Wairarapa Plains Ecological District

Survey report for the Protected Natural Areas Programme

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Department of Conservation
Te Papa Atawhai

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by Sarah Beadel, Alison Perfect, Aalbert Rebergen, John Sawyer

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Prepared by Alison Perfect[1], Sarah Beadel[1], Aalbert Rebergen[2] and John Sawyer[3]

[1] Wildland Consultants Ltd
P. O. Box 7137
Te Ngae
Rotorua

[2] Department of Conservation
P. O. Box 191
Masterton

[3] Department of Conservation
P. O. Box 5086
Wellington

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Cover photo: Waiorongomai Wetlands and Karaka Bush, Allsops Bay, western Lake Wairarapa. Photo: Aalbert Rebergen.

Foreword

This report describes the location and size of the most important natural areas in the Wairarapa Plains Ecological District that are not already protected for nature conservation. The Department of Conservation has recommended that those nationally important areas are protected. To achieve that protection the Department of Conservation now seeks to establish good working relationships with landowners, and other agencies involved in environmental protection in the district.
This report is one of a series produced as part of New Zealand's Protected Natural Areas Programme (PNAP). The long-term goal of the PNAP is… *to protect examples of the full range of indigenous biological and landscape features in New Zealand*…
The Department of Conservation has compiled this report during the past three years while undertaking a comprehensive field survey of the district. It has also collated all existing information about the indigenous biological resources of the district.
The Wairarapa Plains Ecological District is rich in terms of indigenous plant and animal life, both of species and communities. The plains support a complex mosaic of vegetation types and land uses from internationally important wetland areas at Lake Wairarapa, to swamp forest remnants throughout the plains, and coastal plant and animal communities at Ocean Beach. However, the existing network of protected natural areas in the Wairarapa covers only a small proportion of the Ecological District and is inadequate to conserve, in perpetuity, the Ecological District's biological diversity.
The protection of nature in the Wairarapa Plains presents significant challenges. On-going management of the district to conserve its distinctive natural diversity will be achieved by a collective approach to nature conservation involving landowners, communities, and land management agencies such as the Department of Conservation. We all have a role to play in conserving nature.
I believe that by identifying areas of biological importance in the Wairarapa Plains we are better placed to work collectively for their protection and on-going management. We, as a community, may even look towards restoring some of the indigenous biological resources of the district that have already been lost.

Allan Ross
Conservator
Wellington Conservancy
Department of Conservation

Executive summary

Wairarapa Plains Ecological District (117 633 ha) lies in the southern North Island between the Rimutaka and Tararua Ranges to the west, and the eastern Wairarapa hills and Aorangi Ranges to the east. The southern coastal boundary of the Ecological District is at Palliser Bay and the northern boundary is where the Ruamahanga River emerges from hill country near Mount Bruce. The Ecological District is primarily a sedimentary basin produced by marine and alluvial deposition, but also contains localised low hills. Lake Wairarapa and the smaller Lake Onoke are distinctive features; their shorelines retain some of the extensive wetlands that previously dominated the Ecological District.

People have inhabited the Ecological District for many centuries. Prior to human settlement, podocarp-dominant forest covered most of the Ecological District. Maori fires in the seventeenth century destroyed most original podocarp forest. Native grasslands, fernland, swamps and scrub then replaced the forests. Arrival of Europeans in the mid-nineteenth century brought further change to indigenous ecosystems. Much of the remaining forest was removed, smaller wetlands were drained, and native fernland and scrub cleared. Indigenous ecosystems have now largely been replaced with exotic pasture and tree shelter-belts. More recently, diversion and barrage construction on the Ruamahanga River has halted the frequent widespread flooding which maintained the extensive wetlands of the southern plains, most of which have now also been drained.

A survey was carried out to document the remaining natural areas in the Wairarapa Plains Ecological District to provide a basis for planning for their protection. The following approach was used for that survey.

The Ecological District was subdivided into two bioclimatic zones: coastal (extending inland for approximately 1 km); and semi-coastal - lowland (the remainder of the Ecological District). The Ecological District was also divided into 14 land types, based on landform and underlying geology. Those land types were used, in conjunction with bioclimatic zones and information on vegetation type, to classify study areas into comparable ecological units. That framework of ecological units was used in combination with a set of standard criteria to select Recommended Areas for Protection. The criteria were: present versus past extent, landscape and ecological diversity, naturalness, size, shape of area, surrounding landscape, fragility and threat, ecological viability and long-term sustainability, and representativeness. Other factors taken into account included species distribution limits, rarity and endemism (of flora and fauna), and the values contained within existing protected areas.

Areas of indigenous vegetation in the district were mapped and described in a draft reconnaissance report. Subsequently this ecological information was examined to assess the relative value of the natural areas identified. These natural areas were then assigned to one of five categories: Recommended Area for Protection (RAP); areas of High and Moderate-High and moderate biological importance (that did not qualify as RAP); or none of the above. Field surveys of potential RAPs (i.e. the highest priority for protection) was then undertaken. Nineteen Recommended Areas for Protection were identified and are described in this report. They cover approximately 1250 ha (1.1%) of the Wairarapa Plains Ecological District and

include examples of remnant primary forest, secondary forest, scrub and shrubland, and wetland communities (both freshwater and estuarine).

The RAPs are the highest priorities for protection because they are the largest or best examples of inadequately protected indigenous vegetation in the district. In addition, 182 natural areas were identified and ranked, in terms of their biological importance, into three categories: High, Medium or Low. While not necessarily the best or largest examples of their ecological association or ecological unit in the district, these sites were nevertheless considered to be significant areas of indigenous vegetation or wildlife habitats. Their protection would enhance the Ecological District's network of protected natural areas and provide opportunities for ecological restoration. If protection is not possible for RAP's then the relative priority for protection of those other sites will increase.

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1. Introduction

The Protected Natural Areas Programme (PNAP) was established in 1983 to address Section 3(1)(b) of the Reserves Act 1977:

the preservation of representative samples of all classes of natural ecosystems and landscapes which in the aggregate originally gave New Zealand its own recognisable character.

New Zealand has been mapped into 286 ecological districts determined by landscape and ecological patterns. Ecological districts are grouped into 68 ecological regions, as the basis of the PNA Programme (McEwen 1987).

Implementation of the PNAP for the Wairarapa Plains Ecological District involves: identification of natural areas which maintain the unique indigenous character of the district; and recommendation that the most significant of those areas be protected. The Conservation Management Strategy for Wellington Conservancy (DOC 1996a) identified this Ecological District as a high priority for PNAP survey. Priorities for protection were identified in that strategy including: wetlands; riparian areas with natural vegetation; areas with a portion of pre-European vegetation; regenerating areas with good connections to large areas of indigenous vegetation, and habitats significant for threatened species and geological features.

The Wairarapa Plains Ecological District is situated in the southern North Island between the Rimutaka and Tararua Ranges to the west, and the eastern Wairarapa hills and Aorangi Ranges to the east (Figure 1). It is the sole Ecological District in the Wairarapa Plains Ecological Region. The Ecological District is primarily a sedimentary basin produced by marine and alluvial deposition. It also contains localised low hills, with several gravel-bed streams draining the surrounding ranges through the Ruamahanga River. Lake Wairarapa and the smaller Lake Onoke are distinctive features and retain some of the extensive wetlands that previously dominated the district. A recent history of fires and agricultural development has left few, generally small, forest and shrub remnants; which decrease in number towards the coast. The vegetation over the small area of coastline in the district varies from plant communities supporting mainly adventive species to diverse indigenous sand dune communities.

The initial phase of PNAP survey was carried out in 1996. Areas of indigenous vegetation in the Ecological District were identified, their extent mapped, and comments on vegetation and ecological features recorded. That information was presented in a draft reconnaissance report (Sawyer *et al*. 1997).

An evaluation was then undertaken of the existing data to assess the relative value of all natural areas identified in phase 1 of the PNAP survey.

Those natural areas were assigned to one of five categories: Recommended Area for Protection (RAP); areas of High, Moderate-High or Moderate biological importance (that are not RAP's); or none of the above. Field surveys were then undertaken of areas identified worthy of RAP status. Those RAP's were then described and mapped and included in this report. The ranking of all other sites was completed using reconnaissance survey information unless otherwise specified.

This report also includes overviews of the physical character of the Ecological District, an outline of survey methods, a vegetation history map, and summaries of remaining natural vegetation features currently protected, and features that warrant protection. Common plant names used in the text are included in Appendix 8. A glossary of technical terms used in this report is also attached as an appendix (Appendix 9).

FIGURE 1: LOCATION OF WAIRARAPA PLAINS ECOLOGICAL DISTRICT

2. Location and setting

The Wairarapa Plains Ecological District covers 117 633 ha from its southern coastal boundary at Palliser Bay to the tapering northern tip where the Ruamahanga River emerges from the hill country of the Puketoi and Tararua Ecological Districts (Figure 1). It is an elongated valley of alluvial and marine terraces dominated in the south by Lake Wairarapa and its environs, including Lake Onoke. These form the largest wetland system in the lower North Island. The Ruamahanga River meanders down the eastern side of the plains, receiving the flows of several rivers from the forested ranges to the west and drier, grazed hills to the east.

The relief is generally low and flat, remaining under 20 m a.s.l. over a large area around Lake Wairarapa and reaching 300 m at the district's northern edge. The large, active West Wairarapa Fault divides the plains from the foothills of the Tararua and Rimutaka Ranges. Other smaller faults dissect the plain itself.

Partly as a result of the low stature of fire-induced vegetation present in the 1800's, the area was one of the earliest developed for agriculture and settlement. Today the dominant species of the plains are pasture grasses, shelter belts of macrocarpa (*Cupressus macrocarpa*) and pine (*Pinus* spp.), and riparian vegetation of species such as crack willow (*Salix fragilis*). The remaining indigenous vegetation comprises generally small, isolated remnants. Even the wetlands around Lake Wairarapa are much reduced from their former extent.

2.1 GEOLOGY AND PHYSIOGRAPHY

The following account is based on information provided in King (1930), Kite (1952), Kingma (1967), Kamp (1982), and McEwen (1987), and an interpretation of topographical maps (NZMS260 series).

Wairarapa Plains Ecological District is made up of low-lying Pleistocene and Holocene marine and alluvial deposits. Gravel terraces, fans and alluvial plains form the floor of the Wairarapa basin. This depression is 77 km long and generally 20 km wide, but narrows to *c.* 15 km in the southern quarter, and very sharply to close just a few kilometres north of Masterton. The terrain slopes gradually from its maximum altitude of 300 m a.s.l. in the north, to a low altitude approaching Lakes Wairarapa and Onoke, and the Palliser Bay coast.

In the west, this plain is bordered by the steep foothills of the high greywacke Tararua and Rimutaka Ranges, the boundary closely following the line of the continuous West Wairarapa Fault, which has moved measurably both vertically and horizontally within historic time. On the south-east boundary the Aorangi greywacke range forms an equivalent sharp rise. Most of the eastern boundary runs north where the plains meet the generally moderately steep outskirts of the eastern Wairarapa hill country.

The major river is the Ruamahanga which flows from the very northern extent of the plains, to Lake Onoke on the Palliser Bay coast. Both the Ruamahanga and its main tributaries, the Waingawa and Waiohine, arise in the Tararua Range. Building of the basin floor has been, in large part, the result of an abundant supply of greywacke detritus carried by these rivers, and their fans have restricted the Ruamahanga River to the eastern side of the valley. The Tauweru and other smaller

rivers bring finer sediment from the east, derived from generally softer tertiary mudstone and sandstone formations.

Late Pleistocene aggradation surfaces in the northern two-thirds of the basin are older and considerably higher than those further south, rising gradually from *c.*40 m a.s.l. to 120 m at Masterton and a maximum of 300 m on terraces in the extreme north. The major constituents of the plains in this portion are coalescing gravel fans produced by the Tauherenikau, Waiohine, and Waingawa Rivers during the final cold phase of the Pleistocene, and northward of these, rather older late Pleistocene marine gravel deposits, in which the Ruamahanga is well entrenched. The fans have stony surfaces whereas the terraces, being older, have a veneer of loess and consequent smooth, rounded slopes.

South of Featherston, Morrisons Bush, and Martinborough, a Holocene alluvial plain, falls from 30-40 m a.s.l. to low elevations about Lakes Wairarapa and Onoke, which together with associated lagoons and wetlands lie in the area occupied by an ocean embayment *c.*6 000 years ago. Sand and shingle form wide beaches along the sea coast and an impermanent barrier to Lake Onoke. East of the lake there is only a narrow beach below a terrace escarpment.

Riparian flats in the northern half of the district are narrow, as the courses of the entrenched rivers are virtually straight. Shingle banks occur commonly along the Waingawa and Waiohine, and down the Ruamahanga to just south of the Waiohine confluence. Below this point the Ruamahanga winds on a shallow gradient over a floodplain up to 4 km across, and develops a bed of finer gravel, sand and silt. Further downstream a very shallow gradient produced a silt bed and encouraged widespread flooding of the low surrounds before river diversion works produced the 'Ruamahanga cut-off' at Lake Wairarapa and redirected the river to Lake Onoke.

Wetlands form extensive surrounds to the many very small to large lagoons occurring parallel to the eastern shore of Lake Wairarapa and occasional swampy areas occur further south. Lake Wairarapa frequently flooded the lower Wairarapa Valley prior to flood control measures, extending for kilometres east and south to join Lake Onoke. Flats of mud and sand form a band up to 1 km wide on the eastern side of the lake where the water is no more than 1 m deep. The continued existence of the shallow lake, despite large amounts of alluvial deposition, is associated with continued subsidence of the south-west Wairarapa basin along the West Wairarapa fault (Kamp 1982; Clark 1989). A series of non-coastal dunes also occur on the east side of the lake (C. Ogle pers. comm.) They are thought to have developed by north-westerly winds lifting fine sediments from lake shore turf areas (exposed when lake water levels were low). Deposition of that sand resulted in the formation of non-coastal dunes. Those dunes have now been substantially modified and are now not part of a dune building process.

Late Pleistocene marine gravel terraces (also found in the north of the basin) form a distinctive upland in the south-east, flanking the Aorangi Ranges. The surfaces slope gradually from 100-200 m a.s.l. down to terminal escarpments some 20-40 m above the alluvial plain, broken by some minor stream flats and local very steep-sided narrow gullies. Narrow remnants of the same formation occur frequently along the margin of the plains west of Lake Wairarapa, at Masterton, and between the Tauherenikau and Waiohine Rivers.

Terrace-like wave-cut benches remain on an uplifted block of older Late Pleistocene siltstone and sandstone strata, south of Lake Wairarapa and west of the Ruamahanga River and Lake Onoke. An outcrop of the same formation 15 km long and up to 2 km wide forms a prominent rise above the west side of the Ruamahanga floodplain, opposite Martinborough.

Strong dissection of most of the above block west of Lake Onoke has resulted in the largest area of hilly land (*c.*100 m) in this ecological district. A few small salient hills, no more than *c.*100 m high above base level, occur far to the north. Most notable is Tirohanga Hill, an outcrop of a Pliocene sedimentary rock formation typical of the hill country which flanks either side of the head of the tectonic basin.

2.2 SPECIAL GEOLOGICAL FEATURES

Kenny and Hayward (1996) identified five special geological features in the Ecological District. Of those the Waiohine faulted terraces is the only geological site in the district accorded international importance. Those terraces show progressive displacement of late Quaternary alluvial terraces of the Waiohine River along the West Wairarapa Fault and moved significantly during the large earthquake of 1855. Four sites are regionally significant (Table 1).

TABLE 1: IMPORTANT GEOLOGICAL SITES AND LANDFORMS IN THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT (*FROM KENNY AND HAYWARD 1996*)

*IMPORTANCE & +VULNERABILITY	NAME:	GRID REF.:	RAP, PROTECTED AREA OR OTHER NATURAL AREA[1]
A2	West Wairarapa Fault, Waiohine River faulted terraces	S26 121148	Waiohine Valley Bush; Woodside Bush Fragments (site numbers 0605A&B, and 0611C)
C2	Masterton Fault (Waingawa Fault)	S26 273232	Waingawa Swamp (RAP 3)
C3	Eparaimu uplifted marine benches, Palliser Bay	S28 944787	–
C3	Palliser Bay Pliocene-Pleistocene section	S28 925748	Whangaimoana Beach (Site number 0129)
C3	West Wairarapa Fault, Waingawa River faulted terraces	S26 265302	Waingawa River Bush (RAP 2)

** Importance rankings (Kenny and Hayward 1996:6) are:*

A international scientific importance;
B national scientific, educational or aesthetic importance;
C regional scientific, educational or aesthetic importance.

+Vulnerability rankings (Kenny and Hayward 1996:6) are:

1 highly vulnerable to complete destruction or major modification by humans;
2 moderately vulnerable to modification by humans;
3 unlikely to be damaged by humans;
4 could be improved by human activity;
5 site already destroyed (not neccessarily by human activity).

[1] Only part of the geological site or landform might occur in the RAP or protected natural area listed.

Another significant feature of the Ecological District is the many lakes. Lake Wairarapa is the third largest lake in the North Island, but is only a few metres deep. The Wairarapa Valley was previously a shallow arm of the sea and was infilled relatively recently, mainly by alluvial deposits derived from the western ranges. Lake Onoke is a lagoon formed by the development of a shingle spit. During periods of low rainfall the reduced output allows an extension of the spit to build up, blocking the exit to the sea and forming a true lake.

2.3 SOILS

The soils of the Wairarapa Plains are predominantly alluvial, formed on greywacke from the west and siltstone-mudstone from the east. The major rivers of the area - the Ruamahanga, Tauherenikau, Waiohine, and Waingawa - have constructed gravel fans and river terraces throughout the area. Lacustrine deposits are localised, whereas loess, tephra, and gravel deposits are found throughout the district, and limestone occurs mainly in the eastern areas. Yellow-grey and yellow-brown soils occur on older terraces and recent soils from alluvium on the floodplains (Kamp 1982; Vucetich *et al.* 1996). Gley and organic soils are found around Lake Wairarapa (Thompson 1982). A series of non-coastal dunes exists to the east of the lake (C. Ogle pers. comm.) and their soils are comprised of fine sands and silt deposits. Those dunes have now been substantially modified.

On the eastern fans the soils are shallow, drought inclined and mainly stony. On the terraces and rolling land in eastern, drier parts, the soils have compact heavy textured subsoils. Winter drainage is poor in these areas and soils are dry cut readily in summer. In areas to the north and north-west, with higher rainfalls, subsoils are siltier and more friable with more consistent moisture retention. Soils on the limited areas of hilly land from Tertiary rocks show a similar range. Fertile alluvial soils occur on the river flats ranging from stony, sandy and silty well drained soils bordering rivers to poorly drained, heavier textured soils in back-swamps and around Lake Wairarapa. Limited areas of sandy soils on dunes border this lake (McEwen 1987).

2.4 CLIMATE

The following account is based on Thompson (1982).

The Wairarapa Plains weather is generally sunny, with many areas experiencing over 2000 sunshine hours per year, but rainfall is highly variable and there can be large, occasionally sudden, temperature variations. The weather is influenced to a large extent by the mountains of the Rimutaka and Tararua Ranges which shelter the upper Wairarapa Plains from the predominantly westerly winds, resulting in generally calm or light winds with few wind gusts, and low rainfall. The area near the Aorangi Ranges is similarly sheltered from southerly and easterly winds, whereas the southern plains are frequently windy and experience strong gusts and higher rainfall. For example, average monthly wind speeds at Lake Wairarapa are around 11-14 knots, compared to 4-5 knots at Gladstone (1974-77). Featherston and Waiorongomai, beside the Rimutaka foothills of the middle and lower district, receive *c.*1 326 mm and 1 540 mm rainfall annually, whereas Ruamahanga (centre

of the district) and Gladstone (eastern side) receive *c.*706 mm and 935 mm respectively (1941-1970).

Rainfall is more variable in summer than winter, and in areas further away from the western ranges. The district is relatively dry with the mean annual rainfall ranging from *c.*800-1300 mm, however in parts of the adjacent Tararua Range it reaches 6 000 mm/year and can lead to serious flooding on the plains.

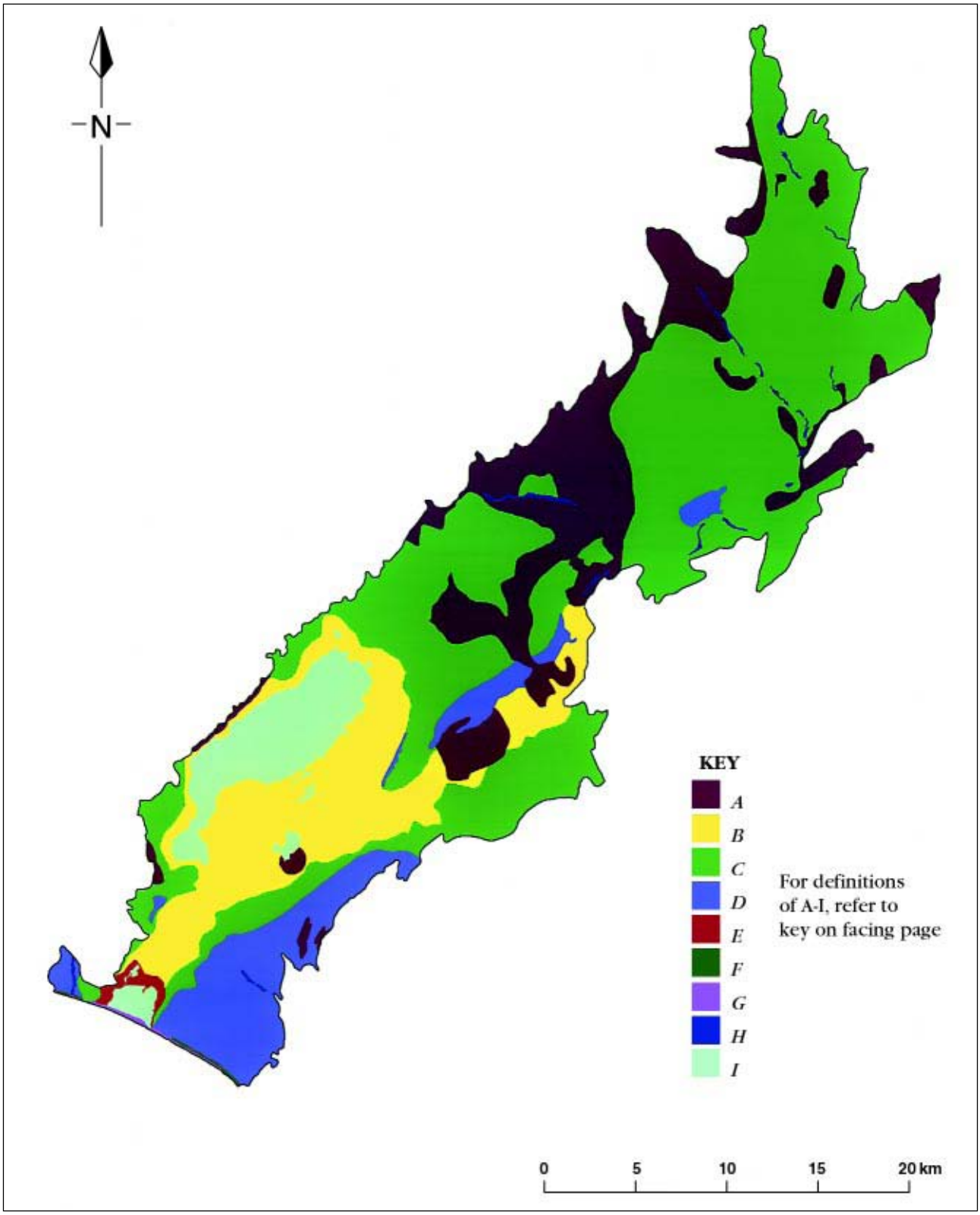
Wairarapa, like other regions east of the main ranges, can experience sharp and sudden changes of temperature, as well as daily variations of up to 11°C in sheltered inland places. The area generally has relatively cold winter night minima of 1-3°C and warm summer afternoon temperatures of 20-23°C, although day temperatures occasionally rise above 23°C in summer. Mean daily temperatures range from *c.*7-17°C, with mean annual temperatures around 12°C. In spring and summer dry fohn winds are common, and dry spells or droughts usually occur at least annually in the lower rainfall area.

Frost is most common in the north-west near the hills (i.e., away from coasts and lakes). Snow occurs rarely; about once a year.

2.5 HISTORICAL VEGETATION COVER *CIRCA* 1853

"The vegetation of the Wairarapa in early European times was characterised by variety. The whole area was a patchwork of grass, swamp, scrub and forest mingled in varying proportions." (Hill 1963). The Wairarapa was previously clothed in totara (*Podocarpus totara*) forest in drier areas, kahikatea (*Dacrycarpus dacrydioides*) and matai (*Prumnopitys taxifolia*) forest and raupo (*Typha orientalis*), harakeke (*Phormium tenax*), and sedges or rush swamps in wetter areas, however most Wairarapa forests were lost to widespread fires around the seventeenth century (Fyfe 1990; Smith 1853; Hill 1962 & 1963). By the mid-nineteenth century (see Figure 2) the remaining forest was concentrated in a large (*c.*9 000 acre) block between the Waiohine and Waingawa Rivers. Smaller forests remained along parts of the Waipoua and Ruamahanga Rivers, the west shore of Lake Wairarapa, on Tirohanga Hill, and in a band extending south and west from the main forest block through Morrisons Bush to the Tauherenikau River. A large forest on the eastern Wairarapa hill country extended into the plains along the Tauweru River. Podocarps (totara, kahikatea, matai) and broadleaf species, e.g., karaka (*Corynocarpus laevigatus*), kotukutuku (*Fuchsia excorticata*), and titoki (*Alectryon excelsus*) dominated the canopy, with mahoe (*Melicytus ramiflorus* subsp. *ramiflorus*), houhere (*Hoberia populnea*), makomako or wineberry (*Aristotelia serrata*), kamahi (*Weinmannia racemosa*), *Pittosporum* spp. and koromiko (*Hebe stricta* var. *stricta* and *Hebe stricta* var. *atkinsonii*) in the understorey (Smith 1853; Hill 1962 & 1963). Elsewhere forests were replaced by native grasslands, covering around half the plains, as well as extensive fernland, particularly rarahu or bracken (*Pteridium esculentum*), swamps, and scrub in a complex mosaic of vegetation types (Hill 1962). Ferns and grasses with *Gingidia* and toetoe grew on dry terraces, and where the ground was very stony, ferns and tutu were found (Smith 1853). Matagouri (*Discaria toumatou*) was probably a common post-fire scrub component, as well as manuka (*Leptospermum scoparium*) and kanuka (*Kunzea ericoides* var. *ericoides*). The grasslands were dominated by *Agrostis, Poa, Rytidosperma* and *Festuca* species with tutu (*Coriaria arborea*) and herbs (e.g., speargrass (*Aciphylla squarrosa*) and *Gingidia*) also present, joined later by wilding *Brassica* species.

FIGURE 2: VEGETATION OF WAIRARAPA PLAINS ECOLOGICAL DISTRICT ca 1853



Groves of swamp forest and podocarp-broadleaved forest were scattered throughout, particularly along rivers, and were likely to be diverse assemblages retaining most typical forest species (Smith 1853; Hill 1962 & 1963). 'Extensive' Maori cultivation was recorded in parts of the district (Smith 1853) and Ngati Kahungunu had villages in the upper valley and to the east of Lake Wairarapa (Hill 1962).

Non-forested swamps occurred throughout the plains but dominated the area around the lakes, where flooding frequently covered land for kilometres and connected the two lakes. This resulted from water being backed up behind the sand bar that intermittently blocked the exit of Lake Onoke to the sea. *Cortaderia toetoe* and raupo were probably common with scattered or local harakeke, sow thistle (*Sonchus* sp.), karetu (*Hierochloe redolens*), *Zoysia pungens*, *Glyceria stricta*, *Epilobium* sp., *Myriophyllum triphyllum, Myriophyllum robustum*, *Myriophyllum propinquum*, *Cardamine* sp., *Rorippa palustris*, *Ranunculus macropus*, bachelor's button (*Cotula coronopifolia*), and other species (Hill 1962 & 1963).

During European settlement much of the remaining forest was removed to provide timber and land for agricultural development or for construction, smaller swamps were drained, and native fernland and scrub cleared or grazed (Hill 1962 & 1963; Ropiha 1994). More recently diversion and barrage construction on the Ruamahanga River has halted the frequent widespread flooding which maintained the extensive wetlands of the southern plains, and many of these areas have also been drained (Department of Conservation 1991).

Key to map, opposite.

A *Podocarp-broadleaved forest and swamp forest (species probably included kahikatea, matai, totara, karaka, kotukutuku, titoki, broadleaf), local black beech (e.g., western shores of Lake Wairarapa, south-eastern hills).*

B *Non-forest wetlands (sedges, toetoe, harakeke, raupo, sow thistle, tall grasses) and scattered groves of swamp forest. Turfs on mud and sand flats around Lake Wairarapa.*

C *Native grassland (*Agrostis, Poa, Rytidosperma *and* Festuca *spp. with tutu, speargrass and* Gingidia*), fernland, scattered wetlands (forest and non-forest) and small groves of trees. Patches of scrub (manuka, kanuka, tauhinu and matagouri probably dominant) throughout.*

D *Probably mainly fern and scrub on low hills to the east and to seaward, tending to forest in gullies.*

E *Estuarine and saline wetlands around Lake Onoke including turfs, oioi, saltmarsh, sedgeland, and rushland.*

F *Cliff vegetation (whaririki, toetoe, grasses and herbs) edging marine terraces at coast.*

G *Duneland with pingao, spinifex, hinarepe,* Calystegia soldanella, Raoulia australis *and* Pimelea arenaria *above the unvegetated littoral zone.*

H *River shingle beds predominantly unvegetated but with grasses and scattered shrubs likely in the more stable areas.*

I *Lakes.*

Sources: Smith 1853; Hill 1962, 1963; Nicholls 1974; Sawyer et al. 1997

3. Flora

3.1 GENERAL

In the Wairarapa Plains Ecological District 479 indigenous and 236 adventive plant species have been recorded (see Appendices 1 and 2). Separate plant species checklists are also available for many of the natural areas (e.g., Druce 1971a & b, 1974; Rebergen 1996c). A complete bibliography of plant checklists for the Wairarapa Plains Ecological District is included in Sawyer (1998).

3.2 THREATENED AND LOCAL PLANTS

In the Wairarapa Plains Ecological District, 21 nationally threatened plant species have been recorded (Table 2). Several of those (*Lepidium oleraceum*, *Pterostylis micromega*, *Atriplex cinerea,* and *Sebaea ovata*) are now thought to be extinct in the district. *Fissidens berteroi* (a rare species of moss) is known from only one other location in New Zealand. More information about these threatened plant species is available in Sawyer *et al.* (1998).

Thirty-three species of regionally threatened plants are believed to occur in the district (Appendix 3). Several species, including *Mimulus repens* (native musk), *Melicytus* sp. "Blonden"*, Eryngium vesciculosum* (sea holly) and kokehohe, are not considered nationally or regionally threatened, but are known only to occur at a very few sites.

Species present in the district which are generally uncommon in the North Island include *Carex cirrhosa, Carex buchananii, Hypsela rivalis,* and *Eleocharis pusilla* (Ogle *et al*. 1990).

3.3 DISTRIBUTION LIMITS

Leptinella maniototo reaches its northern limit of distribution at Lake Wairarapa.

TABLE 2: NATIONALLY THREATENED PLANTS OF THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT

SCIENTIFIC NAME	COMMON NAME	NATIONAL STATUS (Cameron *et al.* 1995)	NATIONAL PRIORITY (Molloy and Davis 1994)
Amphibromus fluitans		Critical	O
Anogramma leptophylla	Jersey fern	Endangered	O
Atriplex cinerea	grey salt bush	Local	–
Austrofestuca littoralis	hinarepe	Rare	–
Centipeda minima		Local	–
Coprosma wallii		Vulnerable	B
Coprosma sp. "v" (of Eagle 1982)		Vulnerable	A
Crassula ruamahanga		Rare	–
Fissidens berteroi		Endangered	A
Ileostylus micranthus	pirita	Local	–
Isolepis basilaris		–	B
Korthalsella salicornioides	mistletoe	Insufficiently known	O
Lepidium oleraceum	Cook's scurvy grass	Endangered	B
Mazus novaezeelandiae	dwarf musk	Vulnerable	C
Pimelea arenaria	sand pimelea	Rare	–
Pittosporum obcordatum	heart-leaved kohuhu	Rare	B
Pterostylis micromega		Critical	A
Streblus banksii	large-leaved milk tree	Local	–
Teucridium parviflorum		Vulnerable	C
Tupeia antarctica	mistletoe	Rare	B
Urtica linearifolia	swamp nettle	Vulnerable	B

*The **national status** of plants used in Table 2 was taken from Cameron* et al. *(1995). The terms used have the following definitions:*

***Critical**: Taxa with an extremely high probability of extinction in the wild within the immediate future (a proposed IUCN category).*

***Endangered**: Taxa in danger of extinction and whose survival is unlikely if causal factors continue operating.*

***Vulnerable**: Taxa believed likely to move into the Endangered category in the near future if causal factors continue operating.*

***Rare**: Taxa with small populations which are not Endangered or Vulnerable but are at risk.*

***Insufficiently known**: Taxa that are suspected but not definately known to belong to any of the above categories because of a lack of information.*
***Local**: Taxa that are sufficiently restricted to warrant noting and some monitoring.*

*The **national priority** of plants used in Table 2 was taken from Molloy and Davis (1994). The terms used have the following definitions:*
*Category **A**: highest priority threatened species.*
*Category **B**: second priority threatened species.*
*Category **C**: third priority threatened species.*
*Category **O**: species which are threatened in New Zealand but which are known to be secure in other parts of their range outside New Zealand.*

4. Fauna

Wildlife in the Ecological District was historically more diverse and abundant than at present, a circumstance typical of New Zealand. Early writers noted kereru and high numbers of kaka in Wairarapa forests, as well as parakeet, huia, weka and tui; with rivers and wetlands harbouring a diverse range of birds (Hill 1962). Other species that were present include takahe and fernbird (see also Moore *et* al. 1984). A checklist of species recorded from the Ecological District is in Appendix 5.

Significant sub-fossil cave deposits of birds at Ruakokoputuna indicate that the present bird fauna is greatly reduced from that of the past (McEwen 1987). Sub-fossil records for species of lizard and frog indicate a much broader range over the North Island than is suggested by the present distribution of relict island populations. Skeletal material from lizards *Cyclodina alani* and *Hoplodactylus duvaucelii* has been found in several North Island caves, including the Haurangi caves near Martinborough (Worthy 1987a). Similarly skeletal material of frog species (*Leiopelma markhami* and *L. waitomoensis*) has been found in the Wairarapa (Worthy 1987b).

Of the larger introduced animals, possums, pigs and red deer are present. Pigs were present in scrub, fern and swamp country by the mid-1800s (Hill 1962), probably at high densities, as Smith (1853) noted an abundance of both pigs and eels to the north of the district.

4.1 THREATENED ANIMALS

Twenty-five nationally threatened animal species (19 birds; 5 fish; 1 reptile) have been recorded from the Wairarapa Plains Ecological District (Table 3). In addition, fifty-nine regionally threatened species (46 birds, 6 fish, 7 lizards) have been recorded in the district listed (Appendix 4).

4.2 BIRDS

A total of 75 native and 26 introduced bird species have been recorded, including 19 nationally threatened birds (Table 3) and 46 regionally threatened birds (DOC, 1996a; Appendix 4).

Native birds, including five threatened species, regularly use the Lake Wairarapa wetlands (DOC 1996a & b) which support over 10 000 waterfowl. The eastern lake shore is particularly important for feeding, roosting and breeding of waterfowl, while the Lake Onoke spit is an important breeding area for Caspian tern. The Ruamahanga River bed is also important for breeding of banded dotterel and black-fronted dotterel, and bittern are also present. New Zealand dabchick breed near Lake Wairarapa, the most southern breeding location in New Zealand. Marsh crake and spotless crake occur at the Lake Wairarapa wetlands.

TABLE 3: NATIONALLY THREATENED ANIMALS OF THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT (FROM SAWYER *et al*. 1997)

COMMON NAME	SCIENTIFIC NAME	NATIONAL STATUS (DOC 1996A)	NATIONAL PRIORITY (MOLLOY & DAVIS 1994)
Asiatic whimbrel	*Numenius phaeopus variegata*	Rare	–
Australasian bittern	*Botaurus poiciloptillus*	Vulnerable	O
Banded dotterel	*Charadrius bicinctus*	Vulnerable	C
Black fronted tern	*Sterna albostriata*	Vulnerable	B
Black stilt	*Himantopus novaezealandiae*	Endangered	A
Caspian tern	*Sterna caspia*	Vulnerable	O
Curlew sandpiper	*Calidris ferruginea*	Rare	–
Grey duck	*Anas superciliosa superciliosa*	Vulnerable	–
Least golden plover	*Pluvialis fulva*	Rare	–
New Zealand dabchick	*Poliocephalus rufopectus*	Vulnerable	C
New Zealand falcon	*Falco novaeseelandiae*	Vulnerable	B
New Zealand pigeon	*Hemiphaga novaeseelandiae novaeseelandiae*	–	B
Royal spoonbill	*Platalea leucorodia regia*	Vulnerable	O
Sharp-tailed sandpiper	*Calidris acuminata*	Rare	–
Variable oystercatcher	*Haematopus unicolor*	Rare	C
White-fronted tern	*Sterna striata*	–	C
White heron	*Egretta alba modesta*	Endangered	O
Wrybill	*Anarhynchus frontalis*	Vulnerable	B
Yellow-crowned parakeet	*Cyanoramphus auriceps auriceps*	–	C
Fish			
Banded kokopu	*Galaxias fasciatus*	Rare	C
Brown mudfish	*Neochanna apoda*	Vulnerable	B
Giant kokopu	*Galaxias argenteus*	Threatened	B
Koaro	*Galaxias brevipinnis*	Rare	C
Lamprey	*Geotria australis*	Indeterminate	–

4.3 REPTILES

The seven lizard species found in the Ecological District are all classed as regionally threatened (Appendix 4). The ornate skink is present in bush remnants north of Masterton, the copper skink in localised populations on the plains and along the Tararua foothills, and the speckled skink has been recorded at Mikimiki and near Carterton. These are the only records of this species in the Wellington Conservancy (Department of Conservation 1995). The only inland records of spotted skink in the North Island are from Wellington Conservancy; (Dyerville, and from near Martinborough).

4.4 FISH

Twelve species of freshwater fish have been recorded in the district. Of these the banded kokopu, brown mudfish, giant kokopu, and koaro are nationally threatened (Table 3), and the black flounder, blue-gilled bully, common smelt, longfinned eel, redfinned bully, and shortfinned eel are regionally threatened (DOC 1996a; Appendix 4).

Whitebait, flounder, eels, perch and brown trout all provide a significant recreational fishery. Although generally depleted from historical levels, eels are still exploited commercially, as are flounder in Lake Onoke. Traditionally the wetlands provide a major eel and whitebait fishery, with Lake Onoke being one of the most important sites in the lower North Island (Sawyer *et al*. 1997). Some marine fish enter the Lake Wairarapa wetlands to feed and spawn (see Hicks 1993).

5. Human history and land use

5.1 HISTORY

The Wairarapa was home to the Ngati Kahungunu and about 780 people lived here in 1849, around half this number in villages to the east of Lake Wairarapa. The largest village of 196 people was at Kaikokirikiri in the upper valley. Not all of these settlements were permanently inhabited.

"The Maori economy was based largely on subsistance crops such as kumara (*Ipomoea batatas*) and the semi-cultivated fern root supplemented by hunting and collecting. Karaka, tawa (*Beilschmiedia tawa*), tutu, titoki, and fuchsia or kotukutuku all bore edible berries that were highly prized. Ducks in the lake and birds in the forest provided abundant quarry for the hunter. Eels in the lake and swamp, and fish in the lake and sea were very important items of native diet." (Hill 1962:14)

The scale and intensity of change increased with the arrival of European settlers. Proximity to Wellington and the predominance of grass and fernland made the Wairarapa an attractive proposition to prospective farmers and in 1844 the first sheep station in New Zealand was established at Wharekaka. Hill (1963:88) described the Wairarapa as the "area that first felt the impact of many thousands of livestock spread over several hundred thousand acres".

Throughout the district "burning of scrub, fern and tussock to promote fresh growth for stock was regularly carried out and casual travellers also fired the fern ... Where, however, the forest was fired, tall *Sonchus* spp. immediately sprang up" (Hill 1963). Some native herbs (particularly speargrass) and small shrubs were cleared from open country by hand, and exotic pasture grasses sown, e.g., sweet vernal (*Anthoxanthum odoratum*), timothy (*Phleum pratense*), Yorkshire fog (*Holcus lanatus*), cocksfoot (*Dactylis glomerata*) and couch (*Elytrigia repens*) (Hill 1963). Other adventive species arrived with stock and goods, and spread from Maori and European gardens. Sheep, cattle, horses, rabbits, possums, goats, hedgehogs, cats, dogs, ship rats and Norway rats, mustelids, exotic fish and several invertebrate species were introduced or spread into the area, joining the pigs and kiore already present.

Sheep and cattle browsing and trampling severely affected the native vegetation. Cattle preferentially browsed broadleaf shrubs and young trees and "... thus had significant effects upon the species composition of all forest areas to which they had access, and in the absence of fences, these areas must have been quite extensive. The fern and scrub was also opened up by trampling and thus made available for sheep. 'Cattle ... speedily destroy the fern and grass takes its place...the fern has, in many parts, disappeared, and thousands of acres of the native rye-grass, and other grass are now to be found' (Allom 1849, p. 21)." Sheep targeted various plant species and rapidly reduced their distribution (Hill 1963:88).

Today the dominant species of the plains are pasture grasses, shelter belts of macrocarpa, pampas grass, radiata pine and riparian willows (such as crack willow). Sheep, beef, and dairy farming are the main forms of agriculture, with market gardening and increasing viticulture.

5.2 THREATENING PROCESSES

The major threats to the indigenous ecosystems and habitats of the Wairarapa Plains Ecological District are habitat destruction (such as draining of wetlands) and habitat fragmentation (through subdivision or partial clearance) associated with commercial land management and land-use change. The spread and effects of adventive species (e.g., goats, possums, pigs, deer, mustelids, rodents, magpies, hedgehogs, old man's beard, Cape ivy, marram) such as competition, predation, or habitat alteration, are a severe and often insidious threat to indigenous communities and species populations. Many forest and scrub remnants are unfenced and grazed by stock or feral animals which deplete or eliminate the understorey and damage existing trees and shrubs. Over time the species density has reduced and the canopy deteriorated as gaps are not replaced by new growth. If the causal factors continue to operate, these areas are eventually reduced to treeland (the Wairarapa contains several remnants at this stage of deterioration) and gradually disappear altogether. However, many remnants retain their regenerative capability and can be restored to good condition with appropriate management (e.g., stock exclusion, pest control).

Other threats include fire, coastal erosion and protection works, water pollution, soil erosion, and physical damage to communities and their substrate by visitors and recreational vehicles (DOC 1996a). Management including adequate monitoring is required to protect indigenous habitats, in addition to legal protection.

5.3 RELATION TO ADJOINING DISTRICTS

The following districts border the Wairarapa Plains Ecological District (McEwen 1987a & b)

Tararua Ecological District (Tararua Ecological Region) to the west

"Steep, high, dissected hills and mountains of Tararua and Rimutaka Ranges, rising to 1571 m ..., heavily faulted and broken by major rivers with steep hill slopes dropping to small river flats; severe erosion" (McEwen 1987a:6). Strong westerlies, frequent cloud cover, high rainfall, and snow at high altitudes. Extensive forests remain with alpine communities above the treeline. There are large areas of fire-induced gorse shrubland and smaller areas of exotic forest around the northern Rimutaka Range.

Puketoi Ecological District (Pahiatua Ecological Region) to the north

A long narrow inland district of low ranges and dissected hills, generally above 300 m a.s.l., including the steep Puketoi Range bordering Eastern Wairarapa. Cool and wet, with drainage to the Ruamahanga River in the south, and Manawatu River in the north. Most of the original cover of podocarp-broadleaved native forest was cleared for farming. A little riparian black beech (*Nothofagus solandri* var. *solandri*) and red beech (*Nothofagus fusca*) is found in the north-west only.

Eastern Wairarapa Ecological District (Eastern Wairarapa Ecological Region) to the east and north-east

Moderately to very steep hill country including distinctive 'taipos' (steep hills with sharp relief). Diverse soil parent materials including mudstone, sandstone, igneous rock and breccia, conglomerate, limestone, alluvium and coastal sands from Cenozoic and Mesozoic periods; areas of moderate to severe soil erosion. Prone to drought with very warm summer and moderate winter temperatures. Extensive farming and forestry with some large and many small native forest and shrubland remnants. Fires around 200 years before European settlement left the district largely covered by scrub, grass, fern and tussockland.

Aorangi Ecological District (Aorangi Ecological Region) to the south-east

A steeply dissected greywacke and argillite range reaching 983 m, cut by north-easterly faults, and draining into the Ruamahanga River and the sea. Mostly intact indigenous vegetation ranging from coastal forest, scrub, and grassland in the south to higher stature vegetation and black beech, red beech and silver beech (*Nothofagus menziesii*) forests in the north, with localised areas affected by logging, fires and revegetation. Strong winds and torrential rain frequently occur in the district.

6. Outline of survey methods

6.1 RECONNAISSANCE PHASE

The reconnaissance phase of the Wairarapa Plains Ecological District PNAP survey was carried out in 1996. Existing ecological information was compiled from published and unpublished sources (see References and Selected Bibliography) and study sites were identified using topographic maps and aerial photographs. Sites were inspected in the field where possible, or viewed from an adjacent area or high point through binoculars. Information from sources such as unpublished file reports from earlier inspections was used to describe some areas. Data was collected on the "Phase 1" plot sheet in Appendix 11 and presented in a draft reconnaissance report which included maps of identified sites and a preliminary table of protected areas (Sawyer *et al.* 1997). Subsequent information on potential and existing study sites and protected areas was incorporated into this report as it became available.

6.2 ECOLOGICAL DISTRICT BOUNDARIES

The Ecological District was originally described by McEwen (1987b) using the criteria of geology, climate and topography. It's boundaries were published at 1:500 000 scale and have been refined for the more detailed maps used in this report on the basis of landform (Figure 1). The Ecological District boundary was digitised into a Geographic Information System (GIS) held by Department of Conservation (Wellington Conservancy).

6.3 BIOCLIMATIC ZONES

Bioclimatic zones refer to the broad distribution of vegetation zones along both altitudinal and coastal to inland gradients where a particular climatic regime dictates the character of the natural ecosystem (Leathwick et al. 1995). Bioclimatic zones used in this report were slightly modified from the definitions of Muerk (1984) and include a coastal zone.

Two broad bioclimatic zones have been identified for the Wairarapa Plains Ecological District (Figure 3).

- *Coastal*: extending approximately 1 km inland from the sea coast.
- *Semi-coastal - Lowland*: the remainder of the district, which is less than 300 m a.s.l., and generally has a warm summer climate. Winters are cool and are harsher further inland.

The bioclimatic zone boundaries were digitised into a Geographic Information System at the Wellington Conservancy office, Department of Conservation.

6.4 GEOLOGICAL AND LANDFORM UNITS

The Wairarapa Plains Ecological District has been stratified into 14 landform units (Figure 4). Those units were used in conjunction with bioclimatic zonation (above), and vegetation type information, to classify study sites into comparable ecological units for the assessement of representativeness. The geological and landform units were digitised into a Geographic Information System held by the Department of Conservation, Wellington Conservancy. The following is a description of the landform units of the Wairarapa Plains Ecological District:

1. Sand and shingle beaches

Along the western sea coast, forming wide benches and a barrier to Lake Onoke. Further east, a narrow rock formation and poorly developed beach occurs below a terrace escarpment.

2. Estuarine channels

Within the area of salt water influence (shown by vegetation, salt water fauna, or brackish water) and extend up the seaward stretches of rivers. This affects a substantial length of the Ruamahanga River, although the landward limit and strength of the influence is not consistent.

3. Estuarine lakes

The waters of Lake Onoke exit to the sea at the south-east and are influenced by salt water input via this channel. During periods of low rainfall the formation of a sand bar across the exit results in raised lake levels until removed by natural or human means, with high tides or winds bringing waves over the bar. The smaller Pounui Lagoon is connected to Lake Onoke and is also brackish.

4. Lakes

Consist of Lake Wairarapa and some small, associated open water bodies.

5. Mud and sand flats

Extend for up to 1 km into Lake Wairarapa along the eastern side, where the water is no more than 1 m deep.

6. Wetlands

Occur widely around the many lagoons bordering the east side of Lake Wairarapa. Occasional sizeable swampy areas occur further south, as far as the coast.

7. River shingle beds

Occur frequently along the beds of the Waingawa and Waiohine Rivers, and the Ruamahanga as far south as the Waiohine confluence.

8. Riparian flats

Bordering rivers and streams in the northern half of the district are narrow, owing to entrenchment, but from about Masterton to near Martinborough the Ruamahanga River meanders across an alluvial flood plain up to 4 km wide. Small streams cutting through terraces in the south-east and south-west, nearing the coast, are bordered by flat to nearly flat land.

9. Older aggradation plain

Formed of marine gravel terraces, through Pleistocene infilling of a former seaway, and wide spreading shallow fans of greywacke detritus carried from the eroding Tararua Range by the Tauherenikau, Waiohine, and Waingawa Rivers during the last glacial stage of the Pleistocene era. These fans have stony surfaces, but a loess veneer lends a smoothness to the terraces (a maximum altitude 300 m a.s.l.).

10. Younger aggradation plain

A post-Pleistocene alluvial plain falls gradually from 30-40 m a.s.l. a little south of Featherston, Morrisons Bush, and Martinborough to low elevations about Lake Wairarapa and thence to Lake Onoke and the coast. Non-coastal dunes also occur on east side of lake which are windblown deposits from the exposed bed of Lake Wairarapa (C. Ogle pers. comm.).

11. Marine terraces

Late Pleistocene marine gravel terraces form a prominent, though partially dissected, upland, overall sloping gradually from 100-200 m a.s.l. below the Aorangi Range down to terminal escarpments *c.* 20-40 m a.s.l. above the southern alluvial plain. Small remnants of the same formation occur intermittently along the western margin of the district as far north as the Waiohine River.
South of Lake Wairarapa and westward of Lake Onoke, terrace-like remnants of a wave-cut bench occur in an otherwise hilly landscape. Inland, a 15 km long and 1-2 km wide, undulating to locally hilly outcrop of the same Pleistocene sedimentary strata, forms a conspicuous rise above the west side of the Ruamahanga flood plain.

12. Incised gullies

Narrow, deep, and steep sided, and are limited to local dissection of terraces.

13. Low hills

Mainly found in an area some 100 ha north-west of Lake Onoke. A very few small hills (less than 100 m high) occur elsewhere, the most notable being Tirohanga Hill, an exceptional outcrop of Pliocene sedimentary rock, near the northern head of the Manawatu Basin.

14. Rivers

Drain the plains. However, only a small section of river was mapped linking Lake Wairarapa to the estuarine channel land type.

6.5 VEGETATION AND HABITAT CLASSES

The vegetation of the Wairarapa Plains was classified into fifteen vegetation and habitat classes (Perfect & Beadel 1998 – see Table 4). Site information collected during the initial phase of the survey in 1996 on the plot sheet attached in Appendix 12 and presented in Sawyer *et al.* (1997) was used to determine which vegetation classes were present in each study area. That site information was checked using aerial photographs and through discussions with staff of the Department of Conservation.

FIGURE 3: BIOCLIMATIC ZONES IN THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT

FIGURE 4: LAND TYPES IN THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT

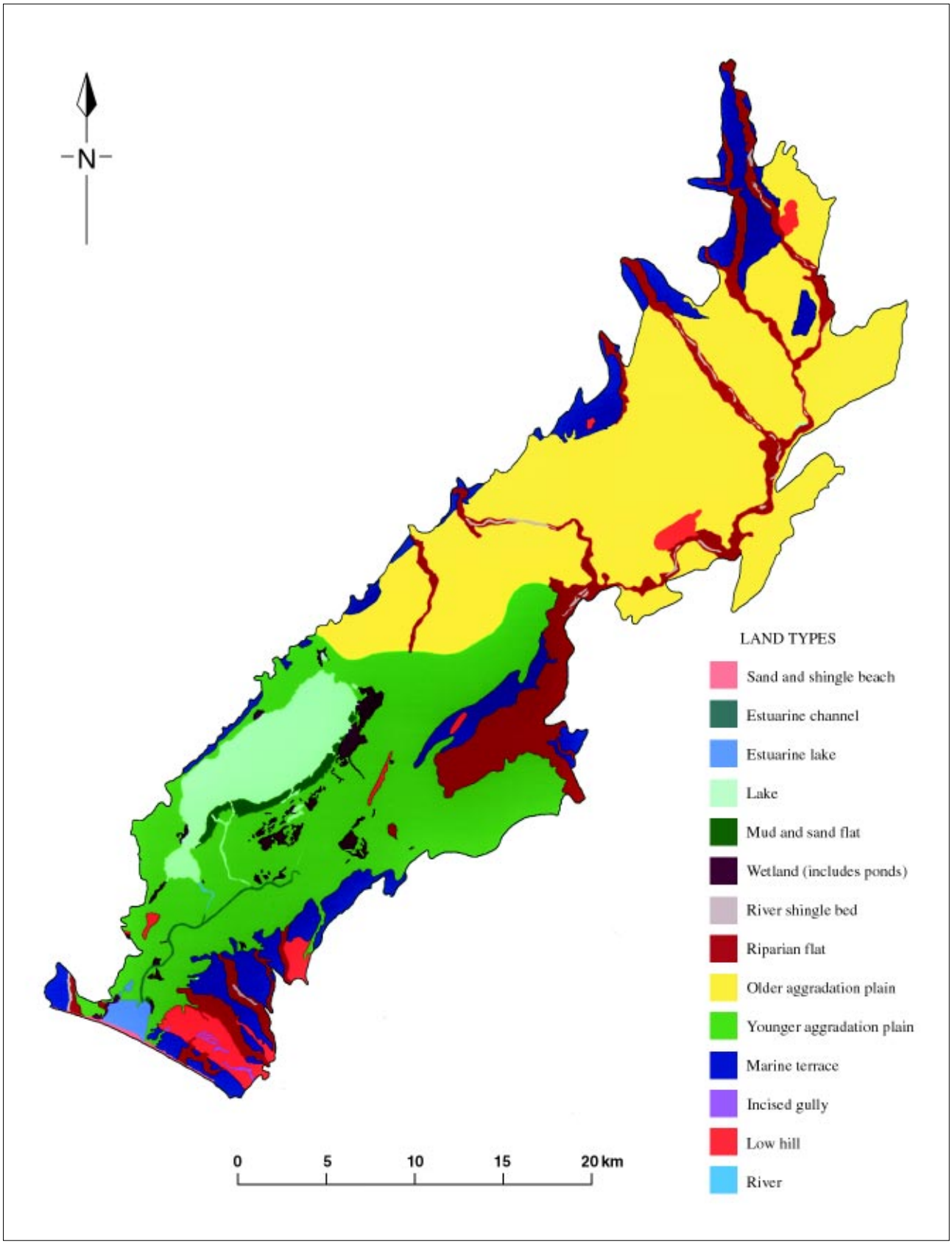


TABLE 4: VEGETATION AND HABITAT CLASSES OF THE WAIRARAPA PLAINS ECOLOGICAL DISTRICT

HABITAT CLASS	APPROXIMATE EXTENT IN 1853	APPROXIMATE EXTENT IN 1998	1998 AREA AS % OF 1853 AREA
Primary forest	22,400	467	2
Modified primary forest	-	157	-
Secondary forest	-	189	-
Secondary scrub and shrubland	10,046	371	4
Treeland	-	197	-
Cliffs	122	42	34
Freshwater wetland (non-forest, emergent vegetation includes willow forest)	18,143	2,447	13
Lakes	7,803	7,942	-
Duneland (including duneslacks)	223	159	71
Estuarine wetland or saline wetland	747	49	7
Tussockland	57,440	18	0.03
River shingle bed	617	5	0.8
Estuarine channel	-	97	-
Unvegetated (including water other than lakes and estuarine channels)	-	123	-
TOTAL	117,811	12,263	10.4

6.6 EVALUATION

Maps (scale *c.* 1:71 430) produced in the reconnaissance stage of the study showed the extent of indigenous vegetation in the Ecological District (Sawyer *et al.* 1997). Those were compiled into a single base map for the Ecological District.

Maps showing bioclimatic zones, and geological and landform units were prepared to lay over the base map. The type and extent (in ha) of all ecological units (i.e., each unique combination of bioclimatic zone, landform type, and vegetation class) was then estimated from existing information for each study site and protected natural area. These data were entered into a computer database (Microsoft Excel 4.0), and used to derive tables showing the extent of natural vegetation of each class on different land types in the coastal and semi-coastal - lowland bioclimatic zones when compared with estimated historical vegetation[1]). An indicative estimate

[1] Historical vegetation cover (*c.* 1853) was estimated for each landform unit (within each bioclimatic zone).

was made from this information as to which ecological units were most common in the district, which units have been most reduced from their former extent, and which units are in danger of being eliminated from the district altogether. The total remaining area of protected and unprotected indigenous vegetation in each land type and bioclimatic zone was also recorded (Perfect & Beadel 1998).
The data were used in conjunction with site information to assess the relative ecological importance of the study sites. Assessments used the following primary and secondary criteria.

Primary Criteria

1. *Present versus past extent*
An estimate of the relative extent of an indigenous vegetation class remaining in the ecological district compared with that in an 1853 reconstruction.

2. *Landscape and ecological diversity*
The diversity of physical and ecological features, and the patterns that exist within the area(s) under consideration.

3. *Naturalness*
Most mainland ecosystems are modified but the degree of naturalness that remains in each site is an important consideration.

4. *Size*
Areas which are relatively large (i.e., compared to the mean size of remaining areas of indigenous vegetation in an ecological district) are preferred to small areas. Larger areas are likely to be more viable in the long term.

5. *Shape of area*
Areas which are primarily compact are preferable to areas which are highly convoluted or fragmented.

6. *Surrounding landscape*
The degree to which the area is protected/buffered by this.

7. *Representativeness*
The most important criterion. One or more of the best examples of the characteristic communities within relevant land types in each bioclimatic zone were identified as natural heritage sites.

8. *Fragility and threat*
An assessment of known or likely threats and the capability of the vegetation or habitat to resist change initiated by the threat agent(s).
(cf. O'Connor *et al*. 1990; Myers *et al*. 1987; Diamond 1975; Young and Mitchell 1994; Shaw 1994; Ogle 1981; Whaley *et al*. 1995; Beadel *et al*. 1996a & b, & 1998)

Other Criteria

The presence of special or rare features and the area's rating as a fauna habitat were also assessed (see the Ecological Assessment Sheet).

Status of Recommended Areas for Protection

All sites were classified into one of five categories according to its condition and relative importance in terms of the criteria described above. That classification was undertaken using an assessment form that was designed using the above criteria (based on Whaley *et al*. 1995). Some sites were found, on the basis of existing information, to be either fully protected; no longer present; composed predominantly of exotic vegetation; outside the Ecological District boundary or otherwise too small or poor quality for inclusion. Those sites were excluded from the classification. Further field assessment, especially of lower ranked sites, may lead to slight changes in category.

1. *Recommended Area for Protection*
   These sites are the best quality or only remaining unprotected representative examples of indigenous vegetation or wildlife habitats on particular land types within the bioclimatic zone in the Ecological District. This category also includes intact altitudinal or geographic sequences across the Ecological District, or diverse assemblages of land type, vegetation, and bioclimatic character. These sites are described and mapped in this report.

2. *High*
   These sites are also good quality representative examples of vegetation and/or wildlife habitat which complement RAP's, and existing protected natural areas. They may include:
   a. relatively small sites with vegetation types or plant taxa under-represented or not represented in protected natural areas;
   b. relatively large areas with features which are represented in protected areas or RAP's but which are nevertheless worthy of protection;
   c. sites containing vegetation types which would once have been more common in the ecological district and are unrepresented in protected natural areas or RAPs, but which have been degraded by weed invasion, animal damage, or other similar agents.

3. *Medium*
   These sites are often smaller than RAP's or "High" sites, with interesting or special features, although the ecological unit(s) is/are usually in a lower quality condition.

4. *Low*
   These sites include natural areas that contain features represented in the above categories. These areas are often smaller, and may be considered modified, but are nevertheless significant.

5. *Unprotected natural areas not ranked as RAP's or of biological importance*
   These sites are generally those that do not support significant populations or communities of indigenous plants and animals. They are often highly modified and comprised predominantly of exotic species; or too small to be considered viable.

Ecological Assessment Sheet
Wairarapa Plains Ecological District 1997

Site no. Grid reference
Area Date
Altitudinal range

	Primary
	Modified primary
	Secondary
	Exotic
	Induced

Landscape Diversity

Bioclimatic Zone	No. of land types	No. of vegetation types

EVALUATION CRITERIA	L	M	H
Present versus past extent: Relative extent of vegetation class remaining in ecological district compared with that in1853 reconstruction. H 0-10% vegetation class remaining in ecological district M 11-30% vegetation class remaining in ecological district L 31-100% vegetation class remaining in ecological district			
Landscape and ecological diversity: H An altitudinal sequence; or multiple vegetation types, land types, and bioclimatic zones M Spans more than 1 bioclimatic zone or more than 2 land types L Single feature (includes 1 land type in 1 bioclimatic zone, and 1 or more vegetation types)			
Naturalness: Involves the assessment of the degree an area (e.g. vegetation ecosystem) has been free from the effects of human disturbance and intervention. An assessment of the indigenous content of the area. H Low-level or nil human disturbance (includes secondary vegetation established following natural disturbance) M Moderate level of human disturbance (e.g. relatively good quality secondary vegetation developed following human disturbance, low levels of selective logging 20 or more years earlier) L Exotic/induced/heavily logged			
Size of area (ha)[1]: Compared to mean size of remaining natural areas in ecological district.			
Shape of area (ha): H Primarily compact, no major constrictions M Irregular or convoluted L Highly convoluted or discontinuous			
Surrounding landscape : H Part of a continuous natural landscape M Part of a semi-continuous natural landscape/one of many discrete natural areas - some linkages L Very isolated from other areas			
Fragility and threat : H High level of threat, likely to destroy or substantially degrade/damage the vegetation or habitat M Threats present but low likelihood of occurrence; vegetation relatively resilient or able to recover from threatening process L No threats known			
Representativeness[1]: Combination of above criteria; above rankings used as guide to evaluate representativeness. H Best, relatively large, good quality example; only example of type which was formerly more extensive M Similar to other areas that occur elsewhere in the district L Degraded, small, better quality examples exist elsewhere in the ecological district.			

[1] The values for **representativeness** and **size of area** will differ for each Ecological District depending on the extent of remaining indigenous vegetation.

The values for **representativeness** and **size of area** will differ for each Ecological District depending on the extent of remaining indigenous vegetation.

Ecological Assessment Sheet (Page 2)

Secondary Criteria

Known notable features ☐ **None known**

Distribution limits	
Nationally rare veg. Types	
Taxa endemic to ED	
Features rare in district (*incl. only known site for taxa in ED*)	
SSWI rank	
Other	

Threatened and local plants **Notes:**
Cameron *et al*. (1995)

Class:	No:
Extinct	
Critical	
Endangered	
Vulnerable	
Rare	
Insufficiently known	
Local	

Wildlife
Molloy *et al*. (1994)

Category:	No. of spp.:
A	
B	
C	
I	
O	
M	

Category:	No. of spp.:
Extinct	
Presumed extinct	
Endangered	
Threatened	
Rare	
Regionally threatened	
Occasionally rare	

Category		**Justification**
RAP		
High		
Medium		
Low		
X		

6.7 FIELD SURVEY

Field survey of 23 sites was undertaken (RAPs 1-19 and sites 0806A, 0903, 0619 and 0229). Field data was collected using the plot sheet presented in Appendix 10 (from Beadel 1994). Vegetation types were determined using aerial photographs and then mapped in the field. Significant features, conditions and threats to those sites were identified. Landowners were contacted to obtain permission for access to their property. A letter outlining the reasons for the survey was given to those landowners that were visited.

RAP 8 was not field surveyed because adequate information was already available. Only parts of the Lake Wairarapa Wetland Stewardship Area Extension (RAP 12) were visited; the remainder was described from existing information sources. Mangaroa (RAP 16) and Fensham Bush (RAP 4) also were not field surveyed and the site descriptions included in this report are from existing sources and aerial photographs.

7. What natural vegetation remains?

Historical Vegetation Cover of the Ecological District (Section 2.5) was used to calculate the approximate extent and proportions of vegetation and habitat classes that were previously present on the various land types in each bioclimatic zone. The year 1853 was used as a baseline against which to compare present vegetation (rather than the more commonly used benchmark of 1840), as information on the vegetation cover was available for that time (e.g., Smith 1853; Hill 1962, 1963). Table 4 shows the difference between historic and current extent of each vegetation and habitat class.

Much of the vegetation cover of the time was recovering from widespread fires that had occurred approximately 200 years previously. The vegetation, if allowed, would have continued to develop into different communities, such as forest. Maori were also settled in the valley in the 1850s, although this was still prior to extensive European settlement and the associated radical changes to land cover (Section 5.1). The district now retains an indigenous cover (excluding lakes) of approximately 4,321 ha (3.7% of the district). Approximately 2% remains of the forest present in the semi-coastal - lowland bioclimatic zone in the 1850s, while none remains in the coastal bioclimatic zone (Table 5). Scrub, shrublands and tussockland have also been heavily reduced with only *c.*0.5% remaining of the 1850s cover in the semi-coastal - lowland bioclimatic zone and around 2% in the coastal bioclimatic zone (Table 6). These are generally small remnants of vegetation less than 10 ha. The forests are predominantly kahikatea, while totara is often found in dense stands on more gravelly soils. Larger forest remnants tend to be more diverse, including matai, hinau, karaka, rewarewa (*Knightia excelsa*), titoki, tawa, *Pittosporum* spp. and kowhai (*Sophora microphylla*). On higher ground, particularly on the slopes of the west and east, stands of kanuka and black beech merge into the foothills of the Rimutaka, Tararua and Aorangi Ranges. Most of the matagouri shrublands, rarahu (bracken) fernlands and native grasslands extant in 1853 have been eliminated.

TABLE 5: PAST (1850) AND PRESENT EXTENT OF PRIMARY FOREST, WAIRARAPA PLAINS ECOLOGICAL DISTRICT

	BIOCLIMATIC ZONES	
EXTENT	COASTAL	SEMI-COASTAL – LOWLAND
Past	100 ha	22 300 ha
Present	0 ha	467 ha
Present extent as a % of past	0%	2.1%

Extensive wetland areas around Lake Wairarapa and smaller areas around Lake Onoke still support a complex and diverse pattern of plant communities. River diversion and drainage schemes have reduced the size of wetlands from their former extent (Table 7). Those wetlands now represent approximately 18.6% and 13% of the 1850's wetland vegetation cover of the coastal and semi-coastal – lowland

bioclimatic zones respectively. The character of most existing wetlands has been affected to varying degrees by eutrophication and the spread of adventive plants, such as willow (*Salix* spp) and tall fescue (*Festuca arundinacea*).

TABLE 6: PAST (1850) AND PRESENT EXTENT OF SCRUB, SHRUBLAND, FERNLAND AND TUSSOCKLAND, WAIRARAPA PLAINS ECOLOGICAL DISTRICT

	BIOCLIMATIC ZONES	
EXTENT	COASTAL	SEMI-COASTAL – LOWLAND
Past	1,100 ha	66 400 ha
Present	24 ha	365 ha
Present extent as a % of past	2.2%	0.5%

Extensive wetland areas around Lake Wairarapa and smaller areas around Lake Onoke still support a complex and diverse pattern of plant communities. River diversion and drainage schemes have reduced the size of wetlands from their former extent (Table 7). Those wetlands now represent approximately 18.6% and 13% of the 1850's wetland vegetation cover of the coastal and semi-coastal - lowland bioclimatic zones respectively. The character of most existing wetlands has been affected to varying degrees by eutrophication and the spread of adventive plants, such as willow (*Salix* spp) and tall fescue (*Festuca arundinacea*).

TABLE 7: PAST (1850) AND PRESENT EXTENT OF FRESHWATER WETLANDS (NON-FORESTED) IN WAIRARAPA PLAINS ECOLOGICAL DISTRICT

	BIOCLIMATIC ZONES	
EXTENT	COASTAL	SEMI-COASTAL – LOWLAND
Past	360 ha	18 600 ha
Present	67.6 ha	2 428.5 ha
Present extent as a % of past	18.6%	13.1%

Turf communities vary from a sparse cover (e.g., south of Oporua Floodway) to dense mats, with *Crassula sinclairii, Glossostigma elatinoides, Isolepis cernua, Limosella lineata, Ranunculus limosella*, and *Lilaeopsis novae-zelandiae*.
Marshland is extensive and includes large areas of short rushes (e.g., *Juncus articulatus*) along the eastern lake where raupo and willow dominate nearby swamps, with local oioi (*Leptocarpus similis*) and *Carex sinclairii*. Tall swamp vegetation is rather restricted in size. On the western side of Allsops Bay there are manuka wetlands and *Baumea rubiginosa*-pukio (*Carex secta*) sedgeland, vegetation types that are uncommon on the eastern shore.
Small ponds are dominated by swamp grasses and herbs (e.g., Mercer grass (*Paspalum distichum*); water purslane (*Ludwigia palustris*)) while larger ponds (and the eastern Wairarapa lakeshore) support turfs. *Ruppia polycarpa* occurs in the lake itself, while ponds include more dense vegetation such as *Myriophyllum triphyllum, Azolla filiculoides*, and *Lemna minor* (Ogle *et al*. 1990). Hornwort (*Ceratophyllum demersum*) occurs locally (Shaw 1998). Little is known of the

aquatic communities of the lakes and streams, or the extent to which they have been affected by eutrophication, siltation from soil erosion, pollution, adventive species introductions and changes to drainage and shade-providing riparian vegetation.

Along the coastline of Palliser Bay diverse duneland communities remain on the Lake Onoke spit and parts of Ocean Beach. However, expanding populations of marram (*Ammophila arenaria*) and gorse (*Ulex europaeus*), the decline of indigenous species such as pingao (*Desmoschoenus spiralis*), and local extinctions of rare indigenous plants, such as *Atriplex cinerea*, are cause for concern.

8. What values are currently protected?

The term 'Protected Natural Area' (PNA) was defined by the Department of Lands and Survey (1984) as ... *a legally protected area, characterised by indigenous species or ecosystems, in which the principal purpose of management is retention of the indigenous state ...*

Existing protected areas in the Wairarapa Plains Ecological District amount to approximately 10 500 ha (approx. 9%) of the district area. These areas are described in Appendix 6 and their locations marked on Figure 5 and include reserves administered by the Department of Conservation, Queen Elizabeth II covenants, and sites protected under the Tasman Accord. They exclude areas protected specifically for reasons other than wildlife conservation (e.g., recreation reserves and marginal strips).

Lake Wairarapa Wetland Stewardship Area (including Lakes Wairarapa and Onoke, Pounui Lagoon, some associated wetlands, and duneland on the Lake Onoke spit) is the largest protected area in the district and is administered by the Department of Conservation. Matthews and Boggy Pond Wildlife Management Reserves are contiguous with the above area. Moore *et al.* (1984) and Ogle *et al.* (1990) provide accounts of the vegetation and bird fauna in and around the Lake Wairarapa wetland complex. Further coastal vegetation (additional to Lake Onoke spit above) occurs in the Ocean Beach and Coastal Cliffs Conservation Areas.

Alluvial swamp and semi-swamp forest occurs at Carter Scenic Reserve, with other small examples in the Kahutara, Oporua, Tuhitarata Bush and E.C. Holmes Memorial Scenic Reserves.

Queen Elizabeth II covenants comprise *c.*310 ha of the protected areas in the Wairarapa Plains Ecological District (see Appendix 6).

8.1 REPRESENTATIVENESS

Approximately 9% of the Wairarapa Plains Ecological District is within the existing protected natural area network. However, that area is not spread evenly amongst the range of land types and their respective indigenous cover classes.

The remaining estuarine and freshwater lakes and mud and sand flats are well represented within the existing reserve network. Protected examples of these land types (Lakes Onoke and Wairarapa) occupy more or less the same area as they did in 1853. Sand and shingle beaches and estuarine channels are also reasonably well-protected within existing reserves (*c.*60% and 36% of their 1853 extent respectively).

Approximately 30.5% of the 'wetland' land type in the semi-coastal - lowland bioclimatic zone is currently protected. However, this figure is misleading as over 90% of the Ecological District's historical wetlands have been drained and subsequently reclassified as aggradation plains and riparian flats land types. As a result, not all types of freshwater wetland habitat are well-represented in reserves. For example, while *c.*72% of non-forest freshwater wetlands are protected, few examples of tall swamp vegetation remain in protected natural areas.

The most conspicuous gaps in the reserve network with regard to land type are in protection of indigenous habitats on marine terraces, aggradation plains, riparian flats, and low hills. These comprise *c.*90% of the Ecological District but the natural values of only *c.* 0.9% are legally protected.

The current protected area network is also grossly unrepresentative of forests, scrub and shrublands. Less than 1% of their former extent is currently protected. For tussocklands less than 0.1% is protected.

Most protected forests are small (2-8 ha) and dominated by kahikatea, often with pukatea (*Laurelia novae-zelandiae*), matai, totara, tawa, or titoki. They are representative of the previous Wairarapa Plains forests, and probably also of wet alluvial lowland forests throughout New Zealand prior to clearance and drainage. Further protection of swamp forest is recommended because: only a small area is already protected; the remnants that remain are few and small; widespread drainage around these remnants is causing detrimental long-term impacts of those sites; weed invasion is occurring in places.

Similarly, little black beech forest is protected (the Wairarapa Lake Shore Scenic Reserve includes around 15 ha of black beech forest and scrub of varying condition), and very small areas of maire tawake (*Syzygium maire*) forest occur locally in some swamp reserves. Small areas of manuka shrubland are present at Pounui Lagoon, with kanuka scrub at Carter Scenic Reserve (Wassilieff *et al*. 1986; DOC 1996a).

9. What values need protection?

Two hundred sites, with a combined area of 2 060 ha, were identified as being of biological importance using the information and decision criteria (see Section 6). Nineteen of those sites were classified as RAPs (see Figure 5). The RAP selection process emphasises selection of vegetation/land type units which are inadequately protected in their relevant bioclimatic zones, particularly where the extent of loss of these 'ecological units' has been substantial. However, examples of some ecological units have not survived. Ecological restoration will be necessary if the original suite of ecological units is again to be represented in the Wairarapa Plains Ecological District.

Whilst RAPs are of highest priority for protection, in the event that one or more cannot be securely protected as part of the protected natural area network, the relative priority for protection of other sites of biological importance would increase. (See Appendix 7 for further information.)

9.1 COASTAL BIOCLIMATIC ZONE

Minimal significant indigenous cover remains on marine terraces, riparian flats, or the younger aggradation plains around the coast (Lake Onoke, Kiriwai Lake, Ocean Beach Dunes, and Wharekauhau Bush Fragments). Some extremely small areas of forest, scrub and shrubland remain (less than 8 ha of each; Lake Onoke, Kiriwai Lake, Ocean Beach Dunes, and Wharekauhau Bush Fragments) and these remnants are a high priority for protection. The only remaining example of coastal tussockland (18 ha) in the District is currently protected. An example of estuarine wetland (44 ha) is contained within a single site (RAP 17) at Lake Onoke, Kiriwai Lake, and Ocean Beach Dunes.

9.2 SEMI-COASTAL – LOWLAND BIOCLIMATIC ZONE

Little indigenous vegetation (less than 4% of what remained *c.*1853) is left on the following land types: riparian flats (Dunvegan Forest Remnants and Tauherenikau), younger and older aggradation plains (Waingawa Swamp, Allen/Lowes Bush, Ruamahanga River Terrace, Peter's Bush, Te Kopi Road, Bucks Road Bush, Tauherenikau, Lake Wairarapa Wetland Stewardship Area Extension, Waiorongomai Bush, Allsops Bay Bush); marine terraces (Waingawa River Bush, Fensham Bush, Wharekauhau Bush Fragments, Whangaimoana Stream Bush); incised gullies (none known); and river shingle beds (site number 0724). Of these, the latter two types represent only a small area or would naturally carry little vegetation cover.

The remaining four are the largest land types of the Wairarapa Plains and cover *c.*106 000 ha or 90% of the Ecological District. The paucity of native vegetation over this area reflects the early and extensive modification of the area for agriculture, and the ease with which much of the historic natural cover was damaged or destroyed by fire and grazing. It starkly emphasises the significance of all indigenous remnants on these land types.

While the lake area has been little reduced, freshwater wetlands of riparian flats and the younger aggradation plain (Lake Wairarapa Wetland Stewardship Area Extension) have been reduced by over 99% and 93% respectively, and total freshwater, non-forest wetlands by *c.*86%. Estuarine wetlands (Lake Onoke, Kiriwai Lake, and Ocean Beach Dunes) are also much reduced. The area of forest has been reduced by around 96% since 1853, similarly for scrub and shrubland. Most study sites with these vegetation classes have been designated RAPs (exceptions are those sites considered inviable, due to fragmentation, or small size). All RAP's contain some forest, scrub or shrubland, even those which are primarily beach or wetland habitats (e.g., Lake Wairarapa Wetland Stewardship Area Extension and Lake Onoke, Kiriwai Lake, and Ocean Beach Dunes).

No tussockland (previously covering *c.*57 000 ha) was found. Restoration of this vegetation community within the Ecological District is worthy of consideration, but it would be difficult to achieve and sustain.

Simpson (1997) recently identified the mosaic of indigenous habitat fragments found on the lower Wairarapa Plains as a priority area for ecological restoration work in the Wellington Conservancy. This area (including Tauherenikau to Whangaimoana Stream Bush RAPs) is a valuable resource and the linking function it performs between the larger areas of indigenous cover in the Tararua/Rimutaka and Aorangi Ranges can be enhanced with protection and management measures.

9.3 PRIORITIES FOR PROTECTION

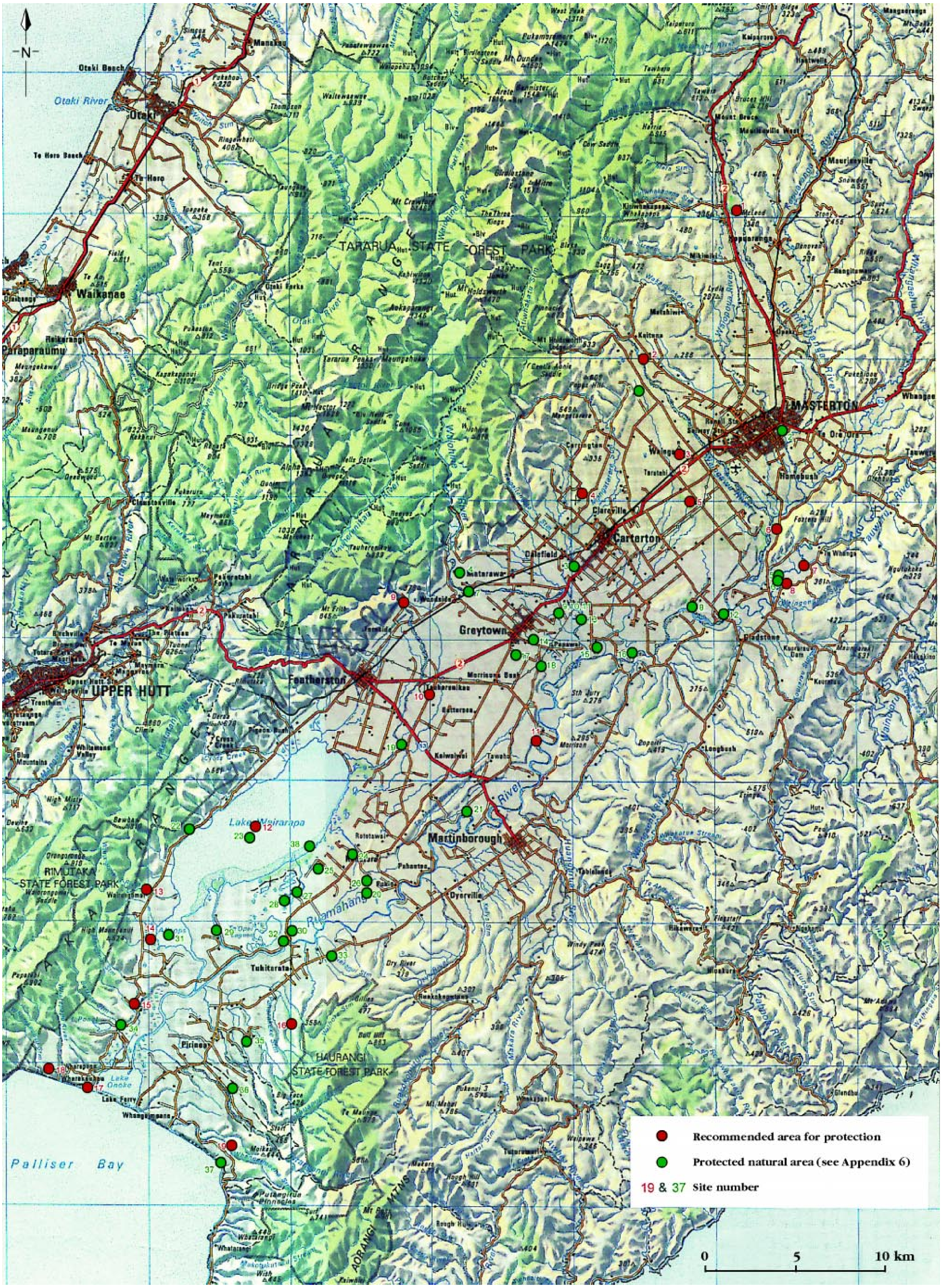
Nineteen RAPs (*c.*1 250 ha) were identified and mapped for the Wairarapa Plains Ecological District (Figure 5). These areas are considered the highest priority for protection because they are either the largest areas of unprotected indigenous vegetation in the district, or the largest or best areas of inadequately protected vegetation types on particular landforms or bioclimatic zones, or because they complement existing protected areas. RAPs are relatively small in comparison to those in some other ecological districts. Some very small sites have been accorded RAP status due to their unique vegetation associations, the rarity of the ecological unit in the modern landscape, or their importance as part of or adjacent to larger natural areas.

However, even if all RAPs are formally protected, adequate representation of the district's natural diversity in the protected area network will not be achieved. For instance within the semi-coastal - lowland bioclimatic zone, if lakes are excluded, even if all areas of biological importance are secured then the sum total of protected natural areas would still only represent 3.7% of the semi-coastal - lowland bioclimatic zone. In the coastal bioclimatic zone, if all areas are secured, then several vegetation classes (modified primary forest, secondary forest, cliff vegetation) and land types would still be poorly represented in the protected area network.

Priorities for protection in the ecological district (based on interpretation of information gathering during the course of the PNAP survey) are:

- all remaining examples of indigenous forest, scrub, and shrubland;
- large or diverse areas of indigenous habitat (e.g.,Allen/Lowes Bush RAP 5 and Waiorongomai Bush RAP 13);
- primary vegetation remaining from pre-European times (e.g., Mangaroa RAP 16);

FIGURE 5: LOCATION OF PROTECTED NATURAL AREAS AND RECOMMENDED AREAS FOR PROTECTION



- areas in moderate to advanced stages of regeneration, e.g., Waituna Western Bush (site number 0229);
- areas which exhibit specific features likely to improve their long term survival. This includes areas in close proximity to other fragments such as Tauherenikau RAP 10. It also includes wetland associations in locations not affected (or only mildly affected) by local drainage or a reduction in water table levels. For example, all or part of Allen/Lowes Bush (RAP 5), Lake Wairarapa Wetland Stewardship Area Extension (RAP 12), and Lake Onoke, Kiriwai Lake, and Ocean Beach Dunes (RAP 17).
- areas supporting species or communities where distributions have been severely affected, particularly those once typical of the district. For example, matagouri scrub in Matagouri Scrub (RAP 15), tall swamp in Lake Wairarapa Wetland Stewardship Area Extension (RAP 12), or which are nationally or regionally endangered species (e.g., a population of *Fissidens berteroi* in Prince Stream (site number 0428).

One hundred and eighty-two sites were identified as areas of High, Medium or Low biological importance (but not as RAPs) using the criteria in Section 6.6 above: 38 High (355.6 ha); 58 Medium (211.5 ha); and 86 Low (252.5 ha). While not necessarily the best or largest examples of their type, these sites are nevertheless examples of significant indigenous vegetation or wildlife habitats and their protection is recommended to improve the representiveness of the protected area network in the Wairarapa Plains Ecological District.

Some information about these sites is presented in Appendix 7 and mostly is taken from the draft PNAP reconnaissance report (see Sawyer *et al*. 1997). Further information about those sites has been obtained from publications, reports, or discussion with staff of the Department of Conservation.

10. Recommended areas for protection

For information about other sites of High, Moderate-High or Moderate biological importance in the Wairarapa Plains Ecological District refer to Appendix 7

RECOMMENDED AREAS FOR PROTECTION

1. Dunvegan Forest Remnants
2. Waingawa River Bush
3. Waingawa Swamp
4. Fensham Bush
5. Allen/Lowes Bush
6. Ruamahanga River Terrace
7. Peter's Bush
8. Te Kopi Road
9. Bucks Road Bush
10. Tauherenikau
11. Ruamahanga River Terrace Bush
12. Lake Wairarapa Wetland Stewardship Area Extension
13. Waiorongomai Bush
14. Allsops Bay Bush
15. Matagouri Scrub
16. Mangaroa
17. Lake Onoke, Kiriwai Lake, and Ocean Beach Dunes
18. Wharekauhau Bush Fragments
19. Whangaimoana Stream Bush

RAP 1 DUNVEGAN FOREST REMNANTS

Area: 18.9 ha

Altitudinal Range: 220 m

Grid Reference: NZMS260 T25 318402

Geology and Landform Units: Riparian flats

Study Area No.: 1002a

Survey Methodology: Rebergen 1998d; A. Rebergen pers. comm.; field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE (Rebergen 1998a)	LANDFORM
Semi-coastal – lowland	1. Matai-totara/matai-totara-kahikatea-(titoki)-(tawa)-(black maire)-(white maire)-(porokaiwhiri) forest [understorey: (mahoe)-(tarata)-(horoeka)-(manatu)-(putaputaweta)-(ti kouka)/*Coprosma areolata-C. grandifolia-C. rhamnoides*-mahoe-*Raukaua anomalus*)].	river terrace, terrace riser
	2. (Matai)-(totara)/totara-kahikatea-titoki-(tawa)-(white maire)-(black maire) forest [understorey: (*Coprosma areolata*)-(*Raukaua anomalus*)-(mapou)-(*C. rigida*); sparse understorey; local tawa].	river terrace, terrace riser
	3. Black beech-totara-titoki forest [understorey: (*Coprosma areolata*)-(*Raukaua anomalus*)-(mapou)-(*C. rigida*)].	terrace riser
	4. Matai-(totara)/matai-totara-tawa-titoki-(white maire)-(manatu)-(rewarewa)-(kanuka) forest [understorey: *Coprosma areolata*-(*Raukaua anomalus*)-(mapou)-(*C. rigida*)-(poataniwha); patchy canopy; some very big totara; includes *Ileostylus micranthus*].	river terrace, terrace riser
	5. Titoki-hawthorn forest (canopy includes white maire, black maire, tawa; understorey grazed out, emergents have been logged).	river terrace
	6. (Totara)-(matai)/totara-titoki-tawa-manatu-(matai) forest [understorey: (kowhai)-(white maire)-(mapou)-(kanuka)-(ti kouka)/poataniwha-(rohutu)-(*Coprosma areolata*)-(*C. rhamnoides*)].	river terrace
	7. Totara forest.	river terrace

Landform: A series of river terraces along the Ruamahanga River at the northern tip of the plains.

Vegetation: Riparian black beech forest, now unusual on the Wairarapa Plains.

Flora: Species include *Acaena juvenca* (piripiri), *Arthropodium candidum*, hedgehog grass (*Echinopogon ovatus*), *Ileostylus micranthus,* rimu, puka, ramarama, rohutu, *Melicytus* "blondin", narrow-leaved maire, kamahi, poroporo, northern rata, and large tarata trees. (Rebergen 1998d).

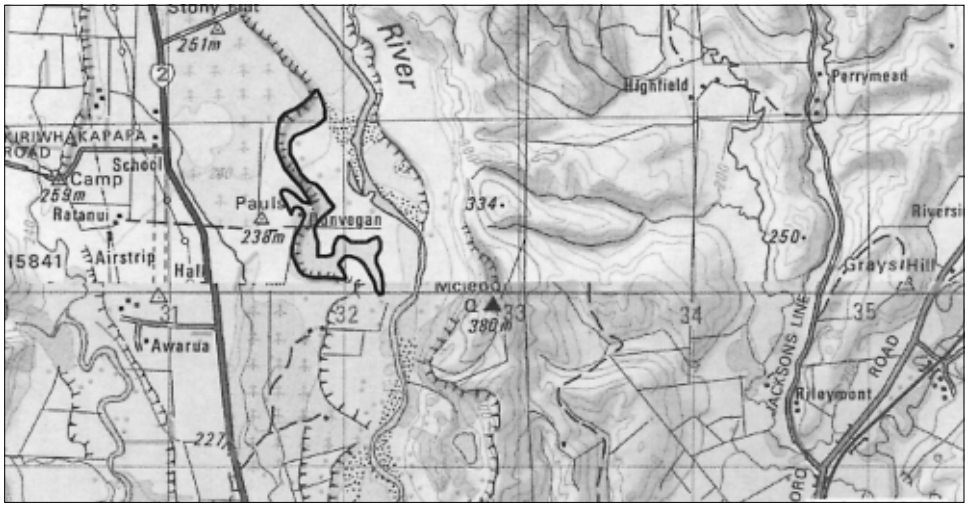
Fauna: Birds noted in this RAP are tui (including fledged juveniles), bellbird, shining cuckoo, kereru, fantail, grey warbler and silvereye. Bats may also be present.

Threat/Modification: Whilst together these remnants comprise a reasonable sized area, they have the poor elongated shape typical of riparian fragments. Part of the area of primary forest is fenced (see vegetation type 1 on the map); exclusion of stock through the rest of the site would reduce soil compaction and vegetation damage and allow regeneration.

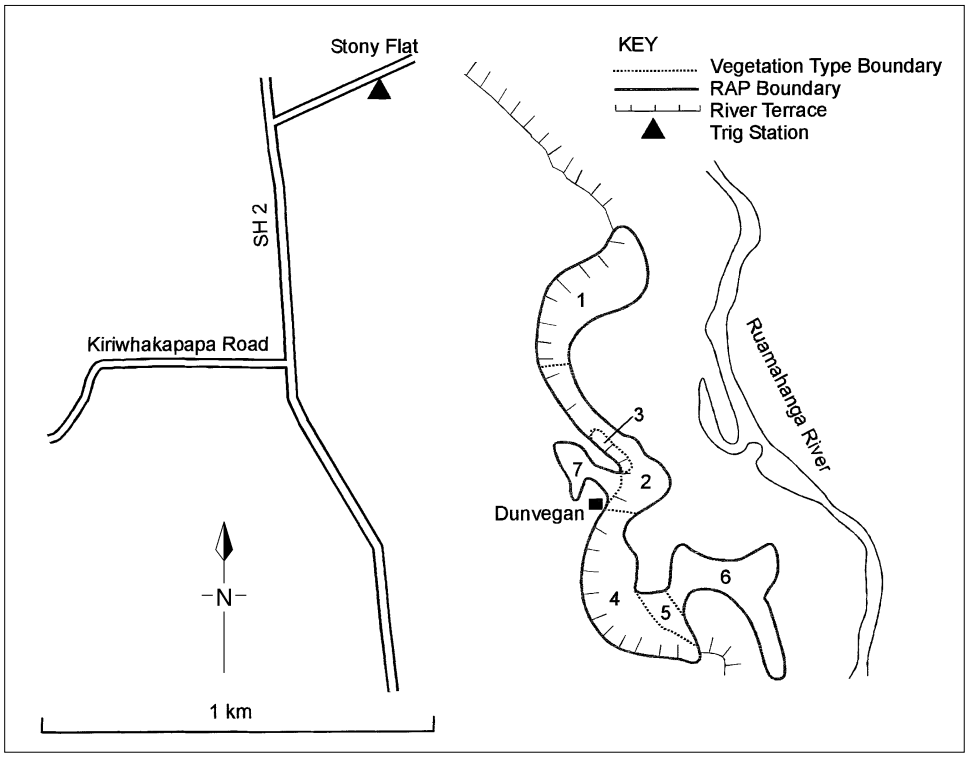
Discussion: The Dunvegan remnants are one of the larger remaining examples of primary forest in the ecological district, and the second largest on this land type, with a substantial proportion on river terrace as well as river terrace risers. The healthy condition and large stature of the vegetation in parts of this RAP are also special features. A number of plant species uncommon in this ecological district are present.

References: Rebergen 1998a&d.

Location of RAP 1, Dunvegan Forest Remnants



Site of RAP 1, Dunvegan Forest Remnants



RAP 2 WAINGAWA RIVER BUSH

Area: 8.6 ha

Altitudinal Range: 180 m

Grid Reference: NZMS260 S26 255295

Geology and Landform Units: Marine terraces

Study Area No.: 801

Survey Methodology: Rebergen 1998e; field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE (Rebergen 1998e)	LANDFORM
Semi-coastal – lowland	1. Totara-(kanuka)-(titoki)-(black maire)-(white maire)/pasture treeland (patchy canopy).	river terrace
	2. Kanuka-totara forest.	river terrace
	3. Totara-northern rata-(willow)-(*Eucalyptus* sp.)-(kowhai) scrub [understorey: kanuka-(rangiora)-(mahoe)-(*Coprosma rhamnoides*)/grass].	terrace riser
	4. Totara-titoki-(ti kouka)-(kahikatea)-(kanuka) forest [understorey: kawakawa-(poroporo)-(rangiora); low, very dense, closed canopy].	terrace riser
	5. Maire tawake-pukatea-kahikatea forest with scattered red and black beech [understorey: (mahoe)-(kotukutuku)-(tawa)-(titoki)-(hange-hange)-(red mapou); little undergrowth but abundant seedlings during spells between grazing, diverse ferns; few herbs including *Nertera depressa*].	river terrace with natural springs
	6. Kahikatea-totara-red beech-black beech-(maire tawake)-(horoeka)-(kanuka)-(pokaka)-(ti kouka) forest. (Very sparse undergrowth includes mapou and mahoe; narrow strip of pukio at base of kahikatea.)	river terrace, terrace riser
	7. Manuka-(*Olearia virgata*)-(hukihuki)/*Juncus* sp./*Isolepis prolifer*-*Gonocarpus micranthus*-(*Sphagnum*)-(*Gratiola sexdentata*) rush-shrubland.	river terrace
	8. Titoki-totara-(white maire)-(kanuka)-(rewarewa)-(black beech) treeland.	top of river terrace
	9. Black beech-totara-kanuka/mahoe forest (intact canopy).	terrace riser
	10. Totara-titoki-kanuka-(white maire)-(black maire)-(hinau) forest (no undergrowth).	river terrace
	11. Totara-kahikatea-maire tawake-pukatea-titoki/rohutu forest (mixed sparse undergrowth).	river terrace

Landform: Floodplain and terraces flanking the Waingawa River between the foothills of the Tararua Ranges, on ancient marine terraces. Underlain by the West Wairarapa Fault.

Vegetation: A narrow band of riparian forest remnants, predominantly totara, titoki and kanuka mixtures. The wet area fed by local springs maintains maire tawake and kahikatea forest and a small *Sphagnum* wetland, partially buffered by treeland. Northern rata is particularly uncommon on the plains and occurs as a co-dominant canopy species only in this RAP (see scrub type 3 at northern end of RAP). *Sphagnum* wetland and maire tawake forest are also rare vegtation types.

Flora: Notable species include northern rata, black maire, white maire, maire tawake, *Sphagnum*, black beech, red beech, *Gratiola sexdentata, Olearia virgata, Gonocarpus micranthus, Ileostylus micranthus,* rohutu, poroporo, kamahi, and *Nertera depressa* (Rebergen 1998e).

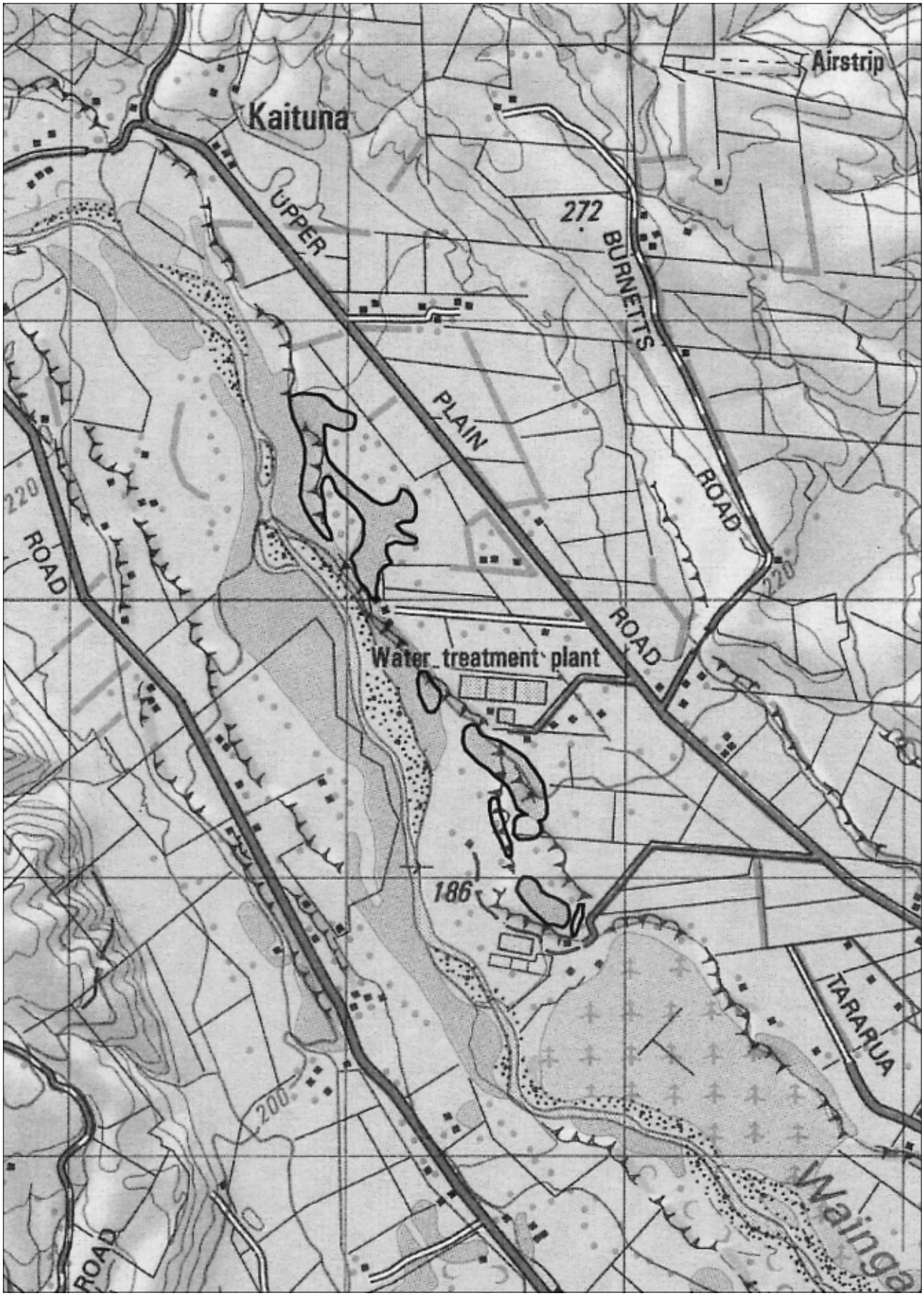
Fauna: Kereru, fantail, grey warbler, silvereye, New Zealand kingfisher, pukeko and tui (breeding successfully) were recorded. The swamp forest is potential mudfish habitat. (Rebergen 1998e)

Threat/Modification: The remaining vegetation is a patchwork of narrow fragments. Many are subject to heavy grazing and show little or no regeneration. (Rebergen 1998e)

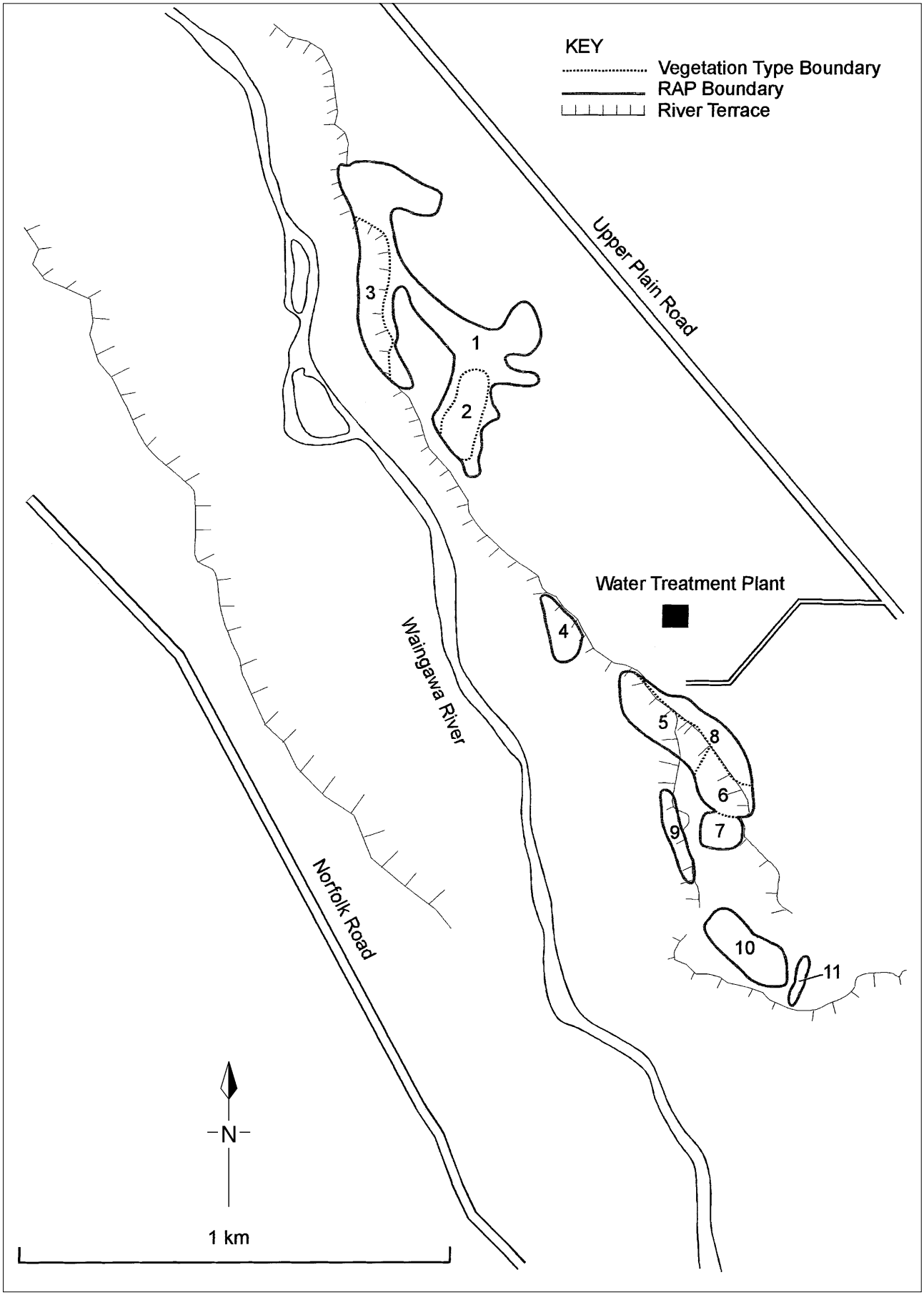
Discussion: Indigenous vegetation on marine terrace formations is now rare in the ecological district, comprising less than 2% of the semi-coastal - lowland terrace area. While parts of this RAP are small and are in less than ideal condition, the land type, close juxtaposition of fragments, their regenerative potential, significant flora and vegetative communities warrant protection for the site. The RAP includes part of a regionally important geological site identified by Kenny and Hayward (1996) (Waingawa River faulted terraces, see Section 2.2 above).

References: Rebergen 1998e

Location of RAP 2,
Waingawa River Bush



Site of RAP 2,
Waingawa River Bush



RAP 3 WAINGAWA SWAMP

Area: 10.6 ha

Altitudinal Range: +/-120 m

Grid Reference: NZMS260 S26 275232

Geology and Landform Units: Older aggradation plain.

Study Area No.: 705

Survey Methodology: Field inspection; aerial photographs (1983)

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Manuka-hukihuki-(*Olearia virgata*) scrub	alluvial plain
	2. Corkscrew willow/(manuka)-(*Olearia virgata*)-(gorse)/*Juncus gregiflorus*-(purei)/pasture rush-grassland	alluvial plain
	3. (Manuka)/harakeke-(hukihuki) flaxland	alluvial plain
	4. Open water	alluvial plain

Landform: A large gently sloping depression in a flat alluvial plain. This RAP may have been induced through faulting (see Grapes and Downes 1997).

Vegetation: Freshwater wetland that may have been induced through the clearance of the original forest cover. The presence of a single kahikatea indicates that the wetland may originally have been kahikatea swamp forest.

Flora: *Olearia virgata* is present, a species which is uncommon within the ecological district.

Fauna: Two nationally threatened bird species (New Zealand dabchick, and white heron) have been recorded in the RAP. Pied stilt use the wetland for breeding (A. Rebergen pers. comm.) Australasian harrier, pied stilt and pukeko occur in the wetland, these species are ranked as low risk regionally threatened species (DOC, 1996a).

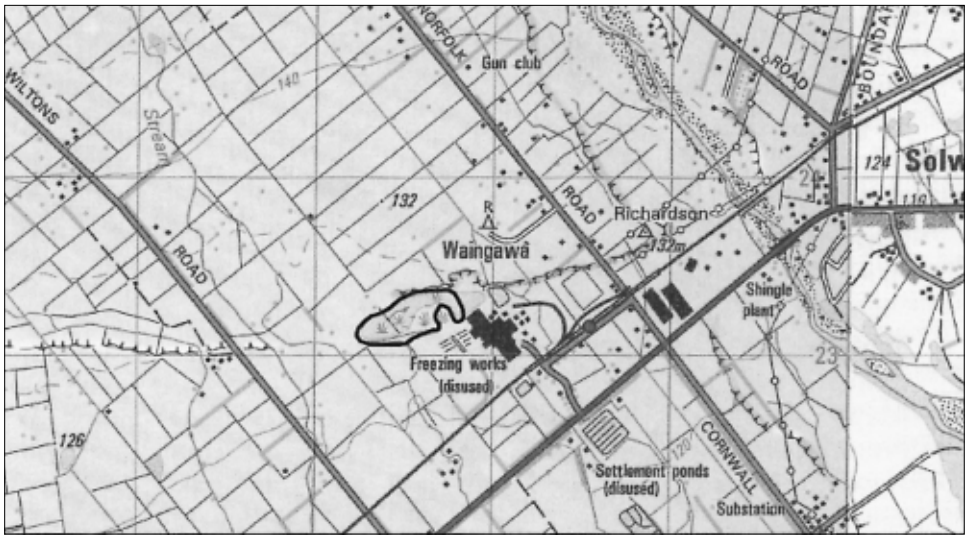
Threat/Modification: The north-eastern end of the swamp is used for dumping of landfill. The cessation of this activity should be a high priority. Several weeds (gorse, blackberry, broom, Himalayan honeysuckle and corkscrew willow) are considered to be a threat to the indigenous vegetation. As all are physiognomic dominants, an increase in their abundance will cause change to the natural character of the present vegetation. The Wellington Region pest plant management strategy identifies gorse, blackberry and Himalayan honeysuckle as species where regional intervention and management is appropriate. The immediate and long term control of these species should

be a high priority. Part of the wetland is not fenced and fencing to exclude stock around the entire margin of the wetland should be a high priority. Water levels in the wetland appear to be maintained by a water race. Securing the certainty of supply of water via this race should be undertaken.

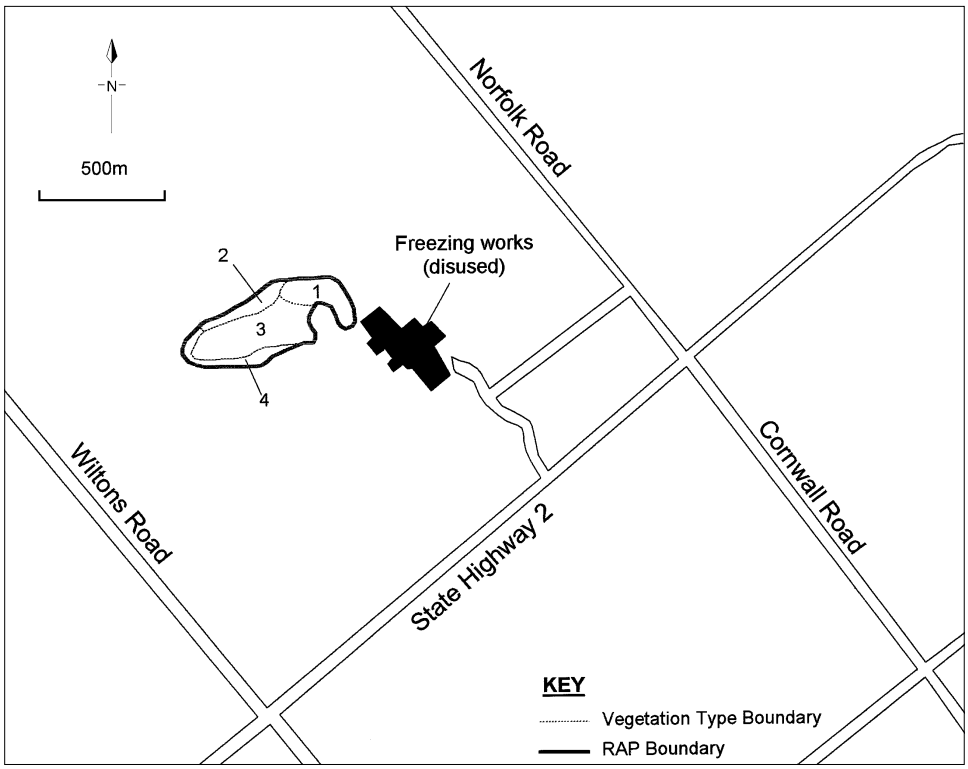
Discussion: Waingawa swamp is the largest example of semi-coastal - lowland non-forest freshwater wetland on the older aggradation land type left within the district. It is relatively natural and contains a diverse range of plant species with an uncommon occurrence of *Olearia virgata*. The presence of two nationally threatened and three regionally threatened bird species adds considerably to its value for conservation.

References Anon 1996; DOC 1996a.

Location of RAP 3, Waingawa Swamp



Site of RAP 3, Waingawa Swamp



RAP 4 FENSHAM BUSH

Area: 38.8 ha

Altitudinal Range: 100-170 m

Grid Reference: NZMS260 S26 208204

Geology and Landform Units: Low hills, marine terraces

Study Area No.: 602

Survey Methodology: Existing information; aerial photographs

BIOCLIMATIC ZONE	VEGETATION	LANDFORM
Semi-coastal – lowland	1. Kahikatea-(tarata)-(titoki) forest ⇔ Black beech forest.	alluvial plain
	2. Manuka-dominated regenerating forest and scrub. A variety of species including kahikatea, rimu, matai, titoki, *Coprosma* spp., porokaiwhiri, pukatea, poataniwha, whauwhaupaku, horoeka, and kamahi.	hill
	3. Manuka-willow scrub.	alluvial plain

Landform: A single low hill with minor gullies near the western edge of the Wairarapa Plains.

Vegetation: Primary forest on mainly flat and occasionally swampy ground, with regenerating forest and scrub covering a hill. A variety of sedges, ferns and herbs are present. Radiata pine is locally common in the area of secondary forest and scrub.

Flora: *Botrychium biforme* (regionally threatened; Empson & Sawyer 1996) is present (Sawyer *et al*. 1997). Species uncommon in the ecological district include maire tawake, rimu, red beech (possibly planted here), mountain rohutu, rohutu, and ramarama (Druce 1969; Wellington Botanical Society 1995; Royal Forest and Bird Protection Society 1995).

Fauna: Common forest birds are likely to be present. Brown mudfish (nationally threatened) were recorded from the manuka-willow scrub during a 1996/97 survey (Rebergen 1997l).

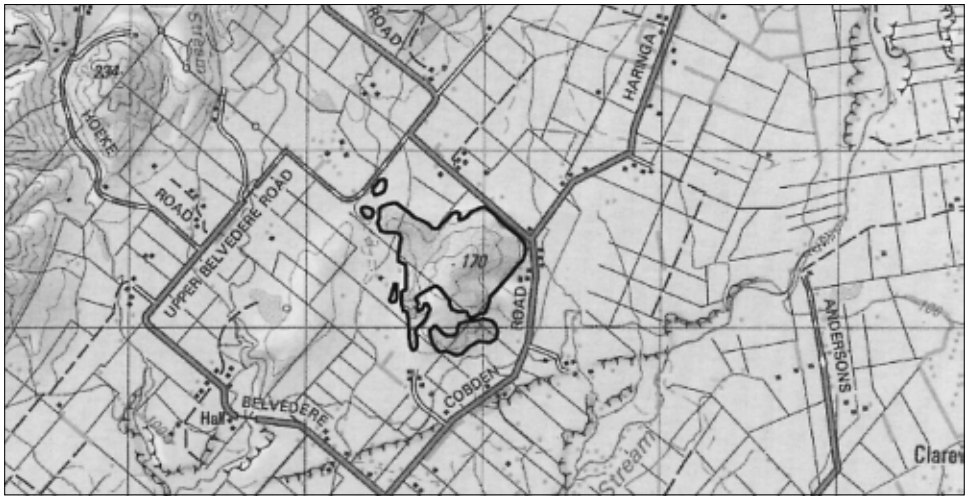
Threats/Modifications: A variety of weeds are present in this RAP. Blackberry and tradescantia occur in the primary forest; barberry, tree lucerne, old man's beard, radiata pine and gorse on the hill; and hawthorn, cotoneaster and Jerusalem cherry throughout. The RAP has been fenced to exclude stock and allow regeneration in the understorey (Royal Forest and Bird Protection Society 1995).

Discussion: A relatively large good quality, representative example of the vegetation of the ecological district, which incorporates the diverse flora of three forest types within a fenced area (Sawyer *et al*. 1997).

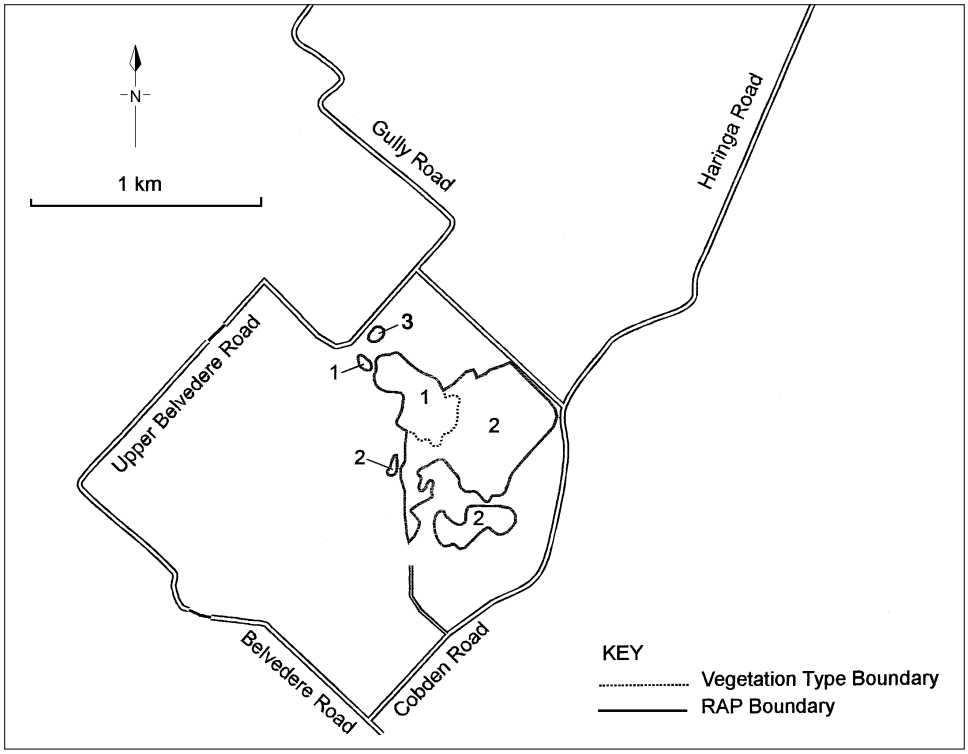
Comments: Fensham Bush has been described from existing sources. This site was not included in the 1998 RAP evaluation and category 1 RAP field assessments because the information these evaluations and assessments were based on showed it to be protected. Although administered and managed by the Royal Forest and Bird Protection Society, the area is not currently legally protected for the purpose of conservation. However, legal protection of this area for conseration purposes is currently being undertaken.

Refererences: Druce 1969; Wellington Botanical Society 1995; Royal Forest & Bird Protection Society 1995; Sawyer *et al*. 1997.

Location of RAP 4, Fensham Bush



Site of RAP 4, Fensham Bush



RAP 5 ALLEN/LOWES BUSH

Area: 46.0 ha (DOC 1994)

Altitudinal Range: 110 m

Grid Reference: NZMS260 S26 282202

Geological and Landform Units: Older aggradation plain

Study Area No.: 704

Survey Methodology: Field inspection; existing information

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Kahikatea tawa-(mahoe) swamp forest ⇔ Kahikatea-(pukatea) treeland	plain
	2. Kahikatea-pukatea-(tawa) forest ⇔ (Ti kouka)/ *Olearia virgata*-pohuehue-(mahoe) scrub.	plain
	3. Raupo reedland.	minor depression in plain
	4. (Ti kouka)/*Olearia virgata*-hukihuki/raupo/ (pukio) shrubland.	depression
	5. Kahikatea-pukatea-ti kouka treeland.	plain

Landform: Early Waiohine terraces. This landform may have been induced through faulting (Grapes and Downes 1997).

Vegetation: Primary and secondary kahikatea swamp forest and raupo swamp.

Flora: A healthy population of dwarf musk (*Mazus novaezeelandiae* ssp), classed as vulnerable in Cameron *et al*. 1995, was discovered in wet treeland during this survey. This is the only known extant population in the ecological district, although historical records refer to three other locations (Sawyer et al. 1998). Rimu, pokaka, kotukutuku, rohutu, *Olearia virgata,* poroporo, maire tawake and kamahi are also present.

Fauna: Kereru and brown mudfish are previously recorded from this site (DOC Ecological Site Inventory no. 551; A. Rebergen, pers. comm.) Tui and fantail were noted during survey.

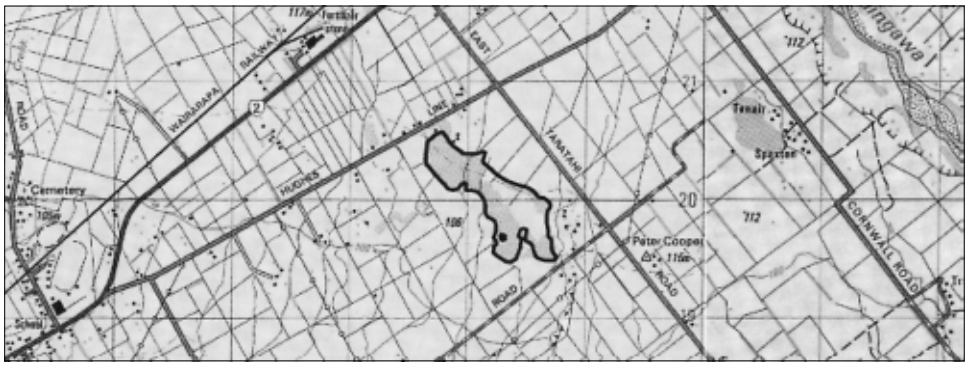
Threat/Modification: Sheep and cattle graze part of the RAP, particularly during dry conditions. An underlying aquifer and two streams through the bush provide water, but the possibility of the aquifer falling has been discussed (DOC 1994). Control of cathedral bells is currently underway to reduce a heavy local infestation (G. Foster, pers. comm.); *Selaginella kraussiana,* blackberry, Japanese honeysuckle, sweet brier, elderberry, and old man's beard are also recorded (Ogle

1988b; DOC 1994). *Iris foetidissima* found in the north-west may be planted specimens or garden escapes. Part of the forest may be threatened by logging or clearance (DOC 1994:17).

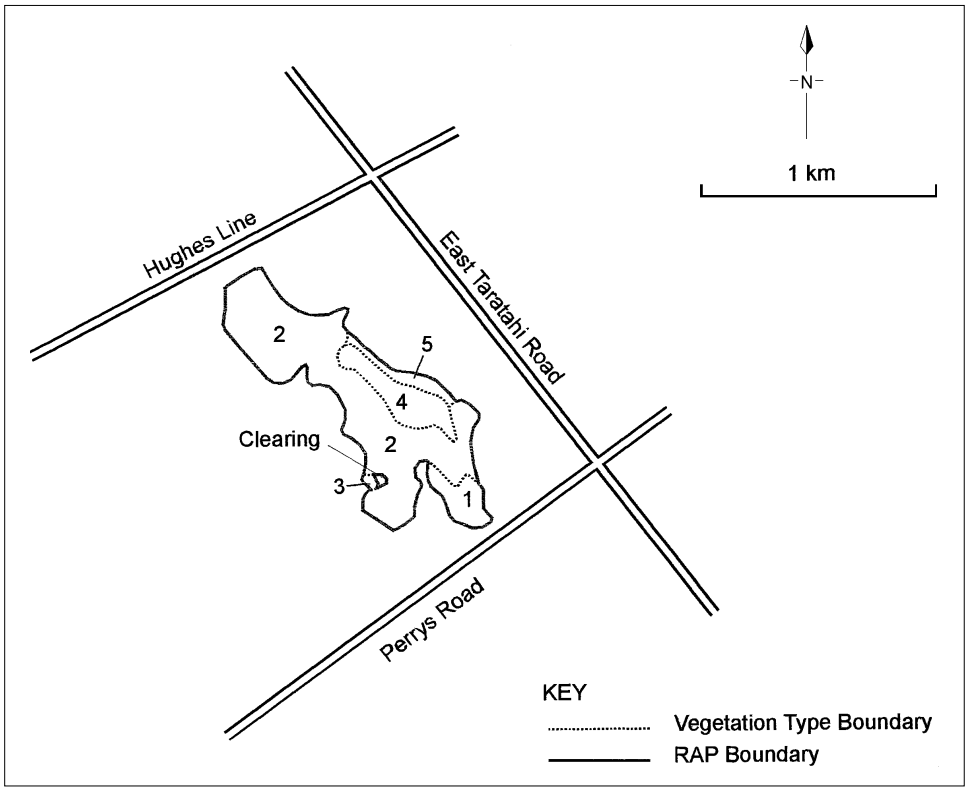
Discussion: In an application to the Forest Heritage Fund by the Department of Conservation, Allen/Lowes Bush was described as "…the largest and most intact area of kahikatea swamp forest distinctive for its size, maturity, ecological diversity and condition within Wellington Conservancy, if not the entire North Island…" and "…the best representative of the once extensive podocarp swamp forest of the Wairarapa Plains…" The size and quality of the site suggest it's character and diversity are sustainable (DOC 1994:17). Forest on this land type (older aggradation plain) is very much reduced from it's former large extent in the ecological district, particularly in the central plains. This RAP is large and contains relatively tall trees, and is thus clearly visible from the nearby busy State Highway 2.

References: DOC 1998; DOC 1994; Ogle 1988b.

Location of RAP 5, Allen/Lowes Bush



Site of RAP 5, Allen/Lowes Bush



RAP 6 RUAMAHANGA RIVER TERRACE

Area: 12.0 ha

Altitudinal Range: 80-90 m

Grid Reference: NZMS260 T26 343189

Geology and Landform Units: Older aggradation plain

Study Area No.: 726

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
semi-coastal – lowland	1. (Kahikatea)-(pukatea)/(ti kouka)/pukio-(harakeke) sedgeland.	river flat
	2. (Totara)/titoki-totara-tawa-kowhai-(black maire) forest and shrub treeland [understorey: small-leaved milk tree/*Coprosma virescens-Coprosma areolata-Melicytus micranthus*-(*Coprosma wallii*); abundant kowhai seedlings].	terrace riser

Landform: A terrace edge along the floodplain of the Ruamahanga River.

Vegetation: A predominantly broad-leaved canopy over a small-leaved shrub layer. The canopy is patchy (*c.*50% cover) in the south, but improves toward the north to *c.*80% cover.

Flora: Two plants of *Coprosma wallii* (one male, one female) grow on this terrace (Townsend *et al*. 1998), (classed as vulnerable, Cameron *et al*. 1995), and one of the best population (in numbers and health) of the regionally uncommon *C. virescens*.

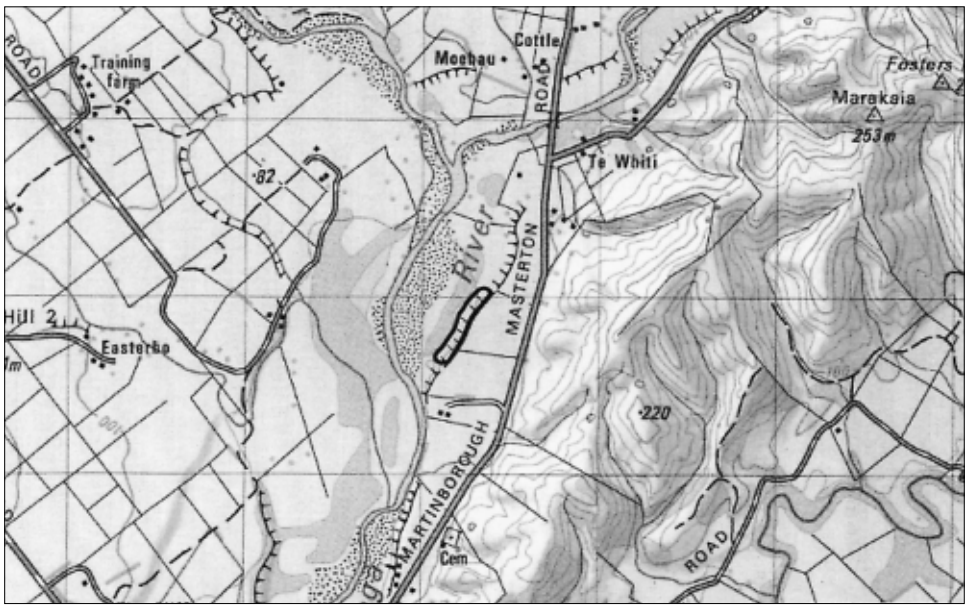
Fauna: Fantail, tui, pukeko and common gecko were recorded.

Threat/Modification: This RAP comprises the degraded remains of a lowland riparian forest with few large trees and a moderately to very modified canopy. It has been grazed by cattle but this pressure will soon disappear when the partially constructed, enclosing fence is completed. High numbers of seedlings, particularly kowhai and mahoe, indicate regeneration potential.

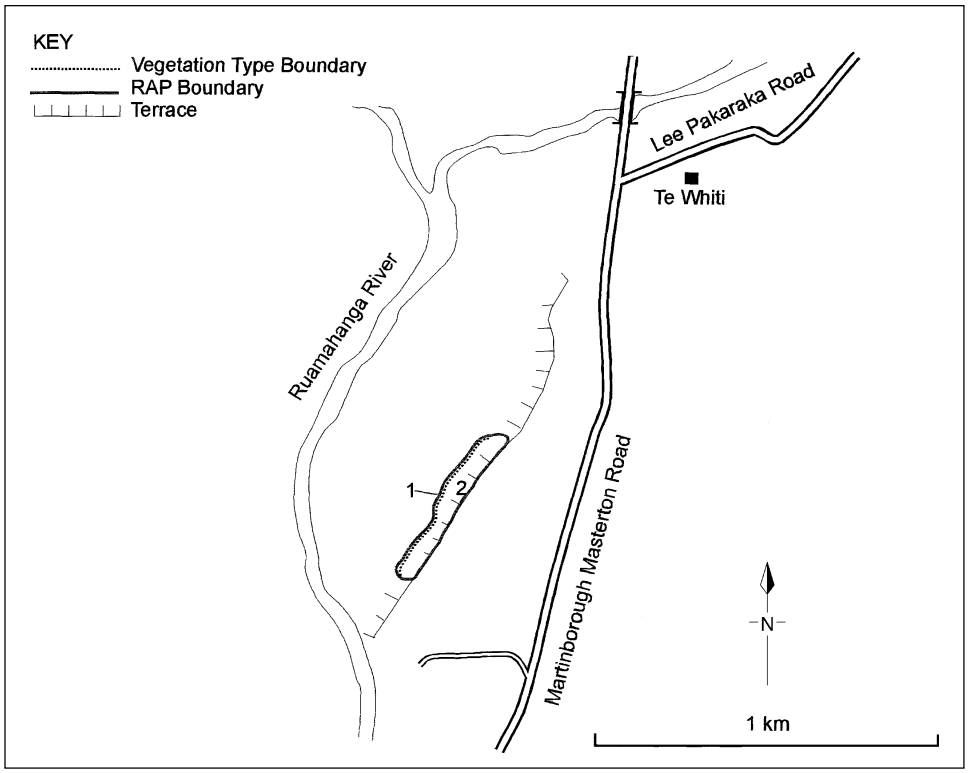
Discussion: This area has excellent restoration potential, both for representative alluvial forest and shrubland of the Wairarapa Plains, and as a suitable site for establishing further rare plant populations. Plantings by landowners include seedlings of the nationally endangered plants, *Pittosporum obcordatum* and *Olearia hectorii* (provided by DOC). *P. obcordatum* is found naturally at an adjacent site on the Ruamahanga River terrace (RAP 34). *C. wallii* is found at only two other sites in Wellington Conservancy, including another location on the Wairarapa Plains (Sawyer *et al.* 1998).

References: Sawyer *et al*. 1998; Rebergen 1996c.

Location of RAP 6, Ruamahanga River Terrace



Site of RAP 6, Ruamahanga River Terrace



RAP 7 PETER'S BUSH

Area: 12.2 ha

Altitudinal Range: 80 m

Grid Reference: NZMS260 T26 364154

Geological and Landform Units: Older aggradation plain

Study Area No.: 720

Survey Methodology: Rebergen 1998f; A. Rebergen pers. comm.; field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Titoki-(turepo)-(manatu)-(kowhai)-(matai)-(totara)-(black maire)-(houhere) forest [dense understorey of divaricating shrubs].	alluvial terrace
	2. Tawa-titoki-(black maire)-(manatu) forest.	alluvial terrace
	3. Totara-matai-kahikatea forest [understorey: *Coprosma areolata-C. rigida-Myrsine divaricata*-poataniwha-rohutu-*Melicytus micranthus;* big emergent trees over low shrub layer].	alluvial terrace
	4. Totara-titoki-manatu treeland.	alluvial terrace
	5. Titoki-kanuka-kahikatea forest.	alluvial terrace

Landform: Alluvial plain deeply cut by the Tauweru River.

Vegetation: A core forest area fringed by treeland to the south-west, and pasture to the north and west. A dense layer of divaricating shrubs occurs through the totara forest and in parts of the titoki forest in conjunction with a higher water table. At the south end, the deeply cut Tauweru River course divides the RAP.

Flora: A diverse array of divaricating species are present, including rohutu, *Coprosma areolata, C. rigida, Myrsine divaricata,* poataniwha and *Melicytus micranthus.*

Fauna: Records include kereru, tui, fantail, grey warbler, white faced heron, king fisher, grey teal and grey duck (Rebergen 1998f).

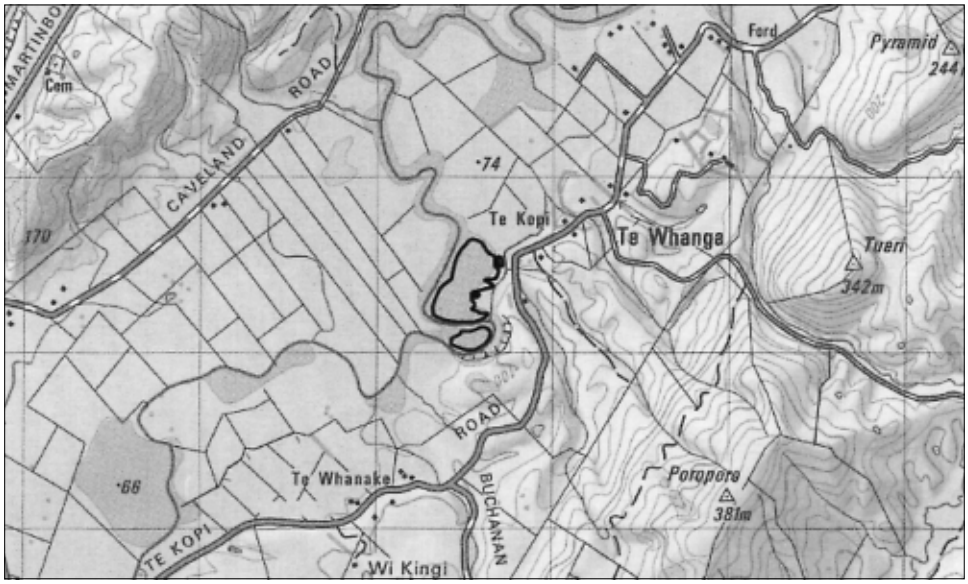
Threat/Modification: Long term cattle grazing and trampling has influenced the forest composition and continues to damage plants and selectively restrict regeneration. Canopy dieback is significant, particularly among tawa. This is associated with severe drought conditions present during the site inspection but may also involve more permanent hydrological changes of concern throughout the Wairarapa Plains (DOC 1994). Canopy gaps are not apparent but

may allow weeds to become a problem if canopy tree failure continues. Jerusalem cherry occurs throughout the site, however few other weed species have been found.

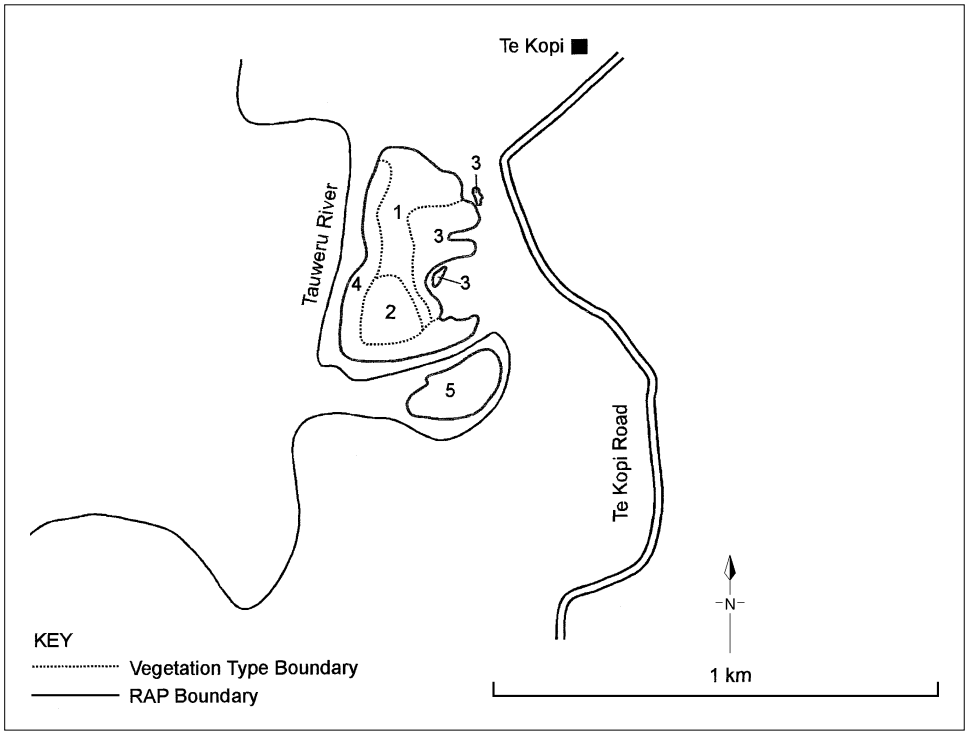
Discussion: Primary forest on this land type was previously a major component of the vegetation of the ecological district. This RAP now comprises one of the larger forest remnants on older aggradation plains, and is the largest of this vegetation type. It is also a link in a network of adjacent fragments to the north-east and south-west.

References: Rebergen 1998f.

Location of RAP 7, Peter's Bush



Site of RAP 7, Peter's Bush



RAP 8 TE KOPI ROAD

Area: 2.6 ha

Altitudinal Range: 64-68 m

Grid Reference: NZMS260 T26 349 141

Geology and Landform Units: Older aggradation plain

Study Area No.: 0701

Survey Methodology: A. Townsend pers. comm.

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Kahikatea - matai forest	floodplain
	1. (Matai) / titoki - (tawa) - (totara) forest ⇔ Pasture	floodplain

Landform: Floodplain of the Tauweru River.

Vegetation: Vegetation comprises a mosiac of modified podocarp forest, and pasture.

Flora: *Pittosporum obcordatum*, classed as nationally rare (Cameron *et al*. 1995) occurs on the eastern side of the river. *Pittosporum obcordatum* is also a priority species for management work (Molloy and Davis 1994).

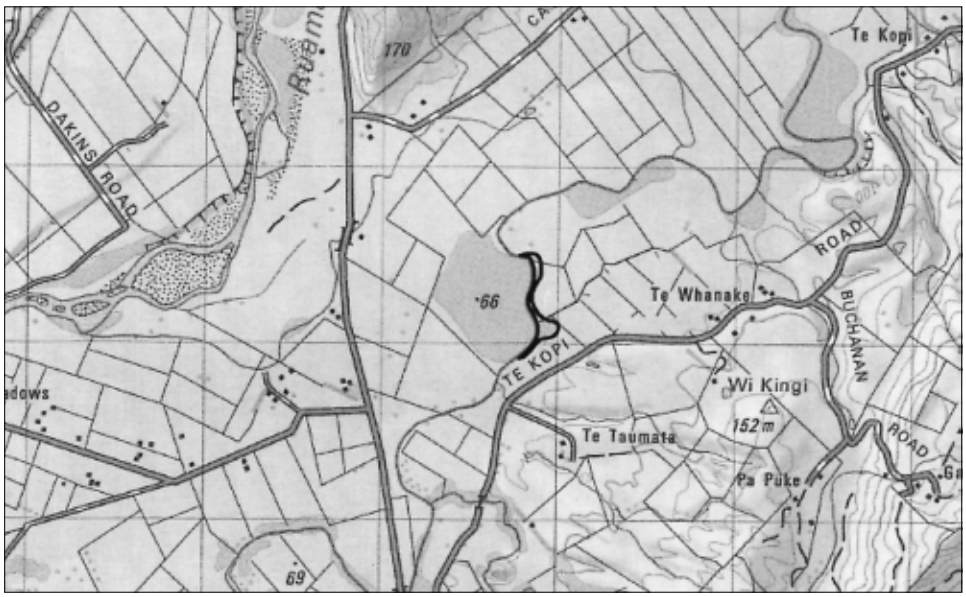
Fauna: Kereru are present in this RAP. Kereru is a priority species for management work (Molloy and Davis 1994).

Threat/Modification: The RAP is fenced, although sheep occasionally gain access. Pasture grasses, seasonal drought and the planted tree species are cited as threats to part of the site supporting *Pittosporum obcordatum* (Townsend *et al.* 1998).

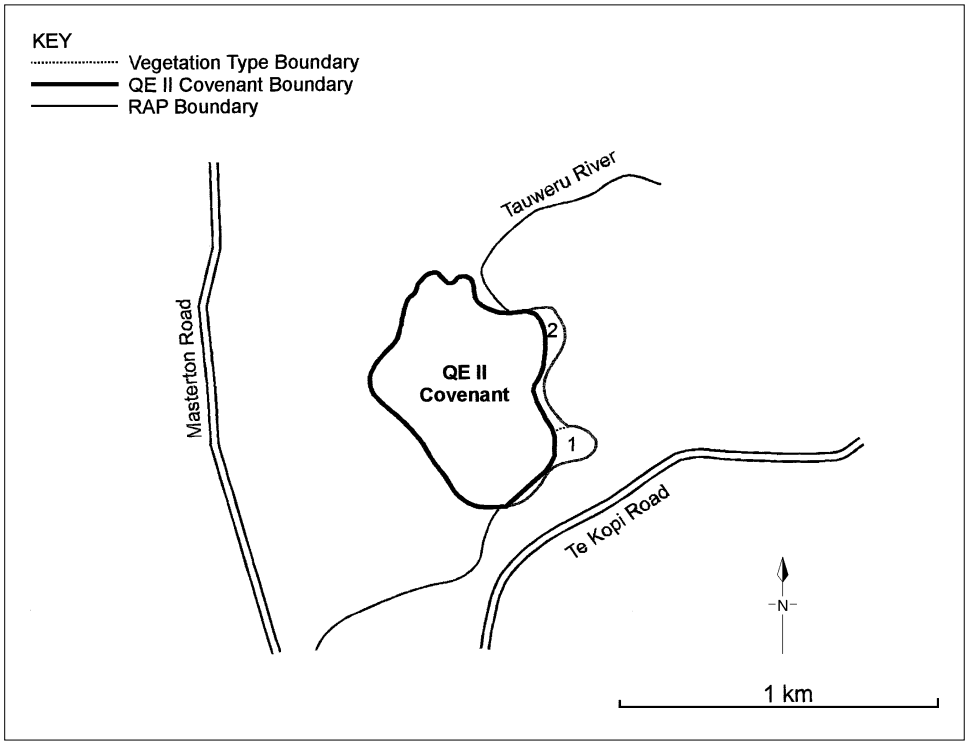
Discussion: The presence of *Pittosporum obcordatum* in this site makes it particularly significant for conservation protection. *Pittosporum obcordatum* is known from only 13 locations throughout New Zealand (Clarkson & Clarkson 1984; de Lange *et al.* 1996). The RAP is contiguous with a QEII Open Space Covenant. The site has been highly modified, through the removal of large podocarps via selective logging and the planting of exotic conifers. The areas of pasture would have probably supported riparian swamp shrubland species in the past, but grazing and logging has reduced these significantly.

Reference: Sawyer *et* al. 1998; Townsend *et al*. 1998.

Location of RAP 8,Te Kopi Road



Site of RAP 8,Te Kopi Road



RAP 9 BUCKS ROAD BUSH

Area: 8.2 ha

Altitudinal Range: 100-120 m

Grid Reference: NZMS260 S26 082128

Geological and Landform Units: Older aggradation plain

Study Area No.: 620

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Black beech forest [understorey: narrow leaved maire-totara/ mingimingi-(whauwhaupaku)-(*Coprosma crassifolia*)-(poataniwha)-(*Raukaua anomalus*)/bare rock-pasture]	terrace
	2. Kanuka-totara forest ⇔ Kanuka-totara treeland [understorey: (kanuka)-(kaikomako)/ (mingimingi)/bare rock-pasture; a few emergent beech are present].	terrace
	3. Kowhai-(rewarewa)/mahoe-kohuhu-kanuka-titoki-whauwhaupaku forest [understorey: rangiora-koromiko-kawakawa-*Olearia paniculata*-karamu/mingimingi-prickly mingimingi-(*Coprosma crassifolia*)/bare ground-kowaowao-(huruhuru whenua)]	riverbank, slip face

Landform: A small area at the base of the foothills of the Tararua Range following the Tauherenikau River.

Vegetation: Modified primary forest and secondary forest. The kanuka forest was almost certainly induced through human clearance of the original forest cover, however the combination of natural river bank erosion and human clearance seems the most likely factor in the establishment of the mahoe forest.

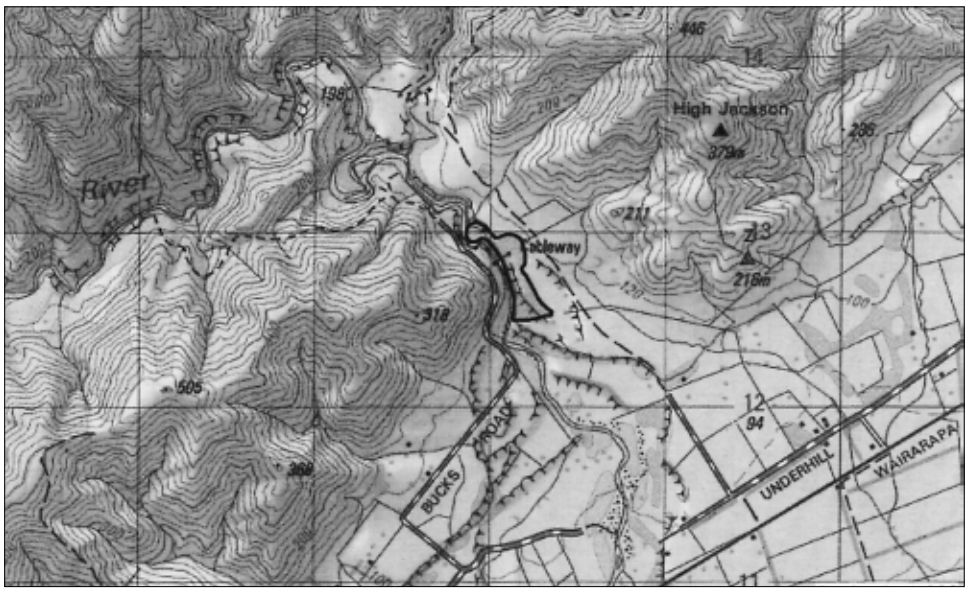
Flora: No significant plant species were identified.

Fauna: Common forest birds were noted.

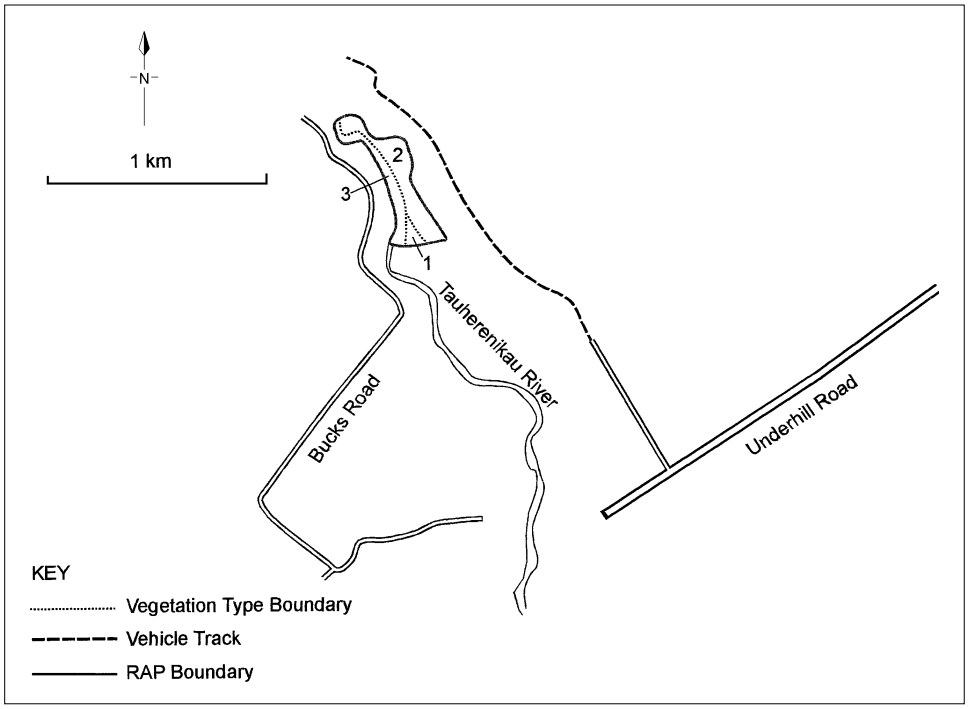
Threat/Modification: Forest on the terrace is grazed extensively by cattle and sheep, however a barbed wire fence restricts river bank access to sheep only. Almost all understorey has been removed on the terrace and correspondingly there is no regeneration of canopy species. On the river banks where limited access has resulted in a much greater diversity and abundance of understorey species, regeneration of canopy species was observed.

Discussion: The older, aggradation plain, land type, on which Bucks Road bush occurs, is the largest in the ecological district. Only 1% of the original forest cover on this land type remains. This area of forest is the best remaining example of semi-coastal - lowland beech forest on older aggradation plains.

Location of RAP 9, Bucks Road Bush



Site of RAP 9, Bucks Road Bush



RAP 10 TAUHERENIKAU

Area: 22.9 ha

Altitudinal Range: 30-40 m

Grid Reference: NZMS260 S27 090063; 098062; 102058

Geological and Landform Units: Riparian flats, older aggradation plain

Study Area No.: 412, 413, 414

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Kahikatea-totara/tawa-(titoki) forest [understorey: kawakawa-supplejack/tradescantia].	plain
	2. Tawa-(karaka)/kawakawa-(supplejack) forest [some tawa, titoki and karaka saplings, kaikomako; infested with tradescantia] ⇔ Tawa treeland [roads and buildings through and around vegetation; treeland occurs in the more heavily utilised areas].	plain
	3. (Totara)-titoki-tawa forest and scrub [understorey: kawakawa-climbers-(mahoe)].	plain
	4. (Totara)-titoki-tawa/Jerusaleum cherry forest ⇔ Totara/Jerusaleum cherry treeland.	plain
	5. Titoki-kaikomako-(poataniwha) treeland [occasional totara saplings, matai, *Coprosma crassifolia*, mahoe; Jerusalem cherry throughout] ⇔ Totara/titoki-hawthorn-(poataniwha) treeland to east.	plain

Landform: Alluvial plain along the Tauherenikau River.

Vegetation: Primary and secondary forest on fertile alluvial flats. Some very large remnant kahikatea are found toward the river (Racecourse Bush, type 1 on map). Undergrowth varies from thick (Donalds Bush, centre) to very sparse (Lowlands Bush, eastern fragment).

Flora: Karaka is present in the western fragment (previously a common element of broadleaved forests; Hill 1962). Black, white, and narrow-leaved maire all occur in this RAP (Rebergen 1997e).

Fauna: Fantail, grey warbler, spurwing plover and kereru were seen; morepork and tui were recorded previously (NZWS National Habitat Register 28/14).

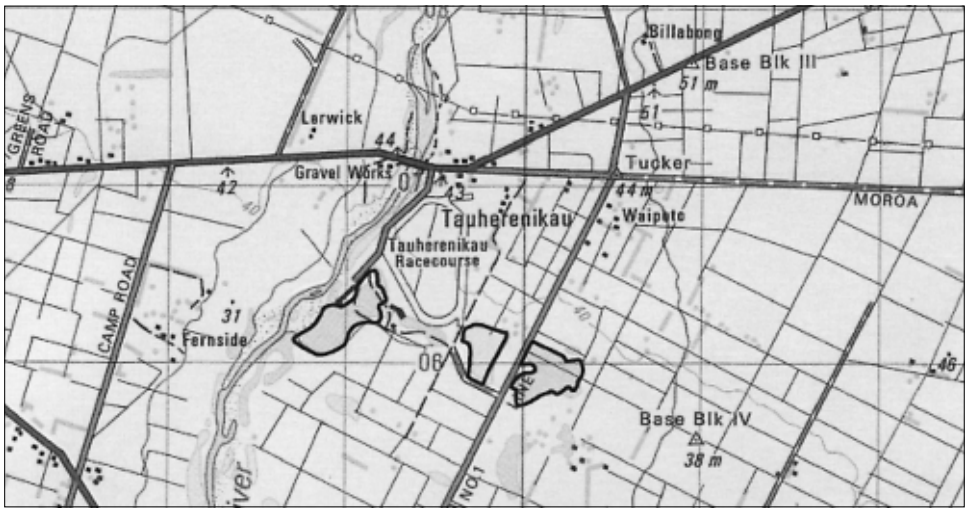
Threat/Modification: Previous logging and continued grazing have substantially modified the stature, structure and composition of parts of this RAP. Adventive species and planted exotic species are noticeable; Jerusalem cherry grows throughout Lowland's bush and a severe infestation of tradescantia in Racecourse Bush is a significant threat to future regeneration. Other weeds (e.g., English ivy, sycamore) and any potential fire risks are concentrated around the

high use areas of the racecourse driveway and buildings which intersect part of the RAP. A sawn native log (tawa?) in Racecourse Bush confirms a previous note of some "large, old 'dead' specimens" being removed (DOC 1996b).

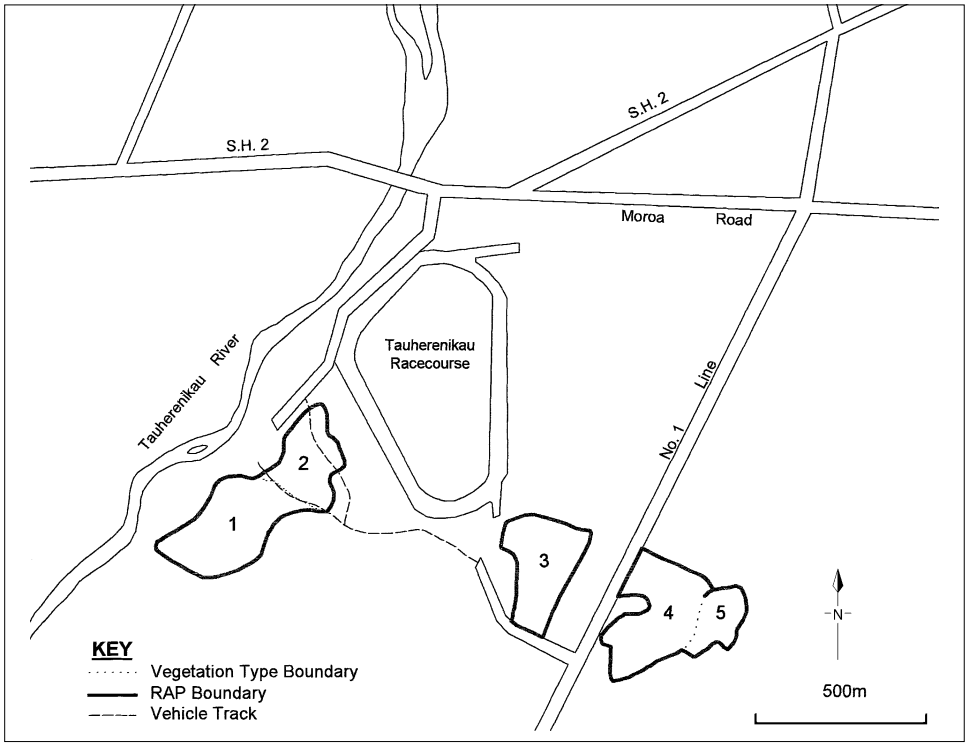
Discussion: This RAP has a relatively large total area of forest on alluvial flats and represents a previously common landscape component. The western and central fragments are linked by a corridor of remnant and planted vegetation including kohuhu, kowhai, kawakawa, titoki, and macrocarpa, set among racecourse facilities. The tall primary forest remnant, good understorey in ungrazed areas, and central plains location are noteworthy features. Weed control is required and stock exclusion recommended.

References: Hill 1962; DOC 1996b; Rebergen 1997e; New Zealand Wildlife Service 1986; Wellington Botanical Society 1973a.

Location of RAP 10, Tauherenikau



Site of RAP 10, Tauherenikau



RAP 11 RUMAHANGA RIVER TERRACE BUSH

Area: 38.0 ha

Altitudinal Range: 40-100 m

Grid Reference: NZMS260 S27 173026

Geological and Landform Units: Riparian flats & younger aggradation plain.

Study Area No.: 507a

Survey Methodology: Field inspection; field reconnaissance from a nearby high point.

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Kanuka forest [understorey: (mahoe)-(kohuhu)-(mingimingi)/ *Coprosma rhamnoides*-(*Coprosma crassifolia*)-(sweet brier)/ pasture].	gully terrace scarp
	2. Totara-(matai)-(kahikatea)/titoki-(hinau)-(porokaiwhiri)-(kowhai)-(kaikomako)-(tawa)-(houhere) treeland [understorey: (mahoe)-(kaikomako)-(poataniwha)-(*Melicytus micranthus*)/pasture].	riparian flat lower terrace scarp
	3. Kanuka/broom-(tutu)-(mahoe)-(rangiora)-(koromiko) shrubland.	landslide scar
	4. Totara/kanuka-kowhai-houhere-(titoki) treeland [understorey: *Muehlenbeckia australis*-(kowhai)-(mahoe)/(*Coprosma propinqua*)-(mingimingi)-(houhere)/black nightshade/cocksfoot].	terrace scarp
	5. Titoki-totara-nagio-kanuka-houhere treeland [understorey: elderberry-mahoe-titoki/bare ground; a few emergent rewarewa are present in the canopy].	terrace scarp

Landform: The RAP consists of a long thin terrace scarp orientated along a south-west north-east axis. There is a gully at the north-east end which grades into a riparian flat beside the Rumahanga River. Landslides on the terrace scarp have occurred at the apex of a river meander loop.

Vegetation: Modified primary forest is dominant on the terrace scarp and on the riparian flats. Secondary vegetation is present in the gully, where it was probably induced by human clearance of the original forest cover, and on landslide scars.

Flora: Two mistletoes *Korthalsella lindsayi* and *Ileostylus micranthus* (the second classed as 'local' in Cameron *et* al. 1995) occur in the treeland on the riparian flat (Rebergen 1997d).

Fauna: Common forest birds are present.

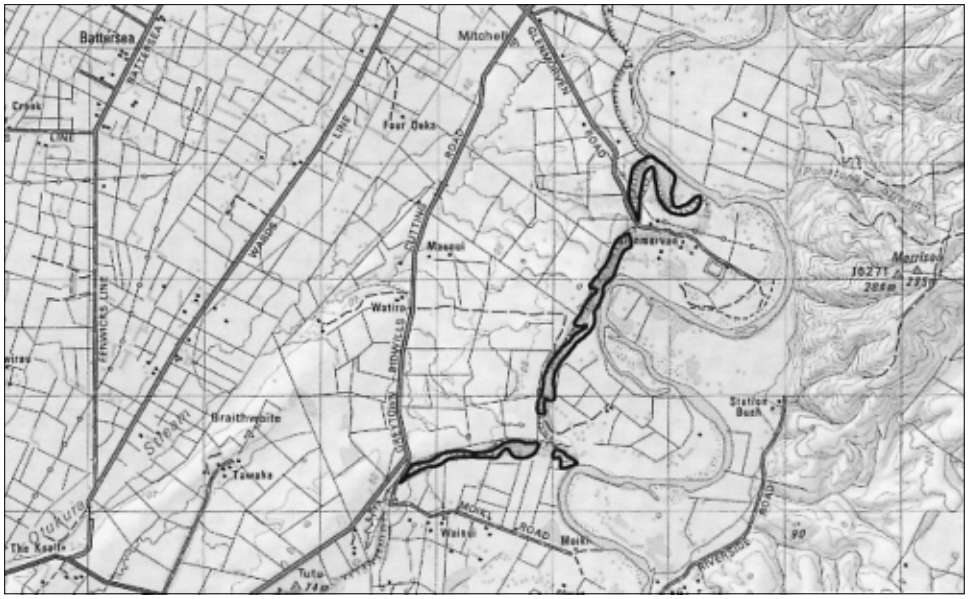
Threat/Modification: The understorey within the forest and treeland has been severely grazed by stock over most of the RAP. This grazing has led to the almost total removal of understorey

shrubs and ground cover, and moreover to an absence of regeneration of canopy species. Fencing to exclude stock is of high priority. Possum presence was evident.

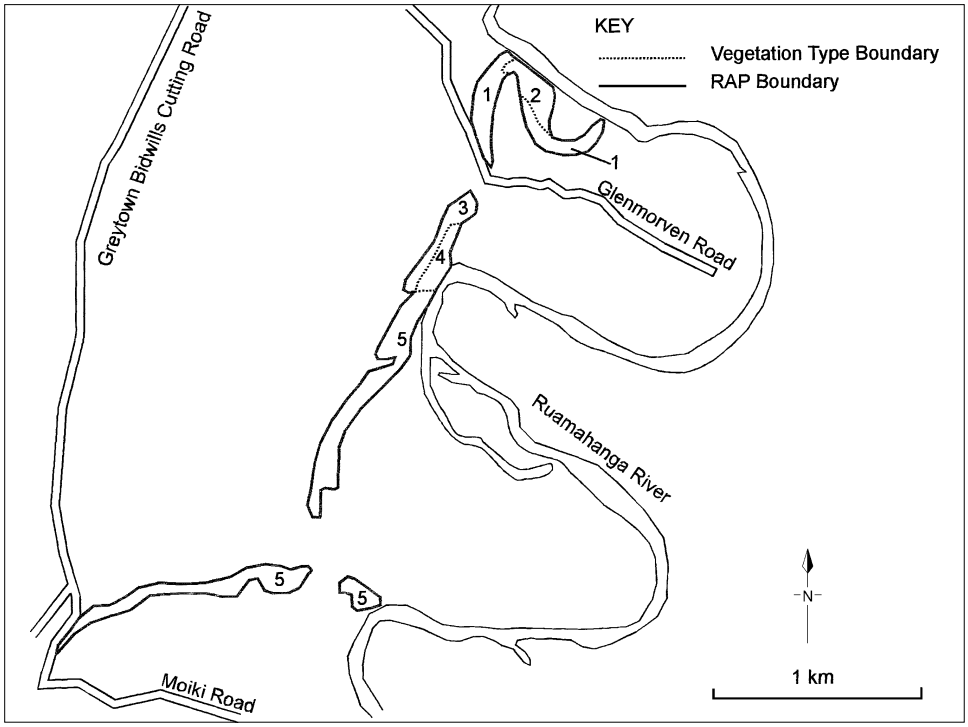
Discussion: Both primary and modified primary forest have been heavily reduced in extent within the ecological district. This RAP contains the largest unprotected areas of semi-coastal - lowland modified primary forest on both the riparian flats and younger aggradation plain land types in the ecological district. The presence of two nationally threatened plant species adds considerable conservation value to the RAP.

References: Rebergen 1997d & m.

Location of RAP 11, Rumahanga River Terrace Bush



Site of RAP 11, Rumahanga River Terrace Bush



RAP 12 LAKE WAIRARAPA WETLAND STEWARDSHIP AREA EXTENSION

Area: 777.7 ha

Altitudinal Range: <20 m

Grid Reference: NZMS260 S27 010953

Geological and Landform Units: Younger aggradation plain

Study Area No.: 245, 246, 249, 264, 402, 403, 404, 405

Survey Methodology: Field inspection; existing information; topographical map (NZMS260 S27); aerial photographs

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Ti kouka/manuka-karamu-(*Coprosma areolata*)-(koromiko)-(kamahi)/*Carex geminata*-*Baumea tenax*-kiokio-(harakeke) shrub-sedgeland.	freshwater wetland, plain
	2. Manuka-(ti kouka)/harakeke-raupo/*Carex geminata* reed-flaxland.	freshwater wetland
	3. (Manuka)/mixed herbfield ⇔ Pasture [herbfield species include jointed rush, *Isolepis prolifer,* selfheal, shore lobelia, loose strife, *Thelymitra longifolia*, *Pterostylis* sp. (aff. *P. banksii*), *Isolepis inundata, Gonocarpus micranthus* and *Pratia angulata*].	plain
	4. Kanuka-(*Coprosma propinqua*)/*Carex geminata*-water pepper-pasture shrub-sedgeland ⇔ Pasture. Scattered tauhinu and ti kouka.	plain
	5. Manuka-(ti kouka)-(tauhinu)/harakeke-raupo shrubland ⇔ (Manuka)-(ti kouka)/*Carex geminata*-soft rush sedgeland [with small, local raupo clumps].	freshwater wetland, plain
	6. Kanuka-ti kouka/*Coprosma areolata*-karamu-harakeke/*Carex geminata*-ferns scrub (on lower wetter margins) ⇔ Kanuka/mahoe/*Coprosma areolata*-(bush lawyer)/*Carex geminata*-tall grasses scrub (in drier, raised centre).	plain
	7. Manuka/kanuka-(mahoe)-(ti kouka)-(karamu)-(harakeke) scrub (occasional mapou, kohuhu, toetoe and pink bindweed).	plain
	8. Crack willow-kanuka forest.	freshwater wetland, lake margins
	9. A mosaic of: • Tall fescue grassland; • Native turf (including *Crassula sinclairii, Glossostigma elatinoides, Isolepis cernua, Limosella lineata, Ranunculus limosella, Lilaeopsis novae-zelandiae);* • Short rushland and sedgeland (including jointed rush, leafless rush, *Juncus* spp., three square sedge, *Bolboschoenus caldwelli,* tall fescue, creeping bent).	mudflats

	10. A mosaic of crack willow forest with scattered alder, ti kouka, harakeke, ferns, *Juncus* spp., *Carex* spp. (including pukio, rautahi) and *Cyperus ustulatus*; alder forest; raupo/pukio-*Juncus* spp. reedland; and open water.	river delta, lake margins
	11. Lake margins. Predominantly unvegetated or pasture with occasional rushes and turf species, e.g., *Crassula sinclairii, Lilaeopsis novae-zelandiae.* Scattered crack willow, alder, and manuka	lake and lagoon margins
	12. Rush and sedgeland.	lagoon margins
	13. Crack willow-alder treeland (over grasses and rushes.)	lagoon margins
	14. Open water.	lake bed

Landform: The lake lies in a fault angle depression on the low lying sedimentry plain between the Rimutaka Ranges and the eastern Wairarapa hill country in the southern Wairarapa Plains. The current landscape and historical alterations are described by Moore *et al.* 1984 and DOC 1991.

Vegetation: Described in Moore *et al.* (1984), Ogle *et al.* (1990) and DOC (1991).

Flora: The area has a rich indigenous flora, particularly of native turf species, and numbers of threatened or biogeographically interesting plants among the 189 indigenous vascular species recorded (Ogle *et al.* 1990). Threatened and local taxa include *Amphibromus fluitans* (classed as critical in Cameron *et al.* 1995), *Pterostylis micromega* (critical[1]), *Crassula ruamahanga* (rare), *Centipeda minima* (local), *Urtica linearifolia* (vulnerable) and a large population of *Korthalsella salicornioides* (insufficiently known) (Ogle *et al.* 1990; Townsend *et al*. 1998; Sawyer *et al.* 1998). *Leptinella maniatoto* occurs at its northern limit and populations of various species otherwise uncommon in the North Island are present (Ogle *et al.* 1990). Townsend *et al*. (1998) cite historical records of *Mazus novaezeelandiae* (vulnerable) along the western lake shore.

Fauna: A large number and diverse range of resident and migratory birds includes several nationally threatened species: falcon, kereru, and breeding populations of New Zealand dabchick, Australasian bittern, banded dotterel, grey duck and variable oystercatcher. Numerous regionally threatened bird species are also present. The area (including Lake Onoke; see RAP 17) is ranked outstanding in terms of fish habitat, rare and endangered species (brown mudfish, koaro, giant kokopu) and use of fisheries (Davis 1987; DOC 1991).

[1] *Pterostylis micromega* has not been seen in this area since 1950 and may be extinct.

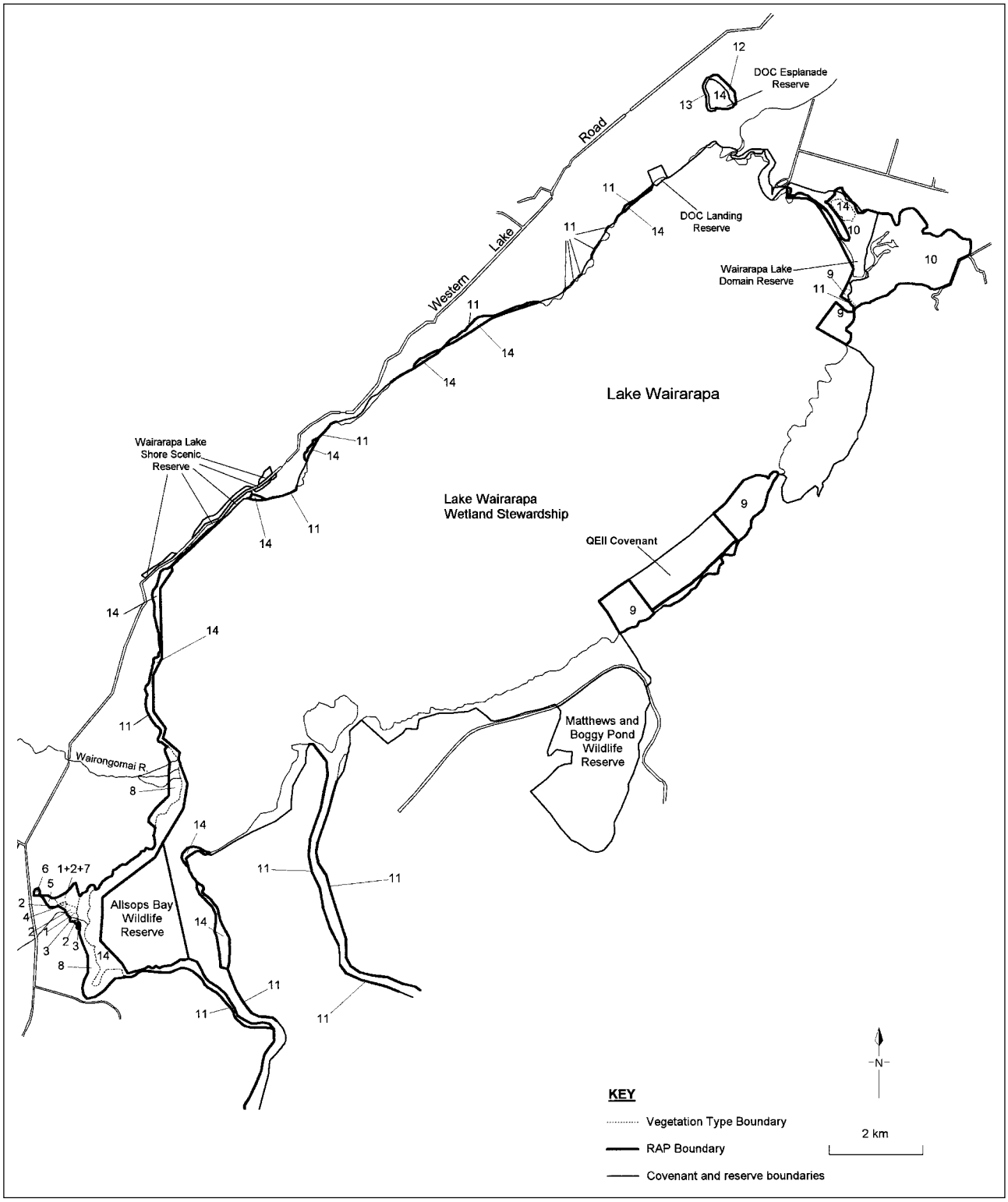
Threat/Modification: The Lake Wairarapa area has been extensively modified by drainage and construction of flood control measures, resulting in the reduced extent and managed water levels of the modern wetlands. Willow and alder are locally extensive at the Tauherenikau River delta, Wairio wetlands, western Allsops Bay and the Waiorongomai River mouth. A Department of Conservation programme for control of alder is currently underway. Extensive tall fescue along the eastern lakeshore continues to spread along and into the lake, trapping sediment and reducing the mudflat area. Mercer grass and jointed-leaved rush are locally dominant (DOC 1991; A. Rebergen, pers. comm.) Nutrient enrichment from sources such as agricultural run-off encourages weed growth.

Within the RAP, Allsops Bay wetland is outstanding in terms of diversity and condition, attributed to fencing and stock exclusion over a substantial area, and a lower nutrient and relatively weed-free status (Ogle 1990, pers. obs.) Much of the Allsops Bay wetland has been fenced and stock excluded for many years (R. Matthews, pers. comm.), but both the herbfield and western arm are narrow and heavily grazed by sheep, causing modification and threatening their long term viability.

Discussion: Lake Wairarapa and the associated wetland surroundings are an ecological complex of outstanding conservation value, and are of national and international significance. This area provides a relatively large and healthy habitat to many native species including numbers of threatened or uncommon plants and animals. The current complex is a comparatively large total area, however it is only a fraction of the extensive wetlands, once maintained by periodic flooding, which formerly occupied most of the lower Wairarapa Plains (Moore *et al.* 1984; Ogle *et al.* 1990; DOC 1991). Much of the remaining wetland area is now protected in reserves administered by the Department of Conservation or the South Wairarapa District Council. The RAP encompasses further outstanding wetlands deserving legal protection in their own right. It also incorporates areas containing less significant or adventive fauna and flora, but nevertheless of significant conservation value in terms of protecting the integrity and stabilty of the lake shore and waters to reduce adverse siltation, erosion, pollution, and spread of exotic pest plants. It is recommended the existing protected areas be extended as shown to allow improved management for conservation and water quality.

References: DOC 1991; Moore *et al.* 1984; Davis 1987; Ogle *et al.* 1990.

Location of RAP 12, Lake Wairarapa Wetland Stewardship Area Extension



Site of RAP 12, Lake Wairarapa Wetland Stewardship Area Extension

RAP 13 WAIORONGOMAI BUSH

Area: 56.0 ha

Altitudinal Range: 15-50 m

Grid Reference: NZMS260 R27 898925; S27 905922

Geological and Landform Units: Younger aggradation plain

Study Area No.: 203a, 203b

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Kahikatea-rewarewa/kahikatea-titoki-(matai)-(kanuka) forest and treeland [understorey includes kawakawa, makawe, mouku, mamaku, nikau, kaikomako, rangiora, *Coprosma areolata,* horoeka, ponga, kareao, porokaiwhiri, whauwhaupaku, local holly].	river terrace
	2. Miro forest [understorey: kawakawa].	river terrace
	3. Kanuka treeland.	river terrace
	4. (Rewarewa)/titoki-mahoe-kanuka-(karaka) forest and treeland [understorey: kawakawa-mahoe].	river terrace
	5. Kanuka-karaka-mahoe-ti kouka-(kowhai)-(ngaio)/kawakawa forest and treeland.	river terrace
	6. Tree lucerne-willow/tutu-(tauhinu)/tall grasses-(toetoe)-(tree lucerne) shrubland ⇔ Tutu-buddleia-(toetoe) shrubland ⇔ Ngaio-kanuka-akeake-(kohuhu) shrubland.	river bank and terrace
	7. Soft rush/pasture rushland.	depression in river terrace
	8. Kanuka/mahoe-kohuhu-(ngaio)-(titoki)-(mapou)-(ti kouka) forest [understorey: kawakawa-(koromiko)].	river terrace
	9. Rewarewa/titoki-kanuka-houhere-(kahikatea)-(ti kouka)-(hawthorn)-(black maire)-(karaka)-(matai) treeland.	river terrace
	10. Matai-titoki-black maire-karaka-kareao/karaka-kawakawa-(nikau) forest [generally good understorey development].	river terrace
	11. Ti kouka-(kowhai)-(puka) treeland.	river terrace
	12. Kahikatea/karaka-mahoe-porokaiwhiri-houhere-ngaio-(kanuka)-(exotic conifers) forest [kawakawa understorey].	alluvial plain
	13. Kanuka-(kowhai) treeland ⇔ Titoki-karaka-(kaikomako)-(mahoe)-(matai)-(kahikatea) treeland [groundcover comprises pasture] ⇔ Ti kouka treeland [groundcover comprises pasture] ⇔ Pasture.	alluvial plain, old river channel
	14. Titoki-karaka-(ngaio)-(mahoe)-(tarata)/kawakawa-karaka-mahoe forest [understorey: karaka-kawakawa].	alluvial plain
	15. Kanuka-kahikatea forest ⇔ Tree lucerne-ti kouka treeland ⇔ Ngaio-tree lucerne treeland [from east to west].	alluvial plain

Landform: Raised terraces of the Waiorongomai River merging into an alluvial aggradation plain which extends to Lake Wairarapa.

Vegetation: A relatively large, although attenuated, forest remnant comprising several distinct vegetation types. The kahikatea forest (type 1) includes local karaka and matai, and a poorly drained pole kahikatea stand. Numerous epiphytes including puka, orchids, *Collospermum* and *Astelia* species occur locally. Native vegetation is reduced to treeland through much of the RAP east of the road, and in parts to the west.

Flora: *Korthalsella salicornioides* (classed as insufficiently known; Cameron *et al*. 1995), *Streblus banksii* (large leaved milk tree), *Metrosideros robusta* (epiphytic on cabbage tree – Philip Simpson pers. comm.), *Botrychium biforme*, *Gunnera prorepens*, *Drymoanthus adversus*, nikau, akeake, miro, and puka are present.

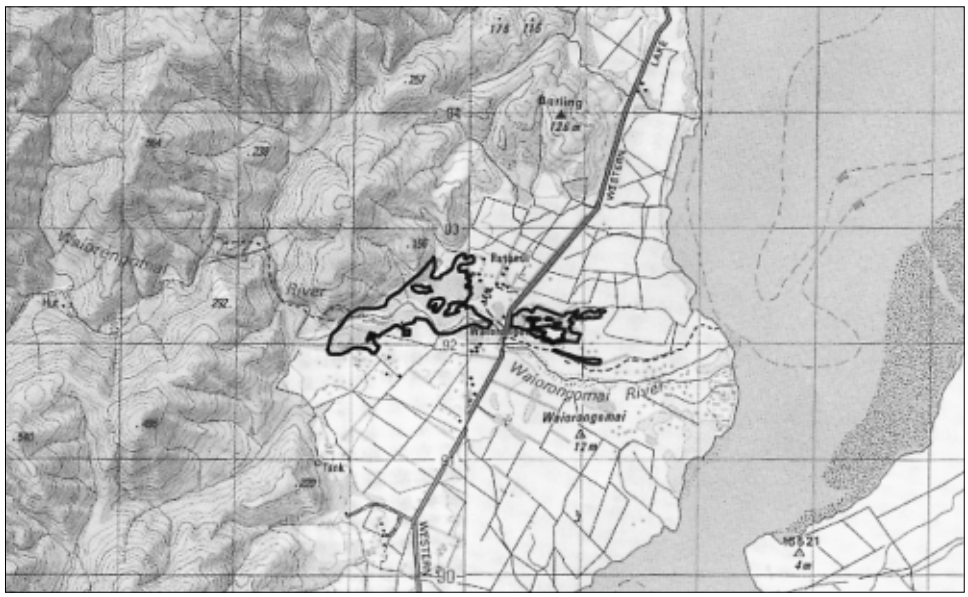
Fauna: Many kereru were seen during the survey, and a variety of common birds including tui, Australasian harrier, and paradise shelduck.

Threat/Modification: Adventive species are relatively common around the carpark and near Western Lake Road, including holly, English ivy, tradescantia, hawthorn, radiata pine, barberry, willow, false acacia, and camellia. Most of the RAP is fenced and ungrazed by domestic stock, except in the treeland area where stock have access. There is little or no native regeneration in these areas and holly seedlings and saplings are locally common.

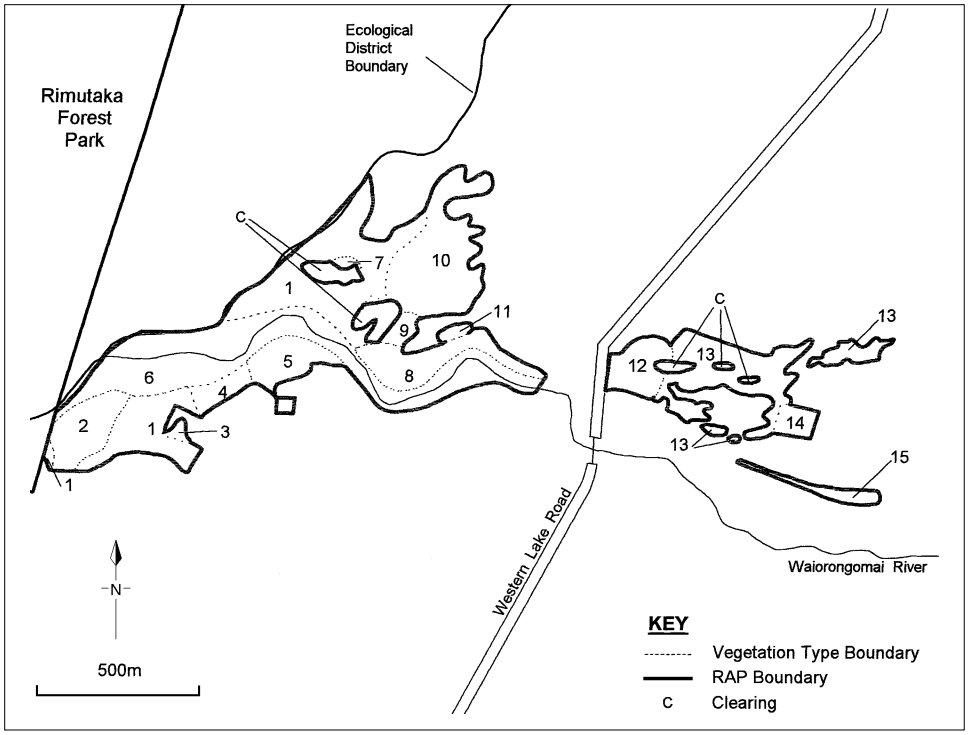
Discussion: This area is the third largest forest remnant on the Wairarapa Plains and the largest on this landform type. The continued existence of this large area is attributable to the highly commendable actions of the landowner, also the owner of RAP 14 and an outstanding area of RAP 12. It contains species and assemblages now uncommon elsewhere in the plains including good populations of akeake, karaka, nikau (regenerating, c.f. some other sites) and miro, semi-coastal - lowland forest, and podocarp-dominated forest. The forest is contiguous with Rimutaka Forest Park in the adjacent Tararua Ecological District; this considerably enhances the wildlife values and longterm viability of Waiorongomai Bush. This RAP is a conspicuous part of the lower Wairarapa plains network of indigneous vegetation identified by Simpson (1997) as a priority for restoration in the Wellington Conservancy. Part of this RAP is also known as Wilderness Bush (Druce 1987).

Reference: Druce 1987 (list number 141), Simpson 1997.

Location of RAP 13, Waiorongomai Bush



Site of RAP 13, Waiorongomai Bush



RAP 14 ALLSOPS BAY BUSH

Area: 8.3 ha

Altitudinal Range: <20 m

Grid Reference: NZMS260 S27 903888

Geology and Landform Units: Younger aggradation plain

Study Area No.: 202

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION	LANDFORM
Semi-coastal – lowland	1. (Rewarewa)/karaka-titoki/(mahoe) forest and treeland. Other canopy trees include matai, hinau and kaikomako around the edges.	Plain

Landform: Lakeside alluvial plain at Allsops Bay, Lake Wairarapa.

Vegetation: Karaka forest. Undergrowth is sparse through the centre, increasing in stature, complexity and diversity toward fenced edges. Grazed portions to the west and east are reduced to treeland.

Flora: Karaka was previously one of the main broadleaved species of podocarp-broadleaf plains forests (Hill 1962), however karaka dominated associations are now uncommon in the district. Poroporo and nikau are also present but uncommon elsewhere.

Fauna: No significant species noted.

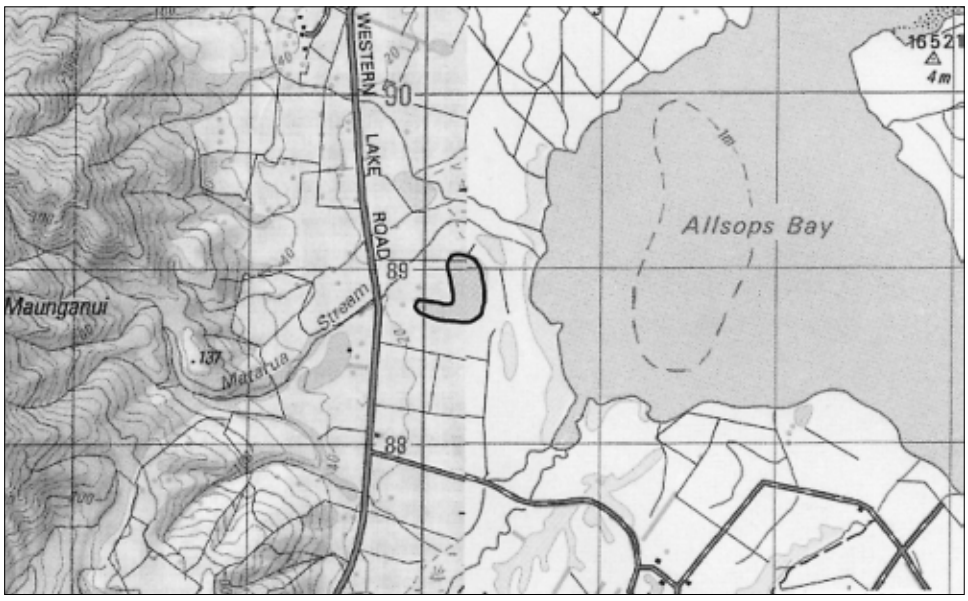
Threats/Modifications: Much of this bush fragment has been protected by fencing for up to 50 years (R. Mathews pers. comm.); the sparse understorey may be attributable to an intact canopy and low light conditions in the forest interior. Adjustments to the fenceline to include matai, on the east side, and a substantial area of treeland west of the current fence would improve the integrity of the site.

Discussion: This RAP is the only substantial stand of karaka on the Wairarapa Plains ant lies beside the Allsops Bay wetlands in RAP 12. Forests on aggradation plains were previously a much more common landscape component and this site is one of the largest forest remnants on this land type remaining.

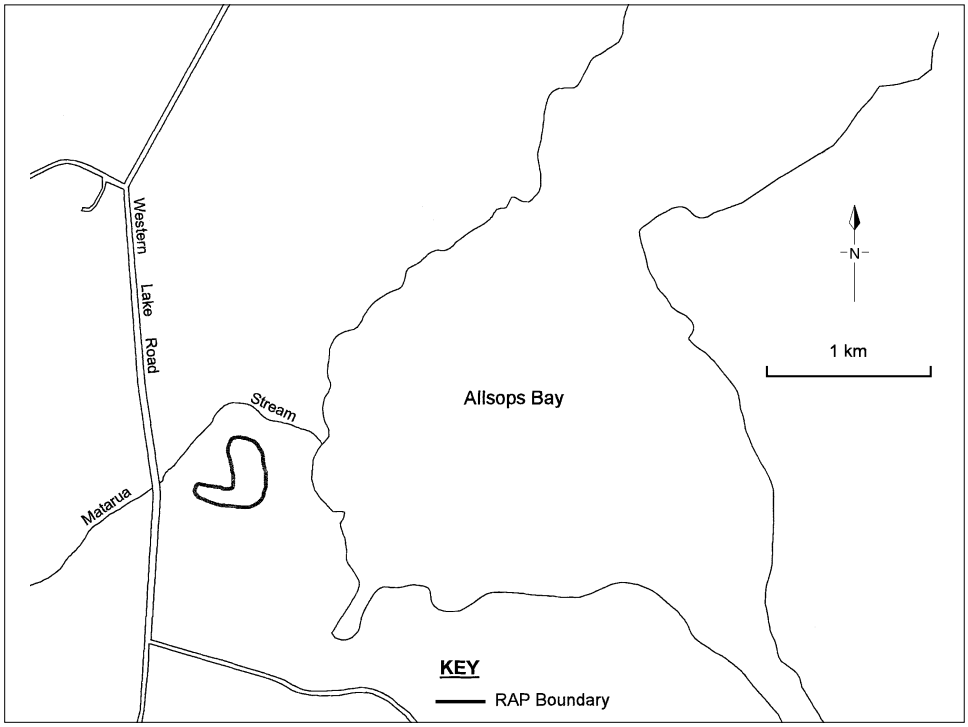
Comments: RAP 14, Waiorongomai Bush (RAP 13), and the Allsops Bay Wetlands (part of RAP 12) are among the best indigenous habitat remnants in the ecological district. Most are fenced and have informal protection, reflecting positive conservation management by the landowner. This RAP is also known as Karaka Bush (Druce 1987).

Refererence: Hill 1962, Druce 1987 (list number 141).

Location of RAP 14, Allsops Bay Bush



Site of RAP 14, Allsops Bay Bush



RAP 15 MATAGOURI SCRUB

Area: 0.3 ha

Altitudinal Range: ≤30 m

Grid Reference: NZMS260 R27 891842

Geology and Landform Units: Low hills

Study Area No.: 131

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Kanuka/mingimingi-(karamu)-(matagouri)-(whararikí)-scrub ⇔ (Tī kouka)-kanuka-mahoe-whararikí-(rangiora)-(koromiko)- (whau-whaupaku)-(mapou)-(tarata)-small-leaved pohuehue scrub.	Hillslope

Landform: The upper slope of a low hill above a road cutting. Part of a small isolated cluster of low hills in the lower plains.

Vegetation: Low secondary scrub regenerating after clearance by fire. Whararikí and a relatively large population of matagouri are concentrated toward the roadside edge of this narrow RAP.

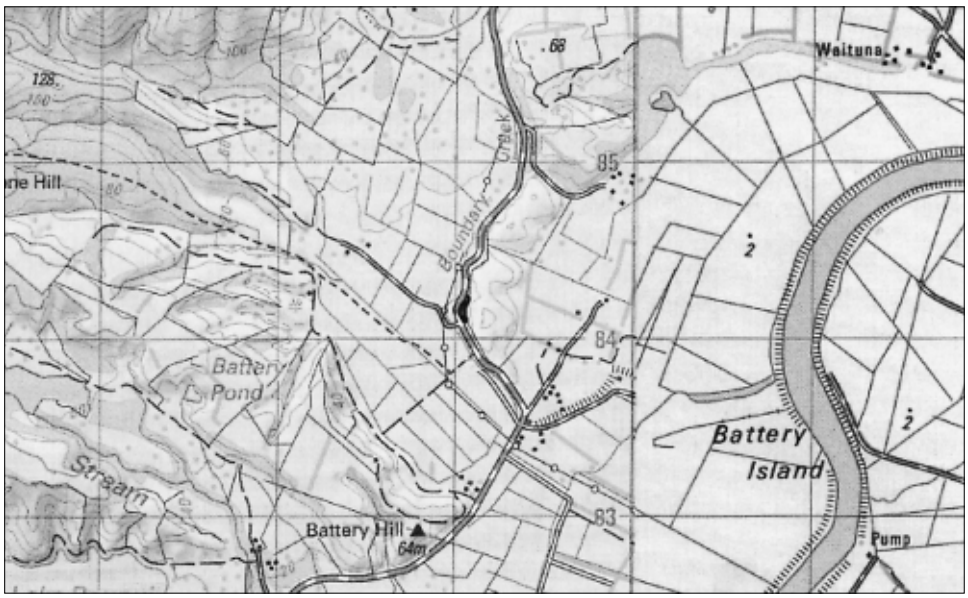
Flora: Matagouri is regionally threatened in Wellington Conservancy (Empson & Sawyer 1996) and known from few sites in the Wairarapa Plains Ecological District. It is uncommon through the wider Wairarapa area, particularly on landforms other than dunes.

Fauna: Spur-winged plover, Australasian harrier, and pukeko were seen in the vicinity of the RAP.

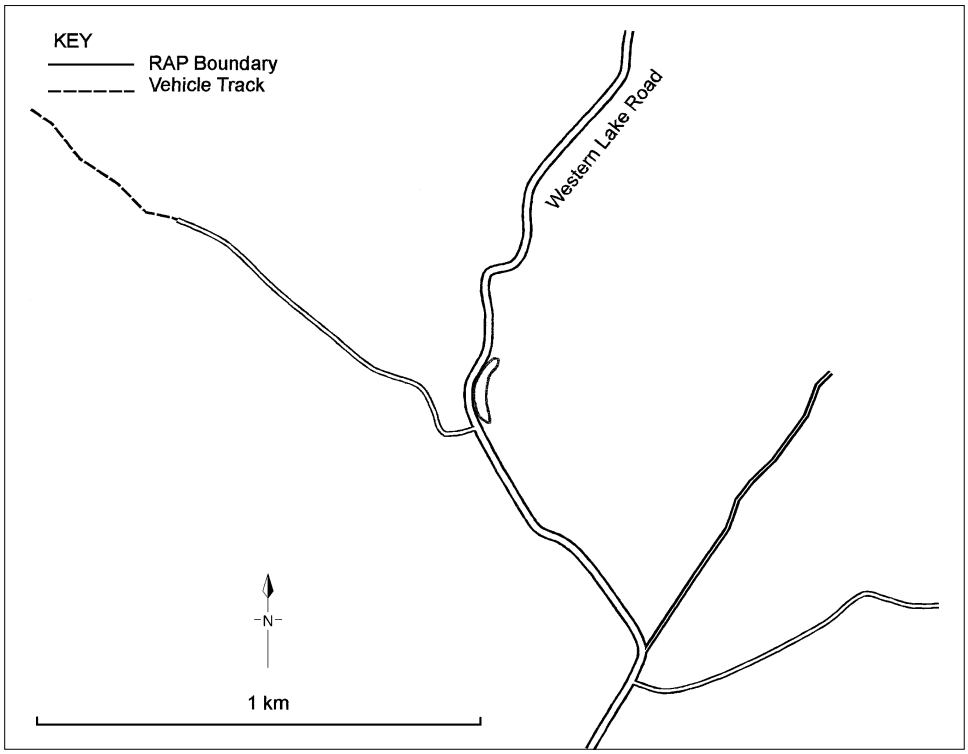
Threat/Modification: The small size and narrow shape of this site may reduce its long- term viability. Substantial road dust blankets parts of the vegetation, while agricultural runoff, fertiliser drift, and fire are risks related to the site location adjacent to the road and farmland. Scrub and shrubland above an adjacent road cutting harbours gorse, tree heath, and Spanish heath.

Discussion: This site has significant conservation and land stabilising values as well as lending a scenic aspect to the road. A regionally threatened plant species (matagouri) is present. The low hills of this district now maintain very little of their former native cover; this type was typical post-fire vegetation and was therefore once common.

Location of RAP 15, Matagouri Scrub



Site of RAP 15, Matagouri Scrub



RAP 16 MANGAROA

Area: 121.8 ha

Altitudinal Range: 40-180 m

Grid Reference: NZMS260 S27 000830

Geology and Landform Units: Low hills, marine terraces

Study Area No.: 130

Survey Methodology: J. Hansen pers. comm.; 1979 aerial photographs

BIOCLIMATIC ZONE	VEGETATION	%	LANDFORM
Semi-coastal – lowland	1. Black beech-(rewarewa) forest [sparse undergrowth of mingimingi and prickly mingimingi, black beech, some whahariki].	80	gully
	2. (Rewarewa)/kanuka-manuka-whauwhaupaku-horoeka-(mingimingi)-(prickly mingimingi) scrub.	20	gully head and edges

Landform: A long gully along the Mangaroa Stream in low hill country east of the plains, bordering Aorangi Ecological District. The northern tip of the RAP overlies ancient marine terraces.

Vegetation: The core consists of primary beech forest in excellent condition with large, tall trees. Thick scrub around the edges and gully head results from previous fires, probably used to clear land for farming, and buffers the larger forest areas.

Flora: Kamahi and mature black beech are notable as they are unusual in the modern landscape.

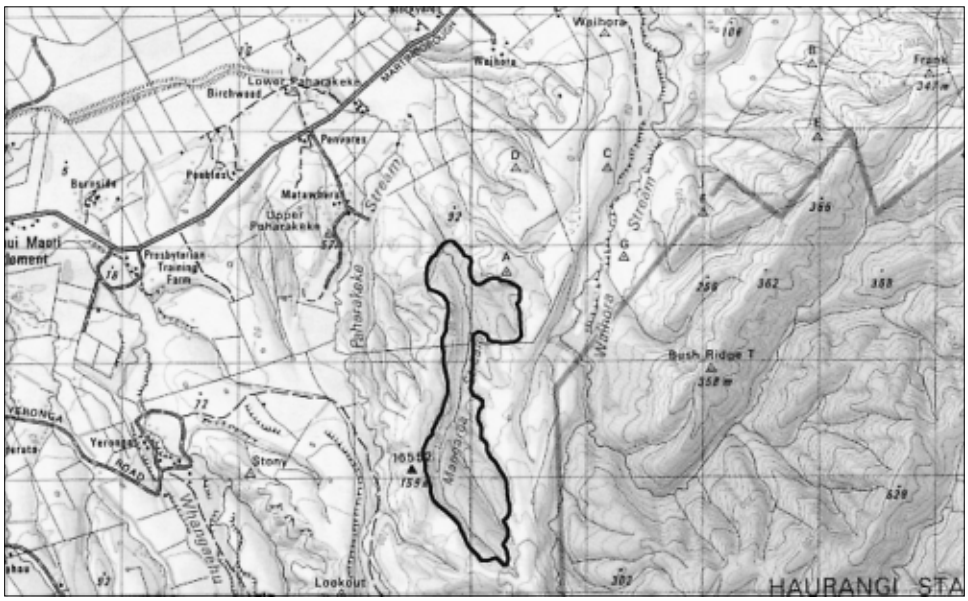
Fauna: Common forest birds are present.

Threats/Modifications: Much of the gully is fenced and protected from grazing. Fire may be a potential hazard; gorse is present around the edges but poses no threat to the site. A four-wheel drive track bisects the area.

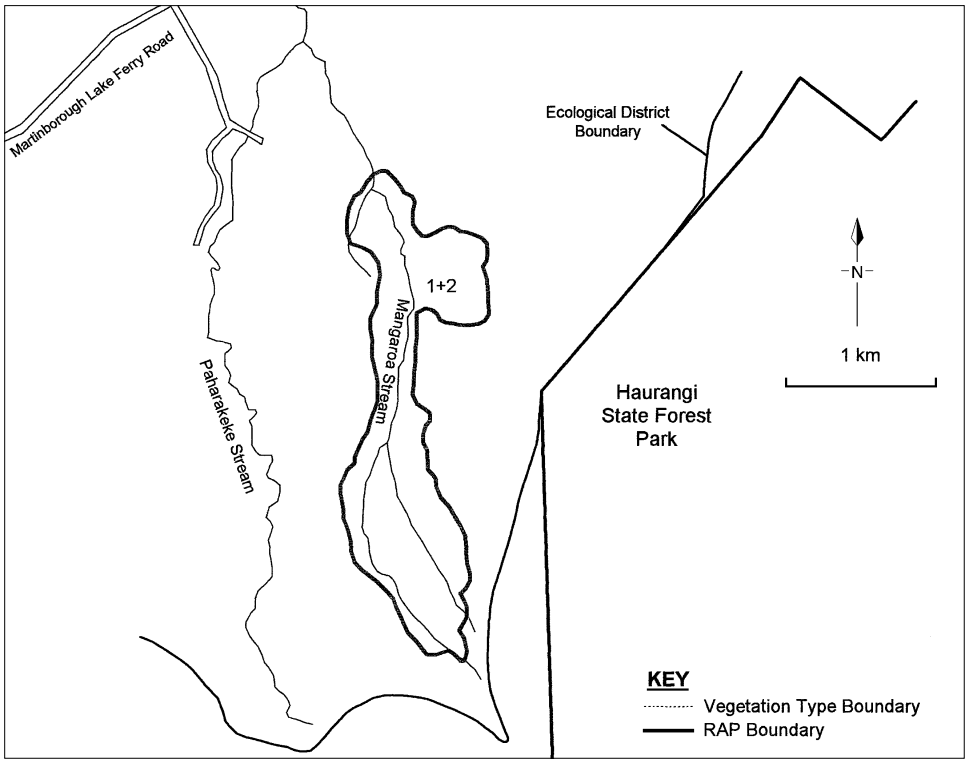
Discussion: The continued existence of forest remnants of this condition, size, and composition is outstanding and probably relates to its location at the edge of the district on low hill country, as well as the highly commendable actions of the landowners. This land type comprises a relatively minor portion of the ecological district, but is nevertheless a characteristic part of the lower plains area. The very small proportion of native vegetation left on this land type is therefore of concern.

Reference: Wellington Botanical Society 1999.

Location of RAP 16, Mangaroa



Site of RAP 16, Mangaroa



RAP 17 LAKE ONOKE, KIRIWAI LAKE, AND OCEAN BEACH DUNES

Area: 91.3 ha

Altitudinal Range: 0-40 m

Grid Reference: NZMS260 R28 897795; 865794; 855784

Geological and Landform Units: Sand and shingle beaches, estuarine channels, estuarine lakes, mud and sand flats, wetlands, riparian flats, younger aggradation plain, marine terraces

Study Area No.: 101, 103, 122

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Coastal	1. Sand sedge-*Pimelea arenaria* -buck's-horn plantain-shore bindweed-(harestail) grassland.	basin behind low dunes
	2. Sand sedge-(*Raoulia australis*) sandfield.	high rear dune
	3. *Isolepis nodosa*/buck's-horn plantain-(shore bindweed)-(shore lobelia) sedgeland.	rear of low dune
	4. Spinifex-(marram)-(sand sedge)-(shore bindweed)-driftwood grassland.	very low dune
	5. Unvegetated.	sand beach
	6. *Pimelea arenaria* -(shore bindweed)-(*Raoulia australis*) sandfield ⇔ (Shore bindweed) sandfield to east.	very low dunes and sand basin
	7. Buck's-horn plantain herbfield.	basin behind low dune
	8. Tall grasses.	low dune
	9. Gorse-tall fescue/pasture shrubland.	low dunes, stopbanks, near lake shore
	10. Oioi-sea rush-(marsh ribbonwood) sedgeland/tall fescue-sea rush-(marsh ribbonwood) grass-rushland.	saltmarsh
	11. Saltmarsh ribbonwood-tall fescue-(*Cyperus ustulatus*)-(sea rush) shrubland ⇔ Mercer grass *Isolepis prolifer* grassland.	lake margin

cont.on next page

	12. A mosaic of: • kanuka treeland; • *Carex geminata* rushland; • harakeke/pukio-*Carex geminata*-(giant umbrella sedge) flaxland (with occasional ferns, treefern, kanuka); • ti kouka/mahoe-kanuka-gorse-(wheki)-(harakeke)-(mamaku) shrubland; • oioi-raupo-*Cyperus ustulatus* sedgeland; • *Schoenoplectus validus*/*Carex geminata*-tall fescue grass-sedgeland; • *Isolepis prolifer*-jointed rush sedgeland; • *Carex geminata*-tall fescue-water pepper-pukio-(jointed rush)-(gorse) grass-sedgeland; • *Carex geminata* sedgeland with local giant umbrella grass; • *Isolepis prolifer*-jointed rush-water pepper sedgeland ⇔ Raupo reedland.	gully
	13. Raupo reedland.	gully, lake margin
	14. Sea rush-*Schoenoplectus validus*-(tall fescue)/*Isolepis prolifer*-jointed rush-(bachelor's button) rushland.	lake margin
	15. Water.	estuarine lake
	16. Saltmarsh ribbonwood-oioi-sea rush-tall fescue-(gorse) shrub-rushland (with occasional bachelor's button and *Isolepis prolifer;* remuremu, *Apium prostratum* and *Samolus repens* form turf locally at water's edge and beneath rushes; occasional brome; local *Isolepis cernua* in water).	saltmarsh
	17. A mosaic of: • Saltmarsh ribbonwood/*Carex geminata* shrubland; • Saltmarsh ribbonwood-tall grass-gorse-(sea rush)-(leafless rush)/*Carex geminata*-pasture-driftwood shrubland; • Driftwood-(gorse)-(sheep's sorrel)-(red clover) gravel field with occasional *Isolepis nodosa,* taupata, ngaio, boneseed, Cape ivy, herb Robert, *Brassica* sp., *Oxalis* sp.; • Exotic grasses-(shore bindweed)-shrub-grassland; • Driftwood-Mercer grass gravelfield; • Sea rush-(*Schoenoplectus pungens*) rushland; • Gorse-marsh ribbonwood-(lupin) shrubland; • Sea rush-saltmarsh ribbonwood-tall fescue-(sea rush) rushland; • Buck's-horn plantain-Mercer grass grass-herbfield, thorn apple scattered around eastern margins.	flats, gravel lakeshore, lake margin, saltmarsh, lakebed edge

Landform: This RAP lies between the Rimutaka and Aorangi Ranges at the southern end of the Wairarapa Plains Ecological District. The current landscape of Lake Onoke, and it's historical alteration, is described by Moore *et al.* (1984) and DOC (1991). The RAP extends from the brackish Lake Onoke through to the low dunes and sandy beach to the west, including a gully cut through the aggradation plain to Kiriwai Lake. The beach backs onto coastal cliffs.

Vegetation: Tussock grassland, gorse shrubland, and areas of herb-sandfield occur along the beach dunes. The gully contains primarily non-forest freshwater wetland; rushes, sedges, reeds and local shrubland surround the water of Kiriwai Lake, while treeland, scrub and gorse shrubland line the gully sides. Occasional local *Schoenoplectus pungens*, *Schoenoplectus tabernaemontani*, *Carex geminata, Isolepis nodosa,* sea rush, soft rush, gorse, sand sedge, *Cyperus ustulatus*, pampas, and bachelor's button occur around Lake Onoke.

Flora: One of only three known populations of *Isolepis basilaris* (rare; Cameron *et al*. 1995) in the Wellington Conservancy grows near the west end of Kiriwai Lake. *Atriplex cinerea* (local) was previously recorded at Palliser Bay (Sawyer et al. 1998). *Austrofestuca littoralis* (sand tussock), *Pimelea arenaria* (rare) and hinarepe (rare) and Pingao also occur at this site. Mimulus repens occurs at Kiriwai.

Fauna: A variety of birds utilise Kiriwai Lake and it's surrounds including welcome swallow, Australasian harrier, spur-winged plover, white faced heron, fantail, pipit, and caspian tern (Sawyer *et al.* 1997; pers. obs.) Banded dotterel breed along the shore and inanga breed in saltmarsh by the entry point of the Ruamahanga River into Lake Onoke (A. Rebergen, pers. comm.; Rebergen 1997a). A more extensive list is given by Moore *et al.* 1984.

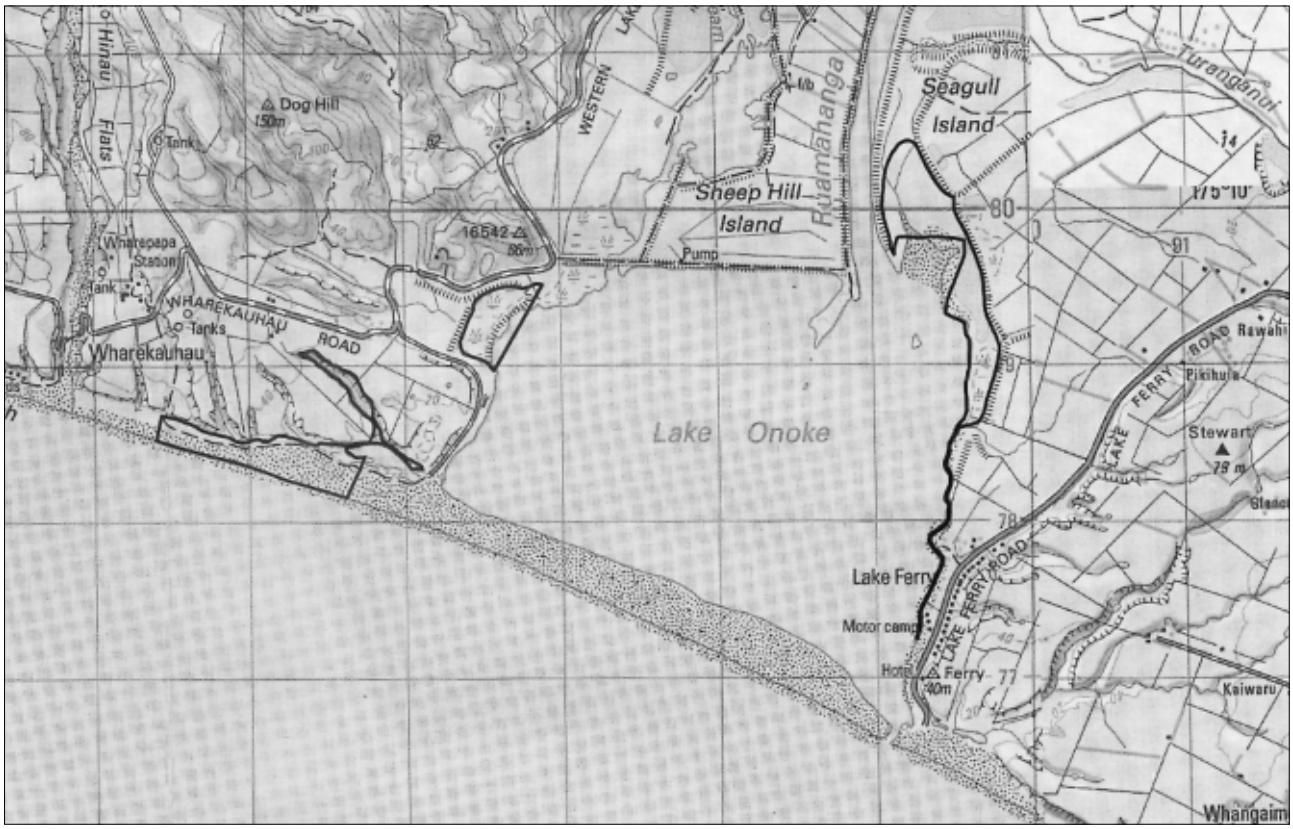
Threat/Modification: Cattle and sheep graze most of this RAP, trampling vegetation and contributing to erosion, soil compaction, and potential nutrient enrichment problems in the lake waters. Parts of Lake Onoke's margins are highly modified, but warrant RAP status to help maintain the integrity of the lake. Drains and stopbanks dissect the saltmarsh areas at the west and north-east of Lake Onoke. A small dam between the gully and Kiriwai Lake appears recently constructed or maintained.

Discussion: This RAP complements and is continguous with the Lake Wairarapa Wetland Stewardship Area, and lies very close to the Ocean Beach Stewardship to the west, forming a large natural area. Nationally and regionally threatened species and a variety of wetland and dune vegetation as well as a wide range of land types are found here. The coastal scrub in the gully leading to Kiriwai Lake is also noteworthy as this vegetation type was previously widespread but is now very uncommon in the Wairarapa Plains Ecological District.

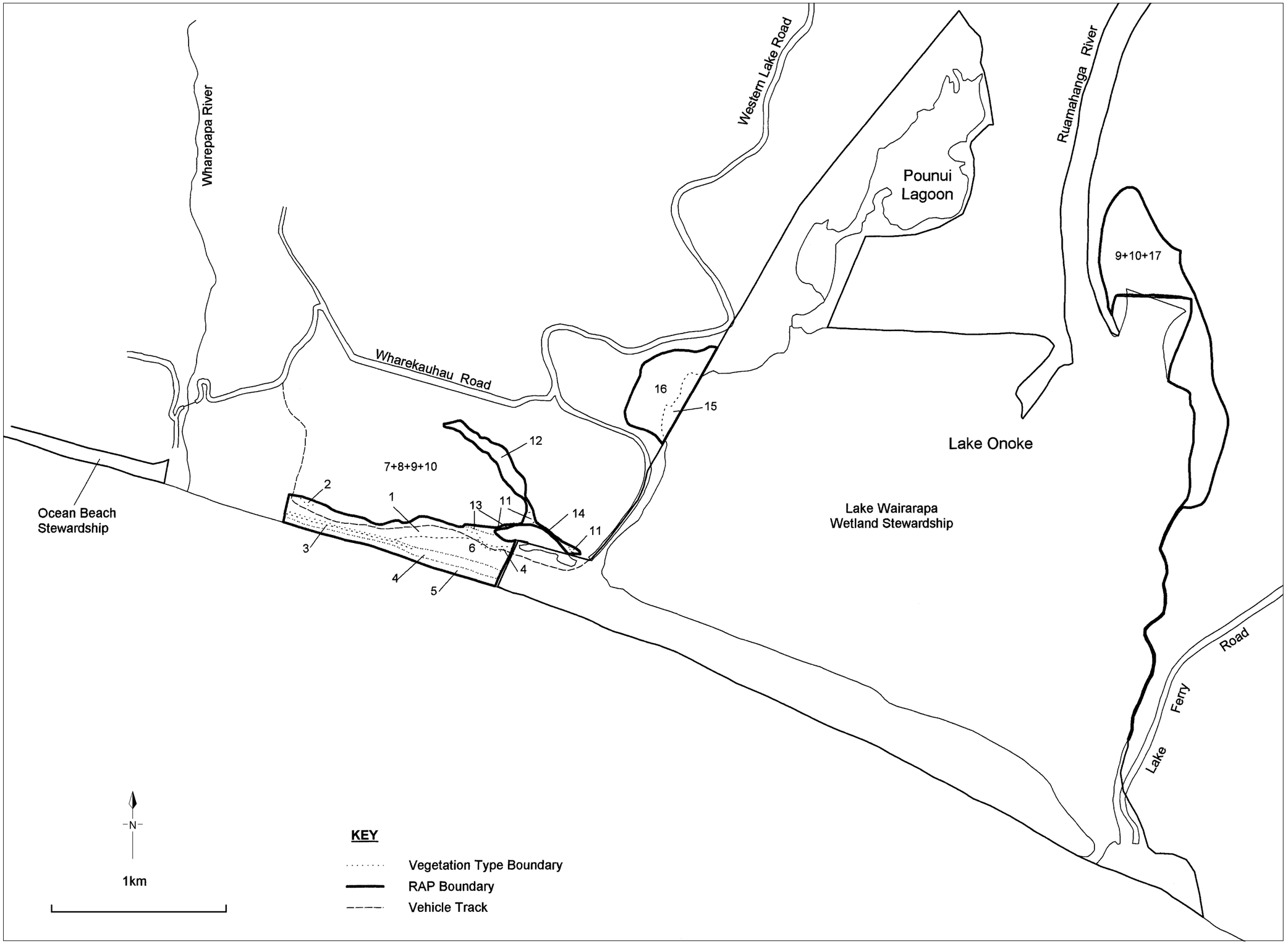
Comments: The RAP contains two areas of Crown land administered by Land Information New Zealand. Neither of these areas are formally protected for their conservation values.

References: DOC 1991; Moore *et al.* 1984; Rebergen 1997a; Sawyer *et al.* 1997; Sawyer et al. 1998.

Location of RAP 17,
Lake Onoke, Kiriwai Lake, and
Ocean Beach Dunes



Site of RAP 17,
Lake Onoke, Kiriwai Lake, and
Ocean Beach Dunes



RAP 18 WHAREKAUHAU BUSH FRAGMENTS

Area: 4.5 ha

Altitudinal Range: <20-75 m

Grid Reference: NZMS260 R28 828797; 830796; 837793

Geology and Landform Units: Marine terraces

Study Area No.: 109a, 109b, 109c

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION	LANDFORM
semi-coastal – lowland	1. Radiata pine/ngaio-taupata-kawakawa-(radiata pine)-(tarata) forest [understorey: (*Melicytus micranthus*)-(*Coprosma propinqua*)-(*Melicytus crassifolius*)] ⇔ Radiata pine/radiata pine-ngaio-karaka-maritime pine-(ti kouka) forest [understorey: (mahoe)-(kawakawa)-(taupata)-(karaka)-(wharangi)].	marine terrace
	2. A mosaic of: • Radiata pine-(eucalypt) treeland; • Ngaio-(karaka)-(mahoe) forest [understorey kawakawa-wharangi; occasional titoki, ti kouka and kohekohe in the canopy]; • Radiata pine/taupata-(karaka) forest [understorey: kawakawa-karaka-wharangi].	marine terrace
	3. Ngaio-karaka-mahoe-(taupata)-(tarata) forest and scrub with scattered whauwhaupaku and ti kouka).	marine terrace, terrace riser

Landform: Coastal marine terraces along Palliser Bay coast.

Vegetation: Coastal forest associations partially dominated by radiata and maritime pine.

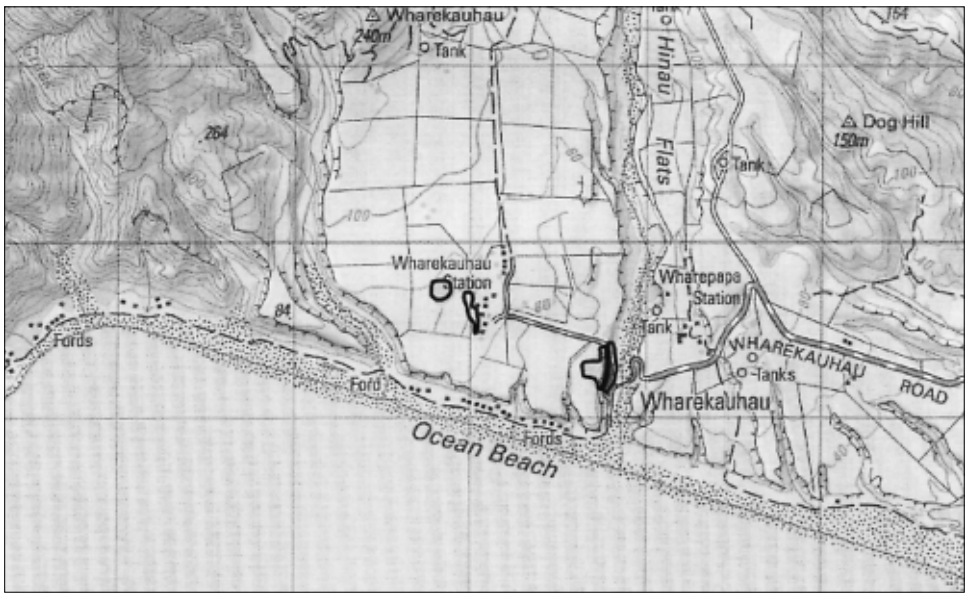
Flora: Kohekohe, not known from any other site in the ecological district, occurs in this RAP. Large-leaved milk tree (*Streblus banksii*) and rohutu are also present.

Fauna: No significant fauna were recorded during survey.

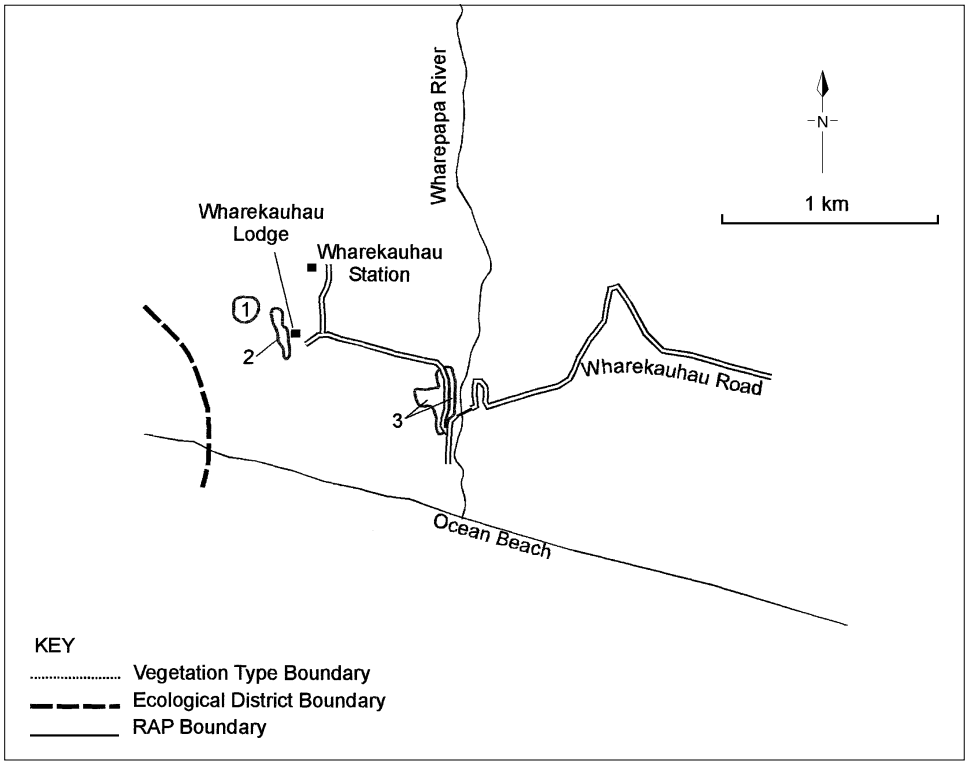
Threat/Modification: Most of the area is grazed and the western fragments contain tall planted exotic trees. Ground-smothering weeds are locally prevalent in the central fragment. Old man's beard is also present.

Discussion: Marine terraces are the most extensive land type in the coastal zone, covering *c.*874 ha, but less than 10% of this area is retained in native vegetation. The Wharekauhau fragments, although small and modified, contain the only indigenous forest found in the coastal bioclimatic zone and are therefore highly significant.

Location of RAP 18,
Wharekauhau Bush Fragments



Site of RAP 18, Wharekauhau
Bush Fragments



RAP 19 WHANGAIMOANA STREAM BUSH

Area: 12.1 ha

Altitudinal Range: 75-120 m; 85-100 m; 80 m; 100-150 m

Grid Reference: NZMS260 S28 955745; 953743; 954743; 962734

Geological and Landform Units: Marine terraces

Study Area No.: 116

Survey Methodology: Field inspection

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal – lowland	1. Karaka treeland.	terrace river
	2. Kanuka shrubland.	marine terrace slope
	3. Ngaio-mahoe-kohuhu-(ti kouka)-(whauwhaupaku)/(kawakawa)-(rangiora) scrub [localised gorse toward tops of terrace risers].	terrace riser, gully

Landform: Indigenous vegetation in a series of gullies cut through marine terraces by the Whangaimoana River, and on part of the narrow river floodplain.

Vegetation: Reasonably diverse secondary scrub with a canopy varying from patchy in the west to more intact toward the north-east. Areas of ti kouka and karaka treeland probably result from previous scrub clearance.

Flora: No significant species were recorded during this survey.

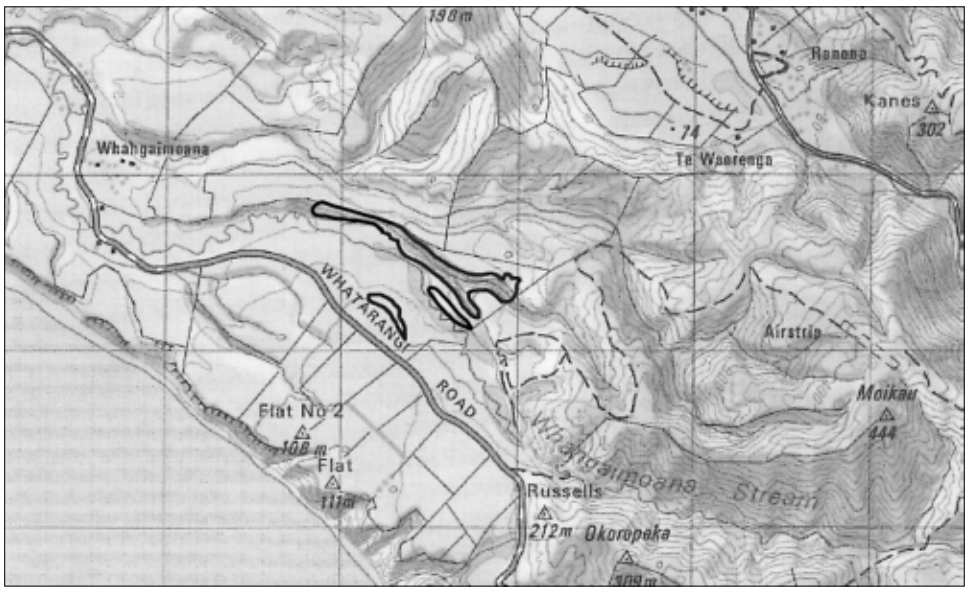
Fauna: Common forest birds are likely to be present.

Threat/Modification: The main threats to this site are further clearance, and continued grazing preventing regeneration. Willow forest dominates part of the river section between scrub remnants.

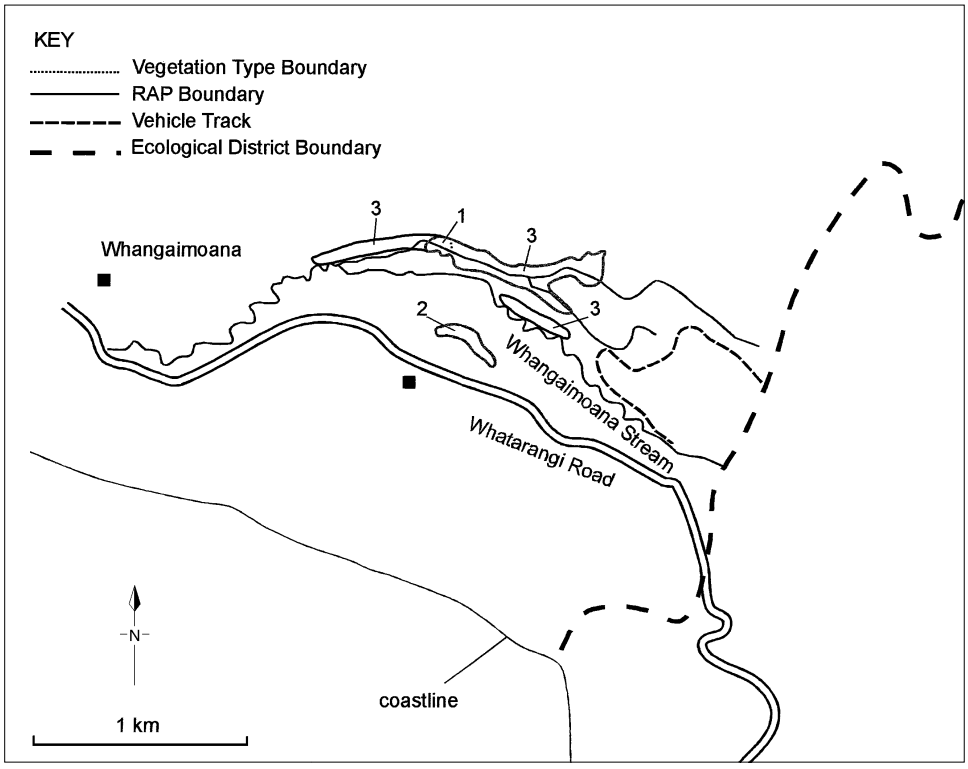
Discussion: This RAP is the only sizeable area of scrub/shrubland on marine terraces, a combination now very much reduced from its former extent.

Comments: Maori stone walls and othet signs of historical occupation are visible (see Leech and Leech 1979). Landowner has fenced off part of Area 3 and is considering further protection.

Location of RAP 19, Whangaimoana Stream Bush



Site of RAP 19, Whangaimoana Stream Bush



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Appendix 1: Indigenous vascular plants in the Wairarapa Plains Ecological District

The following list was compiled from information collected during the 1997-98 PNAP survey, during the initial phase of the PNAP survey in 1996 (with reference to Sawyer & Keenan 1997; Sawyer 1998; Ogle *et al*. 1990a; Druce 1971a, 1971b, 1990; Hill 1962; Mason 1951), and from other field excursions by the authors, often with members of the Wellington Botanical Society. Andrew Townsend helped with the compilation of this list.

Abbreviations used:

aff.	affinities with
agg.	aggregate, comprising more than one species.
cf.	compare with
f.	forma, form
incl.	including
sp.	species (singular)
spp.	species (plural)
subsp.	subspecies
s.s.	*sensu stricto*, in the narrow sense
×	hybrid
var	variety
*	possibly adventive

GYMNOSPERM TREES

Dacrycarpus dacrydioides	kahikatea
Dacrydium cupressinum	rimu
Podocarpus totara	totara
Prumnopitys ferruginea	miro
Prumnopitys taxifolia	matai

MONOCOT. TREES

Cordyline australis	ti kouka
Cordyline banksii	ti ngahere, forest cabbage tree
Rhopalostylis sapida	nikau

DICOT. TREES AND SHRUBS

Alectryon excelsus var. *excelsus*	titoki
Aristotelia serrata	makomako, wineberry
Beilschmiedia tawa	tawa
Brachyglottis greyi var. *greyi*	
Brachyglottis repanda	rangiora
Carmichaelia australis	makaka, maukoro
Carpodetus serratus	putaputaweta
Coprosma areolata	
Coprosma crassifolia	
Coprosma grandifolia	kanono
Coprosma linariifolia	
Coprosma lucida	karamu
Coprosma microcarpa	
Coprosma propinqua subsp. *propinqua* (incl. *C. propinqua* var. *latiuscula*)	
Coprosma propinqua × *C. robusta*	
Coprosma rhamnoides	
Coprosma rigida	
Coprosma rigida × *C. propinqua*	
Coprosma robusta	karamu
Coprosma rotundifolia	
Coprosma rubra	
Coprosma sp. "v" (of Eagle 1982)	
Coprosma tenuicaulis	hukihuki
Coprosma tenuifolia	
Coprosma virescens	
Coprosma wallii	
Coriaria arborea var. *arborea*	tutu
Corynocarpus leavigatus	karaka
Cyathodes juniperina	prickly mingimingi
Cyathodes sp. (*C. juniperina* agg.) (lvs small, <1cm × <1 mm) (Druce 1971b)	
Discaria toumatou	matagouri
Elaeocarpus dentatus	hinau
Elaeocarpus hookerianus (Druce 1971b)	pokaka
Fuchsia excorticata	kotukutuku, tree fuchsia
Fuchsia excorticata × *F. perscandens*	
Gaultheria antipoda	tawiniwini
Gaultheria rupestris	
Geniostoma rupestre var. *liguistrifolium*	hangehange
Griselinia littoralis	papauma
Griselinia lucida	puka
Hebe parviflora agg.	
Hebe stricta var. *atkinsonii*	koromiko
Hebe stricta var. *stricta*	koromiko
Hedycarya arborea	porokaiwhiri, pigeonwood
Helichrysum lanceolatum	niniao
Hoheria angustifolia	narrow-leaved lacebark

Hoheria angustifolia × *H. sexstylosa* var. *sexstylosa* (Druce 1971b)	
Hoheria sexstylosa var. *sexstylosa*	houhere, lacebark
Ileostylus micranthus	mistletoe
Knightia excelsa	rewarewa
Korthalsella clavata	mistletoe
Korthalsella lindsayi	mistletoe
Korthalsella salicornioides	mistletoe
Kunzea ericoides var. *ericoides*	kanuka
Laurelia novae-zelandiae	pukatea
Leptospermum scoparium	manuka
Leucopogon fasciculatus	mingimingi
Lophomyrtus bullata	ramarama
Lophomyrtus bullata × *L. obcordata*	
Lophomyrtus obcordata	rohutu
Macropiper excelsum var. *excelsum*	kawakawa
Melicope simplex	poataniwha
Melicytus micranthus (incl. *M. m.* var. *microphyllus*) (Druce 1990)	mahoe-wao
Melicytus ramiflorus subsp. *ramiflorus*	mahoe
Melicytus sp. "Blonden"	
Metrosideros robusta	northern rata
Myoporum laetum	ngaio
Myrsine australis	mapou
Myrsine divaricata	
Myrsine salicina (Druce 1971b)	toro
Neomyrtus pedunculata	rohutu
Nestegis cunninghamii	black maire
Nestegis lanceolata	white maire
Nestegis montana	narrow-leaved maire
Nothofagus fusca	red beech
Nothofagus menziesii (Ogle *et al*. 1990a)	silver beech
Nothofagus solandri var. *solandri*	black beech
Nothofagus solandri × *N. truncata*	
Nothofagus truncata (1996b)	hard beech
Olearia arborescens	
Olearia paniculata	
Olearia rani	heketara
Olearia solandri	
Olearia virgata var. *virgata* (incl. *O. v.* var. *ramuliflora*) (Druce 1971b)	
Ozothamnus leptophyllus	tauhinu
Pennantia corymbosa	kaikomako
Pimelea arenaria	sand daphne
Pittosporum cornifolium	
Pittosporum divaricatum	
Pittosporum eugenioides	tarata; lemonwood
Pittosporum obcordatum	
Pittosporum ralphii	
Pittosporum tenuifolium subsp. *tenuifolium*	kohuhu

Plagianthus divaricatus	makaka, marsh ribbonwood
Plagianthus regius	manatu, ribbonwood
Pseudopanax arboreus var. *arboreus*	whauwhaupaku, five finger
Pseudopanax crassifolius	horoeka, lancewood
Pseudowintera axillaris	
Pseudowintera colorata	
Raukaua anomalus	
Raukaua edgerleyi	raukawa
Schefflera digitata	pate
Solanum aviculare var. *aviculare* (incl. *Solanum aviculare* var. *albiflorum* and *S. cheesemanii*) (Druce, 1987)	poroporo
Solanum laciniatum	poroporo
Sophora microphylla	kowhai
Sophora tetraptera	kowhai
Streblus banksii	larged-leaved milk tree
Streblus heterophyllus	turepo
Syzygium maire	maire tawake
Teucridium parvifolium (incl. *Teucridium parvifolium* var. *luxurians*)	
Tupeia antarctica	mistletoe
Urtica ferox	ongaonga
Weinmannia racemosa	kamahi

MONOCOT. LIANES

Freycinetia banksii	kiekie
Ripogonum scandens	kareao, supplejack

DICOT. LIANES

Calystegia sepium	pohue
Calystegia tuguriorum (Druce 1971b)	
Clematis foetida	akakaiku
Clematis forsteri (incl. *C. australis, C. hookeriana, C. petriei*)	poananga
Clematis paniculata	puawananga
Fuchsia perscandens	
Metrosideros colensoi (Druce 1971b)	rata
Metrosideros diffusa	rata
Metrosideros fulgens	rata
Metrosideros perforata	aka
Muehlenbeckia australis	pohuehue
Muehlenbeckia australis × *M. complexa* (Druce 1971b)	
Muehlenbeckia complexa	pohuehue
Parsonsia capsularis	

Parsonsia capsularis × *P. heterophylla* (Druce 1971b)	
Parsonsia heterophylla	New Zealand jasmine
Passiflora tetrandra	New Zealand passion flower
Rubus australis	bush lawyer
Rubus australis × *R. complexa* (Druce 1971b)	
Rubus australis × *R. schmideloides* (Druce 1971b)	
Rubus australis × *R. squarrosus* (Druce 1971b)	
Rubus cissoides var. *cissoides*	bush lawyer
Rubus schmidelioides var. *schmidelioides*	bush lawyer
Rubus squarrosus	leafless bush lawyer
Urtica linearifolia	

LYCOPODS AND PSLIOPSIDS

Isoetes kirkii
Lycopodium scariosum
Lycopodium varium (incl. *L. billardierei* & *L. novaezelandicum*; Druce 1971)
Lycopodium volubile
Tmesipteris elongata
Tmesipteris lanceolata
Tmesipteris tannensis

FERNS

Adiantum aethiopicum (Druce 1971b)	
Adiantum cunninghamii	maidenhair fern
Adiantum diaphanum (Druce 1971b)	huruhuru tapairu
Adiantum fulvum	huruhuru tapairu
Anarthropteris lanceolata (Druce 1971b)	
Anogramma leptophylla	
Arthropteris tenella	
Asplenium bulbiferum	mouku
Asplenium bulbiferum × *A. flaccidum* (Druce 1971b)	
Asplenium bulbiferum × *A. hookerianum* (Druce 1971b)	
Asplenium flabellifolium	
Asplenium flaccidum	hanging spleenwort
Asplenium flaccidum × *A. hookerianum*	
Asplenium gracillimum	petako-paraharaha
Asplenium hookerianum	petako-paraharaha
Asplenium oblongifolium	shining spleenwort
Asplenium polyodon	pekato
Azolla filiculoides	floating water fern
Blechnum chambersii	rereti

Blechnum discolor	petipeti, crown fern
Blechnum filiforme	climbing blechnum
Blechnum fluviatile	kiwikiwi
Blechnum membranaceum (Druce 1971b)	
Blechnum novae-zelandiae s.s.	kiokio
Blechnum novae-zelandiae (swamp form)	swamp kiokio
Blechnum penna-marina subsp. *alpina* (Ogle *et al*. 1990a)	
Blechnum procerum	
Blechnum triangularifolium	
Botrychium biforme	
Ctenopteris heterophylla	
Cyathea cunninghamii	punui
Cyathea dealbata	ponga
Cyathea medullaris	mamaku
Cyathea smithii	katote
Dicksonia fibrosa	wheki-ponga
Dicksonia squarrosa	wheki
Diplazium australe	
Doodia media	
Grammitis billardierei (Druce 1971b)	
Histiopteris incisa	water fern
Hymenophyllum bivalve	mauku
Hymenophyllum cupressiforme	
Hymenophyllum demissum	irirangi
Hymenophyllum dilatatum	matua mauku
Hymenophyllum ferrugineum	
Hymenophyllum flabellatum	mauku
Hymenophyllum flexuosum	mauku
Hymenophyllum multifidum	mauku
Hymenophyllum rarum (Druce 1971b)	mauku
Hymenophyllum revolutum	mauku
Hymenophyllum sanguinolentum	piripiri
Hymenophyllum scabrum (Druce 1971b)	mauku
Hypolepis ambigua	
Hypolepis lactea	
Hypolepis rufobarbata	
Lastreopsis glabella	
Lastreopsis hispida	
Lastreopsis microsora subsp. *pentangularis* (Druce 1971b)	
Lastreopsis velutina (Druce 1971b)	
Leptopteris hymenophylloides (Druce 1971b)	
Lindsaea linearis	
Lindsaea trichomanoides	
Paesia scaberula	ring fern
Pellaea rotundifolia	tarawera
Phymatosorus pustulatus	hound's tongue fern
Phymatosorus scandens	mokimoki
Pilularia novae-zelandiae (Ogle *et al*. 1990a)	

Pneumatopteris pennigera	pakau
Polystichum richardii	
Polystichum silvaticum (Druce 1971b)	
Polystichum vestitum	
Pteridium esculentum	rarahu, bracken
Pteris macilenta	
Pteris tremula	
Pyrrosia eleagnifolia	
Rumohra adiantiformis	
Trichomanes endlicherianum	
Trichomanes reniforme	konehu
Trichomanes venosum	

ORCHIDS

Acianthus sinclairii	
Bulbophyllum pygmaeum	piripiri
Caladenia carnea	
Caladenia chlorostyla	
Chiloglottis cornuta	
Corybas cheesemanii	
Corybas macranthus	
Corybas sp. (aff. *C. rivularis*)	spider orchid
Corybas trilobus s.s.	
Drymoanthus flavus	
Drymonanthus adversus	
Earina autumnalis	raupeka
Earina mucronata	peka-a-waka
Gastrodia cunninghamii	huperei
Microtis unifolia	onion-leaved orchid
Pterostylis alobula	
Pterostylis banksii	tutukiwi
Pterostylis foliata (WELT 1054; 1963 record)	
Pterostylis micromega (CHR 77786; 1950 record)	swamp hood orchid
Pterostylis montana agg. (Druce 1971b)	
Pterostylis trullifolia	
Thelymitra longifolia	maikuku
Winika cunninghamii	

GRASSES

Amphibromus fluitans	
Austrofestuca littoralis	hinarepe
Cortaderia fulvida	toetoe
Cortaderia toetoe	toetoe
Deyeuxia avenoides	
Deyeuxia quadriseta (Hill 1962)	

Dichelachne crinata (Druce 1971b)	
Echinopogon ovatus	
Elymus multiflorus (Hill 1962)	
Isachne globosa	swamp millet
Lachnagrostis filiformis	
Microlaena avenacea	bush rice grass
Microlaena polynoda (Druce 1971b)	
Microlaena stipoides	meadow rice-grass
Oplismenus imbecillis	
Poa anceps subsp. *anceps*	
Poa imbecilla	
Poa pusilla (Ogle *et al*. 1990a)	
Rytidosperma biannulare (Hill 1962)	
Rytidosperma clavatum (Druce 1971b)	
Rytidosperma gracile	

SEDGES

Baumea rubiginosa	
Baumea tenax (Ogle *et al*. 1990a)	
Bolboschoenus caldwelli (Ogle *et al*. 1990a)	
Bolboschoenus fluviatilis (Ogle *et al*. 1990a)	Purua grass
Carex buchananii	
Carex cirrhosa	
Carex dipsacea var. *dipsacea*	
Carex dissita (Druce 1971b)	
Carex flagellifera	manaia
Carex forsteri	
Carex gaudichaudiana	
Carex geminata s.s.	
Carex inversa (Druce 1971b)	
Carex lambertiana (Druce 1971b)	
Carex lessoniana (Druce 1971b)	
Carex maorica	
Carex pumila	sand carex
Carex raoulii s.s	
Carex secta s.s.	purei
Carex sinclairii	grass sedge
Carex solandri	
Carex testacea	
Carex virgata	purei
Cyperus ustulatus	toetoe upokotangata
Desmoschoenus spiralis	pingao
Eleocharis acuta	sharp spike sedge
Eleocharis gracilis (Ogle *et al*. 1990a)	slender spike sedge
Eleocharis pusilla (Ogle *et al*. 1990a)	
Eleocharis sphacelata	bamboo spike sedge
Gahnia pauciflora	takahikahi
Isolepis cernua	

Isolepis distigmatosa	
Isolepis inundata (Druce 1971b)	
Isolepis nodosa	clubrush
Isolepis prolifer	
Isolepis reticularis	
Leptocarpus similis	oioi
Morelotia affinis	
Schoenoplectus pungens	three square
Schoenoplectus tabernaemontani	kapungawha
Schoenus apogon	
Schoenus concinnus (Ogle *et al*. 1990a)	
Schoenus maschalinus (Ogle *et al*. 1990a)	
Uncinia banksii	matau
Uncinia ferruginea	matau
Uncinia laxiflora (Druce 1971b)	
Uncinia leptostachya	
Uncinia rupestris (incl. *U. angustifolia*) (Druce 1990c)	
Uncinia rupestris × *U. uncinata*	
Uncinia scabra	
Uncinia uncinata	
Uncinia sp. (unnamed; aff. *U. rupestris*) (Druce 1971a)	

RUSHES

Juncus australis (Druce 1971b)	wiwi
Juncus caespiticius	
Juncus distegus (Ogle *et al*. 1990a)	
Juncus gregiflorus	wiwi
Juncus maritimus var. *australiensis*	sea rush
Juncus pallidus	wiwi
Juncus planifolius	
Juncus pusillus (Ogle *et al*. 1990a)	wiwi
Juncus sarophorus (Druce 1971b)	wiwi
Luzula picta s.s. (Druce 1971b)	

MONOCOT. HERBS (OTHER THAN ORCHIDS, GRASSES, SEDGES, RUSHES)

Arthropodium candidum (Druce 1971b)	
Astelia fragrans	kakaha
Astelia solandri	kowharawhara
Collospermum hastatum	kahakaha
Dianella nigra	turutu
Lemna minor	duckweed
Lepilaena bilocularis	

Libertia grandiflora	mikoikoi
Libertia ixioides (Druce 1971b)	mikoikoi
Phormium cookianum	whaririki, flax
Phormium tenax	harakeke, flax
Potamogeton cheesemanii	pond weed
Potamogeton ochreatus (Ogle *et al*. 1990a)	
Potamogeton pectinatus	pond weed
Potamogeton suboblongus	
Ruppia megacarpa	
Ruppia polycarpa	horse's mane weed
Triglochin striata	arrow grass
Typha orientalis	raupo
Wolffia australiana (Ogle *et al*. 1990a)	water meal
Zannichellia palustris (Ogle *et al*. 1990a)	

COMPOSITE HERBS

Anaphaloides bellidioides	
Centipeda minima	
Cotula australis	
Cotula coronopifolia	bachelor's button
Craspedia uniflora var. *grandis* (Wassilieff *et al.* 1986)	
Craspedia viscosa	
Gnaphalium audax	
Gnaphalium gymnocephalum	cudweed
Gnaphalium involucratum (Druce 1971b)	cudweed
Gnaphalium limosum (Druce 1971b)	cudweed
Gnaphalium sphaericum	
Lagenifera pumila	papataruwharuwha
Lagenifera strangulata	
Leptinella dioica subsp. *dioica* [see Lloyd (1972) p.321]	
Leptinella dispersa subsp. *dispersa*	
Leptinella maniototo	
Leptinella squalida subsp. *squalida*	
Pseudognaphalium luteoalbum	cudweed
Senecio glomeratus (Druce 1971b)	fireweed
Senecio hispidulus (Druce 1971b)	fireweed
Senecio minimus	fireweed
Senecio quadridentatus (Druce 1971b)	

DICOT. HERBS (OTHER THAN COMPOSITES)

Acaena anserinifolia	piripiri
Acaena juvenca	
Aciphylla squarrosa s.s.	

Apium prostratum	New Zealand celery
Australina pusilla	
Callitriche muelleri	
Callitriche petriei subsp. *petriei* (Druce 1971b)	
Cardamine sp. (a) [*C.debilis* agg., "Narrow Petal" of Pritchard 1957] (Druce 1971b)	bittercress
Cardamine sp. (b) [*C. debilis* agg., *C.* "Long Style" of Pritchard 1957] (Ogle *et al*. 1990a)	bittercress
Cardamine sp. (c) [*C. debilis* agg. "Glossy Leaf" of of Pritchard 1957] (Ogle *et al*. 1990a)	
Cardamine sp. (d) [cf. *C. corymbosa*:" Mainland Coastal Race" of Pritchard 1957] (Ogle *et al*. 1990a)	
Centella uniflora	
Chenopodium glaucum var. *ambiguum* (Druce 1971b)	
Colobanthus apetalus (incl. *C. a.* var. *alpinus*)	
Coriaria sarmentosa (Hill 1962)	
Crassula kirkii	
Crassula moschata (WELT 50140; 1895 record)	
Crassula ruamahanga	
Crassula sinclairii	
Daucus glochidiatus (Hill 1962)	native carrot
Dichondra repens var. (Druce 1971b)	
Dichondra sp. (*D. brevifolia* agg.) (Ogle *et al*. 1990a)	
Drosera peltata subsp. *auriculata*	
Elatine gratioloides (Ogle *et al*. 1990a)	
Epilobium alsinoides (Hill 1962)	
Epilobium chionanthum (Ogle *et al*. 1990a)	willow herb
Epilobium insulare (Ogle *et al*. 1990a)	willow herb
Epilobium komarovianum (Ogle *et al*. 1990a)	willow herb
Epilobium nerteroides (Ogle *et al*. 1990a)	
Epilobium nummulariifolium	willow herb
Epilobium pallidiflorum (Ogle *et al*. 1990a)	willow herb
Epilobium pedunculare agg.	
Epilobium rotundifolium	
Eryngium vesciculosum	sea holly
Euphrasia cuneata	
Galium propinquum (Druce 1971b)	mawe
Galium trilobum	
Galium sp. [unnamed; cf. *G. perpusillum*; see Mason (1951)] (Ogle *et al*. 1990a)	
Geranium microphyllum (Druce 1971b)	
Gingidia montana (Hill 1962)	
Glossostigma cleistanthum	
Glossostigma diandrum (Ogle *et al*. 1990a)	
Glossostigma elatinoides (Ogle *et al*. 1990a)	
Gonocarpus micranthus subsp. *micranthus*	
Gratiola sexdentata	

Gunnera monoica (incl. *G. albocarpa* & *G. strigosa*) (Mason 1951)	
Gunnera prorepens	
Haloragis erecta subsp. *erecta*	toatoa
Hydrocotyle dissecta	
Hydrocotyle elongata	
Hydrocotyle heteromeria	
Hydrocotyle hydrophila (Ogle *et al*. 1990a)	
Hydrocotyle moschata	
Hydrocotyle novae-zelandiae s.s.	
Hydrocotyle pterocarpa	
Hypericum japonicum	
Hypsela rivalis (see Mason 1951)	
Lepidium oleraceum (Hill 1962)	
Lilaeopsis novae-zelandiae	
Lilaeopsis ruthiana	
Limosella lineata (CHR 417049)	
Lobelia anceps	shore lobelia
Mazus novaezeelandiae subsp. *novaezealandiae*	dwarf musk
Mimulus repens	native musk
Myosotis spathulata (incl. *M. s.* var. *radicata*)	
Myriophyllum propinquum	water milfoil
Myriophyllum robustum (Hill 1962)	
Myriophyllum triphyllum	water milfoil
Myriophyllum votschii (Ogle *et al*. 1990a)	
Nertera depressa (incl. *N. cunninghamii*)	
Nertera setulosa (Ogle *et al*. 1990a)	
Oxalis exilis	
Parietaria debilis	
Pelargonium inodorum	kopata
Plantago raoulii (Druce 1971b)	kopakopa
Potentilla anserinoides	kowai
Pratia angulata	panakenake
Pratia perpusilla (Ogle *et al*. 1990a)	
Ranunculus acaulis	sand buttercup
Ranunculus amphitrichus	
Ranunculus glabrifolius (Druce 1971b)	kawariki
Ranunculus limosella (Ogle *et al*. 1990a)	
Ranunculus macropus (Ogle *et al*. 1990a)	
Ranunculus reflexus	maruru
Rorippa palustris	
Rumex flexuosus	
Samolus repens var. *repens*	
Scandia geniculata (Hill 1962)	
Schizeilema trifoliolatum	
Scleranthus biflorus	
Sebaea ovata (WELT 47848, date unknown – early 1900s)	
Selliera radicans	remuremu
Solanum americanum (Ogle *et al*. 1990a)	

Stellaria decipiens (incl. *S. minuta* and *S. parviflora*)	kohukohu
Urtica incisa	stinging nettle
Viola lyallii	
Wahlenbergia sp.	

Appendix 2: Adventive vascular plants in the Wairarapa Plains Ecological District

GYMNOSPERMS

Pinus pinaster	maritime pine
Pinus radiata	radiata pine
Cupressus macrocarpa	macrocarpa

DICOT. TREES AND SHRUBS

Acer pseudoplatanus	sycamore
Alnus glutinosa	alder
Berberis glaucocarpus	barberry
Betula sp.	birch
Chamaecytisus palmensis	tree lucerne
Cotoneaster glaucophyllus f. *serotina*	cotoneaster
Crataegus monogyna	hawthorn
Cytisus scoparius	broom
Elaeagnus × *reflexa*	elaeagnus
Euonymus europaeus	spindle tree
Hydrangea macrophylla	hydrangea
Hypericum androsaemum	tutsan
Juglans regia	walnut
Ligustrum ovalifolium	privet
Lupinus arboreus	lupin
Lycium ferocissimum	boxthorn
Malux × *domestica*	apple
Physalis peruviana	Cape gooseberry
Populus alba cv. Nivea	silver poplar
Populus nigra cv. Italica	Lombardy poplar
Prunus cerasifera	cherry plum
Prunus persicaria	peach
Pseudotsuga menziesii	Douglas fir
Pyracantha sp.	firethorn
Robinia pseudacacia	false acacia
Rosa rubiginosa	sweet brier
Rubus sp. (*R. fruticosus* agg.)	blackberry
Rubus laciniatus	cut-leaved blackberry
Salix alba var. *vitellina*	golden willow
Salix babylonica	weeping willow
Salix cinerea	grey willow

Salix fragilis	crack willow
Sambucus nigra	elder
Solanum mauritianum	woolly nightshade
Solanum pseudocapsicum	Jerusalem cherry
Ulex europaeus	gorse

DICOT. LIANES

Asparagus asparagoides	smilax
Calystegia silvatica	great bindweed
Clematis vitalba	old man's beard
Cobaea scandens	Cathedral bells
Convolvulus arvensis	field bindweed
Hedera helix	ivy
Lonicera japonica	Japanese honeysuckle
Senecio mikanioides	Germany ivy

LYCOPSIDS

Selaginella kraussiana

GRASSES

Agrostis capillaris	brown-top
Agrostis castellana (Ogle *et al*. 1990a)	dryland browntop
Agrostis gigantea	redtop
Agrostis stolonifera	creeping bent
Alopecurus geniculatus	kneed foxtail
Anthoxanthum odoratum	sweet vernal
Arrhenatherum elatius	tall oat grass
Bromus diandrus	ripgut brome
Bromus willdenowii	prairie grass
Cortaderia selloana	pampas
Cynosurus cristatus	crested dogtail
Dactylis glomerata	cocksfoot
Echinochloa crus-gallii (Ogle *et al*. 1990a)	barnyard grass
Ehrharta erecta	veld grass
Elytrigia repens	twitch, couch
Festuca arundinacea	tall fescue
Festuca nigrescens (Ogle *et al*. 1990a)	chewing fescue
Festuca rubra (Hill 1962)	red fescue
Glyceria declinata	floating sweetgrass
Glyceria striata	
Holcus lanatus	Yorkshire fog
Hordeum murinum	barley grass

Lagurus ovatus	harestail
Lolium perenne	perennial ryegrass
Paspalum dilatatum	paspalum
Paspalum distichum	mercer grass
Phalaris aquatica	
Phleum pratense	timothy
Poa annua	annual poa
Poa trivialis (Ogle *et al*. 1990a)	rough-stalked meadow grass
Rytidosperma racemosum (Ogle *et al*. 1990a)	danthonia
Stipa sp. (Hill 1962)	

SEDGES

Carex otrubae (Ogle *et al*. 1990a)
Carex sylvatica (Ogle *et al*. 1990a)
Cyperus eragrostis
Isolepis marginata (Ogle *et al*. 1990a)

RUSHES

Juncus articulatus	jointed-leaved rush
Juncus bufonius	
Juncus dichotomus (Ogle *et al*. 1990a)	
Juncus effusus	
Juncus microcephalus	
Juncus tenuis	

MONOCOT. HERBS (OTHER THAN GRASSES, SEDGES AND RUSHES)

Agapanthus praecox	agapanthus
Alisma lanceolatum	water plantain
Allium triquetum	three-cornered garlic
Aponogeton distachyus (Ogle *et al*. 1990a)	Cape pond weed
Crocosmia × *crocosmiiflora*	montbretia
Elodea canadensis	Canadian pond weed
Iris pseudacorus (Ogle *et al*. 1990a)	yellow flag
Potamogeton crispus	curled pond weed
Sisyrinchium iridifolium	
Sisyrinchium sp."blue"	
Spirodela punctata (Ogle *et al*. 1990a)	purple-backed duckweed
Tradescantia fluminensis	wandering Jew
Zantedeschia aethiopica	arum lily

DICOT. HERBS (COMPOSITE FAMILY)

Achillea millefolium	yarrow
Anthemis cotula	stinking mayweed
Aster lanceolatus	Michaelmas daisy
Aster subulatus	sea aster
Bidens frondosa	beggar's ticks
Carduus tenuiflorus	winged thistle
Centipeda cunninghamii	sneezewort
Chamaemelum nobile	chamomile
Cichorium intybus	chicory
Cirsium arvense	Californian thistle
Cirsium vulgare	Scotch thistle
Conyza bilbaoana	fleabane
Conyza canadensis	wavy-leaved fleabane
Crepis capillaris	hawks beard
Gnaphalium coarctatum	cudweed
Hypochoeris radicata	catsear
Lapsana communis	nipplewort
Leontodon taraxacoides	hawkbit
Leucanthemum vulgare	oxeye daisy
Matricaria dioscoidea	rayless chamomile
Mycelis muralis	wall lettuce
Picris echioides	oxtongue
Senecio jacobaea	ragwort
Silybum marianum	variegated thistle
Soliva sessilis	Onehunga weed
Sonchus asper	prickly sowthistle
Sonchus oleraceus	puha, sowthistle
Taraxacum officinale	dandelion
Xanthium spinosum (Hill 1962)	Bathurst bur

DICOT. HERBS (OTHER THAN COMPOSITE FAMILY)

Acaena agnipila	Australian sheep's bur
Acaena novae-zelandiae	
Alcea rosea	hollyhock
Amaranthus retroflexus (Ogle *et al*. 1990a)	amaranthus
Anagallis arvensis	scarlet pimpernel
Apium graveolens	wild celery
Brassica napus (Hill 1962)	swede
Brassica oleracea (Hill 1962)	wild cabbage
Brassica rapa (Hill 1962)	turnip
Callitriche stagnalis	starwort
Capsella bursa-pastoris	shepherd's purse
Cardamine hirsuta	bitter-cress
Centaurium erythraea	century
Cerastium glomeratum	mouse-eared chickweed

Chamaecytisus palmensis	tagasaste
Chenopodium album agg.	fathen
Chenopodium murale	nettle-leaved fathen
Chenopodium pumilio	clammy goosefoot
Ciclospermum leptophyllum (Ogle *et al*. 1990a)	slender celery
Conium maculatum	hemlock
Coronopus didymus	twin cress
Crassula decumbens (Ogle *et al*. 1990a)	cape crassula
Cucurbita maxima	pumpkin
Datura stramonium	thorn apple
Dianthus armeria	Deptford pink
Dipsacus sylvestris (Ogle *et al*. 1990a)	wild teasel
Epilobium ciliatum	willow herb
Erodium cicutarium (Ogle *et al*. 1990a)	storksbill
Erodium moschatum	storksbill
Euphorbia peplus	milkweed
Foeniculum vulgare	fennel
Fumaria muralis	scrambling fumitory
Fumaria officinalis	fumitory
Galium aparine	cleavers
Galium palustre	marsh bedstraw
Geranium molle	dove's foot cranesbill
Hyoscyamus niger	henbane
Lamium amplexicaule	henbit
Lathyrus odoratus	sweet pea
Lepidium bonariense (Ogle *et al*. 1990a)	Argentine cress
Ligustrum ovalifolium	privet
Linum bienne	pale flax
Lotus pedunculatus	lotus
Lotus suaveolens	hairy lotus
Ludwigia palustris	water purslane
Lythrum hyssopifolia	hyssop loosestrife
Malva neglecta	dwarf marrow
Melilotus indica	King Island melilot
Mentha pulegium	pennyroyal
Mentha spicata	spearmint
Mentha × *piperita* var. *citrata*	bergamot mint
Mimulus guttatus	monkey musk
Modiola caroliniana	creeping marrow
Myosotis laxa subsp. *caespitosa*	water forget-me-not
Navarretia squarrosa	Californian stinkweed
Oenanthe pimpinelloides	parsley dropwort
Orobanche minor	broomrape
Parentucellia viscosa	tarweed
Pastinaca sativa	wild parsnip
Plantago lanceolata	narrow-leaved plantain
Plantago major	broad-leaved plantain
Polygonum aviculare	wireweed
Polygonum hydropiper	water pepper
Polygonum persicaria	willow weed

Prunella vulgaris	selfheal
Ranunculus acris	giant buttercup
Ranunculus flammula	spearwort
Ranunculus repens	creeping buttercup
Ranunculus sceleratus	celery-leaved buttercup
Ranunculus trichophyllus (Ogle *et al*. 1990a)	water buttercup
Raphanus raphanistrum subsp. *raphanistrum*	wild radish
Rorippa nasturtium-aquaticum	watercress
Rumex acetoslla	sheep's sorrel
Rumex conglomeratus	clustered dock
Rumex crispus	curled dock
Rumex obtusifolius	broad-leaved dock
Rumex sagittatus	climbing dock
Sagina procumbens	pearlwort
Sedum acre	stonecrop
Sisymbrium officinale	hedge mustard
Sisymbrium orientale	oriental mustard
Solanum nigrum	black nightshade
Solanum physalifolium	hairy nightshade
Solanum tuberosum	potato
Spergula arvensis	spurrey
Stellaria graminea (Ogle *et al*. 1990a)	stickwort
Stellaria media	chickweed
Trifolium dubium	suckling clover
Trifolium fragiferum (Ogle *et al*. 1990a)	strawberry clover
Trifolium pratense	red clover
Trifolium repens	white clover
Trifolium subterraneum	subterranean clover
Urtica urens	nettle
Verbascum thapsus	woolly mullein
Verbascum virgatum	moth mullein
Verbena bonariensis	purple-top
Veronica anagallis-aquatica	water speedwell
Veronica persica	scrambling speedwell
Veronica scutellata (Ogle *et al*. 1990a)	march speedwell
Veronica serpyllifolia	speedwell
Vicia hirsuta	hairy vetch
Vicia sativa	vetch
Viola odorata	violet

Appendix 3: Regionally threatened plants of the Wairarapa Plains Ecological District

(status taken from Empson and Sawyer 1996 and DOC 1996a)

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS
Botrychium biforme	parsley fern	Susceptible
Brachyglottis greyi var. *greyi*		Low risk
Carex buchananii		Vulnerable
Carex cirrhosa		Endangered
Craspedia viscosa		Indeterminate
Craspedia uniflora var. *grandis*		Indeterminate
Crassula kirkii		Low risk
Crassula moschata		Susceptible
Desmoschoenus spiralis		Vulnerable
Discaria toumatou	matagouri	Vulnerable
Doodia media		Low risk
Eleocharis sphacelata		Vulnerable
Gunnera prorepens		Susceptible
Hymenophyllum cupressiforme		Indeterminate
Isachne globosa	swamp millet	Susceptible
Juncus pusillus		Indeterminate
Korthalsella clavata		Indeterminate
Korthalsella lindsayi		Susceptible
Lepilaena bilocularis		Indeterminate
Leptinella maniototo		Indeterminate

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS
Leptinella dispersa subsp. *dispersa*		Low risk
Myriophyllum votschii		Susceptible
Pilularia novae-zelandiae		Indeterminate
Pittosporum divaricatum		Indeterminate
Potamogeton pectinatus	fennel-leaved pond weed	Unknown
Pratia perpusilla		Susceptible
Pterostylis foliata		Susceptible
Ranunculus macropus	wao-riki	Susceptible
Rubus squarrosus		Susceptible
Rumex flexuosus	Dock	Endangered
Ruppia polycarpa		Indeterminate
Schoenus concinnus		Indeterminate

The following categories are used in Appendix 3 (Empson and Sawyer 1996).

Critical*: Taxon facing very high probability of extinction in the wild in the near future.*
Endangered*: Taxon facing high probability of extinction in the wild in the near future.*
Vulnerable*: Taxon facing high probability of extinction in the wild in the medium-term.*
Susceptibile*: Taxon of concern because its range is restricted or it is found at few locations which makes it susceptible to effects of human activities.*
Low risk*: Taxon which does not qualify for any threatened categories listed above but is of sufficient conservation concern to warrant listing.*
Indeterminate*: Taxon with indeterminate or unknown status.*

Appendix 4: Regionally threatened animals of the Wairarapa Plains Ecological District

(from Sawyer *et al*. 1997, status taken from DoC 1996a)

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS (DOC 1996a)
Birds		
Australasian harrier	*Circus approximans gouldi*	Low risk
Bar-tailed godwit (Eastern)	*Limosa lapponica baueri*	Susceptible
Banded rail	*Rallus philippensis assimilis*	Indeterminate
Bellbird	*Anthornis melanura*	Susceptible
Black-billed gull	*Larus bulleri*	Susceptible
Black-fronted dotterel	*Charadris melanops*	Susceptible
Black shag	*Phalacrocorax carbo*	Vulnerable
Cattle egret	*Bubulcus ibis*	Susceptible
Fantail	*Rhipidura fuliginosa*	Low risk
Glossy ibis	*Pelgadis falcinellus*	Susceptible
Greenshank	*Tringa nebularia*	Susceptible
Grey teal	*Anas gibberifrons gracilis*	Low risk
Grey warbler	*Gerygone igata*	Susceptible
Lesser knot	*Calidris canutus*	Susceptible
Little black shag	*Phalacrocorax sulcirostris*	Vulnerable
Little egret	*Egretta garzetta*	Susceptible
Little shag	*Phalacrocorax melanoleucos brevirostris*	Vulnerable
Marsh crake	*Porzana pusilla affinis*	Indeterminate
Morepork	*Ninox novaeseelandiae novaeseelandiae*	Low risk

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS (DOC 1996a)
New Zealand kingfisher	*Halcyon sancta vagrans*	Low risk
New Zealand pipit	*Anthus novaeseelandiae*	Susceptible
New Zealand scaup	*Aythya novaeseelandiae*	Vulnerable
New Zealand shoveler	*Anas rhynchotis variegata*	Low risk
North Island fernbird	*Bowdleria punctata vealeae*	Extinct
Paradise shelduck	*Tadorna variegata*	Low risk
Pectoral sandpiper	*Calidris melanotos*	Susceptible
Pied shag	*Phalacrocorax varius*	Susceptible
Pied stilt	*Himantopus himantopus leucocephalus*	Low risk
Pied tit	*Petroica macrocephala macrocephala*	Susceptible
Pukeko	*Porphyrio porphyrio melanotus*	Low risk
Red-billed gull	*Larus novaehollandiae scopulinus*	Low risk
Red-crowned parakeet	*Cyanoramphus novaezelandiae*	Indeterminate
Rifleman	*Acanthisitta chloris granti*	Susceptible
Shining cuckoo	*Chrysococcyx lucidus lucidus*	Low risk
Silvereye	*Zosterops lateralis lateralis*	Low risk
South Island pied oystercatcher	*Haematopus ostralegus finschii*	Susceptible
Southern black-backed gull	*Larus dominicanus*	Low risk
Spotless crake	*Porzana tabuensis plumbea*	Indeterminate
Spotted shag	*Stictocarbo punctatus punctatus*	Endangered
Spur-winged plover	*Vanellus miles novaehollandiae*	Low risk
Tui	*Prosthemadera novaeseelandiae*	Susceptible
Turnstone	*Arenaria interpres*	Susceptible
Welcome swallow	*Hirundo tahitica neoxena*	Low risk
White-faced heron	*Ardea novaehollandiae novaehollandiae*	Low risk
Whitehead	*Mohoua albicilla*	Susceptible

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS (DOC 1996a)
Fish		
Black flounder	*Rhombosolea retiarus*	Susceptible
Blue gilled bully	*Gobiomorphus hubbsi*	Susceptible
Common smelt	*Retropinna retropiana*	Low risk
Longfinned eel	*Anguilla dieffenbachii*	Susceptible
Redfinned bully	*Gobiomorphus huttoni*	Low risk
Shortfinned eel	*Anguilla australis*	Susceptible
Reptiles		
Common gecko	*Hoplodactylus maculatus*	Low risk
Wellington green gecko	*Naultinus elegans punctatus*	Indeterminate
Common skink	*Oligosoma nigriplantare polychroma*	Low risk
Copper skink	*Cyclodina aenea*	Low risk
Forest gecko	*Hoplodactylus granulatus*	Susceptible
Speckled skink	*Oligosoma infrapunctatum*	Vulnerable
Spotted skink	*Oligosoma lineoocellatum*	Susceptible

Appendix 5: Animals recorded in the Wairarapa Plains Ecological District

(taken from Sawyer *et al.* 1997)

INDIGENOUS BIRDS	
Asiatic black-tailed godwit	*Limosa limosa melanuroides*
Asiatic whimbrel	*Numenius phaeopus variegata*
Australasian bittern	*Botaurus poiciloptillus*
Australasian coot	*Fulica atra australis*
Australasian gannet	*Sula bassana serrator*
Australasian harrier	*Circus approximans gouldi*
bar-tailed godwit	*Limosa lapponica*
banded dotterel	*Charadrius bicinctus*
banded rail	*Rallus philippensis*
bellbird	*Anthornis melanura*
black-billed gull	*Larus bulleri*
black-fronted dotterel	*Charadrius melanops*
black-fronted tern	*Sterna albostriata*
black shag	*Phalacrocorax carbo novaehollandiae*
black stilt	*Himantopus novaezelandiae*
Caspian tern	*Hydroprogne caspia*
cattle egret	*Bubulcus ibis*
chestnut-breasted shelduck	*Tadorna tadornoides*
curlew sandpiper	*Calidris ferruginea*
Eastern bar-tailed godwit	*Limosa lapponica baueri*
fairy martin	*Petrochelidon ariel*

fantail	*Rhipidura fuliginosa*
glossy ibis	*Pelgadis falcinellus*
greenshank	*Tringa nebularia*
grey duck	*Anas superciliosa*
grey teal	*Anas gracilis*
grey warbler	*Gerygone igata*
lesser knot	*Calidris canutus*
least golden plover	*Plurialis fulva*
lesser yellowlegs	*Tringa flavipes*
little black shag	*Phalacorcorax sulcirostris*
little egret	*Egretta garzetta immaculata*
little shag	*Phalacorcorax melanoleucos*
little whimbrel	*Numenius minutus*
marsh crake	*Porzana pusilla*
morepork	*Ninox novaeseelandiae*
Nankeen night heron	*Nycticorax caledonicus*
New Zealand dabchick	*Podiceps rufopectus*
New Zealand falcon	*Falco novaeseelandiae*
New Zealand kingfisher	*Halcyon sancta vagans*
New Zealand pigeon	*Hemiphaga novaeseelandiae*
New Zealand pipit	*Anthus novaeseelandiae*
New Zealand scaup	*Aythya novaeseelandiae*
New Zealand shoveler	*Anas rhynchotis*
North Island fantail	*Rhipidura fuliginosa placabilis*
North Island fernbird	*Bowdleria punctata vealeae*
red-billed gull	*Larus novaehollandiae scopulinus*
red-necked stint	*Calidris ruficollis*
rifleman	*Acanthisitta chloris*

royal spoonbill	*Platalea leucorodia regia*
paradise shelduck	*Tadorna variegata*
parakeet	*Cyanoramphus* spp.
pectoral sandpiper	*Calidris melanotos*
pied shag	*Phalacrocorax varius*
pied stilt	*Himantopus himantopus leucocephalus*
pied tit	*Petroica macrocephala*
pukeko	*Porphyrio porphyrio melanotus*
sharp-tailed sandpiper	*Calidris acuminata*
shining cuckoo	*Chrysococcyx lucidus*
silvereye	*Zosterops lateralis*
South Island pied oystercatcher	*Haematopus ostralegus finschii*
Southern black-backed gull	*Larus dominicanus*
spotless crake	*Porzana tabuensis*
spotted shag	*Stictocarbo punctatus punctatus*
spur-winged plover	*Vanellus miles novaehollandiae*
tui	*Prosthemadera novaeseelandiae*
turnstone	*Arenaria interpres*
variable oystercatcher	*Haematopus unicolor*
welcome swallow	*Hirundo tahitica neoxena*
white-faced heron	*Ardea novaehollandiae*
white-fronted tern	*Sterna striata*
white heron	*Egretta alba modesta*
white-winged black tern	*Chlidonias leucopterus*
whitehead	*Mohoua albicilla*
wrybill	*Anarhynchus frontalis*

INTRODUCED BIRDS	
Australian magpie	*Gymnorhina tibicen hypoleuca*
blackbird	*Turdus merula*
black swan	*Cygnus atratus*
brown quail	*Synoicus ypsilophorus*
California quail	*Lophortyx californica*
Canada goose	*Branta canadensis*
chaffinch	*Fringilla coelebs*
cirl bunting	*Emberiza cirlus*
Eastern rosella	*Platycerus eximius*
rock pigeon	*Columba livia*
goldfinch	*Carduelis carduelis*
greenfinch	*Carduelis chloris*
dunnock	*Prunella modularis*
house sparrow	*Passer domesticus*
mallard	*Anas platyrhynchos*
mute swan	*Cygnus olor*
pheasant	*Phasianus colchicus*
redpoll	*Carduelis flammea*
rook	*Corvus frugilegus*
skylark	*Alauda arvensis*
song thrush	*Turdus philomelos*
starling	*Sturnus vulgaris*
yellowhammer	*Emberiza citrinella*
FISH	
banded kokopu	*Galaxias fasciatus*
black flounder	*Rhombosolea retiarus*
blue gilled bully	*Gobiomorphus hubbsi*

brown mudfish	*Neochanna apoda*
brown trout	*Salmo trutta*
common smelt	*Retropinna retropiana*
giant kokopu	*Galaxias argenteus*
koaro	*Galaxias brevipinnis*
lamprey	*Geotria australis*
longfinned eel	*Angiulla dieffenbachii*
perch	*Perca fluviatilis*
red finned bully	*Gobiomorphus huttoni*
shortfinned eel	*Angiulla australis*
MAMMALS	
cattle	*Bos taurus*
feral cat	*Felis catus*
ferret	*Mustela furo*
Greys becked whale	*Mesoplodon greyii*
hare	*Lepus* sp.
hedgehog	*Erinaceus europeaeus occidentalis*
horse	*Equus caballus*
mouse	*Mus musculus*
pig	*Sus scrofa*
possum	*Trichosurus vulpecula*
rabbit	*Oryctolagus cuniculus cuniculus*
rat	*Rattus* sp.
red deer	*Cervus elaphus scoticus*
sheep	*Ovis aries*
stoat	*Mustela erminea*

REPTILES	
Lizards	
common gecko	*Hoplodactylus maculatus*
common skink	*Oligosoma nigriplantare polychroma*
copper skink	*Cyclodina aenea*
forest gecko	*Hoplodactylus granulatus*
speckled skink	*Oligosoma infrapunctatum*
spotted skink	*Oligosoma lineoocellatum*
Wellington green gecko	*Naultinus elegans punctatus*
OTHER REPTILES	
hawksbill turtle	*Eretmochelys imbricata*

Appendix 6: Protected natural areas[1] in the Wairarapa Plains Ecological District

(Source: Wassilief *et al.* 1986; Clark 1989; Ogle *et al.* 1990; DOC 1996a&b, 1998; Townsend *et al.* 1998; Sawyer *et al.* 1997)

The location of these protected natural areas is shown in Figure 5. This list has been compiled as at 1998.

PNA NO.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] OR QEII REF. NO.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
1	QEII O.S.C.	-	CA 5/07/258	S26 247276	10.442	Wetland and ponds on floodplain.	Unknown.
2	Masterton Stewardship	-	T26004	T26 349248	3.6043	Unknown; on plain.	Unknown.
4	Waiohine Faulted Terraces Scientific Reserve	-	S26017	S26 122147	1.6087	Scrub on river terraces.	Local totara scrub, pasture.
5	QEII O.S.C.	701	MS 5/07/181	T26 345145	0.942	Podocarp-broadleaved forest on plain.	(Matai)/titoki-(tawa)-(totara) forest. Kahikatea/titoki-(kowhai) forest.
6	QEII O.S.C.	701	MS 5/07/180	T26 346143	11.387	Podocarp-broadleaved forest on plain.	(Matai)/titoki-(tawa)-(totara) forest. Kahikatea/titoki-(kowhai) forest.
7	Matarawa Stewardship	601	S26006	S26 128135	8	Forest on flood plain. Birds include kereru.	(Kahikatea)-(totara)/ titoki-tawa-(totara) forest. Totara forest.
8	Carter Scenic Reserve and Wildlife Refuge	514	S26009, S26018	S26 285125	31.5877	Birds include kereru. Plants include *Teucridium parvifolium, Crassula ruamahanga, Ileostylus micranthus*, *Coprosma* sp "v" (of Eagle 1982), *Urtica linearifolia*.	(Kahikatea)-(matai)/ titoki forest. Swamp forest and flax. Raupo, rush, sedge and flaxland. Kanuka scrub. Willow swamp forest.
9	QEII O.S.C.	510	SO 5/07/212.1	S26 190120	2.38	Primary podocarp-broadleaved forest on plain.	(Kahikatea)-(matai)-(pukatea)/tawa-titoki forest.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

PNA NO.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] OR QEII REF. NO.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
10	QEII O.S.C.	510	SO 5/07/212.2	S26 190120	0.7583	Primary podocarp-broadleaved forest on plain.	(Kahikatea)-(matai)-(pukatea)/tawa-titoki forest.
11	QEII O.S.C.	510	SO 5/07/247	S26 190120	0.3014	Primary podocarp-broadleaved forest on plain.	(Kahikatea)-(matai)-(pukatea)/tawa-titoki forest.
12	Gladstone Stewardship	-	T26007	T26 306118	6.3660	Treeland on floodplain.	Unknown.
13	Riversdale Road Stewardship	-	S26008	S26 206116	7.9874	Unknown; on floodplain.	Unknown.
14	R. W. Tate Scenic Reserve	508	S26007	S26 170102	1.5317	Forest on alluvial plain.	Titoki-tawa-(kowhai)-(poplar) forest. Exotic scrub.
15	Gretel Lagoons QEII O.S.C.	511	CA 5/07/197	S27 216096	7.634	Podocarp forest and wetland on floodplain.	Kahikatea-totara-matai/titoki-tawa-mahoe forest.
16	Taumata QEII O.S.C.	520	CA 5/07/070	S27 241092	1.96	Primary podocarp-broadleaved forest on floodplain.	Unknown.
17	QEII O.S.C.	-	SO 5/07/175	S27 160090	1.7	Podocarp-broadleaved forest and ponds on plain.	Unknown.
18	Fabians Stewardship	-	S27027	S27 177083	1.8337	Unknown; on plain.	Unknown.
19	Diversion Stewardship	-	S27016	S27 077025	0.7082	Unknown; on floodplain.	Unknown.
20	Pukio Conservation Area	214	S27022	S27 055992	19	Oxbow wetland.	Willows.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

PNA NO.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] OR QEII REF. NO.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
21	Georges Stewardship	306	S27024	S27 125979	0.9105	Wetland on floodplain.	Willow and/or rushes.
22	Wairarapa Lake Shore Scenic Reserve	247	S27008	S27 930965	27.3739	Forest on plain and rolling hill country. Altitudinal sequence (lakeside swamp to lower foothills of Rimutaka Range). Plants include: *Ileostylus micranthus*, *Korthalsella salicornioides, Pterostylis foliata.* Animal species: kereru, spotted skink. Black beech/nikau association usual.	Black-beech- rewarewa-pukatea forest. Black beech-kanuka forest. Kowhai-titoki-mahoe-karaka scrub. Hinau-rewarewa/mixed broadleaf-nikau forest. Titoki-karaka-rewarewa--matai-miro forest. Black beech/nikau forest.
23	Lake Wairarapa Wetland Stewardship	101, 102, 103, 106, 217, 225, 264	S27001	S27 970960, R28 880780	9278.0036	Lakes, wetlands, duneland. Fish species: banded kokopu, giant kokopu, lamprey, bluegilled bully, brown mudfish. Birds include: bittern (breeding), banded dotterel (breeding), black-fronted tern, Caspian tern (breeding), grey duck (breeding) dabchick (breeding), variable oystercatcher (breeding), wrybill, falcon, kereru, white-fronted tern, little shag, black shag. Plant species include: *Carex cirrhosa, Carex buchananii, Crassula ruamahanga, Hypsella rivalis, Leptinella maniototo, Pilularia novaezelandiae, Amphibromus fluitans, Pterostylis micromega, Centipeda minima, Urtica linearifolia*, *Korthalsella salicornioides,* pingao, hinarepe.	*Crassula sinclairii-Glossostigma elatanoides-Lilaeopsis* sp.-*Limosella lineata.* Jointed rush rushland. Crack willow forest. (Marsh ribbonwood)/sea rush-oioi shrub-rushland. Harakeke-(toetoe)-(*Cyperus ustulatus*) flaxland. Duneland with spinifex, hinarepe, marram, shore bindweed.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

PNA NO.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] OR QEII REF. NO.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
24	Kahutara Scenic Reserve	222	S27017	S27 045948	3.6219	Forest on flood plain. Plant species: large- leaved milk tree. Animal species: kereru.	Kahikatea-matai above closed canopy of titoki.
25	Pearce Wetland QEII O.S.C.	-	SO 5/07/163	S27 020940	125.3008	Wetland on floodplain.	Unknown.
27	Parera Stewardship	-	S27018	S27 006920	0.7151	Unknown (wetland?); on floodplain.	Unknown.
28	Matthews and Boggy Pond Wildlife Reserve (Government Purpose Reserve)	215, 218	S27002	S27 995915	415.6230	Wetland on floodplain. Plants include: spike edge (uncommon in district), *Amphibromus fluitans*, *Ileostylus micranthus*, *Korthalsella clavata, Urtica linearifolia*. Birds include: bittern, dabchick, Caspian tern, banded dotterel.	*Azolla filiculoides*-raupo-willow. *Azolla filiculoides* - raupo-*Carex* sp. Manuka scrub. Willow forest.
29	Ruamahanga Cutoff Wildlife Reserve (Government Purpose Reserve)	-	S27003	S27 949895	51.7997	Rivercourse and wetland. Birds include bittern.	Scattered willow and raupo.
30	Oporua Scenic Reserve	209	S27019	S27 000893	1.6919	Forest on floodplain.	Kahikatea (immature) with titoki, kanuka, kowhai, mapou, ti kouka and several *Coprosma* species.
31	Allsops Bay Wildlife Management Reserve (Government Purpose Reserve)	264	S27004	S27 915890	215.268	Open water on Lake Wairarapa. Birdlife and fishery.	Unknown.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

PNA no.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] or QEII REF. No.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
32	E. C. Holmes Memorial Scenic Reserve	207	S27020	S27 998888	1.3086	Forest on flood plain.	(*Eucalyptus*)-(pines)/ mahoe-(titoki). *Eucalyptus*/kahikatea-titoki-kowhai-karaka-cypress-birch forest. Kanuka forest.
33	Tuhitarata Scenic Reserve	204, 205	S27021	S27 003877	10.0742	Swamp forest on flood plain. Birds include kereru.	(Kahikatea)-(pukatea)/ (kahikatea)-(pukatea) forest. Kahikatea-pukatea forest. Kahikatea-pukatea-rewarewa-ti kouka treeland. Tawa forest. Broadleaved scrub. (Kahikatea)-(pukatea)/ (kahikatea)-pukatea-tawa-(titoki) forest. (Kahikatea)-(pukatea)/ kahikatea-pukatea-titoki forest. Kahikatea-ti kouka-rarahu-harakeke treeland.
34	Homewood Bush QEII O.S.C.	105	SO 5/07/002B	R27 882827	2	Podocarp-broadleaved forest on plain.	Karaka-titoki-ti kouka-(kahikatea)-(mahoe)-(pukatea) forest.
35	Wharerata Bush QEII O.S.C.	-	SO 5/07/100	S27 970817	7.944	Broadleaved-kanuka forest on floodplain.	Unknown.
36	Pirinoa Bush QEII O.S.C.	125	SO 5/07/219	S28 960784	10.6	Broadleaved forest on terrace.	Kanuka-matai-rewarewa-black beech-ngaio forest.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

PNA no.[1]	SITE NAME AND PROTECTION STATUS	STUDY SITE NO.[2]	CMS[3] or QEII REF. No.	GRID REF. (NZMS260)	AREA (ha)	ECOLOGICAL INFORMATION	VEGETATION TYPE
37	Coastal Cliffs Stewardship.		S28003	S28 950730	62.25	Flax and grasses on coastal cliffs.	Whahariki and grasses. Kanuka shrubland.
38	Pearce Wetlands QEII		5/7/163	S27 014954	125.3	Supports the greatest numbers and variety of both wader birds and water fowl of any part of Lake Wairarapa. Provides a link of indigenous vegetation between the Boggy Pond Matthews Lagoon reserves and the J.K. Donald Reserve. Supports more than 42 indigenous vascular plant species.	Marshland (short rushes and sedges, swamp grasses). Native turf. Bare and sparsely vegetated substrate - exposed at low water levels.

[1] *Refer to Figure 5.*

[2] *From Sawyer* et al. *1997.*

[3] *CMS = Conservation Management Strategy (see DOC 1996a).*

Appendix 7: Other areas of biological importance in the Wairarapa Plains Ecological District

The following sites were inspected as part of the PNAP survey but were not classified as Recommended Areas for Protection because they are not the largest or best examples of inadequately protected indigenous vegetation in the district. However, they may be considered significant and worthy of protection for other reasons. For example, they may become the best example if an RAP is destroyed. In addition, these sites may support populations of rare or threatened species of plant or animal. It may be impossible to secure legal or physical protection for RAPs and therefore the second best site (a site ranked as "High") may become the priority area for conservation.

The Department of Conservation holds information about the biological importance of the following sites (see for example Sawyer *et al*. 1997and Perfect & Beadel 1998). The relative importance of these sites has been determined such that they fall into three priority groups for protection: High; Moderate-High; and Moderate. These sites were ranked mainly using field assessments carried out in 1996 so their current status must be regarded as tentative. Four sites (numbers 0229, 0619, 0806a and 0903) were inspected during the 1998 field survey because it was thought they may have been worthy of RAP status.

1 HIGH

LAKE NGANOKE

Site No: WP0108 **Grid Ref:** S27 927812 **Source:** Sawyer *et al*. 1997.
Area: 6 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: Wetland, not known **Land System:**
Principal Landform: Lake
Species: *Cordyline australis, Phormium tenax, Carex secta, Typha orientalis, Cyperus ustulatus, Melicytus ramiflorus, Corynocarpus laevigatus, Pinus radiata, Salix* sp.,

OCEAN BEACH CLIFFS

Site No: WP0123 **Grid Ref:** R28 836790 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Coastal **Altitude:**
Other Landform: Terrace, marine platform, gully sides/faces. **Land System:**
Principal Landform: Cliff
Dominant species: *Phormium cookianum*

WHANGAIMOANA BEACH

Site No: WP0129 **Grid Ref:** S28 918752 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Coastal **Altitude:**
Other Landform: Wetland **Land System:**
Principal Landform: Duneland
Site Description: Coastal wetland area.
Vegetation Type: Coastal wetland.
Dominant species: *Desmoschoenus spiralis*

LAKE ROAD SHRUBLAND

Site No: WP0132 **Grid Ref:** R27 875816 **Source:** On-site survey
Area: 3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Flood plain
Dominant species: *Leptospermum scoparium* (manuka)

TE OPAI BUSH FRAGMENTS

Site No: WP0210, 0211, 0213b **Grid Ref:** S27 002895, 001899, 004903 **Source:** Current survey
Area: 8 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

ROTO FARM WETLAND

Site No: WP0223 **Grid Ref:** S27 020950 **Source:** Sawyer *et al.* 1997
Area: 40 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** <5 m
Other Landform: Plain **Land System:** Alluvial plain
Principal Landform: Wetland
Vegetation Type: Wetland, shrubland.
Dominant species: Not known.

ROTOTAWAI LAKE

Site No: WP0226 **Grid Ref:** S26 067965 **Source:** Sawyer *et al.* 1997
Area: 7 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** <10 m
Other Landform: **Land System:** Alluvial plain bordering old sanddune
Principal Landform: Lake
Vegetation Type: Wetland.
Dominant species: *Alnus* sp.

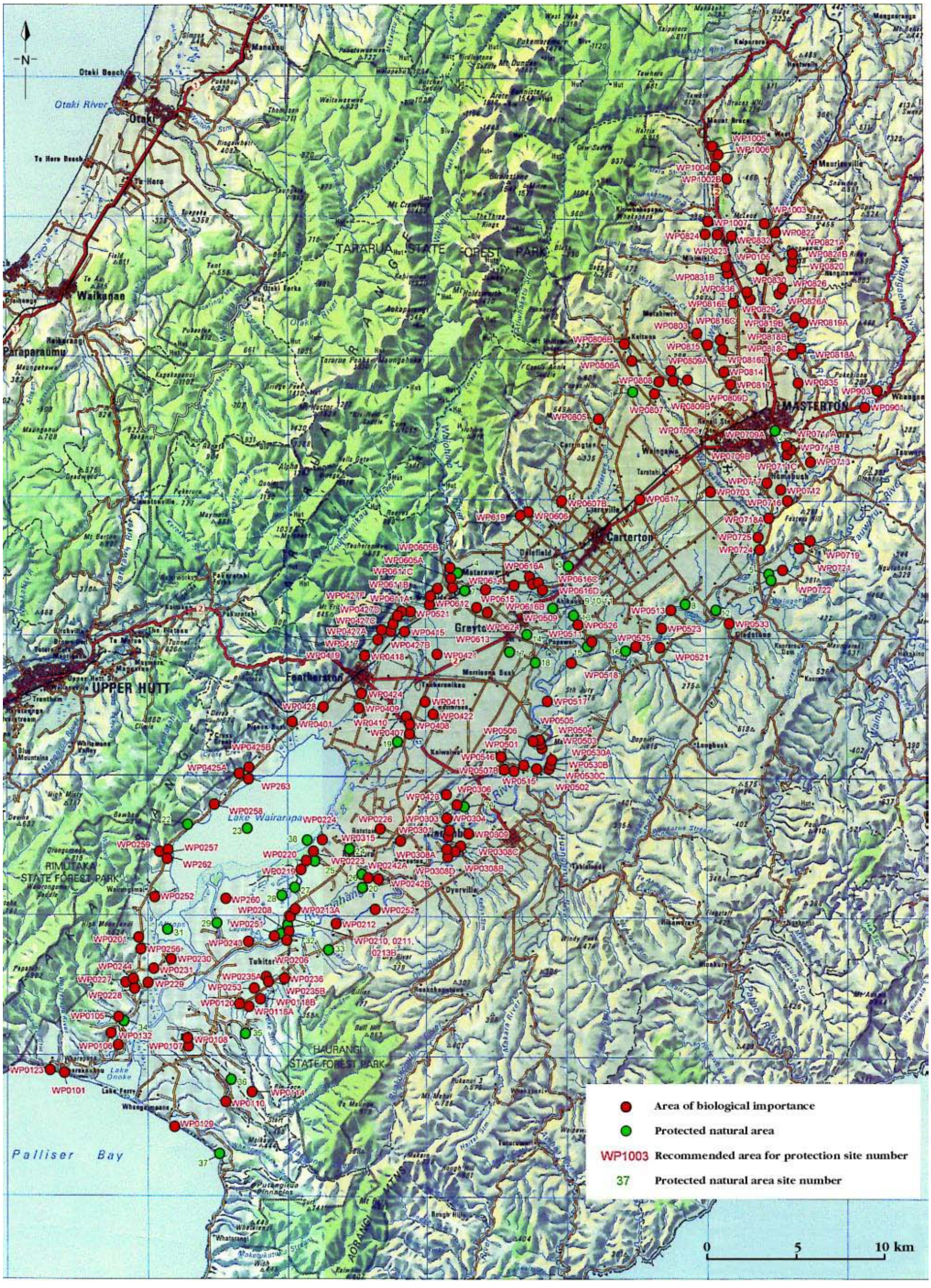
RIVERSLEA BUSH

Site No: WP0227 **Grid Ref:** R27 886855 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 2-3 m
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Forest interspersed with pasture.
Dominant species: *Alectryon excelsus*

WAITUNA WESTERN BUSH

Site No: WP229 **Grid Ref:** R27 900853 **Source:** On-site survey
Area: ha **Bioclomatic Zone:** **Altitude:** ≤ 60 m
Other Landform: Terrace riser, gully, pond **Land System:** Younger aggradation plain; low hills
Principal Landform: Hillslope
Vegetation Type: Forest and shrubland.
Dominant species: A mosaic dominated by kanuka with local black beech in patches on hillslopes and gullies, and non-forest wetland around pond.

FIGURE 6: LOCATION OF OTHER AREAS OF BIOLOGICAL IMPORTANCE



TE TIPUA WETLAND

Site No: WP0243 **Grid Ref:** S27 973880 **Source:** Sawyer *et al*. 1997
Area: 25 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:**
Principal Landform: Wetland.
Site Description: Wetland.
Vegetation Type: Wetland.
Dominant species: *Typha orientalis*.

TI KOUKA TREELAND

Site No: WP260 **Grid Ref:** S27 958913 **Source:** Current survey
Area: 9 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Floodplain
Site Description:
Vegetation Type: Treeland.
Dominant species: Ti kouka.

HIKINUI STREAM REMNANT

Site No: WP0304 **Grid Ref:** S27 116970 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** <5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

PIGEON BUSH

Site No: WP0401 **Grid Ref:** S27 004038 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MURPHY'S LINE BUSH

Site No: WP0409 **Grid Ref:** S27 053048 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 15 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

TAUHERENIKAU RIVER BUSH

Site No: WP0415 **Grid Ref:** S26 086104 **Source:** Sawyer *et al*. 1997
Area: 8 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 70 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

DONALD ST BUSH

Site No: WP0424 **Grid Ref:** S27 055060 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

PRINCE STREAM

Site No: WP0428 **Grid Ref:** S27 025049, 015045 **Source:** Current survey
Area: 0.005 ha ($5m^2$) **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Stream
Dominant species: Not known.

TAUMATA OXBOW

Site No: WP0511 **Grid Ref:** S27 217096 **Source:** Sawyer *et al.* 1997
Area: 11 ha (3.4) **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: Flood plain **Land System:** Alluvial plain
Principal Landform: Oxbow
Site Description: Forest on plain
Vegetation Type: Forest
Dominant species: *Dacrycarpus dacrydioides*

CARTER SCARP

Site No: WP0513 **Grid Ref:** S26 273122 **Source:** Sawyer *et al.* 1997
Area: 15 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Terrace riser
Site Description: Forest on terrace riser
Vegetation Type: Forest
Dominant species: *Kunzea ericoides*

MAKAHAKAHE STREAM REMNANT

Site No: WP0533 **Grid Ref:** T26 316111 **Source:** Current survey
Area: 10 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Steep river terrace
Vegetation Type: Forest.
Dominant species: *Helichrysum lanceolatum,* matai, kahikatea, totara.

WAIOHINE RISER

Site No: WP0612 **Grid Ref:** S26 116138 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: Forest on terrace riser.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa*.

TOTARA BUSH

Site No: WP0613 **Grid Ref:** S26 135123 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 80 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

MAIRE TAWAKE GROVE

Site No: WP619 **Grid Ref:** S26 167186 **Source:** A. Rebergen 1998, pers. comm, on-site survey
Area: 1 ha **Bioclimatic Zone:** **Altitude:** 120 m
Other Landform: **Land System:** Older aggradation plain
Principal Landform: Terrace
Vegetation Type: Maire tawake-kahikatea-pukatea forest (a few totara, titoki, hinau, tawa, and ti kouka, and a single nikau, in the canopy).
Dominant species:

WOODSIDE ROAD

Site No: WP0624 **Grid Ref:** S27 143118 **Source:** Current survey
Area: 2 ha? **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Forest plain
Dominant species: *Podocarpus totara*.

PERRYS BUSH

Site No: WP0703 **Grid Ref:** T26 304206 **Source:** Sawyer *et al*. 1997
Area: 20 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 110 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

SOLWAY REMNANTS A

Site No: WP0709A **Grid Ref:** T26 312245 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

TE WHANGA BUSH

Site No: WP0721 **Grid Ref:** T26 368165 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 74 m
Other Landform: **Land System:** Terrace tread
Principal Landform: Plain, terrace tread
Site Description: Forest on plain.
Vegetation Type: Forest, tall closed forest with scattered emergents.
Dominant species: *Prumnopitys taxifolia*.

NO NAME

Site No: WP0724 **Grid Ref:** T26 347164 **Source:** Sawyer *et al*. 1997
Area: ? <5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Terrace
Dominant species: Not known.

MATAHIWI BUSH 1

Site No: WP0803 **Grid Ref:** S26 295317 **Source:** Sawyer *et al*. 1997
Area: 13 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 170 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

NORFOLK ROAD BUSH A

Site No: WP0806A **Grid Ref:** S26 248298 **Source:** Sawyer *et al*. 1997
Area: 30 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:**
Principal Landform: Flood plain
Site Description: Regenerating forest, shrubland on flood plain.
Vegetation Type: Shrubland.
Dominant species: *Podocarpus totara*.

WAIPOUA BOG

Site No: WP0816D **Grid Ref:** T26 314307, 316310 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 140 m
Other Landform: **Land System:**
Principal Landform: Wetland
Site Description: Wetland on plain.
Vegetation Type: Wetland.
Dominant species: *Leptospermum scoparium.*

BROOKFIELD BUSH

Site No: WP0817 **Grid Ref:** T26 320283 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 130 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest, pasture on flood plain.
Vegetation Type: Forest, pasture.
Dominant species: *Podocarpus totara*.

RATHKEALE COLLEGE BUSH

Site No: WP0818A **Grid Ref:** T26 365305 **Source:** Sawyer *et al*. 1997
Area: 12 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 140 m
Other Landform: Terrace **Land System:**
Principal Landform: Plain
Site Description: Forest and pasture on plain.
Vegetation Type: Forest, pasture.
Dominant species: *Beilschmiedia tawa.*

BRUCE ROAD

Site No: WP0836 **Grid Ref:** T26 340365 **Source:** Current survey
Area: *c.*30ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Upper river terrace

Vegetation Type: Boulderfield, scrub.

WOODLAND BUSH

Site No: WP903 **Grid Ref:** T26 422278 **Source:** On-site survey
Area: 10 ha **Bioclomatic Zone:** **Altitude:** 125-135 m
Other Landform: Terrace riser, hillslope, pond **Land System:** Older aggradation plain
Principal Landform: Alluvial terrace

Vegetation Type: Titoki-tawa-(totara) forest. Titoki-totara-kahuhu-(*Coprosma propinqua*) forest ⇔ mixed scrub. Tawa-titoki forest. Totara-hawthorn forest. Tall fescue-pukio-(soft rush) tussockland. Swamp sedge-(shrubby pohuehue)/(water pepper) tussockland. Kahikatea/(kowhai)-(totara) forest and treeland ⇔ harakeke/(swamp sedge) flaxland.

DUNVEGAN FRAGMENTS A

Site No: WP1002B **Grid Ref:** T25 313430 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Terrace riser **Land System:**
Principal Landform: Flood plain

Site Description: Forest on flood plain.
Dominant species: Not known.

BUSHGATE

Site No: WP1006 **Grid Ref:** T25 308445 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 280 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace riser

Site Description: Forest on riser.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus*.

AWARUA BUSH

Site No: WP1007 **Grid Ref:** T26 304397 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 220 m
Other Landform: Riverbank **Land System:** Alluvial plain
Principal Landform: Flood plain

Site Description: Forest on flood plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

2 MODERATE-HIGH

POUNUI BUSH

Site No: WP0105 **Grid Ref:** R27 881826 **Source:** Sawyer *et al*. 1997
Area: 5(3) ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 15 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Corynocarpus laevigatus, Alectryon excelsus.*

TURANGANUI POND

Site No: WP0107 **Grid Ref:** S27 928 807 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Lake
Dominant species: *Salix* sp.

WHATATOMATOMA BUSH

Site No: WP0110 **Grid Ref:** S28 957767 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Lowland forest
Vegetation Type: Even canopy,
Dominant species: *Beilschmiedia tawa*

PIRINOA BUSH

Site No: WP0114 **Grid Ref:** S28 976775 **Source:**
Area: 10 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: Terrace **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: 4ha lowland forest on alluvial plain, 10ha along escarpment (forest and shrub)
Vegetation Type: Mixed lowland forest, even tree canopy.
Dominant species: *Podocarpus totara*

PRESBYTERIAN BUSH FRAGMENTS

Site No: WP0118a **Grid Ref:** S27 975837 **Source:**
Area: 4 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: Wetland. **Land System:**
Principal Landform: Terrace risers
Site Description: Regenerating forest on terrace.
Vegetation Type: Forest.
Dominant species: *Kunzea ericoides*

PRESBYTERIAN BUSH

Site No: WP0118b **Grid Ref:** S27 978840 **Source:**
Area: 8 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:**
Principal Landform: Gully
Site Description: Regenerating forest in gully.
Vegetation Type: Forest
Dominant species: *Kunzea ericoides*

MATARUA STREAM BUSH

Site No: WP0201 **Grid Ref:** R27 895884 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Bush remnant beside stream.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus*

DUNROBIN LOOP

Site No: WP0212 **Grid Ref:** S27 036894 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** <5 m
Other Landform: **Land System:** River
Principal Landform: Oxbow
Site Description: Wetland.
Vegetation Type: Wetland.
Dominant species: *Salix* sp.

RUAMAHANGA FLOODWAY WETLAND

Site No: WP0219 **Grid Ref:** S27 010935 **Source:** Sawyer *et al.* 1997
Area: 7 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Wetland
Dominant species: Willow.

MAKAKAHI BACKWATER

Site No: WP0224 **Grid Ref:** S27 028954 **Source:** Sawyer *et al.* 1997
Area: 7 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** <5 m
Other Landform: Wetland **Land System:**
Principal Landform: Lake
Site Description: Wetland.
Vegetation Type: Wetland.
Dominant species: Willow.

PAPATAHI ROAD SHRUBLAND

Site No: WP0231 **Grid Ref:** S27 903863 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** <10 m
Other Landform: **Land System:**
Principal Landform: Terrace riser
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides*

HENRIA BUSH A

Site No: WP0242A **Grid Ref:** S27 056925, 052922 **Source:** Sawyer *et al.* 1997
Area: 10 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** <10 m
Other Landform: Stream bank (old watercourse) **Land System:**
Principal Landform: Plain
Vegetation Type: Treeland with pasture.
Dominant species: *Dacrycarpus dacrydioides*.

LAGOON BUSH

Site No: WP0251 **Grid Ref:** S27 993888 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest/treeland.
Dominant species: *Dacrycarpus dacrydioides*.

PEBBLES KANUKA

Site No: WP0253 **Grid Ref:** S27 975845 **Source:** Sawyer *et al*. 1997
Area: 10 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:**
Principal Landform: Hillslopes
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides.*

SWAMP

Site No: WP0257 **Grid Ref:** S27 916947 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: Terrace Riser, base of fault scarp **Land System:**
Principal Landform: Plain
Vegetation Type: Wetland
Dominant species: *Phormium tenax*.

FOURWINDS

Site No: WP0258 **Grid Ref:** S27 950983 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Fault escarpment
Dominant species: *Kunzea ericoides.*

BURLINGS STREAM

Site No: WP262 **Grid Ref:** S27 915943 **Source:** Current survey
Area: 0.2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform:
Dominant species: Not known.

HINABURN

Site No: WP0263 **Grid Ref:** S27 971999 **Source:** Current survey
Area: 0.3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform:
Vegetation Type: Treeland.
Dominant species: Kanuka.

RUAMAHANGA LOOP

Site No: WP0306 **Grid Ref:** S27 123980 **Source:** Sawyer *et al*. 1997
Area: 12 ha (11) **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 15 m
Other Landform: Lake **Land System:**
Principal Landform: Oxbow
Site Description: Tussockland, wetland.
Dominant species: *Salix* sp.

KAHUTARA ROAD BUSH A

Site No: WP0407 **Grid Ref:** S27 087032 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa*.

KAHUTARA RD BUSH B

Site No: WP0408 **Grid Ref:** S27 089037 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa.*

LOWLANDS BUSH SOUTH

Site No: WP0411 **Grid Ref:** S27 100054 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus*

UNDERHILL ROAD BUSH

Site No: WP0417 **Grid Ref:** S27 065100 **Source:** Sawyer *et al.* 1997
Area: 6 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 70 m
Other Landform: Fault escarpment **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

FARNHAM BUSH

Site No: WP0418 **Grid Ref:** S27 057087 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

ABBOTS CREEK BUSH

Site No: WP0419 **Grid Ref:** S27 043077 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: **Land System:** Foothills of Rimuataka Range
Principal Landform: Hillslope
Site Description: Forest on slope.
Vegetation Type: Forest.
Dominant species: *Nothofagus solandri.*

STONESTEAD CREEK BUSH

Site No: WP0421 **Grid Ref:** S27 108088 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: Old braided river bed **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Shrubland on plain.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides.*

MAIRE STREAM SHRUBLAND

Site No: WP0423 **Grid Ref:** S27 113987 **Source:** Sawyer *et al.* 1997
Area: 7 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: Remnant terrace **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: Shrubland on terrace.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides.*

HINABURN BUSH REMNANTS

Site No: WP0425A **Grid Ref:** S27 968002 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment
Site Description: Shrubland on fault.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides.*

HINABURN BUSH REMNANTS

Site No: WP0425B **Grid Ref:** S27 974005 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: Swamp? **Land System:**
Principal Landform: Fault escarpment
Site Description: Shrubland on slope.
Vegetation Type:
Dominant species: *Kunzea ericoides.*

UNDERHILL FAULT ESCARPMENT

Site No: WP0427A **Grid Ref:** S26 070104 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 80 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment
Site Description: Forest on fault escarpment.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

UNDERHILL FAULT ESCARPMENT C

Site No: WP0427C **Grid Ref:** S26 076110 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment

Site Description: Regenerating forest on fault.
Vegetation Type: Forest.
Dominant species: *Melicytus ramiflorus.*

UNDERHILL FAULT

Site No: WP0427D **Grid Ref:** S26 080114 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment

Site Description: Regenerating forest on fault.
Vegetation Type: Forest.
Dominant species: *Melicytus ramiflorus.*

GREYTOWN PARK BUSH

Site No: WP0509 **Grid Ref:** S26 167116 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain

Site Description: Forest on plain.
Vegetation Type: Forest/Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

AHIARUHE ROAD SHRUB GULLY

Site No: WP0521 **Grid Ref:** S27 268094 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 70 m
Other Landform: Limestone **Land System:** Alluvial plain
Principal Landform: Gully

Site Description: Shrubland, forest on plain
Vegetation Type: Shrubland, forest.
Dominant species: *Kunzea ericoides.*

NO NAME

Site No: WP0530A **Grid Ref:** S27 188012 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Valley

Site Description:
Vegetation Type: Forest
Dominant species:

NO NAME

Site No: WP0530B **Grid Ref:** S27 188010 **Source:** Current survey
Area: 2 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Hillslope

Site Description:
Vegetation Type: Treeland.

NO NAME

Site No: WP0530C **Grid Ref:** S27 188008 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Gully
Site Description:
Vegetation Type: Forest.
Dominant species:

WAIOHINE VALLEY BUSH A

Site No: WP0605A **Grid Ref:** S26 118143 **Source:** Sawyer *et al.* 1997
Area: 6 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 80 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on plain.
Vegetation Type: Forest
Dominant species: *Podocarpus totara*

WAIOHINE VALLEY BUSH B

Site No: WP0605B **Grid Ref:** S26 118149 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Fault escarpment **Land System:**
Principal Landform: Hill slope
Site Description: Forest on hill slope.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

ARCUS ROAD BUSH

Site No: WP0606 **Grid Ref:** S26 175188 **Source:** Rebergen 1999
Area: 6 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain
Vegetation Type: Forest
Dominant species: *Podocarpus totara*, *Coprosma areolata*.

BELVEDERE BUSH B

Site No: WP0607B **Grid Ref:** S26 198197 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: Stream **Land System:** Terrace remnant?
Principal Landform: Hill slope
Site Description: Forest/shrubland on side slope.
Vegetation Type: Forest, shrubland.
Dominant species: *Nothofagus solandri* var *solandri.*

WOODSIDE BUSH FRAGMENTS

Site No: WP0611A **Grid Ref:** S26 100123 **Source:** Sawyer *et al.* 1997
Area: 7 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

WOODSIDE BUSH FRAGMENTS

Site No: WP0611B **Grid Ref:** S26 103129 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

WOODSIDE FRAGMENTS

Site No: WP0611C **Grid Ref:** S26 107135 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: Hillslope **Land System:**
Principal Landform: Fault scarp?
Site Description: Forest on hill slope.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

SWAMP ROAD KAHIKATEA

Site No: WP0615 **Grid Ref:** S26 163138 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 70 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

SOLWAY REMNANTS B

Site No: WP0709B **Grid Ref:** T26 306243 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

UPPER PLAIN ROAD REMNANTS D

Site No: WP0809D **Grid Ref:** S26 285284 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 160 m
Other Landform: Terrace **Land System:** Alluvial plain
Principal Landform: Terrace
riser
Site Description: Forest on terrace, riser.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

WAIPOUA BUSH

Site No: WP0814 **Grid Ref:** T26 314292 **Source:** Sawyer *et al.* 1997
Area: 6 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 130 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MATAHIWI BUSH II

Site No: WP0815 **Grid Ref:** S26 300308 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 150 m
Other Landform: **Land System:** Alluvial
Principal Landform: Hill slope
Site Description: Swamp forest association, forest on hillslope.
Vegetation Type: Forest, wetland.
Dominant species: *Beilschmiedia tawa*.

WAIPOUA RIVER FRAGMENTS C

Site No: WP0816C **Grid Ref:** T26 313308 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclimatic Zone:** Semi-coastal – lowland **Altitude:** 150 m
Other Landform: 2 terraces, 1 riser **Land System:**
Principal Landform: Plain
Vegetation Type: Forest/shrubland (regenerating).
Dominant species: *Dacrycarpus dacrydioides.*

MILLERS BUSH

Site No: WP0820 **Grid Ref:** T26 361364 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Regenerating forest on terrace,
Vegetation Type: Regenerating forest.
Dominant species: *Podocarpus totara*.

WOODLEIGH RIVER REMNANTS

Site No: WP0821B **Grid Ref:** T26 358364, 368374 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 170 m
Other Landform: Borders Kopuaranga River **Land System:**
Principal Landform: Plain
Site Description: Forest and pasture on plain.
Vegetation Type: Forest, pasture.
Dominant species: *Podocarpus totara.*

HAUTOTARA HILL BUSH

Site No: WP0824 **Grid Ref:** S26 300389 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 260 m
Other Landform: **Land System:**
Principal Landform: Hill slope
Site Description: Forest on hill slopes.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

KANUKA BUSH B

Site No: WP0826B **Grid Ref:** T26 354350 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Hill slope
Site Description: Forest on hill slopes.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

MAIN ROAD BUSH

Site No: WP0829 **Grid Ref:** T26 331345 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 170 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

FLAX SWAMP

Site No: WP0830 **Grid Ref:** T26 328345 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 170 m
Other Landform: Stream **Land System:** Alluvial plain
Principal Landform: Wetland
Site Description: Wetland, shrubs beside stream.
Vegetation Type: Wetland.
Dominant species: *Phormium tenax.*

GREENFIELDS POND

Site No: WP0901 **Grid Ref:** T26 415266 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: **Land System:**
Principal Landform: Pond
Vegetation Type: Wetland.
Dominant species: *Juncus* sp.

BENDS BUSH

Site No: WP1005 **Grid Ref:** T25 303452 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 280 m
Other Landform: **Land System:**
Principal Landform: Alluvial
plain Terrace riser
Site Description: Forest on terrace riser.
Vegetation Type: Treeland.
Dominant species: *Sophora microphylla.*

3 MODERATE

OCEAN BEACH DUNES

Site No: WP0101 **Grid Ref:** R27 840787 **Source:** On site survey
Area: 20ha **Bioclomatic Zone:** Coastal **Altitude:** 0-20 m
Other Landform: Dune **Land System:** Sand and shingle beaches and river shingle beds
Principal Landform: Sand beach

Site Description: Coastal duneland and beach.
Vegetation Type: *Isolepis nodosa*/*Plantago coronopus*-(*Calystegia soldanella*) sedgeland.
Marram-(*Calystegia soldanella*)-(*Plantago coronopus*) tussockland.
Gorse-tauhinu-(broom) shrubland.
Marram-*Isolepis nodosa*/(*Carex pumila*) tussockland.
Carex pumila-(scarlet pimpernel) gravelfield.
Marram tussockland.
Pasture.
Sand beach [unvegetated].
(Gorse)-(broom) gravelfield.

KOHUNUI BUSH

Site No: WP0120 **Grid Ref:** S27 965837 **Source:** Saywer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Wetland **Land System:** Alluvial
Principal Landform: Plain

Site Description: Forest on plain.
Vegetation Type: Forest
Dominant species: *Dacrycarpus dacrydioides*

RUAMAHANGA RIVER BUSH

Site No: WP0206 **Grid Ref:** S27 000884 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain

Dominant species: *Dacrycarpus dacrydioides*

TE OPAI BUSH C

Site No: WP0208 **Grid Ref:** S27 000891 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain

Dominant species: *Dacrycarpus dacrydioides*

TE OPAI BUSH A1

Site No: WP0213A **Grid Ref:** S27 005905 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain

Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*

ROTO FARM LAGOON

Site No: WP0220 **Grid Ref:** S27 015939 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** <5 m
Other Landform: Plain **Land System:**
Principal Landform: Wetland
Site Description: Wetland plain.
Vegetation Type: Wetland.
Dominant species: *Typha orientalis*.

HENRIA LAKE

Site No: WP0221 **Grid Ref:** S27 055928 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** <10 m
Other Landform: Wetland **Land System:**
Principal Landform: Lake
Dominant species: *Salix* sp.

BOUNDARY CREEK BUSH

Site No: WP0228 **Grid Ref:** R27 893848 **Source:** Sawyer *et al*. 1997
Area: 1.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Tree, shrubland on plain.
Vegetation Type: Treeland, shrubland.
Dominant species: *Dacrycarpus dacrydioides*.

PAPATAHI BUSH

Site No: WP0230 **Grid Ref:** S27 915868 **Source:** Sawyer *et al*. 1997
Area: 12 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 5-10 m
Other Landform: Terrace **Land System:** Alluvial plain
Principal Landform: Gully
Site Description:
Vegetation Type: Regenerating mixed lowland forest.
Dominant species: *Kunzea ericoides.*

LOWER PAHARAKEKE BUSH A

Site No: WP0235A **Grid Ref:** S27 985855 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: Duneland **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: Not known.

LOWER PAHARAKEKE BUSH B

Site No: WP0235B **Grid Ref:** S27 988854 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: Duneland **Land System:** Sand dune
Principal Landform: Plain
Vegetation Type: Forest, shrubland.
Dominant species: *Beilschmiedia tawa*.

WAIHORA BUSH

Site No: WP0236 **Grid Ref:** S27 998857 **Source:** Sawyer *et al*. 1997
Area: 7 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: Wetland **Land System:**
Principal Landform: Gully
Site Description: Shrubland in gully.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides*.

HENRIA BUSH B

Site No: WP0242B **Grid Ref:** S27 065928 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** <10 m
Other Landform: Stream bank (old watercourse). **Land System:**
Principal Landform: Plain
Site Description:
Vegetation Type: Forest, shrub, pasture.
Dominant species: *Dacrycarpus dacrydioides*.

RIVERSLEA REMNANTS

Site No: WP0244 **Grid Ref:** R27 890856 **Source:** Sawyer *et al*. 1997
Area: 1.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Gravels **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Scattered trees on plain.
Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

WAIORONGOMAI FRAGMENTS

Site No: WP0248 **Grid Ref:** S27 905913 **Source:** Sawyer *et al*. 1997
Area: 1.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description:
Vegetation Type: Forest.
Dominant species: *Corynocarpus laevigatus, Kunzea ericoides.*

MARTINS BUSH

Site No: WP0252 **Grid Ref:** S27 063905 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: *Dacrycarpus dacrydioides* on flood plain.
Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

SIDE SLOPE BUSH

Site No: WP0256 **Grid Ref:** R27 896678 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Gully **Land System:**
Principal Landform: Hillslope
Vegetation Type: Shrubland/forest.
Dominant species: *Kunzea ericoides.*

BURLINGS BUSH

Site No: WP0259 **Grid Ref:** S27 910946 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:**
Principal Landform: Terrace
Vegetation Type: Primary and secondary forest.
Dominant species: Not known.

RUAMAHANGA BUSH REMNANT B

Site No: WP0301 **Grid Ref:** S27 115959 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** <5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain
Site Description: Forest on floodplain.
Vegetation Type: Treeland.
Dominant species: *Podocarpus totara.*

RUAMAHANGA BUSH REMNANT C

Site No: WP0303 **Grid Ref:** S27 115962 **Source:** Sawyer *et al*. 1997
Area: Unknown **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Floodplain
Site Description: Forest on floodplain.
Vegetation Type: Treeland.
Dominant species: *Podocarpus totara.*

MAHAKI ROAD BUSH A

Site No: WP0308A **Grid Ref:** S27 114947 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Floodplain
Site Description: Forest on floodplain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MAHAKI ROAD BUSH B

Site No: WP0308B **Grid Ref:** S27 118947 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: Wetland **Land System:** Alluvial plain
Principal Landform: Floodplain
Site Description: Swamp, forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MAHAKI ROAD BUSH C

Site No: WP0308C **Grid Ref:** S27 123949 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 10 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain
Site Description: Forest on floodplain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MAHAKI SWAMP

Site No: WP0308D **Grid Ref:** S27 115946 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: Floodplain **Land System:** Wetland
Principal Landform: Wetland
Site Description:
Vegetation Type: Wetland.
Dominant species: *Dacrycarpus dacrydioides.*

SMITHS BUSH

Site No: WP0309 **Grid Ref:** S27 130960 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 15 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest, scattered pasture on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

TE KOPURA RISER

Site No: WP0315 **Grid Ref:** S27 082955 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

KAHUTARA RD BUSH C

Site No: WP0410 **Grid Ref:** S27 083042 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa.*

PHARAZYNS BUSH

Site No: WP0422 **Grid Ref:** S27 106045 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 30 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest and pasture on plain.
Vegetation Type: Forest, pasture.
Dominant species: *Alectryon excelsus.*

UNDERHILL FAULT ESCARPMENT B

Site No: WP0427B **Grid Ref:** S26 073106 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 80 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

UNDERHILL FAULT ESCARPMENT E

Site No: WP0427E **Grid Ref:** S26 082117 **Source:** Sawyer *et al*. 1997
Area: 0.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment

Site Description: Forest on fault.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

UNDERHILL FAULT ESCARPMENT F

Site No: WP0427F **Grid Ref:** S26 079117 **Source:** Sawyer *et al*. 1997
Area: 0.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Fault escarpment

Site Description: Forest on fault.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

RUAMAHANGA KAHIKATEA REMNANTS C

Site No: WP0501 **Grid Ref:** S27 170080 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain

Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

RUAMAHANGA KAHIKATEA REMNANTS E

Site No: WP0502 **Grid Ref:** S26 179060 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain

Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

RUAMAHANGA KAHIKATEA REMNANTS D

Site No: WP0503 **Grid Ref:** S26 183022 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Floodplain

Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

RUAMAHANGA KAHIKATEA REMNANTS B

Site No: WP0504 **Grid Ref:** S27 180027 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain

Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

RUAMAHANGA KAHIKATEA REMNANTS F

Site No: WP0505 **Grid Ref:** S27 179027 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on plain
Vegetation Type: Forest
Dominant species: *Podocarpus totara*

RUAMAHANGA KAHIKATEA REMNANTS A

Site No: WP0506 **Grid Ref:** S27 175027 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on plain
Vegetation Type: Forest
Dominant species: *Podocarpus totara*

RUAMAHANGA RIVER TERRACE EXTENSION

Site No: WP0507B **Grid Ref:** S27 145003; 155007 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 50 m
Other Landform: **Land System:**
Principal Landform: Terrace riser
Site Description: Forest on terrace riser.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

WAINUI BUSH

Site No: WP0515 **Grid Ref:** S27 163004 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Vegetation Type: Forest and pasture.
Dominant species: *Dacrycarpus dacrydioides*

TAWAHA SHRUBLAND

Site No: WP0516 **Grid Ref:** S27 153015 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Shrubland on terrace.
Vegetation Type: Shrubland
Dominant species: *Kunzea ericoides*

PLAINS BUSH

Site No: WP0517 **Grid Ref:** S27 187055 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on flood plain.
Vegetation Type: Forest, pasture.
Dominant species: Not known.

RUAMAHUNGA ISLAND BUSH

Site No: WP0518 **Grid Ref:** S27 203082 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on flood plain.
Vegetation Type: Forest.
Dominant species: Not known.

AHIARUHE PLAIN

Site No: WP0523 **Grid Ref:** S26 270107 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:**
Principal Landform: Flood plain
Site Description: Forest on flood plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*

KOKOTAU ROAD BUSH

Site No: WP0525 **Grid Ref:** S27 248095 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

RIVERSDALE BUSH

Site No: WP0526 **Grid Ref:** S26 210112 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: Terrace riser **Land System:**
Principal Landform: Terrace
Site Description: Shrubland on terrace riser.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides.*

MATARAWA TOTARA

Site No: WP0614 **Grid Ref:** S26 143138 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 4 m
Other Landform: Terrace riser **Land System:**
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

SWAMP ROAD FRAGMENTS D

Site No: WP0616D **Grid Ref:** S26 183135 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest remnant on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

SWAMP ROAD FRAGMENTS A

Site No: WP0616A **Grid Ref:** S26 175142 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest remnants on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

SWAMP ROAD FRAGMENTS B

Site No: WP0616B **Grid Ref:** S26 178139 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest remnant on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

SWAMP ROAD FRAGMENTS C

Site No: WP0616C **Grid Ref:** S26 180139 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest remnant on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

MAIN ROAD SWAMP

Site No: WP0617 **Grid Ref:** S26 253200 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 100 m
Other Landform: Lagoon **Land System:** Lagoon
Principal Landform: Swamp
Site Description: Wetland.
Vegetation Type: Wetland, pasture.
Dominant species: Pasture.

TERRACE BUSH

Site No: WP0621 **Grid Ref:** S26 090119 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: Terrace riser **Land System:**
Principal Landform: Terrace
Site Description: Forest on terrace and riser.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

SOLWAY REMNANTS C

Site No: WP0709C **Grid Ref:** T26 303243 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 120 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest remnant on plain.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

OLIVERS REMNANTS A

Site No: WP0711A **Grid Ref:** T26 358238 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest and pasture on plain.
Vegetation Type: Forest, pasture.
Dominant species: *Dacrycarpus dacrydioides.*

OLIVERS REMNANTS B

Site No: WP0711B **Grid Ref:** T26 360235 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

OLIVERS REMNANTS C

Site No: WP0711C **Grid Ref:** T26 358134 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

MAKOURA STREAM BUSH

Site No: WP0712 **Grid Ref:** T26 354208 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest and pasture on plain.
Vegetation Type: Forest, pasture.
Dominant species: *Dacrycarpus dacrydioides.*

LITTLE AVONDALE BUSH

Site No: WP0713 **Grid Ref:** T26 376227 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 90 m
Other Landform: Gravels (water table just below surface) **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

TE WHITI BUSH

Site No: WP0716 **Grid Ref:** T26 355195 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 80 m
Other Landform: Banks of Ruamahunga River **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest strip on plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

KAHIKATEA BUSH

Site No: WP0717 **Grid Ref:** T26 343213 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 80 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

DEER BUSH

Site No: WP0718A **Grid Ref:** T26 343180 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Flood plain
Site Description: Forest on plain and escarpment.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

TAUWERU RIVER BUSH

Site No: WP0719 **Grid Ref:** T26 372-5, 169-171 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides.*

TE WHANAKE BUSH

Site No: WP0722 **Grid Ref:** T26 355148 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 70 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa*.

CLIFFS STATION FOREST REMNANT

Site No: WP0725 **Grid Ref:** T26 336174 **Source:** Current survey
Area: *c.*2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Flood plain
Vegetation Type: Forest.
Dominant species: Totara, kahikatea, tawa, kanuka.

McLENNANS BUSH

Site No: WP0805 **Grid Ref:** S26 225257 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 140 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

NORFOLK ROAD BUSH B

Site No: WP0806B **Grid Ref:** S26 243310 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: Borders Waingawa River **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Forest on flood plain.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

KAKARA PARK BUSH

Site No: WP0807 **Grid Ref:** S26 263275 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 170 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

TARARUA DRIVE BUSH

Site No: WP0808 **Grid Ref:** S26 268283 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

UPPER PLAIN ROAD BUSH REMNANTS A

Site No: WP0809A **Grid Ref:** S26 275289 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 200 m
Other Landform: Terrace riser **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Forest on terrace, riser.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

UPPER PLAIN ROAD BUSH REMNANTS B

Site No: WP0809B **Grid Ref:** S26 276285 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 190 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: Forest on terrace riser.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara*.

PAERAU

Site No: WP0816E **Grid Ref:** T26 319340 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 160 m
Other Landform: Riverbank **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

RATHKEALE COLLEGE BUSH WETLAND

Site No: WP0818B **Grid Ref:** T26 362305 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Stream
Site Description: Wetland.
Vegetation Type: Wetland.
Dominant species: *Salix* sp.

RATHKEALE COLLEGE BUSH - WESTERN

Site No: WP0818C **Grid Ref:** T26 362305 **Source:** Sawyer *et al*. 1997
Area: 6 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa*.

KOPUARANGA RIVER FRAGMENTS A

Site No: WP0819A **Grid Ref:** T26 369327 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 160 m
Other Landform: Riverbank, terrace **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Trees, shrubs on riverbank.
Vegetation Type: Trees, shrubs.
Dominant species: *Dacrycarpus dacrydioides.*

KOPUARANGA RIVER FRAGMENTS B

Site No: WP0819B **Grid Ref:** T26 363328 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 160 m
Other Landform: Terrace **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Regeneration forest on plain.
Vegetation Type: Regenerating forest.
Dominant species: *Dacrycarpus dacrydioides*.

WOODLEIGH BUSH

Site No: WP0821A **Grid Ref:** T26 363374 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Forest on terrace.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides.*

GLEN ORRIN BUSH

Site No: WP0822 **Grid Ref:** T26 352391 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:**
Principal Landform: Plain
Site Description: Forest, pasture on terrace.
Vegetation Type: Treeland, pasture.
Dominant species: *Beilschmiedia tawa.*

HAUTOTARA BUSH

Site No: WP0823 **Grid Ref:** T26 308388 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 220 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Alectryon excelsus.*

KANUKA BUSH A

Site No: WP0826A **Grid Ref:** T26 353348 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 240 m
Other Landform: **Land System:**
Principal Landform: Hill slope
Site Description: Forest on hill slope.
Vegetation Type: Forest.
Dominant species: *Kunzea ericoides.*

CACKLEBERRY KANUKA A

Site No: WP0831A **Grid Ref:** T26 316366 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 200 m
Other Landform: Terrace riser, terrace **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Scrub on plain.
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides.*

CACKLEBERRY KANUKA B

Site No: WP0831B **Grid Ref:** T26 316363 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Terrace riser **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides*

TOTARA ESCARPMENT

Site No: WP0832 **Grid Ref:** T26 319385 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: Terrace **Land System:**
Principal Landform: Terrace riser
Site Description: Forest remnant on terrace, riser.
Vegetation Type: Forest.
Dominant species: *Podocarpus totara.*

GULLY

Site No: WP0835 **Grid Ref:** T26 304103 **Source:** Current survey
Area: 4 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 140 m
Other Landform: Terrace riser **Land System:** Downland?
Principal Landform: Gully
Vegetation Type: Scrub or shrubland?
Dominant species: Not known.

JACKSON BUSH

Site No: WP1003 **Grid Ref:** T26 343396 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 180 m
Other Landform: **Land System:**
Principal Landform: Terrace
Site Description: Forest on plain.
Vegetation Type: Forest.
Dominant species: *Beilschmiedia tawa.*

KAHIKATEA RISER

Site No: WP1004 **Grid Ref:** T25 305430, 305435, 308438 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace riser
Site Description: Forest on terrace riser.
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

Appendix 8: Unprotected natural areas not ranked as RAPs or of biological importance

PIRINOA ROAD END BUSH

Site No: WP0111 **Grid Ref:** S28 974790 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland? **Altitude:** 40 m
Other Landform: **Land System:**
Principal Landform: Alluvial plain

Site Description: Scattered trees over pasture.
Vegetation Type: Treeland.
Dominant species: *Salix* sp.

HUMES ROAD BUSH

Site No: WP0112 **Grid Ref:** S27 974810 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 80 m
Other Landform: Hillslope, terrace riser **Land System:**
Principal Landform: Scarp

Site Description: Shrubland on escarpment.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides*.

TAUANUI RIVER BUSH

Site No: WP0113 **Grid Ref:** S27 945826 **Source:** Sawyer *et al.* 1997
Area: 12 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 15 m
Other Landform: Terrace tread **Land System:**
Principal Landform: Flood plain

Site Description: Willow scrub on flood plain.
Vegetation Type: Scrub.
Dominant species: *Salix* sp.

GLENCALUM BUSH

Site No: WP0117 **Grid Ref:** S28 913780 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 50 m
Other Landform: **Land System:**
Principal Landform: Terrace

Site Description: Willow forest.
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

MATAWHERO CUTOVER

Site No: WP0119 **Grid Ref:** S27 988843 **Source:** Sawyer *et al.* 1997
Area: 8 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: Terrace riser **Land System:**
Principal Landform: Terrace

Site Description: Pine plantation with regenerating scrub.
Vegetation Type: Shrubland.
Dominant species: *Pinus,* sp. and *Kunzea ericoides*.

GLENITI STRIP

Site No: WP0121 **Grid Ref:** S27 955830 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Escarpment
Site Description: Exotic forest of pines.
Vegetation Type: Exotic forest.
Dominant species: *Pinus* sp.

RANONA RISER

Site No: WP0124 **Grid Ref:** S28 970760 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Riser
Vegetation Type: Shrubland.
Dominant species: *Corynocarpus laevigatus.*

WHAKA RISER

Site No: WP0126 **Grid Ref:** S28 945796 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Riser
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides*.

TI KOUKA SWAMP

Site No: WP0128 **Grid Ref:** S27 938828 **Source:** Sawyer *et al*. 1997
Area: **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Slope
Vegetation Type: Wetland.
Dominant species: *Typha orientalis.*

ALLSOPS BAY SHRUBLAND

Site No: WP0232 **Grid Ref:** S27 907875 **Source:** Sawyer *et al*. 1997
Area: 12 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: Slopes **Land System:** Alluvial plain
Principal Landform: Gullies
Site Description: Fragmented kanuka shrubland.
Vegetation Type: Shrubland.
Dominant species: *Kunzea ericoides*.

WILLOWBANK

Site No: WP0233 **Grid Ref:** S27 943850 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Site Description: Willows on braided river.
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

CANAL BUSH

Site No: WP0234 **Grid Ref:** S27 950850 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:**
Principal Landform: Terrace

Dominant species: Vegetation cleared.

MATTHEWS LAGOON EXTENSION

Site No: WP0237 **Grid Ref:** S27 976906 **Source:** Sawyer *et al*. 1997
Area: 70 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Plain

Dominant species: Area developed.

OTARAIA SHRUBLAND

Site No: WP0238 **Grid Ref:** S27 018898 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:**
Principal Landform: Flood plain

Site Description: Willow shrubland.
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

FERNHILL BUSH

Site No: WP0239 **Grid Ref:** S27 030897 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain

Dominant species: Vegetation cleared (pers. comm. from landowner)

WHAKAWIRIWIRI WETLAND

Site No: WP240 **Grid Ref:** S27 040905 **Source:** Sawyer *et al*. 1997
Area: 275 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:**
Principal Landform: Flood plain

Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

TAKAMAITU WETLAND

Site No: WP0241 **Grid Ref:** S27 042920 **Source:** Sawyer *et al*. 1997
Area: 15 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 5 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain

Vegetation Type: Treeland.
Dominant species: *Salix* sp.

WAITUNA SWAMP

Site No: WP0250 **Grid Ref:** R27 898847 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Plain

Vegetation Type: Shrubland.
Dominant species: *Leptospermum scoparium.*

BURNSIDE REMNANTS

Site No: WP0254 **Grid Ref:** S27 964846, 964852 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Pole *Dacrycarpus dacrydioides* on flood plain.
Vegetation Type: Trees and pasture.
Dominant species: *Dacrycarpus dacrydioides.*

MANGATETE STREAM

Site No: WP0255 **Grid Ref:** S27 040961 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform:
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

RUAMAHANGA BUSH REMNANT A

Site No: WP0302 **Grid Ref:** S27 119958 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

HIKINUI ROAD LAGOON

Site No: WP0305 **Grid Ref:** S27 108970 **Source:** Sawyer *et al*. 1997
Area: 8 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Lagoon
Vegetation Type: Shrubland/wetland.
Dominant species: *Salix* sp.

PUMPS BUSH A

Site No: WP0307A **Grid Ref:** S27 090924 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Flood plain
Vegetation Type: Treeland.
Dominant species: *Alectryon excelsus*.

PUMPS BUSH B

Site No: WP0307B **Grid Ref:** S27 088927 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Flood plain
Vegetation Type: Treeland.
Dominant species: *Podocarpus totara.*

LOOP BUSH

Site No: WP0310 **Grid Ref:** S27 123974 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 10 m
Other Landform: **Land System:**
Principal Landform: Flood plain
Vegetation Type: Shrubland.
Dominant species: *Populus* sp.

HUANGARUA RIVER REMNANTS A-D

Site No: WP0311 **Grid Ref:** S27 193950 **Source:** Sawyer *et al.* 1997
Area: 0 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: Flood plain **Land System:**
Principal Landform: Terrace
Vegetation Type: Forest/shrubland.
Dominant species: *Salix* sp.

KOWHAI FLATS BUSH

Site No: WP0312 **Grid Ref:** S27 177937 **Source:** Sawyer *et al.* 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Terrace
Vegetation Type: Treeland.
Dominant species: *Eucalyptus* sp.

PAHAUTEA BUSH

Site No: WP0314 **Grid Ref:** S27 100948 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 20 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Vegetation Type: Treeland.
Dominant species: *Alectryon excelsus*.

TE KOPURA FLAT

Site No: WP0316 **Grid Ref:** S27 081954 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Vegetation Type: Treeland.
Dominant species: *Alectryon excelsus.*

TAHA ARUHE

Site No: WP0416 **Grid Ref:** S27 085090 **Source:** Sawyer *et al.* 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Flood plain
Vegetation Type: Shrubland.
Dominant species: *Pinus* sp.

LONGWOOD ROAD BUSH

Site No: WP0420 **Grid Ref:** S27 065052 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 15 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: Not known.

DIVERSION BUSH II

Site No: WP0426B **Grid Ref:** S27 081013 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

TAUMATA STREAM

Site No: WP0512 **Grid Ref:** S27 238098 **Source:** Sawyer *et al*. 1997
Area: 50 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: River bed
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

CONFLUENCE BUSH

Site No: WP0519 **Grid Ref:** S27 213089 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Salix* sp.

WEST BANK BUSH

Site No: WP0522 **Grid Ref:** S27 266100 **Source:** Sawyer *et al*. 1997
Area: 8 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: *Salix* sp.

GLADSTONE HALL BUSH

Site No: WP0524 **Grid Ref:** T27 318097 **Source:** Sawyer *et al*. 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 70 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Populus* sp.

TILSON'S BUSH

Site No: WP0527 **Grid Ref:** S27 192098 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Dacrycarpus dacrydioides.*

FABIANS ROAD SWAMP

Site No: WP0528 **Grid Ref:** S27 169056 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Wetland
Site Description: Swamp.
Vegetation Type: Wetland.
Dominant species: *Carex* sp.

RIVERSIDE POND

Site No: WP0529 **Grid Ref:** S27 175986 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 40 m
Other Landform: **Land System:**
Principal Landform: Pond
Vegetation Type: Wetland.
Dominant species: *Juncus* sp.

SEGMENT BUSH

Site No: WP0603 **Grid Ref:** S26 098118 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Vegetation Type: Forest.
Dominant species: Exotic species.

UNDERHILL WEST BUSH

Site No: WP0604 **Grid Ref:** S26 113132 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 90 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Vegetation Type: Forest.
Dominant species: *Pinus* sp.

WAIOHINE RIVER BUSH

Site No: WP0608 **Grid Ref:** S26 202128 **Source:** Sawyer *et al*. 1997
Area: 4 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 40 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: *Salix* sp.

CARTERTON TOWN BUSH

Site No: WP0609 **Grid Ref:** S26 232182 **Source:** Sawyer *et al*. 1997
Area: **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Shrubland.
Dominant species: *Eucalyptus* sp.

TRIBUTARY BUSH

Site No: WP0610 **Grid Ref:** S26 262155 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 80 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Forest/shrubland.
Dominant species: *Podocarpus totara.*

SWAMP ROAD FRAGMENTS

Site No: WP0616E **Grid Ref:** S26 192138 **Source:** Sawyer *et al*. 1997
Area: 3 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 50 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Site Description: Trees, grass on plain.
Vegetation Type: Treeland, grass.
Dominant species: *Podocarpus totara*.

MANGATERETERE TUTARA

Site No: WP0618 **Grid Ref:** S26 236243 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 140 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Podocarpus totara.*

MASTERTON SEWAGE PONDS

Site No: WP0702 **Grid Ref:** T26 356203 **Source:** Sawyer *et al.* 1997
Area: 35 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 90 m
Other Landform: **Land System:**
Principal Landform:
Dominant species: Not known.

DUMP BUSH

Site No: WP0706 **Grid Ref:** T26 353230 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 100 m
Other Landform: **Land System:**
Principal Landform: Terrace
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

KENTFORD BUSH A

Site No: WP0707A **Grid Ref:** T26 320127 **Source:** Sawyer *et al.* 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:** Alluvial Plain
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: *Populus* sp.

KENTFORD BUSH B

Site No: WP0707B **Grid Ref:** T26 317124 **Source:** Sawyer *et al.* 1997
Area: 6 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: *Salix* sp.

KENTFORD BUSH C

Site No: WP0707C **Grid Ref:** T26 313128 **Source:** Sawyer *et al.* 1997
Area: 0 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Alectryon excelsus.*

DAKINS ROAD BUSH

Site No: WP0708 **Grid Ref:** T26 324144 **Source:** Sawyer *et al.* 1997
Area: 5 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 60 m
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Forest.
Dominant species: *Salix* sp.

MASTERTON BUSH

Site No: WP0710 **Grid Ref:** T26 337243 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 110 m
Other Landform: **Land System:**
Principal Landform: Terrace
Vegetation Type: Shrubland.
Dominant species: Exotic species.

PAKARAKA BUSH

Site No: WP0714 **Grid Ref:** T26 370209 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 90 m
Other Landform: **Land System:**
Principal Landform:
Vegetation Type: Forest.
Dominant species: *Dacrycarpus dacrydioides*.

RUA STRIP

Site No: WP0715 **Grid Ref:** T26 364204 **Source:** Sawyer *et al*. 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 80 m
Other Landform: **Land System:**
Principal Landform:
Vegetation Type: Treeland.
Dominant species: *Podocarpus totara.*

KOURARAU STREAM BUSH

Site No: WP0723 **Grid Ref:** T26 355123 **Source:** Sawyer *et al*. 1997
Area: **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Gully
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides.*

FORESTRY BUSH

Site No: WP0810 **Grid Ref:** S26 260284 **Source:** Sawyer *et al*. 1997
Area: 30 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 160 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Plain
Vegetation Type: Shrubland?
Dominant species: Not known.

SOUTHBANK SHRUBLAND

Site No: WP0812 **Grid Ref:** S26 280256 **Source:** Sawyer *et al*. 1997
Area: 25 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 140 m
Other Landform: Terrace **Land System:**
Principal Landform: Plain
Vegetation Type: Shrubland.
Dominant species: *Salix* sp.

CHAMBERLAIN BUSH

Site No: WP0813 **Grid Ref:** T26 312257 **Source:** Sawyer *et al*. 1997
Area: 2 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 130 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Vegetation Type: Forest.
Dominant species: *Eucalyptus* sp.

OPAKI BUSH I

Site No: WP0825A **Grid Ref:** T26 344340 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 150 m
Other Landform: **Land System:**
Principal Landform: Hillslope
Vegetation Type: *Treeland.*
Dominant species: *Podocarpus totara.*

OPAKI BUSH II

Site No: WP0825B **Grid Ref:** T26 348337 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 150 m
Other Landform: **Land System:**
Principal Landform: Gully
Vegetation Type: Treeland.
Dominant species: *Kunzea eriocoides.*

BRUCES ROAD KANUKA

Site No: WP0827 **Grid Ref:** T26 338376 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 180 m
Other Landform: **Land System:**
Principal Landform: Plain
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides.*

RANGIORA SWAMP

Site No: WP0828 **Grid Ref:** T26 341354 **Source:** Sawyer *et al.* 1997
Area: 1 ha **Bioclomatic Zone:** Semi-coastal - lowland **Altitude:** 160 m
Other Landform: Terrace **Land System:**
Principal Landform: Plains
Vegetation Type: Shrubland.
Dominant species: *Leptospermum scoparium.*

BURNETTS SWAMP

Site No: WP0833 **Grid Ref:** S26 261297 **Source:** Sawyer *et al.* 1997
Area: 0.5 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:** 200 m
Other Landform: **Land System:** Alluvial plain
Principal Landform: Terrace
Site Description: Terrace wetland.
Vegetation Type: Wetland.
Dominant species: *Phormium tenax.*

WAIPIPI STREAM

Site No: WP0834 **Grid Ref:** T26 330333 **Source:** Sawyer *et al.* 1997
Area: 0 ha **Bioclomatic Zone:** Semi-coastal – lowland **Altitude:**
Other Landform: **Land System:**
Principal Landform: Escarpment
Vegetation Type: Treeland.
Dominant species: *Kunzea ericoides.*

Appendix 9: Common plant names used in the text

akeake	*Dodonea viscosa*
alder	*Alnus glutinosa*
arrow grass	*Triglochin striata*
Australian ngaio	*Myoporum insulare*
bachelor's button	*Cotula coronopifolia*
barberry	*Berberis glaucocarpa*
beech	*Nothofagus* sp.
beggar's ticks	*Bidens frondosa*
black beech	*Nothofagus solandri* var. *solandri*
black maire	*Nestegis cunninghamii*
black nightshade	*Solanum nigrum*
blackberry	*Rubus* sp. (*R. fruticosus* agg.)
boneseed	*Chrysanthemoides monilifera*
brome	*Bromus* sp.
buck's horn plantain	*Plantago coronopus*
buddleia	*Buddleja davidii*
camellia	*Camellia* sp.
Cape ivy	*Senecio angulatus*
cathedral bells	*Cobaea scandens*
catsear	*Hypochoeris radicata*
centella	*Centella uniflora*
cocksfoot	*Dactylis glomerata*
corkscrew willow	*Salix matsudana*
cotoneaster	*Cotoneaster glaucophyllus* f. *serotinus*
couch	*Agropyron repens*
crack willow	*Salix fragilis*
thorn apple	*Datura stramonium*
elderberry	*Sambucus nigra*
English ivy	*Hedera helix*
eucalyptus	*Eucalyptus botryoides*
false acacia	*Robinia pseudacacia*
giant umbrella sedge	*Cyperus ustulatus*
gorse	*Ulex europaeus*
Hall's totara	*Podocarpus hallii*
hangehange	*Geniostoma rupestre* var. *ligustrifolium*
harakeke	*Phormium tenax*
hard beech	*Nothofagus truncata*
harestail	*Lagurus ovatus*
hawthorn	*Crataegus monogyna*
hedgehog grass	*Echinopogon oratus*
heketara	*Olearia rani*
herb Robert	*Geranium robertianum*
Himalayan honeysuckle	*Leycesteria formosa*

hinarepe	sand tussock; *Austrofestuca littoralis*
hinau	*Elaeocarpus dentatus*
holly	*Ilex aquifolium*
hornwort	*Ceratophyllum demersum*
horoeka	lancewood; *Pseudopanax crassifolius*
houhere	*Hoheria populnea*
hukihuki	*Coprosma tenuicaulis*
huruhuru whenua	*Asplenium oblongifolium*
Japanese honeysuckle	*Lonicera japonica*
jointed rush	*Juncus articulatus*
kahikatea	*Dacrycarpus dacrydioides*
kaikomako	*Pennantia corymbosa*
kamahi	*Weinmannia racemosa*
kamu	*Uncinia uncinata*
kanono	*Coprosma grandifolia*
kanuka	*Kunzea ericoides* var. *ericoides*
karaka	*Corynocarpus laevigatus*
karamu	*Coprosma robusta*
kareao	supplejack; *Ripogonum scandens*
karetu	*Hierochloe redolens*
kawakawa	*Macropiper excelsum* var. *excelsum*
kiekie	*Freycinetia banksii*
kneed foxtail	*Alopecurus geniculatus*
kohekohe	*Dysoxylum spectabile*
kohia	*Passiflora tetranda*
kohuhu	*Pittosporum tenuifolium* subsp. *tenuifolium*
kopakopa	*Plantago raoulii*
koromiko	*Hebe stricta* var. *stricta*
kotukutuku	*Fuchsia excorticata*
kowaowao	*Phymatosorus pustulatus*
kowhai	*Sophora tetraptera*, *Sophora microphylla*
leafless rush	*Juncus gregiflorus, J. sarophorus*
loosestrife	*Lythrum hyssopifolia*
lupin	*Lupinus arboreus*
mahoe	*Melicytus ramiflorus* subsp. *ramiflorus*
maire	*Nestegis* species
maire tawake	swamp maire; *Syzygium maire*
mamaku	*Cyathea medullaris*
manatu	ribbonwood; *Plagianthus regius*
manuka	*Leptospermum scoparium*
mapou	*Myrsine australis*
maritime pine	*Pinus pinaster*
marram	*Ammophila arenaria*
marsh ribbonwood	*Plagianthus divaricatus*
matai	*Prumnopitys taxifolia*
Mercer grass	*Paspalum distichum*
mingimingi	*Leucopogon fasciculatus*
miro	*Prumnopitys ferruginea*
mountain beech	*Nothofagus solandri* var. *cliffortioides*
mountain rohutu	*Neomyrtus pedunculata*

narrow-leaved maire	*Nestegis montana*
native carrot	*Daucus glochidiatus*
New Zealand jasmine	*Parsonsia capsularis; Parsonsia heterophylla*
ngaio	*Myoporum laetum*
nikau	*Rhopalostylis sapida*
northern rata	*Metrosideros robusta*
oioi	*Leptocarpus similis*
ongaonga	*Urtica ferox*
pampas	*Cortaderia selloana*
pate	*Schefflera digitata*
pingao	*Desmoschoenus spiralis*
pink bindweed	*Calystegia sepium*
piripiri	*Acaena juvenca*
poataniwha	*Melicope simplex*
pohuehue	*Muehlenbeckia australis*
ponga	*Cyathea dealbata*
poplar	*Populus* sp.
porokaiwhiri	pigeonwood; *Hedycarya arborea*
poroporo	*Solanum laciniatum*
prickly mingimingi	*Cyathodes juniperina*
puka, broadleaf	*Griselinia* sp.
pukatea	*Laurelia novae-zelandiae*
pukio	*Carex secta*
purei	*Carex virgata*
putaputaweta	*Carpodetus serrata*
radiata pine	*Pinus radiata*
rangiora	*Brachyglottis repanda*
rarahu	bracken; *Pteridium esculentum*
raupo	*Typha orientalis*
red beech	*Nothofagus fusca*
remuremu	*Selliera radicans*
rewarewa	*Knightia excelsa*
rimu	*Dacrydium cupressinum*
rohutu	*Lophomyrtus obcordata*
sand pimelea	*Pimelea arenaria*
sand sedge	*Carex pumila*
Scotch thistle	*Cirsium vulgare*
sea rush	*Juncus maritimus*
selfheal	*Prunella vulgaris*
sheep's sorrel	*Rumex acetosella*
shining karamu	*Coprosma lucida*
shore bindweed	*Calystegia soldanella*
shore lobelia	*Lobelia anceps*
small-leaved pohuehue	*Muehlenbeckia complexa*
soft rush	*Juncus effusus*
speargrass	*Aciphylla* sp.
Spanish heath	*Erica lusitanica*
Sphagnum	*Sphagnum cristatum* and/or *S. falcatulum*
spike sedge	*Eleocharis acuta*
spinifex	*Spinifex sericeus*

swamp kiokio	*Blechnum novae-zelandiae* (swamp form) (is *B. minus* of New Zealand authors)
swamp millet	*Isachne globosa*
sweet brier	*Rosa rubiginosa*
tall fescue	*Festuca arundinacea*
tarata, lemonwood	*Pittosporum eugenoides*
tauhinu	*Ozothamnus leptophyllus*
taupata	*Coprosma repens*
tawa	*Beilschmiedia tawa*
three square sedge	*Schoenoplectus pungens*
thorn apple	*Datura stramonium*
ti kouka	*Cordyline australis*
titoki	*Alectryon excelsus*
toetoe	*Cortaderia fulvida* and *C. toetoe*
totara	*Podocarpus totara*
tradescantia	*Tradescantia fluminensis*
trailing St John's wort	*Hypericum humifusum*
tree heath	*Erica arborea*
turepo	*Streblus heterophyllus*
tutu	*Coriaria arborea*
water pepper	*Polygonum hydropiper*
water purslane	*Ludwigia palustris*
weeping mapou	*Myrsine divaricata*
whaririki	*Phormium cookianum*
whauwhaupaku	fivefinger; *Pseudopanax arboreus*
wheki	*Dicksonia squarrosa*
wheki ponga	*Dicksonia fibrosa*
white maire	*Nestegis lanceolata*

Appendix 10: Glossary of technical terms

Adventive:	Arriving from outside; in contrast to native.
Airfall Deposition:	Shower-like fragments from an eruption.
Alluvial:	Deposited by a stream.
Alluvial Flat:	Refer to Landform.
Alluvial Plain:	Refer to Landform.
Alluvial Terrace:	Refer to Landform.
Argillaceous:	Containing clay-size particles or clay minerals.
Basin:	Refer to Landform.
Bioclimatic Zone:	One of the categories used in classifying natural climate and related biota. It refers to the broad distribution of vegetational zones along altitudinal gradients where a particular climatic regime dictates the character of the natural ecosystem. Two bioclimatic zones are recognised within the Wairarapa Plains Ecological District. Refer to text.
Buffer:	A zone surrounding a natural area that reduces the effect of external influences upon the features within the natural area, e.g., vegetation such as modified forest/scrub or a stream.
Buffering:	Refer to Recommended Area for Protection Selection Criteria.
Canopy:	The layer or layers formed by the uppermost crown or their parts. The concept is applicable to any kind of vegetation. In forests it includes lianes and epiphytes.
Cliff:	Refer to Landform.
Coastal Zone:	Refer to Bioclimatic Zone.
Community:	A collection of populations of animals and plants that occur naturally together in a common environment of any size.
Conservation Value:	The relative merit of a natural feature within a regional or national context (say within an ecological region or ecological district).
Cretaceous:	Geological period (q.v.) lasting approximately from 135 - 65 million years ago.
Diversity:	The range of the natural physical and biotic components in the landscape including species, communities, ecosystems, landforms, soil sequences, and dynamic systems and processes.
Drought:	At least 15 consecutive days of no measurable rainfall (Thompson 1982).
Dry Spell:	At least 15 consecutive days of <1 m rain per day. (Thompson 1982).
Dune Hollow:	Depression or low area between dunes, may have groundwater at surface.

Ecological Character: The distinguishing features of a particular place, definable in terms of biotic composition, climatic, edaphic and topographical factors.

Ecological Class: A category which describes the broad ecological patterns within an ecological district in terms of bioclimatic zone, hydrological class, vegetation structural class, and land system, e.g., a coastal palustrine reedland on uplifted marine terrace.

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. New Zealand has been subdivided into 268 such districts, setting the level for assessing the representativeness of major ecosystem types.

Ecological Region: A group of adjacent ecological districts with closely related ecological characteristics, or, in some cases, a single very distinctive ecological district. New Zealand has been subdivided into 85 such regions.

Ecological Unit: Any combination of vegetation class, landform unit and bioclimatic zone (e.g., unmodified primary forest on steep slopes in the lowland bioclimatic zone). The concept of ecological units has been designed to give specific meaning to the Reserves Act 1977 phrase "all classes of natural ecosystems ...". Ecological units were used to determine the remaining representation of different classes of indigenous vegetation in the ecological district.

Endangered: Refer to rarity.

Endemic: Occurring naturally in, and restricted to, a particular country, region or locality. Refer to Indigenous.

Eocene: Geological epoch (q.v.), subdivision of Tertiary, *c*. 54 - 38 million years ago.

Estuarine: Refer to Hydrological Class.

Exotic: Introduced from outside New Zealand.

Fernland: Refer to Vegetation Structural Class.

Foredune: Refer to Landform.

Forest: Refer to Vegetation Structural Class.

Geological Periods and Epochs: Main fossil-bearing geological periods and their approximate ages are as follows:

Era	*Period*	*Million Years Since Beginning of Period*
Cenozoic	Quaternary	1.5
	Tertiary	65
Mesozoic	Cretaceous	135
	Jurassic	190
	Triassic	225
Palaeozoic	Permian	280
	Carboniferous	345

Devonian	395
Silurian	440
Ordovician	500
Cambrian	570

The Quaternary period is subdivided into the Recent (or Holocene) epoch (since the last glaciation) and the Pleistocene epoch. The Teritary period is subdivided into the following epochs (in brackets, millions of years since beginning of epoch): Pliocene (7), Miocene (26), Oligocene (38), Eocene (54), Palaeocene (65). Sometimes the Pleistocene, Pliocene and Miocene are grouped into the Neogene, and the Oligocene, Eocene and Palaeocene into the Palacogene. The Cambrian and all subequent periods are konwn as the Phanerozoic; the pre-Cambrian as the Cryptozoic. The Upper Palaeozoic is Devonian to Permian, the Lower is Cambrian to Silurian, inclusive.

Gley (soil): The product of waterlogged soil conditions and hence an anaerobic envrionment. The reduction of iron compounds by micro-organisms often causes mottling of soil into a patchwork of grey and rust colours.

Gorge: Refer to Landform.

Grass/Sedge/Rushland: Refer to Vegetation Structural Class.

Gully: A deep incision into a hillslope due to fluvial action.

Habitat: The environment in which a plant or animal lives. An organism usually has adaptations which allow it to live in particular conditions, and it may be more or less restricted to this habitat.

Herbfield: Refer to Vegetation Structural Class.

Hillslope: Refer to Landform.

Holocene (Recent): Geological period consisting of recent times since end of the last ice-age (about 10 000 years ago).

Hydrologic Class : One of 6 descriptive categories used in classifying the influence of water on the character of the biotic elements. If water is not a significant influence, a site is considered terrestrial. On sites where water is a major feature the characteristics of the soils and biota will be strongly influenced by the nature of the water body (e.g., palustrine, lacustrine, estuarine) and its nutrient content.

Terrestrial - Free water has an insignificant role in the ecological character of these areas.

Palustrine - A wetland community/environment characterised by emergent vegetation which may, or may not, have free standing water present.

Lacustrine - A lake community/environment lacking persistent emergent vegetation.

Riverine - A system of flowing freshwater.

Indigenous: Native to, occurring naturally in, characteristic of, a particular country, region or locality. All the indigenous features of New Zealand give it its own distinctive character.

Induced: Native vegetation established after destruction or disturbance of the previous cover, and which may dominate for many decades, but is essentially different from the original vegetation, e.g., rarahu fernland, manuka scrub.

Induration: The hardening of a rock or rock material by the action of heat, pressure, or the introduction of some cementing material not commonly contained in the original mass.

Lacustrine: See Hydrologic Class.

Landform: All the physical, recognisable, naturally formed features of land, having a characteristic shape, e.g., hill, valley or alluvial fan. In the PNAP, landform classification emphasises its ecological significance rather than its geomorphological or geological significance.

Landform Definitions (after Soons and Selby (1982), Bayfield and Benson (1985) and interpretation by the authors):

Alluvial Fan: Alluvium deposited as a watercourse encounters a shallower gradient, resulting in a sloped, spreading build up of river-borne material.

Alluvial Flat or Plain: Flat area associated with a river, over which the river course is unconfined (or was unconfined prior to construction of stopbanks).

Alluvial Terrace: Flat to gently sloping area of alluvium of variable height above river level. May be periodically flooded.

Basin: Concave to almost flat area on hillside; may be the site of water accumulation.

Cliff: Very steeply sloping to vertical rock face.

Dune Hollow - Low concave area or depression between dunes, may have groundwater at surface.

Foredune: A coastal dune parallel to the shoreline at the landward margin of the beach.

Gorge: A steep-sided, narrow, drainage-way cut into bedrock.

Gully: Deep incision into hillslope due to fluvial action.

Hillslope: Slope unit on which drainage lines are predominantly parallel.

Rear Dune: A coastal dune parallel to the shoreline, landward of the foredune.

Ridge: The (often acute angled) top of a divide between two drainage ways.

Seepage Swamp: Swamp zone on hillside.

Land Systems: Christian (1957) defines a land system as *...an area throughout which there is a recurring pattern of topography, soils and vegetation: a change in the pattern determines the boundary of a land system*... For the purposes of this study, geology and

	topography were the criteria used to delineate land systems. Defined in text (section 2).
Littoral:	Pertaining to the depth zone between low and high water.
Local:	Refer to Rarity.
Loess:	Unstratified deposits of loosely arranged, angular grains of silt deposited by the wind; buff to light-yellowish or yellowish brown in colour. Generally of Pleistocene age, carried from desert surfaces, alluvial valleys, and outwash plains lying beyond the limits of the ice sheets; or from unconsolidated glacial or glaciofluvial deposits uncovered by successive glacial recessions.
Mesozoic:	This era (the age of great reptiles) 225 - 65 million years ago.
Miocene:	Geological epoch (q.v.), sub-division of Teritary, occurred between *c.* 25 - 7 million years ago.
Native:	Occurring naturally, not known to have been introduced by human agency.
Natural Area:	A tract of land which supports vegetation and landforms considered to be in a predominantly natural state; identified as a suitable unit for evaluation of ecological quality and representativeness, and with potential to be recommended for protection.
Natural Diversity:	Refer to Recommended Area for Protection Selection Criteria.
Naturalness:	The degree to which ecological units/communities/ ecosystems retain their original character. Refer to Original Natural Ecosystem. Also refer to Recommended Area for Protection Selection Criteria.
Nature Conservation Value:	A relative value assessment for nature conservation purposes, based on scientific criteria derived from ecological and biogeographical theory (diversity, naturalness, rarity etc) and on the social value placed on those criteria.
Original Natural Ecosystem:	For the purposes of the PNA Programme the 'original' state of an ecosystem or landscape is considered to equate to its pre-human condition, i.e., its character before the arrival of humans (and their associated, exotic plants and animals) in New Zealand. Areas which have remained in or have returned to this state, and those in the process of returning to it, tend to be the main focus of nature conservation strategies.
OSC:	Open Space Covenant.
Palustrine:	See Hydrologic Class.
Pattern:	Refer to Recommended Area for Protection Selection Criteria.
Pleistocene:	Geological epoch (q.v.); occurring from *c.* $1^1/_2$ million to 10 thousand years ago, during which four major ice ages occurred. Succeeded by Recent epoch.

Pliocene: Geological epoch (q.v.); sub-division of Tertiary, occurring from *c*.700 000 - 105 000 years ago.

Primary: Native vegetation which has never been logged or cleared in any part is primary; vegetation which has experienced selective logging or a similar level of disturbance has been termed 'modified primary'.

Protected Natural Area (PNA): A legally protected area, characterised by indigenous species or ecosystems, in which the principal purpose of management is retention of the indigenous state.

Quaternary: Geological period comprising both Pleistocene (q.v.) and Recent.

Rare: Refer to Recommended Area for Protection Selection Criteria.

Rarity: Refer to Recommended Area for Protection Selection Criteria.

Rear Dune: Refer to Landform.

Recommended Area for Protection (RAP): An area identified as a high priority for protection because it contains the best, or is a good or the only example of its type or class of natural ecosystem and/or landscape in an ecological district. More than one area may be identified in certain circumstances.

An RAP is intended to be the basis for a proposal for a new protected natural area which would supplement the existing system of protected natural areas to make it more fully representative of New Zealand's ecological diversity.

Recommended Area for Protection Selection Criteria: The seven selection criteria used for identifying Recommended Areas for Protection in the PNA Programme are representativeness, diversity and pattern, rarity and special features, naturalness, long-term ecological viability, size and shape, and buffering and surrounding landscape.

Representativeness: The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area, e.g., representation in reserves of the current natural diversity of an ecological district, or representation of the original natural landscape.

The identification and evaluation of key representative natural areas in all ecological districts is the principal objective of the PNA Programme.

Natural Diversity: Natural diversity refers to the range of the natural physical and biotic components in the landscape, including species, plant and animal communities, ecosystems, landforms, soil sequences, and dynamic systems and processes.

Pattern: An ecological term describing the arrangement of species, communities and habitats according to spatial and environmental gradients.

Rarity: A measure of the paucity of numbers or

	occurrences of elements of natural diversity (e.g., species, communities). *Naturalness*: Involves the assessment of the degree an area (e.g., vegetation ecosystem) has been free from the effects of human disturbance and intervention. It is also an assessment of the indigenous content of the area. *Viability*: The ability of an area's plant communities (or in some cases a particular species) to maintain themselves in the long term, in the absence of any special effort to perpetuate them. Regeneration and vigour of a particular species, and the size and stability of communities are important factors for evaluation. *Size and Shape*: Larger areas with "compact shape" are generally inherently more viable and better for the protection of the features present than smaller or more fragmented areas. *Buffering*: Protection of an area (or a particular community) from outside modifyng influences, given by natural features (surrounding vegetation, catchment boundaries, rock barriers) or, in some cases, fences or other artificial structures. *Surrounding Landscape*: The environs which surround and influence a particular natural area, and are influenced by the same set of parameters as the natural area. *Rapid Field Inventory*: Brief on- or near-site inspection of sites identified as study areas to describe the indigenous cover present.
Reedland:	Refer to Vegetation Structural Class.
Representative:	Refer to Recommended Area for Protection Selection Criteria.
Ridge:	Refer to Landform.
Riverine:	Refer to Hydrologic Class.
Sand dune:	Refer to Landform.
Sandfield:	Refer to Vegetation Structural Class.
Scrub:	Refer to Vegetation Structural Class.
Secondary:	Secondary native vegetation is seral regrowth following destruction or disturbance of the previous cover.
Seepage Swamp:	Refer to Landform.
Semi-coastal - lowland Zone:	Refer to Bioclimatic Zone.
Site:	Refer to Recommended Area for Protection Selection Criteria.
Size and Shape:	Refer to Recommended Area for Protection Selection Criteria.
Shrubland:	Refer to Vegetation Structural Class.

Study Area: A tract of land delineated as suitable for survey in rapid field inventory on the basis of some indication that indigenous cover is present. Subsequent inspection may result in changes to study area boundaries to reflect the area's present or potential state, or to align with relevant landscape or legal features (e.g., catchment or forest edges, legal title boundaries). In largely undifferentiated environments, boundary definition may be arbitrary.

Submontane Zone: See Bioclimatic Zone.

Succession: The process of change in the appearance, composition, and structure of a community, usually over a number of years. Change may be due to biotic factors, or site factors, or both.

Surrounding Landscape: Refer to Recommended Area for Protection Selection Criteria.

Terrestrial: See Hydrologic Class.

Tertiary: Geological period (q.v.); occurring from *c.*65 - 1_ million years ago.

Threatened species: *Nationally threatened species* are those whose national presence in the wild is threatened and which are in danger of national extinction. The *national status* categories applied to these species (Cameron *et al.* 1995) are:

Critical: Taxa which face as extremely high probability of extinction in the wild within the immediate future (a proposed IUCN category).

Endangered: Taxa in danger of extinction and whose survival is unlikely if causal factors continue operating.

Vulnerable: Taxa believed likely to move into the Endangered category in the near future if causal factors continue operating.

Rare: Taxa with small populations which are not Endangered or Vulnerable but are at risk.

Insufficiently known: Taxa that are suspected but not definately knownto belong to any of the above categories because of a lack of information.

Local: Taxa that are sufficiently restricted to warrant noting and some monitoring.

The *national priority* categories applied to these species (Molloy and Davis 1994) are:

Category A: Highest priority threatened species.

Category B: Second priority threatened species.

Category C: Third priority threatened species.

Category I: Species about which little information exists, but which are considered to be threatened based on existing evidence.

Category O: Species which are threatened in New Zealand but which are known to be secure in other

parts of their range outside New Zealand.
Category M: Species that are rare or localised, and of cultural importance to Maori.
Regionally threatened species are those whose regional presence in the wild is threatened and which are in danger of national extinction. The *regional status* categories applied to these species (Empson and Sawyer 1996) are:
Critical: Taxon facing very high probability of extinction in the wild in the near future.
Endangered: Taxon facing high probability of extinction in the wild in the near future.
Vulnerable: Taxon facing high probability of extinction in the wild in the near future.
Susceptibile: Taxon of concern because its range is restricted or it is found at few locations which makes it susceptible to effects of human activities.
Low risk: Taxon which does not qualify for any threatened categories listed above but is of sufficient conservation concern to warrant listing.
Indeterminate: Taxon with indeterminate or unknown status.

Treefernland: Refer to Vegetation Structural Class.

Treeland: Refer to Vegetation Structural Class.

Tussockland: Refer to Vegetation Structural Class.

Understorey: The layer or layers of vegetation in a site or habitat which do not form part of the canopy (refer to canopy).

Vegetation Structural Class: Vegetation classification based on the type of plant which is dominant in the canopy, e.g., forest, reedland. These are based on Atkinson (1985), with the following abbreviated definitions :
Forest: more than 80% trees and shrubs (mostly trees) in the canopy.
Treeland: 20-80% trees in the canopy. Treeland is often degraded forest.
Scrub: more than 80% trees and shrubs (mostly shrubs) in the canopy.
Shrubland: 20- 80% shrubs in the canopy.
Tussockland: dominated by herbaceous plants, including grasses, land sedges and rushes, with leaves densely bunched at the base. This includes flax (sometimes specified as flaxland) and toetoe.
Grass/Sedge/Rushland: dominated by herbaceous monocotyledons with narrow linear leaves not densely bunched at the base.
Reedland: dominated by tall herbaceous monocotyledons with linear leaves containing spongy mesophyll tissue.
Fernland: dominated by ferns (including small treeferns).

Sandfield: bare sand exceeds the area covered by any one class of plant growth form.
Treefernland: dominated by treeferns.
Vineland: dominated by vines.
Herbfield: dominated by small herbaceous plants not included in the above categories.

Vegetation Type: A term which includes the dominant canopy species and structural class of an area of vegetation, e.g., rimu/tawa-kamahi forest, *Isolepis nodosa/Muehlenbeckia complexa* sedge-vineland.

In addition, cover values and tiers are included, i.e., :

( )	less than 5 percent cover of the bracketed species
no underline	5-20% cover of species listed
_____ (one underline)	20-50% cover of species underlined
═══ (double underline)	50-100% cover of species underlined

e.g., (rimu)/<u>tawa</u>-<u>rewarewa</u>-pukatea forest indicates rimu (< 5% cover) is emergent over tawa (>50% cover), rewarewa (20-50% cover) and pukatea (5-20% cover)

⇔	mosaic
+	small amount (e.g., less than 0.5%)

Viability: Refer to Recommended Area for Protection Selection Criteria.

Vineland: Refer to Vegetation Structural Class.

Vulnerable: See Rarity in Recommended Area for Protection Selection Criteria.

Appendix 11: Wairarapa Plains Ecological District PNAP field survey form 1998

WAIRARAPA PLAINS ECOLOGICAL DUISTRICT PNAP FIELD SURVEY FORM

STUDY AREA NAME | PNAP SURVEY NO.

RECORDER | DATE | PREDOM. ASPECTS

NZMS 260 | GRID REF. | AERIAL PHOTO

LAND TYPE | BIOC. ZONE | ALTITUDE RANGE

OWNERSHIP (Address/Phone)	LANDOWNER'S ATTITUDE/COMMENTS

Vegetation Dynamics ☐ Primary ☐ Secondary ☐ Modified ☐ Don't Know ☐ Predominantly exotic

	H	M	L	Don't Know	Notes
Present versus past extent					
Landscape diversity					
Naturalness					
Size of area (ha)					
Shape of area					
Surrounding landscape					
Representativeness					
Rarity, special features					
Long term viability					
Fragility and threat					

Threats	**Current[1] (NLMH)**	**Future[2] (NLMH)**	**Comments**
Grazing			Is it grazed? By what?
Weeds			
Wild Animals			
Drainage			
Erosion			
Fire			
Clearance			
Topdressing			
Other			
Requirements			
Fencing		Is it fenced?	
Protection			

BIRDS	OTHER FAUNA

1. Degree of Impact; 2. Likelihood of Occurring

ECOLOGICAL UNITS WITHIN THE NATURAL AREA

Vegetation Type	% Cover	Canopy Height	Landform

ECOL. PATTERN	FLORA

NOTES: Notes (record impression of site), references. Other values: (Landscape, cultural, recreational, educational, economic, historical, spiritual etc) (LMH) (also consider potential damage).

WEEDS

Appendix 12: Wairarapa Plains Ecological District PNAP data phase 1 information sheet

Site Name:	

Site:			Altitude	m.		Cross Ref.
Grid Ref:			Area	ha.		

Description:

Landform:
Land Systems:

Veg Type:
Significant plants:

Comment: