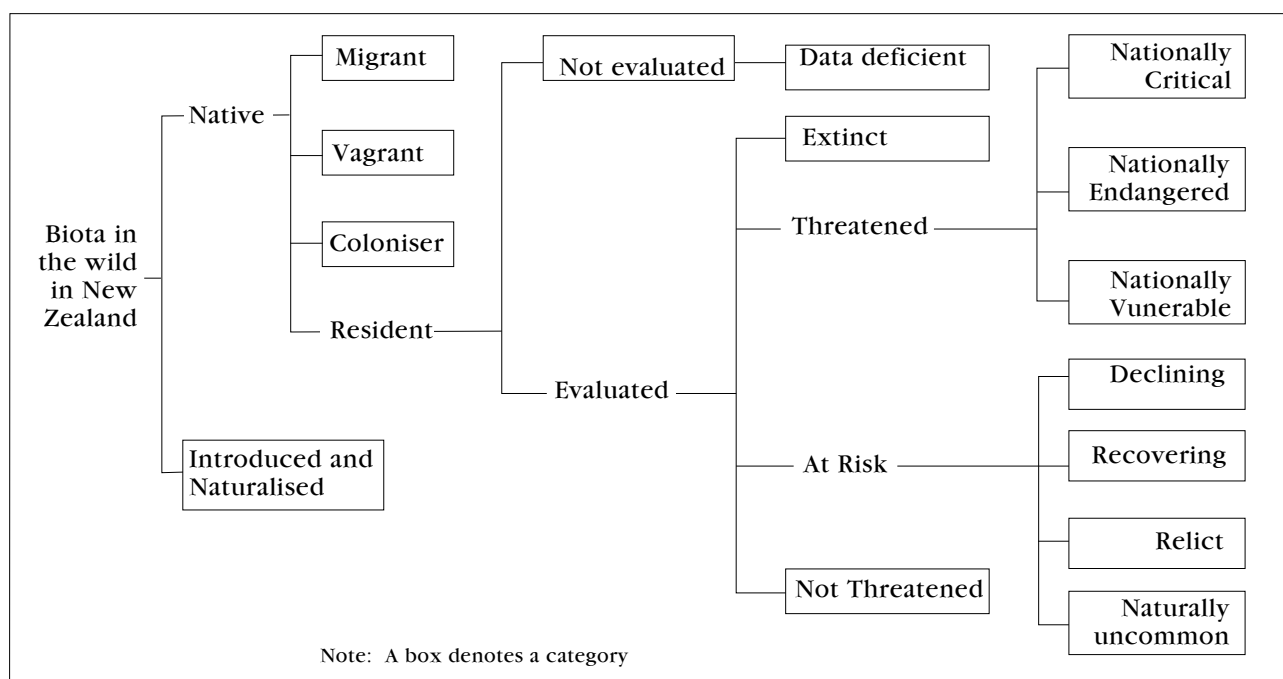


Figure 2. Structure of the New Zealand Threat Classification System

'Threatened' taxa are grouped into three categories: 'Nationally Critical', 'Nationally Endangered' and 'Nationally Vulnerable'.

Taxa with populations that are small (< 250 mature individuals) are considered highly susceptible to stochastic events and so are listed as 'Nationally Critical', regardless of whether their small population size is due to human-induced or natural causes

Nationally Critical

A. *Very small population (natural or unnatural)*

A taxon is 'Nationally Critical', regardless of population trend and regardless of whether the population size is natural or unnatural, when evidence indicates that:

1. There are fewer than 250 mature individuals; or
2. There are ≤ 2 sub-populations and ≤ 200 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1 ha (0.01 km²).

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 km²).

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 km²).

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 km²).

Trend

The population is stable ($\pm 10\%$) 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 km²).

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 km²).

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 km²).

Trend

The population is stable ($\pm 10\%$) 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 km²).

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 km²).

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 $\leq 10 000$ ha (100 km²).

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.

8.3.4 Criteria for 'At Risk' taxa - Townsend *et al.*

Taxa that qualify as 'At Risk' do not meet the criteria for any of the 'Threatened' categories. However, they are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations.

Four 'At Risk' categories exist: 'Declining', 'Recovering', 'Relict' and 'Naturally Uncommon'. Definitions for each are provided below.

Declining

'Declining' taxa do not qualify as 'Threatened' because they are buffered by a large total population size and/or a slower decline rate. However, if the declining trends continue, these taxa may be listed as 'Threatened' in the future.

A. *Moderate to large population and low ongoing or predicted decline*

A taxon is 'Declining' when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 5000-20 000 mature individuals; or
2. The total area of occupancy is ≤ 1000 ha (10 km²).

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 \leq 10 000 ha (100 km²).

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 km²).

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)'8 if its total population size is between 1000 and 5000 mature individuals or its area of occupancy is \leq 100 ha (1 km²).

B. Moderate to large population

A taxon is eligible for listing as 'Recovering (B)'8 if its total population size is between 5000 and 20 000 mature individuals or its area of occupancy is \leq 1000 ha (10 km²).

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 ($\pm 10\%$)**
- B. Have more than 20 000 mature individuals and are stable or increasing at $> 10\%$**

The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. 'Relict' can also include taxa that exist as reintroduced and self-sustaining populations within or outside their former known range.

Naturally Uncommon

Taxa whose distribution is naturally confined to specific substrates (e.g. ultramafic rock), habitats (e.g. high alpine fellfield, hydrothermal vents), or geographic areas (e.g. subantarctic islands, sea-mounts), or taxa that occur within naturally small and widely scattered populations. This distribution is not the result of past or recent human disturbance. Populations may be stable or increasing. Note that a naturally uncommon taxon that has fewer than 250 mature individuals qualifies for 'Nationally Critical'. Taxa that have more than 20 000 mature individuals are not considered 'Naturally Uncommon', unless they occupy an area of less than 100 000 ha (1000 km²).

8.3.5 Other categories - *Townsend et al.*

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*) Migrant_{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 (*Myrmecobila 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*) Vagrant_{TO}, EN A2bd (IUCN 2006); and bristle-thighed curlew (*Numenius tahitiensis*) Vagrant_{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 *Tecomantbe 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.

8.4 CATEGORIES OF IMPORTANCE FOR GEOLOGICAL AND SOIL SITES

8.4.1 Geological Sites

Ranking criteria for important geological sites and landforms in the Northland Region follow Kenny and Hayward (1996).

Sites are listed under three levels of importance:

- (a) International - site of international scientific importance.
- (b) National - site of national scientific, educational or aesthetic importance.
- (c) Regional - site of regional scientific, educational or aesthetic importance.

8.4.2 Soil Sites

Ranking criteria for New Zealand soil sites of international, national, and regional significance, from Arand *et al.* (1993).

Soil sites are listed under three levels of importance:

(a) International

- Contains the best example of a soil (generally a soil group) or soil-vegetation or soil-landform association that is unique to New Zealand (or these latitudes)
- Contains a soil that is naturally uncommon or greatly reduced in extent in other parts of the world
- Contains a wide range of extensive soils with a relatively unmodified vegetation cover has been studied in detail and is known internationally.

(b) National

- Contains the best or a 'classic' example of a soil (either a soil group or a mapping unit) or a soil-vegetation or a soil-landform association in New Zealand
- Contains a soil or soil-vegetation or a soil-landform association that is nationally uncommon or reduced in extent
- Contains a moderate range of extensive soils with a relatively unmodified vegetation cover
- Has been studied in detail and is known nationally.

(c) Regional

- Contains the best regional example of a soil (generally a mapping unit) or a soil or soil-vegetation or a soil-landform association
- Contains a limited range of soils under vegetation that is relatively unmodified.

8.5 CHECKLIST OF PLANT SPECIES IN TANGIHUA ECOLOGICAL DISTRICT

This species list was predominantly compiled from reconnaissance survey work carried out from 1978 to 2009. It includes all vascular plant species known to be indigenous to, or wild and naturalised, in Tangihua Ecological District. Other records, including those from the Department of Conservation Sites of Special Biological Interest (SSBI) information system and Auckland Museum Herbarium (AK), have been referenced following the Latin species names.

8.5.1 Indigenous Species

Gymnosperms

<i>Agathis australis</i>	kauri
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Dacrydium cupressinum</i>	rimu
<i>Halocarpus kirkii</i>	monoao
<i>Libocedrus plumosa</i> (SSBI P06/H043)	kawaka
<i>Phyllocladus toatoa</i> (SSBI P06/H063)	toatoa
<i>Phyllocladus trichomanoides</i> var. <i>trichomanoides</i>	tanekaha
<i>Podocarpus hallii</i>	Hall's totara
<i>Podocarpus totara</i>	totara
<i>Prumnopitys taxifolia</i>	matai
<i>Prumnopitys ferruginea</i>	miro

Monocot. trees and shrubs

<i>Cordyline australis</i>	ti kouka
<i>Cordyline banksii</i>	ti ngahere, forest cabbage tree
<i>Phormium cookianum</i> (SSBI Q07/R07/H020)	wharariki, mountain flax
<i>Phormium cookianum</i> subsp. <i>bookeri</i> (SSBI P07/H009)	wharariki, mountain flax
<i>Phormium tenax</i>	harakeke, flax
<i>Rhopalostylis sapida</i>	nikau

Dicot. trees and shrubs

<i>Ackama rosifolia</i>	makamaka
<i>Alectryon excelsus</i> var. <i>excelsus</i>	titoki
<i>Alseuosmia macrophylla</i>	toropapa
<i>Alseuosmia quercifolia</i>	
<i>Aristotelia serrata</i>	makomako, wineberry
<i>Beilschmiedia tarairi</i>	taraire
<i>Beilschmiedia tawa</i>	tawa

<i>Brachyglottis kirkii</i> var. <i>kirkii</i> (SSBI P07/H027)	kohurangi
<i>Brachyglottis repanda</i> s.s.	rangiora
<i>Carmichaelia australis</i>	makaka, maukoro
<i>Carpodetus serratus</i>	putaputaweta
<i>Colensoa physaloides</i> (SSBI P06/H043)	koru
<i>Coprosma arborea</i>	tree coprosma
<i>Coprosma areolata</i>	
<i>Coprosma crassifolia</i> (SSBI P07/H027)	hupiro
<i>Coprosma grandifolia</i>	kanono
<i>Coprosma lucida</i>	karamu
<i>Coprosma macrocarpa</i> subsp. <i>minor</i> (AK 200562)	
<i>Coprosma parviflora</i>	
<i>Coprosma propinqua</i> var. <i>propinqua</i>	
<i>Coprosma propinqua</i> var. <i>robusta</i>	
<i>Coprosma rhamnoides</i>	
<i>Coprosma rigida</i> (SSBI P07/H040)	
<i>Coprosma robusta</i>	karamu
<i>Coprosma rotundifolia</i> (AK 280074)	
<i>Coprosma spatulata</i> subsp. <i>spatulata</i>	
<i>Coprosma tenuicaulis</i>	hukihuki
<i>Coriaria arborea</i> var. <i>arborea</i>	tutu
<i>Corokia cotoneaster</i> (AK 167998)	
<i>Corynocarpus laevigatus</i>	karaka
<i>Dodonaea viscosa</i>	akeake
<i>Dracophyllum latifolium</i> (incl. <i>D. mathewii</i>)	neinei
<i>Dracophyllum lessonianum</i>	
<i>Dracophyllum sinclairii</i> (AK 200563)	
<i>Dracophyllum traversii</i> (incl. <i>D. pyramidale</i>) (AK 200572)	
<i>Dysoxylum spectabile</i>	kohekohe
<i>Elaeocarpus dentatus</i> (incl. <i>E. d.</i> var. <i>obovatus</i>)	hinau
<i>Epacris pauciflora</i>	
<i>Fuchsia excorticata</i> (SSBI P07/H023)	kotukutuku
<i>Gaultheria antipoda</i>	tawiniwini
<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>	hangehange
<i>Griselinia littoralis</i>	kapuka
<i>Griselinia lucida</i>	puka
<i>Hebe flavida</i> (SSBI P07/H023)	
<i>Hebe ligustrifolia</i> (AK 233972)	
<i>Hebe stricta</i> var. <i>stricta</i>	koromiko

<i>Hedycarya arborea</i>	porokaiwhiri
<i>Helicbrysum lanceolatum</i> (SSBI P06/H043)	niniaio
<i>Hoberia angustifolia</i> (SSBI P06/H063)	narrow-leaved lacebark
<i>Hoberia populnea</i>	
<i>Ileostylus micranthus</i> (AK 223958).	pirina
<i>Ixerba brexioides</i> (SSBI P07/ H009)	tawari
<i>Knightia excelsa</i>	rewarewa
<i>Korthalsella salicornioides</i>	dwarf mistletoe
<i>Kunzea ericoides</i>	kanuka
<i>Laurelia novae-zelandiae</i>	pukatea
<i>Leptospermum scoparium</i>	manuka
<i>Leucopogon fasciculatus</i>	mingimingi
<i>Litsea calicaris</i>	mangeao
<i>Lophomyrtus bullata</i>	ramarama
<i>Macropiper excelsum</i> var. <i>excelsum</i>	kawakawa
<i>Melicope simplex</i>	poataniwha
<i>Melicytus macrophyllus</i>	large leaved mahoe
<i>Melicytus micranthus</i>	mahoe-wao
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>	mahoe
<i>Metrosideros robusta</i>	northern rata
<i>Mida salicifolia</i> (incl. <i>M.s.</i> var. <i>myrtifolia</i>)	mida
<i>Myrsine australis</i>	mapou
<i>Myrsine divaricata</i> (SSBI P06/H063)	
<i>Myrsine salicina</i> (SSBI P06/H043)	toro
<i>Nestegis cunninghamii</i> (SSBI P07/H023)	black maire
<i>Nestegis lanceolata</i>	white maire
<i>Olearia albida</i> (SSBI P07/H027)	
<i>Olearia furfuracea</i>	akepiro
<i>Olearia rani</i>	heketara
<i>Pennantia corymbosa</i> (SSBI P06/H058)	kaikomako
<i>Pittosporum cornifolium</i> (AK 211995)	tawhirikao
<i>Pittosporum eugenioides</i>	tarata
<i>Pittosporum pimeleoides</i> subsp. <i>pimeleoides</i> (SSBI P06/H064)	
<i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>	kohuhu
<i>Plagianthus regius</i> (AK 291105)	ribbonwood
<i>Pomaderris amoena</i> (AK 174960)	
<i>Pomaderris kumerabo</i>	kumarahou
<i>Pomaderris phyllicifolia</i> (AK 292382)	
<i>Pseudopanax crassifolius</i>	horoeka, lancewood
<i>Pseudowintera axillaris</i> (SSBI P06/H043)	horopito

<i>Quintinia serrata</i>	
(incl. <i>Q. acutifolia</i> and <i>Q. elliptica</i>)	tawheowheo
<i>Raukaua anomalus</i> (SSBI P06/H043)	
<i>Raukaua edgerleyi</i> (SSBI P06/H050)	raukawa
<i>Rhabdothermus solandri</i>	taurepo
<i>Schefflera digitata</i>	pate
<i>Solanum aviculare</i> var. <i>aviculare</i>	poroporo
<i>Sophora microphylla</i>	
<i>Streblus heterophyllus</i>	turepo
<i>Syzygium maire</i> (AK 277230)	maire tawake, swamp maire
<i>Vitex lucens</i>	puriri
<i>Weinmannia silvicola</i>	towai

Monocot. lianes

<i>Freycinetia banksii</i>	kiekie
<i>Ripogonum scandens</i>	kareao, supplejack

Dicot. lianes

<i>Calystegia sepium</i>	pohue
<i>Calystegia tuguriorum</i>	
<i>Clematis cunninghamii</i>	ngakau-kiore
<i>Clematis foetida</i>	akakaiku
<i>Clematis paniculata</i>	puawananga
<i>Fuchsia perscandens</i> (SSBI P06/H063)	
<i>Metrosideros albiflora</i>	
<i>Metrosideros carminea</i> (SSBI P07/H023)	akakura
<i>Metrosideros diffusa</i>	rata
<i>Metrosideros fulgens</i>	rata
<i>Metrosideros perforata</i>	aka
<i>Muehlenbeckia australis</i>	puka
<i>Parsonsia capsularis</i>	akakiore
<i>Parsonsia heterophylla</i> (Jones 1991)	akakaikiore
<i>Passiflora tetrandra</i> (SSBI P06/H058)	kohia
<i>Rubus australis</i>	tataramoa
<i>Rubus cissoides</i>	tataramoa
<i>Rubus schmidtioides</i> (SSBI P06/H058)	akatataramoa
<i>Rubus squarrosus</i> (SSBI P06/H043)	akatataramoa

Lycopods and psilopsids

<i>Huperzia varia</i>	whiri-o-raukatauri
<i>Lycopodiella cernua</i>	maatukutuku
<i>Lycopodiella lateralis</i>	
<i>Lycopodium deuterodensum</i>	puakarimu
<i>Lycopodium scariosum</i>	matukutuku

<i>Lycopodium volubile</i>	waewaekoukou
<i>Tmesipteris elongata</i> (SSBI P07/H023)	
<i>Tmesipteris lanceolata</i>	
<i>Tmesipteris sigmatifolia</i>	
<i>Tmesipteris tannensis</i>	

Ferns

<i>Adiantum cunninghamii</i> (AK 200564)	huruhuru tapairu
<i>Adiantum diaphanum</i>	huruhuru tapairu
<i>Adiantum fulvum</i>	huruhuru tapairu
<i>Adiantum hispidulum</i>	
<i>Adiantum viridescens</i> (Cameron 1992)	huruhuru tapairu
<i>Arthropteris tenella</i>	
<i>Asplenium bulbiferum</i> s.s.	mouku
<i>Asplenium flaccidum</i> s.s.	makawe
<i>Asplenium gracillimum</i> (SSBI Q06/H066)	petako-paraharaha
<i>Asplenium oblongifolium</i>	huruhuruwhenua
<i>Asplenium polyodon</i>	petako
<i>Azolla filiculoides</i> (SSBI P06/H014)	retoretore
<i>Blechnum chambersii</i>	rereti
<i>Blechnum discolor</i>	petipeti, crown fern
<i>Blechnum filiforme</i>	panako
<i>Blechnum fluviatile</i> agg. (SSBI P06/H043)	kiwikiwi
<i>Blechnum fraseri</i> (SSBI P07/H023)	
<i>Blechnum membranaceum</i>	
<i>Blechnum minus</i>	swamp kiokio
<i>Blechnum nigrum</i>	
<i>Blechnum novae-zelandiae</i> s.s.	kiokio
<i>Cardiomanes reniforme</i>	
<i>Ctenopteris heterophylla</i>	comb fern
<i>Cyathea cunninghamii</i> (SSBI P06/H043)	punui, gully tree fern
<i>Cyathea dealbata</i>	ponga
<i>Cyathea medullaris</i>	mamaku
<i>Cyathea smithii</i>	katote, soft tree fern
<i>Deparia petersenii</i>	
<i>Dicksonia lanata</i> var. <i>hispida</i> (SSBI P06/H063)	tuakura
<i>Dicksonia squarrosa</i>	wheki
<i>Diplazium australe</i>	
<i>Doodia australis</i>	pukupuku
<i>Doodia squarrosa</i> (AK 300807)	
<i>Gleichenia dicarpa</i>	
<i>Gleichenia microphylla</i>	waewaekaka

<i>Grammitis billardierei</i> (AK 200570)	
<i>Grammitis pseudociliata</i> (SSBI P06/H050)	
<i>Grammitis</i> sp.	
<i>Histiopteris incisa</i>	matata
<i>Hymenophyllum cupressiforme</i> (AK 214238)	mauku
<i>Hymenophyllum demissum</i>	irirangi
<i>Hymenophyllum dilatatum</i>	matua, mauku
<i>Hymenophyllum frankliniae</i>	mauku
<i>Hymenophyllum flabellatum</i>	mauku
<i>Hymenophyllum flexuosum</i>	mauku
<i>Hymenophyllum lyalli</i> (SSBI P06/H050)	mauku
<i>Hymenophyllum multifidum</i>	mauku
<i>Hymenophyllum rarum</i>	mauku
<i>Hymenophyllum revolutum</i>	mauku
<i>Hymenophyllum sanguinolentum</i>	piripiri
<i>Hymenophyllum scabrum</i>	mauku
<i>Hypolepis distans</i>	
<i>Hypolepis lactea</i> (SSBI P07/H009)	
<i>Hypolepis rufobarbata</i> (AK 174553)	
<i>Lastreopsis glabella</i>	
<i>Lastreopsis hispida</i>	
<i>Lastreopsis microsora</i>	
<i>Lastreopsis velutina</i>	
<i>Leptopteris hymenophylloides</i>	heruheru
<i>Lindsaea linearis</i>	
<i>Lindsaea trichomanoides</i>	
<i>Loxogramme dictyopteris</i>	
<i>Lygodium articulatum</i>	mangemange
<i>Microsorium pustulatum</i>	kowaowao, hounds tongue fern
<i>Microsorium scandens</i>	mokimoki
<i>Paesia scaberula</i>	matata
<i>Pellaea falcata</i> (SSBI P07/H075)	
<i>Pellaea rotundifolia</i>	tarawera, button fern
<i>Pneumatopteris pennigera</i>	pakau
<i>Polystichum neozelandicum</i> subsp. <i>neozelandicum</i>	pikopiko, shield fern
<i>Polystichum wawranum</i>	
<i>Pteridium esculentum</i>	bracken, rarahu
<i>Pteris macilenta</i> (of NZ authors)	
<i>Pteris saxatilis</i> (Cameron 1992)	
<i>Pteris tremula</i>	turawera, shaking brake
<i>Ptisana salicina</i> (SSBI P06/H023)	para, king fern
<i>Pyrrosia eleagnifolia</i>	leather-leaf fern

Rumobra adiantiformis
Schizaea bifida (SSBI P06/H063)
Schizaea fistulosa
Sticherus flabellatus (SSBI P06/H063)
Trichomanes elongatum
Trichomanes endlicherianum
Trichomanes strictum
Trichomanes venosum

Orchids

Acianthus sinclairii
Anzybas rotundifolius (AK 231699),
Corunastylis pumila (SSBI P06/H063)
Cyrtostylis oblonga
Diplodium alobulum
Diplodium trullifolium
Drymoanthus adversus
Earina autumnalis
Earina mucronata
Icthyostomum pygmaeum
Linguella puberula (AK 132435)
Microtis parviflora agg.
Microtis unifolia agg.
Nematoceras orbiculatum
Nematoceras rivulare (SSBI P06/H043)
Nematoceras triloba
Orthoceras novae-zeelandiae
Petalochilus alatus (SSBI P06/H063)
Petalochilus chlorostylus
Petalochilus alatus (SSBI P06/H063)
Petalochilus minor
Plumatichilos tasmanicum (AK 108572)
Prasophyllum colensoi
Pterostylis banksii
Pterostylis graminea agg.
Simpliglottis cornuta
Singularybas oblongus
Stegostyla atradenia (AK 231701)
Thelymitra cyanea
Thelymitra ixioides (AK 232573)
Thelymitra longifolia agg.
Thelymitra pauciflora agg.
Thelymitra (c) "rough leaf" (SSBI P06/H063)
Winika cunninghamii

Grasses

<i>Cortaderia fulvida</i>	toetoe
<i>Deyeuxia quadriseta</i>	
<i>Dichelachne avenoides</i>	
<i>Dichelachne crinita</i>	patiti
<i>Isachne globosa</i>	swamp millet
<i>Lachnagrostis filiformis</i>	
<i>Microlaena avenacea</i>	bush rice grass
<i>Microlaena stipoides</i>	patiti
<i>Oplismenus hirtellus</i> subsp. <i>imbecillis</i>	
<i>Poa anceps</i> subsp. <i>anceps</i>	
<i>Rytidosperma gracile</i>	

Sedges

<i>Baumea arthropphylla</i>	
<i>Baumea articulata</i>	
<i>Baumea complanata</i> (SSBI P07/H040)	
<i>Baumea rubiginosa</i>	
<i>Baumea tenax</i>	
<i>Baumea teretifolia</i>	
<i>Bolboschoenus fluviatilis</i>	ririwaka
<i>Carex breviculmis</i>	
<i>Carex dissita</i>	
<i>Carex fascicularis</i>	
<i>Carex flagellifera</i>	manaia
<i>Carex forsteri</i> (AK 291120)	
<i>Carex geminata</i>	
<i>Carex lambertiana</i>	
<i>Carex lessoniana</i>	
<i>Carex maorica</i> (SSBI P06/H058)	
<i>Carex ochrosaccus</i> (Willets 1985)	
<i>Carex secta</i> (SSBI P06/H058)	pukio
<i>Carex solandri</i>	
<i>Carex testacea</i>	
<i>Carex virgata</i>	purei
<i>Cyperus ustulatus</i>	toetoe upokotangata
<i>Eleocharis acuta</i>	
<i>Eleocharis sphacelata</i>	
<i>Gabnia lacera</i>	tarangarara
<i>Gabnia pauciflora</i>	takahikahi
<i>Gabnia setifolia</i>	mapere
<i>Gabnia xanthocarpa</i>	tupari-maunga
<i>Isolepis prolifer</i>	

<i>Isolepis reticularis</i>	
<i>Lepidosperma australe</i>	
<i>Lepidosperma laterale</i>	
<i>Morelotia affinis</i>	
<i>Schoenoplectus tabernaemontani</i>	kapungawha
<i>Schoenus maschalinus</i>	
<i>Schoenus apogon</i>	
<i>Schoenus tendo</i>	wiwi
<i>Uncinia banksii</i>	matau
<i>Uncinia distans</i> (SSBI P07/H009)	matau
<i>Uncinia uncinata</i>	kamu, matau a maui
<i>Uncinia zotovii</i>	matau

Rushes

<i>Juncus edgariae</i>	wi
<i>Juncus pallidus</i>	wi
<i>Juncus pauciflorus</i> (SSBI P06/H014)	
<i>Juncus planifolius</i>	
<i>Juncus sarophorus</i>	wi
<i>Luzula picta</i> var. <i>picta</i> (AK 292343)	

Monocot. herbs (other than orchids, grasses, sedges and rushes)

<i>Arthropodium candidum</i>	
<i>Astelia fragrans</i> (AK 168171)	kakaha
<i>Astelia grandis</i> (Young & Forester 2006)	
<i>Astelia nervosa</i> (AK 174515)	
<i>Astelia solandri</i>	kowharawhara
<i>Astelia trinervia</i>	mauri
<i>Collospermum bastatum</i>	kahakaha
<i>Collospermum microspermum</i> (SSBI P07/H027)	
<i>Cordyline pumilio</i> ti	rauriki; dwarf cabbage tree
<i>Dianella nigra</i>	turutu
<i>Dianella haemata</i>	swamp dianella
<i>Lemna minor</i>	karearea
<i>Libertia grandiflora</i> (SSBI P07/H027)	mikoikoi
<i>Libertia ixioides</i>	mikoikoi
<i>Potamogeton ochreatus</i>	
<i>Potamogeton cheesemantii</i>	red pondweed
<i>Potamogeton suboblongus</i> (SSBI P07/H040)	mud pondweed
<i>Typcha orientalis</i>	raupo

Composite herbs

Euchiton audax

Euchiton collinus

Euchiton sphaericus

Pseudognaphalium luteoalbum agg. pukatea

Senecio minimus

Dicot. herbs (other than composites)

Callitriche muelleri

Callitriche stagnalis

Cardamine debilis agg.

Centella uniflora

Daucus glochidiatus (SSBI P07/H027)

Drosera auriculata

Drosera pygmaea pygmy sundew

Elatostema rugosum parataniwha

Epilobium nerteroides (SSBI P06/H043)

Epilobium nummulariifolium (AK 168560)

Epilobium pallidiflorum tawarewa

Epilobium pedunculare

Epilobium pubens (SSBI P06/H043)

Galium propinquum mawe

Geranium homeanum

Geranium solanderi "coarse hairs" (SSBI Q06/H066)

Gonocarpus incanus piripiri

Gonocarpus micranthus subsp. *micranthus*

Haloragis erecta subsp. *erecta* toatoa

Hydrocotyle dissecta

Hydrocotyle elongata

Hydrocotyle moschata

Hydrocotyle novae-zeelandiae

Hydrocotyle pterocarpa mudwort

Lobelia anceps punakuru

Lobelia angulata (SSBI P06/H023) panakenake

Myosotis sp. (*M. forsteri* agg.) (AK 7494)

Myosotis spathulata (AK 7514)

Myriophyllum propinquum

Myriophyllum triphyllum (AK 101307)

Nertera depressa

Nertera dichondrifolia

Oxalis exilis

Persicaria decipiens agg.

<i>Plectranthus parviflorus</i> (AK 168181)	
<i>Ranunculus acaulis</i>	
<i>Ranunculus amphitricbus</i>	kawariki
<i>Ranunculus reflexus</i>	maruru
<i>Stellaria parviflora</i> (AK 291117)	
<i>Urtica incisa</i> (SSBI P07/H009)	
<i>Viola filicaulis</i> (Young & Forester 2006)	
<i>Wahlenbergia violacea</i>	

8.5.2 Adventive Species

Gymnosperms

<i>Allocasuarina littoralis</i>	she-oak
<i>Pinus pinaster</i>	maritime pine
<i>Pinus radiata</i>	radiata pine

Dicot. trees and shrubs

<i>Acacia decurrens</i>	green wattle
<i>Acacia mearnsii</i>	black wattle
<i>Acacia melanoxylon</i>	Tasmanian blackwood
<i>Acacia verticillatum</i>	prickly Moses
<i>Alnus glutinosa</i>	alder
<i>Cotoneaster glaucophyllus</i>	cotoneaster
<i>Crataegus monogyna</i>	hawthorn
<i>Cytisus scoparius</i>	broom
<i>Elaeagnus × reflexa</i>	elaeagnus
<i>Erica lusitanica</i>	Spanish heath
<i>Eriobotrya japonica</i>	loquat
<i>Erythrina × sykesii</i>	coral tree
<i>Eucalyptus</i> sp.	eucalyptus
<i>Hakea salicifolia</i>	willow-leaved hakea
<i>Hakea sericea</i>	prickly hakea
<i>Hydrangea macrophylla</i>	hydrangea
<i>Hypericum androsaemum</i>	tutsan
<i>Juglans</i> sp.	walnut
<i>Leycesteria formosa</i>	Himalayan honeysuckle
<i>Ligustrum lucidum</i>	tree privet
<i>Ligustrum sinense</i>	Chinese privet
<i>Malus × domestica</i>	apple tree
<i>Paulownia tomentosa</i>	paulownia
<i>Populus</i> sp.	poplar
<i>Prunus persica</i>	peach tree, nectarine
<i>Psoralea pinnata</i>	dally pine

<i>Robinia pseudacacia</i>	false acacia
<i>Rosa rubiginosa</i>	sweet brier
<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)	blackberry
<i>Salix cinerea</i>	grey willow
<i>Salix fragilis</i>	crack willow
<i>Salix matsudana</i> cv. <i>tortuosa</i>	corkscrew willow
<i>Salix viminalis</i>	common osier
<i>Senna septemtrionalis</i>	buttercup bush
<i>Solanum mauritianum</i>	woolly nightshade
<i>Ulex europaeus</i>	gorse

Dicot. trees and shrubs

<i>Archontophoenix cunninghamiana</i>	bangalow palm
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Dicot. lianes

<i>Actinidia chinensis</i>	kiwifruit
<i>Araujia sericifera</i>	moth plant
<i>Calystegia silvatica</i>	great bindweed
<i>Delairea odorata</i>	German ivy
<i>Hedera helix</i>	ivy
<i>Ipomoea indica</i>	blue morning glory
<i>Jasminum polyanthum</i>	jasmine
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Passiflora mixta</i>	banana passionfruit
<i>Roldana petasitis</i>	velvet groundsel
<i>Rosa</i> sp.	rose vine
<i>Rumex sagittatus</i>	climbing dock
<i>Vitis vinifera</i>	grape

Lycopods and psilopsids

<i>Sellaginella kraussiana</i>	creeping clubmoss
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Ferns

<i>Azolla pinnata</i>	
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Orchids

<i>Dendrobium kingianum</i>	
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Grasses

<i>Agrostis capillaris</i>	browntop
<i>Agrostis stolonifera</i>	creeping bent
<i>Aira caryophyllea</i>	silvery hairy grass
<i>Anthoxanthum odoratum</i>	sweet vernal
<i>Arundo donax</i>	giant reed

<i>Axonopus fissifolius</i>	narrow-leaved carpet grass
<i>Bambusa oldhamii</i>	Oldham's bamboo
<i>Briza minor</i>	shivery grass
<i>Bromus willdenowii</i>	prairie brome
<i>Cortaderia selloana</i>	pampas
<i>Cynosurus cristatus</i>	crested dogstail
<i>Dactylis glomerata</i>	cocksfoot
<i>Digitaria sanguinalis</i>	summer grass
<i>Ehrharta erecta</i>	veld grass
<i>Entolasia marginata</i> (Cameron 1992)	bordered panic grass
<i>Glyceria fluitans</i>	floating sweetgrass
<i>Glyceria maxima</i>	reed sweetgrass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Lolium perenne</i>	rye grass
<i>Paspalum dilatatum</i>	paspalum
<i>Paspalum distichum</i>	Mercer grass
<i>Paspalum urvillei</i>	Vasey grass
<i>Pennisetum clandestinum</i>	kikuyu grass
<i>Phyllostachys aurea</i>	
<i>Phyllostachys</i> sp.	bamboo
<i>Poa annua</i>	annual poa
<i>Pseudosasa japonica</i>	bamboo
<i>Rytidosperma racemosum</i>	
<i>Schedonorus arundinaceus</i>	tall fescue
<i>Sporobolus africanus</i>	ratstail
<i>Stenotaphrum secundatum</i>	buffalo grass
<i>Zizania latifolia</i>	Manchurian wild rice

Sedges

<i>Carex longebrachiata</i>	Australian sedge
<i>Carex ovalis</i>	
<i>Cyperus brevifolius</i>	
<i>Cyperus eragrostis</i>	
<i>Cyperus rotundus</i>	nutgrass (purple nutsedge)
<i>Isolepis levynsiana</i>	
<i>Schoenoplectus californicus</i>	

Rushes

<i>Juncus acuminatus</i>	sharp-fruited rush
<i>Juncus articulatus</i>	
<i>Juncus bufonius</i>	

<i>Juncus effusus</i>	soft rush
<i>Juncus microcephalus</i>	
<i>Juncus tenuis</i>	track rush

Monocot. herbs (other than orchids, grasses, sedges and rushes)

<i>Agapanthus praecox</i>	agapanthus
<i>Agave</i> sp.	
<i>Asparagus asparagoides</i>	smilax
<i>Asparagus scandens</i>	climbing asparagus
<i>Canna indica</i>	canna lily
<i>Colocasia esculenta</i>	taro
<i>Crocasmia</i> × <i>crocosmiiflora</i>	montbretia
<i>Hedychium gardnerianum</i>	kahili ginger; wild ginger
<i>Iris pseudacorus</i>	yellow flag
<i>Kniphofia uvaria</i>	red hot poker
<i>Tradescantia fluminensis</i>	tradescantia
<i>Watsonia meriana</i> cv. <i>Bulbillifera</i>	watsonia
<i>Yucca</i> sp.	yucca
<i>Zantedeschia aethiopica</i>	arum lily

Composite herbs

<i>Bidens frondosa</i>	beggars' ticks
<i>Bidens pilosa</i>	cobbler's pegs
<i>Cirsium arvense</i>	California thistle
<i>Cirsium vulgare</i>	Scotch thistle
<i>Conyza albida</i>	fleabane
<i>Crepis capillaris</i>	hawksbeard
<i>Erigeron karvinskianus</i>	Mexican daisy
<i>Gamochaeta purpurea</i>	purple cudweed
<i>Gamochaeta simplicicaulis</i>	cudweed
<i>Gamochaeta spicata</i>	cudweed
<i>Hypochoeris radicata</i>	catsear
<i>Jacobaea vulgaris</i>	ragwort
<i>Lapsana communis</i>	nipplewort
<i>Leontodon taraxacoides</i>	hawkbit
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Senecio bipinnatisectus</i>	Australian fireweed
<i>Senecio diaschides</i>	
<i>Senecio sylvaticus</i>	wood groundsel
<i>Senecio vulgaris</i>	groundsel
<i>Sonchus oleraceus</i>	puha
<i>Taraxacum officinale</i>	dandelion

Dicot. herbs (other than composites)

<i>Ageratina adenophora</i>	Mexican devil
<i>Ageratina riparia</i>	mist flower
<i>Alisma plantago-aquatica</i>	water plantain
<i>Alternanthera philoxeroides</i>	alligator weed
<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Anagallis arvensis</i> subsp. <i>arvensis</i> var. <i>coerulea</i>	blue pimpernel
<i>Cardamine</i> sp.	
<i>Carduus tenuiflorus</i>	winged thistle
<i>Centaureum erythraea</i>	centaury
<i>Cerastium glomeratum</i>	annual mouse-ear chickweed
<i>Daucus carota</i>	wild carrot
<i>Digitalis purpurea</i>	foxglove
<i>Epilobium ciliatum</i>	willow herb
<i>Foeniculum vulgare</i>	fennel
<i>Fumaria muralis</i>	scrambling fumitory
<i>Galium aparine</i>	cleavers
<i>Galium divaricatum</i>	slender bedstraw
<i>Galium palustre</i>	marsh bedstraw
<i>Geranium robertianum</i>	herb Robert
<i>Linum bienne</i>	
<i>Lotus pedunculatus</i>	lotus
<i>Lotus suaveolens</i>	hairy birdsfoot trefoil
<i>Ludwigia palustris</i>	water purslane
<i>Mentha</i> × <i>piperita</i>	peppermint
<i>Mentha pulegium</i>	penny royal
<i>Modiola caroliniana</i>	creeping mallow
<i>Myosotis laxa</i> var. <i>caespitosa</i>	forget-me-not
<i>Nasturtium officinale</i>	watercress
<i>Oenanthe pimpinellioides</i>	parsley dropwort
<i>Orobanche minor</i>	broomrape
<i>Oxalis perennans</i>	woody-rot oxalis
<i>Oxalis</i> sp.	oxalis
<i>Parentucellia viscosa</i>	tarweed
<i>Persicaria hydropiper</i>	water pepper
<i>Persicaria maculosa</i>	willow weed
<i>Physalis peruviana</i>	cape gooseberry
<i>Phytolacca octandra</i>	inkweed
<i>Plantago lanceolata</i>	narrow-leaved plantain
<i>Plectranthus ciliata</i>	plectranthus
<i>Polygonum aviculare</i>	wireweed

<i>Prunella vulgaris</i>	selfheal
<i>Ranunculus flammula</i>	spearwort
<i>Ranunculus repens</i>	creeping buttercup
<i>Rumex acetosella</i>	sheep's sorrel
<i>Rumex conglomeratus</i>	clustered dock
<i>Rumex obtusifolius</i>	dock
<i>Rumex sagittatus</i>	climbing dock
<i>Scrophularia auriculata</i>	
<i>Trifolium dubium</i>	suckling clover
<i>Trifolium pratense</i>	red clover
<i>Trifolium repens</i>	white clover
<i>Utricularia gibba</i>	bladderwort
<i>Verbascum thapsus</i>	woolly mullein
<i>Verbena bonariensis</i>	purple-top
<i>Verbena litoralis</i>	blue vervain
<i>Verbena officinalis</i>	vervain
<i>Veronica arvensis</i>	field speedwell
<i>Veronica plebeia</i>	
<i>Vicia sativa</i>	vetch

8.6 COMMON PLANT NAMES USED IN TEXT

Exotic/naturalised species are indicated by an asterisk.

* African club moss	<i>Selaginella kraussiana</i>
akeake	<i>Dodonaea viscosa</i>
akepiro	<i>Olearia furfuracea</i>
* alligator weed	<i>Alternanthera philoxeroides</i>
* blackberry	<i>Rubus fruticosus</i> agg.
black maire	<i>Nestigis cunninghamii</i>
* black wattle	<i>Acacia mearnsii</i>
* brush wattle	<i>Paraserianthes lophantha</i>
bracken	<i>Pteridium esculentum</i>
native broom	<i>Carmichaelia australis</i>
* browntop	<i>Agrostis capillaris</i>
* buffalo grass	<i>Stenotaphrum secundatum</i>
bush rice grass	<i>Microlaena avenacea</i>
carmine rata	<i>Metrosideros carminea</i>
* Chinese privet	<i>Ligustrum sinense</i>
* cocksfoot	<i>Dactylis glomerata</i>
* crack willow	<i>Salix fragilis</i>
* creeping buttercup	<i>Ranunculus repens</i>
* elaeagnus	<i>Elaeagnus x reflexa</i>
* eucalyptus	<i>Eucalyptus</i> sp.
* gorse	<i>Ulex europaeus</i>
* grey willow	<i>Salix cinerea</i>
gully fern	<i>Pneumatopteris pennigera</i>
gully tree fern	<i>Cyathea cunninghamii</i>
Hall's totara	<i>Podocarpus hallii</i>
hangehange	<i>Geniostoma ruprestre</i> var. <i>ligustrifolium</i>
harakeke, flax	<i>Phormium tenax</i>
heketara	<i>Olearia rani</i>
hinau	<i>Elaeocarpus dentatus</i>
hook sedge	<i>Uncinia uncinata</i>
houhere	<i>Hoberia populnea</i>
* Japanese honeysuckle	<i>Lonicera japonica</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kaikomako	<i>Pennantia corymbosa</i>
kanono	<i>Coprosma grandifolia</i>
kanuka	<i>Kunzea ericoides</i>
karaka	<i>Corynocarpus laevigatus</i>
karamu	<i>Coprosma robusta</i>
karo	<i>Pittosporum crassifolium</i>
kauri	<i>Agathis australis</i>
kawaka	<i>Libocedrus plumosa</i>

kawakawa	<i>Macropiper excelsum</i> subsp. <i>excelsum</i> f. <i>excelsum</i>
kiekie	<i>Freycinetia banksii</i>
* kikuyu grass	<i>Pennisetum clandestinum</i>
king fern	<i>Ptisana salicina</i>
kiokio	<i>Blechnum novae-zelandiae</i>
kohekohe	<i>Dysoxylum spectabile</i>
kohuhu	<i>Pittosporum tenuifolium</i>
koromiko	<i>Hebe stricta</i> var. <i>stricta</i>
kotukutuku	<i>Fuchsia excorticata</i>
kowhai	<i>Sophora microphylla</i>
kumarahou	<i>Pomaderris kumerabo</i>
lancewood	<i>Pseudopanax crassifolius</i>
mahoe	<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>
makamaka	<i>Ackama rosifolia</i>
mamaku	<i>Cyathea medullaris</i>
mamangi	<i>Coprosma arborea</i>
mangeao	<i>Litsea calicaris</i>
manuka	<i>Leptospermum scoparium</i>
mapou	<i>Myrsine australis</i>
matai	<i>Prumnopitys taxifolia</i>
* Mexican devil	<i>Ageratina adenophora</i>
mida	<i>Mida salicifolia</i>
mingimingi	<i>Leucopogon fasciculatus</i>
miro	<i>Prumnopitys ferruginea</i>
* mist flower	<i>Ageratina riparia</i>
monoao	<i>Halocarpus kirkii</i>
mountain flax, wharariki	<i>Phormium cookianum</i>
mountain neinei	<i>Dracophyllum traversii</i>
nikau	<i>Rhopalostylis sapida</i>
northern rata	<i>Metrosideros robusta</i>
* pampas	<i>Cortaderia selloana</i>
parataniwha	<i>Elatostema rugosa</i>
pate	<i>Schefflera digitata</i>
pigeonwood	<i>Hedycarya arborea</i>
pohuehue	<i>Muehlenbeckia complexa</i>
* pine	<i>Pinus radiata</i>
pohutukawa	<i>Metrosideros excelsa</i>
ponga	<i>Cyathea dealbata</i>
* poplar	<i>Populus</i> sp.
* prickly hakea	<i>Hakea sericea</i>
puka	<i>Griselinia lucida</i>
pukatea	<i>Laurelia novae-zelandiae</i>
pukio	<i>Carex secta</i>

	puriri	<i>Vitex lucens</i>
	putaputaweta	<i>Carpodetus serratus</i>
*	radiata pine	<i>Pinus radiata</i>
	ramarama	<i>Lophomyrtus bullata</i>
	raukawa	<i>Raukawa edgerleyi</i>
	raupo	<i>Typha orientalis</i>
	rengarenga	<i>Arthropodium cirratum</i>
	rewarewa	<i>Knightia excelsa</i>
	ribbonwood, manatu	<i>Plagianthus regius</i>
	rimu	<i>Dacrydium cupressinum</i>
*	soft rush	<i>Juncus effusus</i>
	supplejack	<i>Ripogonum scandens</i>
	swamp maire, maire tawake	<i>Syzygium maire</i>
	swamp millet	<i>Isachne globosa</i>
*	tall fescue	<i>Schedonorus arundinaceus</i>
	tanekaha	<i>Phyllocladus trichomanoides</i> var. <i>trichomanoides</i>
	taraire	<i>Beilschmiedia tarairi</i>
	tarata	<i>Pittosporum eugenioides</i>
*	Tasmanian blackwood	<i>Acacia melanoxylon</i>
	taurepo	<i>Rhabdotohamnus solandri</i>
	tawa	<i>Beilschmiedia tawa</i>
	tawari	<i>Ixerba brexioides</i>
	tawheowheo	<i>Quintinia serrata</i>
	ti kouka	<i>Cordyline australis</i>
	ti ngahere	<i>Cordyline banksii</i>
	titoki	<i>Alectryon excelsus</i> var. <i>excelsus</i>
	toatoa	<i>Phyllocadus toatoa</i>
	toetoe	<i>Cortaderia fulvida</i>
	toro	<i>Myrsine salicina</i>
	totara	<i>Podocarpus totara</i>
	towai	<i>Weinmannia silvicola</i>
*	tradescantia	<i>Tradescantia fluminensis</i>
*	tree privet	<i>Ligustrum lucidum</i>
	turepo	<i>Streblus heterophyllus</i>
	turutu	<i>Dianella nigra</i>
	tutu	<i>Coriaria arborea</i> var. <i>arborea</i>
	wheki	<i>Dicksonia squarrosa</i>
*	willow	<i>Salix</i> sp.
*	willow weed	<i>Persicaria persicaria</i>
	wineberry, makomako	<i>Aristotelia serrata</i>
*	woolly nightshade	<i>Solanum mauritianum</i>
*	Yorkshire fog	<i>Holcus lanatus</i>

8.7 CHECKLIST OF FAUNA IN TANGIHUA ECOLOGICAL DISTRICT

Compiled by authors and Dr Ray Pierce and Richard Parrish. Nomenclature follows Miskelly *et al.* (2008) for indigenous bird species and Hitchmough *et al.* (2007) for all other indigenous fauna. Nomenclature for exotic species is as follows: Heather and Robertson (1996) for birds, Gill and Whitaker (1996) for amphibians, McDowall (2000) for fish, and King (2005) for mammals.

PL = present in large numbers (>100 present in study area at one time in last 15 years).

P = present in small numbers (<100 present in study area at one time in last 15 years).

R = recorded (<10 present in study area at one time in last 15 years).

E = not recorded in last 15 years, though previous records exist; presumed locally extinct.

U = unconfirmed record.

Mammals

Indigenous

<i>Chalinolobus tuberculata</i>	long-tailed bat; pekapeka	U
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Introduced (feral)

<i>Bos taurus</i>	cattle	R
<i>Capra hircus</i>	feral goat	P
<i>Erinaceus europaeus</i>	hedgehog	PL
<i>Felis catus</i>	house cat	PL
<i>Lepus europaeus</i>	brown hare	PL
<i>Mus musculus</i>	house mouse	PL
<i>Mustela erminea</i>	stoat	PL
<i>Mustela furo</i>	ferret	PL
<i>Mustela nivalis</i>	weasel	P
<i>Oryctolagus cuniculus</i>	European rabbit	PL
<i>Rattus norvegicus</i>	Norway rat; brown rat	P
<i>Rattus rattus</i>	ship rat	PL
<i>Sus scrofa</i>	feral pig	PL
<i>Trichosurus vulpecula</i>	brush-tail possum	PL

Birds

Indigenous

<i>Anas gracilis</i>	tete; grey teal	P
<i>Anas rhynchotis variegata</i>	NZ shoveler; kuruwheangi	R
<i>Anas superciliosa superciliosa</i>	grey duck; parera	R

<i>Anthus novaseelandiae</i>	NZ pipit	P
<i>Apteryx mantelli</i>	North Island brown kiwi	E
<i>Ardea novaehollandiae</i>	white-faced heron	P
<i>Botaurus poiciloptilus</i>	Australasian bittern; matuku	R
<i>Bowdleria punctata vealeae</i>	North Island fernbird; matata	P
<i>Chrysococcyx lucidus lucidus</i>	shining cuckoo; pipiwharauoa	PL
<i>Circus approximans</i>	Australasian harrier; kahu	PL
<i>Cyanoramphus novaseelandiae</i>	red-crowned parakeet	R
<i>Gallirallus philippensis assimilis</i>	banded rail; moho-pereru	P
<i>Gerygone igata</i>	grey warbler; riroriro	PL
<i>Hemiphaga novaeseelandiae</i>	kukupa; kereru; New Zealand pigeon	PL
<i>Himantopus himantopus leucocephalus</i>	poaka; pied stilt	P
<i>Hirundo tabitica neoxena</i>	welcome swallow	PL
<i>Larus dominicanus</i>	black-backed gull	P
<i>Nestor meridionalis septentrionalis</i>	North Island kaka	R
<i>Ninox novaeseelandiae novaeseelandiae</i>	morepork; ruru	PL
<i>Petroica macrocephala toitoi</i>	tomtit; miromiro	P
<i>Phalacrocorax carbo novaehollandiae</i>	black shag; kawau	P
<i>Phalacrocorax melanoleucos brevirostris</i>	little shag; kawaupaka	P
<i>Podiceps cristatus ssp. australis</i>	puteketeke; Australasian crested grebe	R
<i>Poliocephalus rufopectus</i>	New Zealand dabchick; weweia	R
<i>Porphyrio porphyrio melanotus</i>	pukeko	PL
<i>Porzana tabuensis plumbea</i>	spotless crane; puweto	P
<i>Prosthemadera novaeseelandiae</i>	tui	PL
<i>Rhipidura fuliginosa placabilis</i>	North Island fantail; piwakawaka	PL
<i>Tadorna variegata</i>	paradise shelduck; putangitangi; pari	PL
<i>Todiramphus sanctus</i>	New Zealand kingfisher; kotare	PL
<i>Vanellus miles</i>	spur-winged plover	PL
<i>Zosterops lateralis</i>	silvereve; tauhou	PL
Introduced		
<i>Acridotheres tristis</i>	myna	PL
<i>Alauda arvensis</i>	skylark	PL
<i>Anas platyrhynchos</i>	mallard	PL
<i>Callipepla californica</i>	California quail	PL

<i>Carduelis carduelis</i>	goldfinch	PL
<i>Carduelis chloris</i>	greenfinch	PL
<i>Carduelis flammea</i>	redpoll	P
<i>Cygnus atratus</i>	black swan	P
<i>Emberiza citrinella</i>	yellowhammer	PL
<i>Fringilla coelebs</i>	chaffinch	PL
<i>Gymnorhina tibicen tibicen</i>	Australian magpie (white-backed ssp.)	PL
<i>Meleagris gallopavo</i>	wild turkey	P
<i>Passer domesticus</i>	house sparrow	PL
<i>Phasianus colchicus</i>	pheasant	PL
<i>Platycercus eximius</i>	eastern rosella	PL
<i>Prunella modularis</i>	dunnoek; hedge sparrow	P
<i>Sturnus vulgaris</i>	starling	PL
<i>Synoicus ypsilophorus</i>	brown quail	PL
<i>Turdus merula</i>	blackbird	PL
<i>Turdus philomelos</i>	song thrush	PL

Indigenous Reptiles

Indigenous

<i>Cyclodina aenea</i>	copper skink	P
<i>Cyclodina ornata</i>	ornate skink	
<i>Hoplodactylus granulatus</i>	forest gecko	R
<i>Naultinus elegans elegans</i>	Auckland green gecko	R
<i>Hoplodactylus pacificus</i>	Pacific gecko	U

Fish

Indigenous

<i>Anguilla australis</i>	shortfin eel	PL
<i>Anguilla dieffenbachii</i>	longfin eel	PL
<i>Cheimarrichthys fosteri</i>	torrentfish	P
<i>Galaxias brevipinnis</i>	koaro	P
<i>Galaxias fasciatus</i>	banded kokopu	PL
<i>Galaxias maculatus</i>	inanga	PL
<i>Galaxias postvectis</i>	shortjaw kokopu	R
<i>Gobiomorphus basalis</i>	Cran's bully	PL
<i>Gobiomorphus cotidianus</i>	common bully	PL
<i>Mugil cephalus</i>	grey mullet	PL
<i>Neochanna diversus</i>	black mudfish	R

Introduced

<i>Gambusia affinis</i>	mosquitofish	PL
<i>Oncorhynchus mykiss</i>	rainbow trout	PL

Indigenous Land Snails ⁷

<i>Allodiscus dimorphus</i>		R
<i>Allodiscus planulatus</i>		R
' <i>Allodiscus</i> ' <i>urquharti</i>		R
<i>Amborhytida dunni</i>		R
<i>Cantareus adpersus</i>		R
<i>Cavellia buccinella</i>		R
<i>Charopa coma</i>		R
<i>Chaureopa hazelwoodi</i>		R
<i>Cytora cytora</i>		R
<i>Cytora torquilla</i>		R
<i>Delos coresia</i>		R
<i>Fectola charopiformis</i>		R
<i>Fectola mira</i>		R
<i>Fectola unidentata</i>		R
' <i>Flammoconcha</i> ' <i>albozonata</i>		R
' <i>Geminoropa</i> ' <i>vortex</i>		R
" <i>Golden Phenacobelix</i> "		R
<i>Haurakora corrugata</i>		R
<i>Huonodon hectori</i>		R
<i>Hurupapa</i> sp.		R
<i>Hyalolaoma glabriusculus</i>		R
' <i>Totula</i> ' <i>arewa</i>		R
<i>Kaupotaka adriatus</i>		R
<i>Kaupotaka lampra</i>		R
<i>Koropapa lateumbilicata</i>		R
<i>Lamellidea novoseelandica</i>		R
<i>Liarea bicarinata</i>		R
<i>Liarea hochstetteri</i>		R
<i>Liarea turriculata</i>		R
<i>Mebopotaka cheesemani</i>		R
<i>Microbrunnea minuta</i>		R
' <i>Mocella</i> ' cf <i>manawatawhia</i>		R
<i>Paryphanta busbyi busbyi</i>	kauri snail	PL
<i>Phenacobelix giveni</i>		R
<i>Pictilpunctum hazelwoodi</i>		R

⁷ These lists probably only represent a small proportion of the total number of species present. Systematic surveys of the ED would increase the diversity of these lists.

<i>Punctidae</i> sp. 38		R
<i>Punctidae</i> sp. 161		R
<i>Punctidae</i> sp. 164		R
<i>Punctidae</i> sp. 225		R
<i>Rhytidarex</i> sp.		R
<i>Robapapa arboreus</i>		R
<i>Robapapa umbilicata</i>		R
<i>Sericoconcha conella</i>		R
<i>Sericoconcha pilula</i>		R
<i>Serpho kivi</i>		R
<i>Serratopunctum serratocostata</i>		R
<i>Taguabelix</i> cf <i>pseudelaiodes</i>		R
<i>Thalassobelix ziczac</i>		R
<i>Therasiella celinde</i>		R
<i>Therasiella neozelanica</i>		R
<i>Therasiella serrata</i>		R
<i>Therasiella tamora</i>		R
<i>Ultralaoma sciadium</i>		R

Indigenous Crustaceans⁸

<i>Parenephrops planifrons</i>	koura, freshwater crayfish	PL
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Other Invertebrates

Indigenous

<i>Calliphora quadrimaculata</i>	New Zealand blue blowfly	PL
<i>Cambridgea</i> sp.	spider	P
<i>Cormocephalus</i> sp.	centipede	R
<i>Danaus plexippus</i>	Monarch butterfly	R
<i>Hemideina</i> sp.	tree weta	R
<i>Lasiorhynchus barbicornus</i>	giraffe weevil	P
<i>Peripatus</i> sp.	velvet worm	R
<i>Porrhothele</i> sp.	spider	R
<i>Uloma tenebrionoides</i>	dented beetle	R
<i>Stethaspis</i> sp.	chafer	R
<i>Rhaphidophoridae</i> sp.	cave weta	R

Introduced

<i>Apis mellifera</i>	bee	PL
<i>Bombus</i> sp.	bumble bee	PL
<i>Vespula germanica</i>	German wasp	PL

⁸ These lists probably only represent a small proportion of the total number of species present. Systematic surveys of the ED would increase the diversity of these lists.

8.8 GLOSSARY OF TERMS

Biodiversity

The variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Buffer

A zone surrounding a natural area which reduces the effects of external influences on the natural area. For example, shrubland or exotic plantations surrounding an indigenous remnant provide physical protection to it by reducing changes in wind and light, reducing the chance of weed infestation and providing a corridor for the movement of wildlife into and out of it, so that it is less isolated. Vegetation is often considered a buffer to waterways - riparian vegetation and wetlands protect both water quality and habitat from influences arising on the surrounding land.

Community

An association of populations of plants and animals which occur naturally together in a common environment.

Diversity and Pattern

Diversity is the variety and range of species of biological communities, ecosystems and landforms. Pattern refers to changes in species composition, communities and ecosystems along environmental gradients.

Ecological District

A local part of New Zealand where geological, topographical, climatic and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities.

Ecological Region

A group of adjacent Ecological Districts which have diverse but closely related characteristics, or in some cases a single very distinctive Ecological District.

Ecological unit

Vegetation type occurring on a particular landform, soil or rock type.

Ecosystem

Any inter-related and functioning assemblage of plants, animals and substrates (including air, water and soil) on any scale including the processes of energy flow and productivity (Myers *et al.* 1987).

Endemic

Occurring naturally in, and restricted to, a particular country, region or locality.

Exotic

Introduced to New Zealand; not indigenous.

Forest

Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which tree cover exceeds that of shrubs. Trees are

woody plants > 10 cm diameter at breast height (dbh) and shrubs are woody plants < 10 cm dbh. Tree ferns > 10 cm dbh are treated as trees (Atkinson 1985).

Gumland

Johnson and Gerbeaux (2004) describe gumland as land that is water-logged and has heathland vegetation. It was formerly occupied by kauri forest in northern New Zealand and was historically exploited for kauri gum.

Habitat

The part of the environment where a plant or animal lives. It includes both the living and non-living features of the area.

Indigenous

Native to New Zealand. This includes species which occur naturally in New Zealand *and* other places (e.g. migratory bar-tailed godwits which return to New Zealand from Siberia every summer). Species which only occur in New Zealand are 'endemic'.

Landform

Descriptor of the distinctive naturally formed physical characteristics of the land, e.g. hillslope, gully, ridge top, etc.

Linkages/Corridors

An area of habitat which links two or more other areas of habitat. Depending on the habitat type, the linkage or corridor can comprise indigenous vegetation (e.g. forest, shrubland), exotic vegetation (e.g. pine forest), aquatic habitat (e.g. a farm pond) or any other feature which assists the movement of indigenous species between habitat patches. Where a linkage exists between habitats the opportunities for genetic exchange within a species are greater, which enhances the viability of that population. For many species, in particular mobile fauna such as birds, a corridor does not have to be continuous to be effective. Small remnants can act as stepping stones between two larger habitats.

Natural area

A tract of land which supports natural landforms and predominantly native vegetation or provides habitat for indigenous species; identified as a unit for evaluation of ecological quality and representativeness and has potential to be ecologically significant.

Naturalness

The degree to which a habitat is modified and disturbed by human activity or introduced plants and animals and what natural values are retained despite these factors.

Rarity

This is a measure of commonness and may apply to entire ecosystems through to single species. It may refer to the conservation status of a species (see Appendix 3) or habitat type in any one of the following ways: formerly common but now rare; confined to a limited geographic area; at the limit of its range; or with a contracting or fragmented range. For example, old growth alluvial swamp forests are an extremely rare

ecosystem type in Northland, and indeed nationally, even though they contain no species which are regarded as rare in themselves.

Reedland

Reedlands comprise 20-100% cover of reeds, which are tall erect herbs emergent from shallow water, having branched leaves or stems that are either hollow or have very spongy pith, e.g. raupo, *Baumea articulata* and lake clubrush (Johnson and Gerbeaux 2004, adapted from Atkinson 1985).

Regionally significant

Assessed by the Department of Conservation (Northland Conservancy) to be either rare or threatened within the Northland Region.

Representativeness

The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area. This implies consideration of the full range of natural ecosystems and landscapes that were originally found in the reference area and how well they are represented in the environment today. The reference period for 'original' land cover used for this study was the immediate pre-human era (late Holocene). The identification and evaluation of the key representative natural areas in all Ecological Districts is the principal objective of the PNA Programme (Myers *et al.* 1987). In this survey the concept of representativeness was applied at the level of ecological units.

Riparian protection

Riparian vegetation performs important protective functions to streams such as shading, sediment control, primary production and provision of habitat linkages/corridors. Without riparian protection water temperature can rise depleting the available oxygen and leading to the death of aquatic life. Leaf litter and woody debris enters into the nutrient cycle of the stream providing food for the first consumer in the food web e.g. mayflies, caddisflies and stonefly. Riparian vegetation acts as a filter for non-point source water discharges.

Rushland

Rushlands comprise 20-100% cover of rushes, which are *Juncus* spp., that have stiff, erect stems or similarly non-flattened leaves (Johnson and Gerbeaux 2004, adapted from Atkinson 1985).

Secondary vegetation

Indigenous vegetation established after destruction or disturbance of the previous vegetation and which is essentially different from the original vegetation.

Shrubland

Indigenous vegetation in which the cover of shrubs and trees in the canopy is >80% and in which shrub cover exceeds that of trees. Trees are woody plants > 10 cm diameter at breast height (dbh) and shrubs are woody plants < 10 cm dbh. Tree ferns > 10 cm dbh are treated as trees. This definition combines both indigenous 'scrub' and 'shrubland' cf. Atkinson (1985). These two classes had to be amalgamated as 'scrub' adopts another meaning in this study.

Site

An area of habitat or habitats identified during the field survey phase of the PNAP. Some small habitats occurring in close geographical proximity, with similar characteristics and functions, have been grouped and addressed as one site e.g. forest remnants and wetlands within the same catchment.

Succession

Succession is the dynamic process whereby one plant community changes into another, involving the immigration and local extinction of species, coupled with changes in the relative abundance of different plant species (Crawley 1997). Change may be due to natural or human-induced factors, or both. Primary succession refers to the colonisation of a bare surface by vegetation (e.g. the greening of new volcano after it erupts out of the sea). Secondary succession refers to the process of colonisation and change after original vegetation has been destroyed, e.g. by fire, human-induced land clearance etc.

Survey no.

A sequential number given to each site (e.g. P06/095). The first letter and two figures refer to the NZMS 260 topographical map sheet on which the site is shown.

Sustainability

The long-term ecological viability of a natural area. This is related to the size and shape of the area as well as to threats from introduced pests.

Treeland

Vegetation in which the cover of trees in the canopy is 20-80%, with tree cover exceeding that of any other growth form, and in which the trees form a discontinuous upper canopy above either a lower canopy of predominantly non-woody vegetation or bare ground (Atkinson 1985). Treeland is mainly induced by grazing.

Vegetation type

The most detailed vegetation descriptive name employed in this study, defined by the composition of dominant canopy species, in order of abundance (e.g. taraire-puriri-kahikatea) and the structure of the vegetation, e.g. forest, treeland, shrubland, reedland, etc.

Viability

The ability of natural communities in the site to maintain themselves in the long-term in the absence of particular management efforts to achieve this. Regeneration and vigour of species within these communities and stability of communities and processes contribute to viability.

Wetland

An area of land that is permanently or intermittently waterlogged and supports flora and fauna adapted to wet conditions. Wetland is used as a broad definition for several types of aquatic systems, e.g. ponds, lakes, swamps, bogs, ephemeral wetlands, saltmarshes, mangroves, etc.

8.9 INDEX OF SITES

SITE NAME	LEVEL	SURVEY NO.	PAGE
Adams Road Wetland	2	P06/115	364
Allan Road Bush	1	P06/052	133
Aponga Settlement Scenic Reserve	1	Q06/179	293
Atchinson's Bush	1	Q06/001	289
Avoca Forest Remnants	1	P07/050	283
Avoca Road Kauri Remnant	1	P07/040	264
Avoca South Road Remnants	2	P07/049	388
Awakino and Flaxmill Swamps	1	P07/001	221
Awakino East Bush	1	P07/005	227
Awarua Trust Farm Wetland	1	P06/118	217
Boulder Bed Stream Bush	1	Q06/004	291
Boundary Swamp	1	P07/018	242
Callaghan Road Bush	2	P06/101	354
Coronet Road Bush	1	P06/044	121
David Carson Kauri Grove	1	P06/025	95
Davis Road Bush	1	P06/070	165
Davis Road Swamp	1	P05/106	63
Drake Road Forest Remnants	2	P06/096	346
Ferguson Forest	2	P06/006	314
Forks Bush	2	P06/031	322
Gammon Road Bush	1	P06/026	97
Gammons Road Forest Remnant	2	P06/042	328
Haast Road Bush	2	P07/012	374
Henly Bush	2	P06/033	324
Hikurangi Forest and Tokawhero Forest	1	P06/003	71
Horahora Road Gumland	1	P06/041	117
Horahora Stream Swamp Association	1	P06/075	175
Houto Cone Forest	1	P07/034	250
Huehue Forest and Maungakawakawa Forest	1	P06/013	83
Huehue Stream Riparian Forest and Wetland	1	P06/017	91
Hurihanga Stream Forest Remnants	1	P06/077	181
Inkster Road Remnants	2	Q06/002	396
James Road Bush	1	P06/083	191
Kahuwera Stream Shrubland	1	P06/010	77
Kaihu Scenic Reserve and Surrounds	1	P07/008	232
Kaikau Forest	1	P06/014	87
Kaikou Forest Mosaic	1	P06/002	69
Kaikou River Bush	1	P06/063	148
Kaikou River Forest Remnants	1	P06/093	200
Kaikou Riverine Bush	1	P06/064	150
Kaikoura Road Bush	2	P07/010	372
Kairara Bush	2	P07/009	370
Kakekake Stream Forest Remnants	2	P06/055	334
Karaka Road Bush	2	P07/022	380

Karaka Road Raupo Wetland	1	P07/021	246
Karaka Road Shrubland	1	P07/019	244
Kiekie Bush	1	P06/081	187
Kirikoponui Valley Bush	2	P07/035	382
Kirikopuni Road Remnant	1	P07/003	225
Kirikopuni Valley Road Wetland	2	P07/004	368
Kotaretahi Bush and Ngarurunui Shrublands	1	P06/065	152
Lovatt Road Wetland	1	P06/117	215
Mamaranui Farm Settlement Scenic Reserve and Surrounds	1	P07/041	266
Mangakahia Forest and Te Tarahiorahiri	1	P06/001	65
Mangakahia River Bush	1	P07/023	248
Mangakahia River Scenic Reserve	2	P06/098	350
Mangakahia Road Wetland	2	P06/114	362
Mangakahia Tributary Bush	2	P06/029	320
Mangaraupo Stream Bush	1	P06/032	102
Mangaroa Stream Riverine Forest and Gumland	1	P06/059	139
Mangaroa Wetland	1	P06/060	142
Mangu Road Bush	2	P06/071	342
Mangu Road Wetland	1	P06/099	208
Mapuna Road Remnants	1	P07/044	275
Marlow Road Bush	1	Q06/181	301
Maromaku Forest Remnants	2	Q06/182	397
Massey Road Remnant	1	P07/013	236
Mataraua Road Bush Remnants	2	P06/028	318
Matawaia Bush	1	P06/082	189
Maungaru Trig Forest	1	P07/038	258
Moore Road Mosaic	1	P06/119	219
Motatau Forest	1	P06/084	193
Motatau Road Raupo Wetland	2	P06/102	356
Murray Road Bush	2	P07/016	376
Nathan Road Shrubland	1	P07/007	230
North Houto Forest	1	P07/036	252
Okaharau Bush	1	P07/011	234
Omahu Road Bush	1	P06/054	137
Omahu Stream Riverine Forest	1	P06/053	135
Opouteke Road Forest Remnants	2	P06/045	330
Opouteke Stream Reserve and Surrounds	1	P06/043	119
Orakau Road Forest Remnants	2	P06/009	317
Orakau Road Wetland	2	P06/113	360
Orchid Road Podocarp Forest	1	P06/015	89
Otaenga Bush	2	P06/100	352
Otaenga Road/Awarua Riverine Forest	1	P06/035	107
Otaenga Swamps	1	P06/036	109
Otiria Stream Remnants	2	P07/051	390
Otiwhero Bush	1	P06/034	104
Paerata Wildlife Management Reserve	1	P07/055	287

Pakotai Scenic Reserve	1	P07/014	238
Pakotai Swamp	1	P06/047	125
Paraha Road Wetland	2	P06/112	358
Parker Road Riverine Association	1	P06/030	99
Patakorokoro Hill Bush	1	P06/067	158
Patutahi River System	1	P06/037	111
Pine (Awarau South) Swamp	2	P06/057	338
Pipiwai Stream Old Growth Forest Remnant	1	P06/061	144
Pipiwai Stream Riverine Forest Remnants	1	P06/062	146
Piraunui Stream Bush	2	P06/097	348
Pokapu Road Wetland	2	P05/115	310
Pokere Kahikatea Remnant	1	P06/073	170
Puhitia Road Bush	1	P06/090	196
Pukehorepa Bush Remnant	2	P06/049	331
Pukehuia Road Remnants	1	P07/042	270
Puketurua Bush	1	P06/094	202
Pukupu Bush	2	P07/045	384
Purua Scenic Reserve	1	Q06/180	298
Putaka Stream Forest Remnants	1	P06/046	123
Rakautao Forest	1	P06/011	79
Rata Tipene Road Harakeke Swamp	1	P06/079	185
Rata Tipene Shrubland	1	P06/078	183
Ruatoro Bush	1	P06/068	160
Sharp Road Bush	1	P07/015	240
Sommerville and Karaka Road Riparian Forest	2	P07/017	377
South Houto Forest and Maungaru Range	1	P07/037	254
Taikirau Railway Wetland	2	P06/087	344
Taikirau Swamp	1	P06/074	172
Taikirau Wetland and Shrublands	1	P06/072	167
Tangihua Forest	1	Q07/111	303
Tangihua Road Bush	2	Q07/109	400
Tangowahine Remnants	2	P07/053	394
Tangowahine Scenic Reserve	2	P07/046	386
Tangowahine Valley Road Remnants	2	P07/002	368
Tangowahine-Settlement Roads Remnants	2	P07/052	392
Tarairae Scenic Reserve	1	P07/054	285
Tarakihi Wetland and Environs	1	P06/076	178
Taurangakawau Stream Bush	1	P06/048	127
Te Ahu Ahu Wetlands and Environs	1	P05/048	58
Te Huia Falls Bush	1	P06/051	131
Te Kahukuri Stream Bush	2	P06/056	336
Te Oi Bush	1	P06/012	81
Te Opou Stream Forest	1	P06/004	75
Te Ruakokopu Stream Bush	2	P06/005	312
Te Toa Bush	1	P06/024	93
Te Whatianga Swamp and Environs	1	P06/066	154
Tokawhero Road Forest Remnants	1	P06/104	211

Tongariro Forest Remnants	1	P07/048	280
Totara Bush Associations	1	P06/069	163
Twin Bridges Riparian Forest	1	P06/050	129
Uekehea Habitat Mosaic	1	P05/049	61
Waihue Road Shrubland and Forest Remnant	1	P07/047	277
Waimata Scenic Reserve and Surrounds	1	P07/039	261
Waimatenui East Road Riverine Forest	1	P06/038	113
Waiokumurau Road Bush	2	P06/040	326
Waiokumurau Stream Riverine Forest	1	P06/039	115
Waiototakanga Stream Wetland	1	P06/106	212
Whangaiti Stream Shrubland	2	P06/058	340
William Upton Hewett Memorial Reserve	1	P06/095	205
Wilson Road Forest Remnant	1	P07/043	273
Worsp Road Bush	1	P06/092	198