



Eastern Wairarapa Ecological District

Survey report for the Protected Natural Areas
Programme

ABRIDGED EDITION FEBRUARY 2005



Department of Conservation
Te Papa Atawhai

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Sarah M. Beadel, C. James Bibby, Alison J. Perfect, Aalbert Rebergen, John Sawyer

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Prepared by Sarah M. Beadel¹, C. James Bibby¹, Alison J. Perfect², Aalbert Rebergen³ and John Sawyer⁴

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

² Department of Conservation
Waikato Conservancy
Private Bag 3072
Hamilton

³ Formerly: Department of Conservation, Masterton
Present address:
Otago Regional Council
Private Bag 1954
Dunedin 9001

⁴ Department of Conservation
Wellington Conservancy
P.O. Box 5086
Wellington

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Cover photo: Maungapakeha Taipo, a site of biological significance in Eastern Wairarapa Ecological District. Photo: The late Tim Harington.

Foreword

This report is an introduction to the Eastern Wairarapa Ecological District, a vast expanse of land to the east of the lower North Island and the third largest ecological district in New Zealand. In particular it describes the most significant natural areas that are not already protected for nature conservation. The Department of Conservation has recommended that these natural areas be protected so that the natural character of the district may be preserved.

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 Eastern Wairarapa Ecological District supports a rich and diverse flora and fauna including coastal dunes, wetlands, primary forest and regenerating shrublands. However, the existing protected natural area network covers only a small proportion of the district and is inadequate to protect, in perpetuity, its biological diversity. What indigenous vegetation there is now only partially reflects what has been lost. Some elements of the flora, such as the Mount Percy daisy, cannot be found growing in the wild anywhere else in the world.

The Department of Conservation alone cannot achieve protection of biodiversity. On-going management to conserve the distinctive natural diversity of the district will be achieved most effectively by a collective approach to nature conservation involving landowners, local communities and land management agencies, such as the Department of Conservation.

The completion of this report has been a huge task, one that has involved a great many people. The identification of the most significant remaining natural areas in the Eastern Wairarapa is a major step forwards for conservation in the region. Land owners, community groups and land management agencies, including the Department of Conservation, are now much better placed to be able to work collectively for the protection and restoration of these important areas.

Allan Ross
Conservator
Wellington Conservancy
Department of Conservation

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Executive summary

Eastern Wairarapa Ecological District (406 724 ha) is situated on the east coast of the lower North Island. The district is mostly moderately steep to rugged hill country (to a height of 633 m asl) with a mixed greywacke, limestone, siltstone and sandstone geology, but localised marine and alluvial terraces and areas of relatively easy terrain are also present. The hill country is finely dissected and is drained to the east and west by numerous small to moderate-sized streams and rivers. It is the third-largest ecological district in the country.

Prior to human settlement, the hill country of the Eastern Wairarapa Ecological District was, for the most part, covered in podocarp broadleaf forest dominated by rimu, northern rata and tawa. Hard beech and black beech were prominent on ridge tops, with totara-dominant podocarp forest on the lower hills. However, Maori fires around the seventeenth century destroyed most of the original forest, and by the time of European settlement in the mid-nineteenth century the predominant vegetation cover was low fernland, scrub, and shrubland. Arrival of Europeans brought further and ongoing changes to indigenous ecosystems. Much of the remaining forest was cleared, native fernland, scrub and grassland communities were burnt and grazed, and small wetlands drained; these were largely replaced by exotic pasture grasslands. In addition, a suite of invasive plant and animal pests was introduced to the further detriment of indigenous ecosystems and species.

A survey was carried out to document the remaining natural areas in the Eastern Wairarapa Ecological District in order to provide a basis for planning for their protection. The Ecological District was subdivided into three bioclimatic zones (coastal, semi-coastal and lowland) on the basis of the distribution of indicator plant species. It was also subdivided into 13 land types, based on landform and underlying geology. These frameworks were 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, and representativeness. Other factors were also taken into account such as species distribution limits, rarity and endemism (of flora and fauna), and the features represented within existing protected areas.

Areas of indigenous vegetation were mapped and described in a draft reconnaissance report. Subsequently, this ecological information was examined to assess the relative ecological value of the natural areas identified. These natural areas were then assigned to one of five categories: Recommended Areas for Protection (RAP); areas of High, Moderate-High and Moderate biological importance (that did not qualify as an RAP); or none of the above. Field surveys of potential RAPs (i.e. the highest priority for protection) were then undertaken. Forty-nine Recommended Areas for Protection were identified and are described in this report. These comprise c.12 800 ha or 3 percent of the Eastern Wairarapa Ecological District. They include examples of remnant primary forest, secondary forest, scrub and shrubland, dunelands, wetland and tussockland communities.

The RAPs are the highest priorities for protection because they are the largest or best examples of the range of currently inadequately protected indigenous communities in the Ecological District. In addition, a further 462 natural areas were identified

and ranked, in terms of their biological importance, into three categories: High, Moderate-High and Moderate. Although not necessarily the best or largest examples of their type, these sites were considered to be significant indigenous vegetation or wildlife habitats. Their protection would enhance the District's network of protected natural areas and provide opportunities for ecological restoration. If protection is impossible for one or more RAPS, then the relative priority of those other sites will increase.

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 268 Ecological Districts determined by landscape and ecological patterns. The ecological districts are grouped into 68 Ecological Regions, and these frameworks have been used as the basis of the PNA Programme (McEwen 1987a & b). Identifying the natural areas which maintain the indigenous character of each district, and recommending protection for the most significant of these, provides a framework for the identification of a comprehensive national network of natural areas representative of New Zealand's natural biodiversity.

The Eastern Wairarapa Ecological District is one of 13 that lie wholly or partially within the Department of Conservation's Wellington Conservancy. It is the only ecological district in the Eastern Wairarapa Ecological Region (see Figure 1) and is the third largest ecological district in the country. The Conservation Management Strategy for Wellington Conservancy (DOC 1996a) identified it as a high priority for PNAP survey. Particular priorities for protection noted were wetlands; riparian areas with natural vegetation; areas containing examples of pre-European vegetation; regenerating areas with good connections to large areas of indigenous vegetation; and habitats significant for threatened species and geological features (DOC 1996a; CMS Vol. 1).

The preliminary phase of the PNAP survey started in 1988 but most of the work was carried out between 1993-1996 by Wellington Conservancy, DOC. Areas of indigenous vegetation in the ecological district were identified, their spatial extent mapped, and comments on vegetation and other biological features recorded. This information was presented in a draft reconnaissance report (Sawyer *et al.* 1998b).

Wildland Consultants Ltd completed the latter phase of the PNAP survey for the Wairarapa Area Office, Wellington Conservancy, DOC. This contract was to undertake an evaluation of the existing data to assess the relative value of the natural areas identified in phase 1 of the PNAP survey. These natural areas were then assigned to one of five categories: Probable and possible Recommended Areas for Protection (RAPs); areas of High, Moderate-High and Moderate biological importance (not RAPs); none of the above. Field surveys of natural areas identified as probable and possible RAPs were then undertaken, followed by description and mapping of confirmed RAPs. Although accorded their RAP status as part of this evaluation, the other areas of biological importance were not resurveyed and their descriptions are from reconnaissance survey information unless otherwise specified.

The report 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.

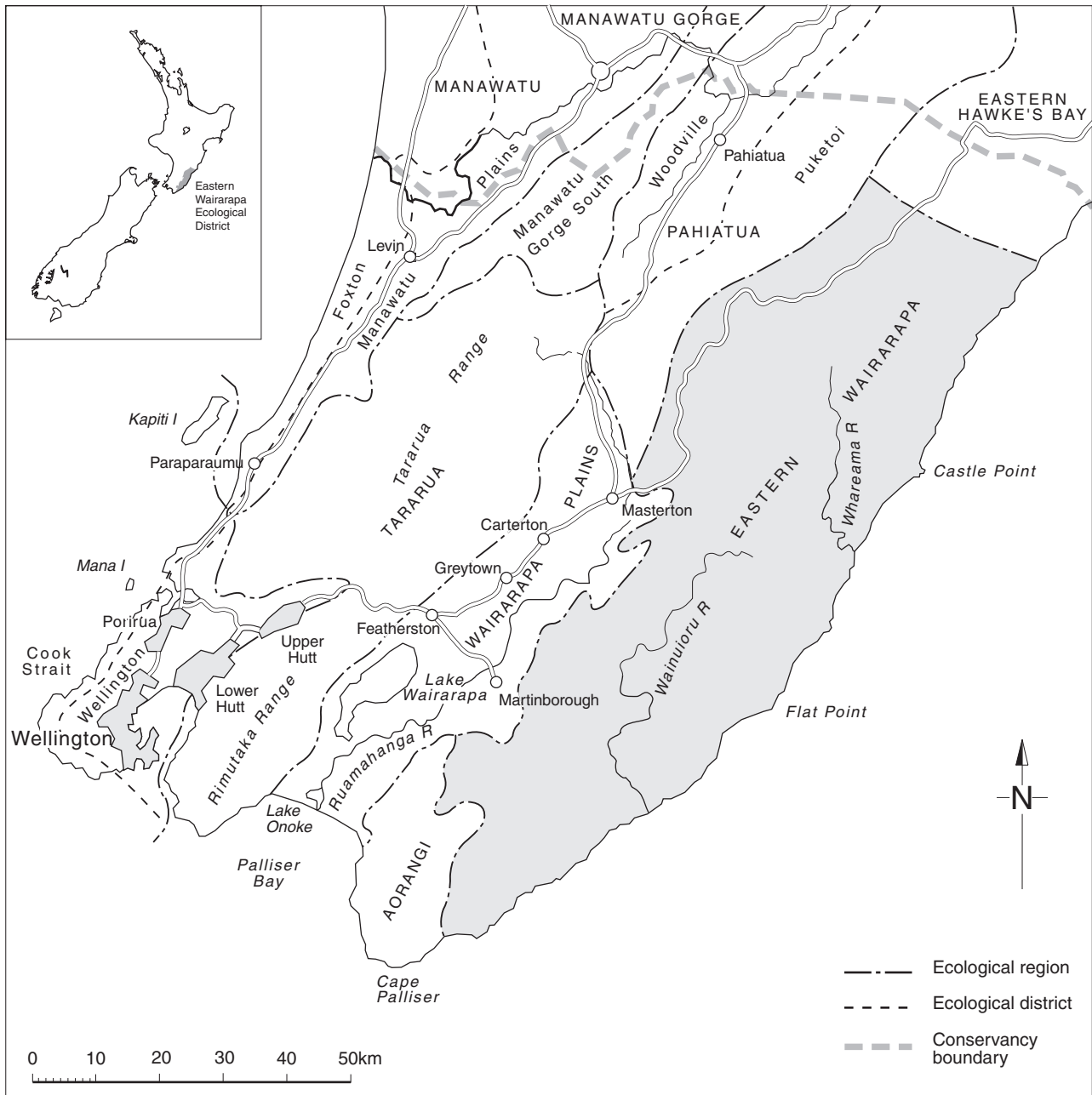


Figure 1. Location of the Eastern Wairarapa Ecological District.

2. Location and setting

At c.406 724 ha the Eastern Wairarapa Ecological District is the largest in the Wellington Conservancy. It extends to the east coast of the lower North Island, bounded by the sharply contrasting relief of the Wairarapa Plains to the west and the mountainous Aorangi Ranges to the southwest. To the north, the boundary is less distinctive, running northwest from near Akitio and then southwest to the northern Wairarapa Plains near Masterton where it adjoins the Wairarapa Plains Ecological District.

A short southern coastline aligns approximately east-west at White Rock, continuing as an extensive eastern coast of wave-cut platforms and sandy beaches. Hill country rises steeply from the shore and occupies the bulk of the district, broken by steep hard ridges with jagged outlines (termed “taipos”) to the east and patterned by low hill ranges broadly parallel to the coast. Toward the centre, and scattered elsewhere, are localised areas of subdued relief.

The steep, often incised, rivers have produced only narrow riparian flats. The larger areas of coastal plain near Uruti Point and around Glenburn-Flat Point are of marine origin. Mt Adams (663 m a.s.l.) is the highest point in the ecological district.

A history of fire and agricultural development for sheep and cattle farming has left a mosaic of small indigenous habitat fragments scattered amidst farmland and increasing areas of radiata pine forestry. Most fragments have been moderately to severely affected by logging or exotic species, including farm animals and pest plants. A series of larger areas of indigenous vegetation of varying quality and stature remain towards the coast.

Long, generally unsealed and often tortuous roads link the small villages, coastal settlements and farms.

2.1 GEOLOGY AND PHYSIOGRAPHY

The following account is based on information from Kamp (1982), King (1930), Kingma (1967), McEwen (1987b), and on interpretation of topographical maps (NZMS260 series).

Eastern Wairarapa Ecological District is predominantly composed of moderately steep to rugged hills (maximum height 663 m a.s.l.) and contains a greatly contorted mixture of greywacke, limestone, siltstone and sandstone. This has produced some very striking landforms, such as the fossiliferous limestone outcrop at Castle Point, marine terraces, fossiliferous coastal reefs, and the series of steep, jagged high ridges known as taipos.

The geological history is complex. In broad terms, marine sedimentary rocks from Mesozoic to Pliocene age have been variously uplifted and intensely faulted. Most of the straight to sinuous, and in places coalescing, faults run northeastward and determine the general alignment of the different rock formations. There are early Cretaceous sandstones, mudstone, alternating sandstone and mudstone, minor igneous rocks and breccia; late Cretaceous sandstone, mudstone, conglomerate and breccia; tertiary mudstone, sandstone and limestone; Quaternary alluvium and coastal sands and minor igneous rocks.

The district has mainly hill and stepland soils from a large range of parent materials. The soils on Tertiary mudstones are moderately deep, while those on more indurated sandstone, argillites and limestones are shallower and more drought-prone. In areas with higher rainfall, the soils are more leached and are generally less fertile. Small areas of soils from loess, with compact subsoils and impeded drainage, occur on rolling lands along the western border of the district (McEwen 1987b).

The terrain is dissected. The chief rivers flowing west to the Wairarapa Plains are the Whangaehu, Tauweru, and Huangarua. The Wainuioru River drains the

centre before flowing into the Pahaoa and turning southeast to the sea. The main rivers of the east are the Owahanga, Mataikona, Whakataki, Whareama, Kaiwhata, Pahaoa, Awhea, and Opouawe. The major rivers have more-or-less flat flood plains c.1 km wide, reaching 2 km along part of the Whareama, and small flats line many lesser rivers and streams flowing through very narrow valleys. However, with the notable exception of the Mataikona and Whareama Rivers, the waterways have become deeply entrenched along parts of their courses during periods of lowered base water levels, and now flow in deep, steep-sided, narrow gullies bordered by consequent terraces. These alluvial terraces are quite extensive in places (elsewhere small and numerous) and most widely represented in the Wainuioru, upper Pahaoa, Tauweru, and Huangarua river systems.

In the west of the Ecological District a wide belt of hills c.15 km across, formed of Pleistocene pumiceous silts and sands with some limestone bands, stretches from about Mauriceville southwards to the foot of the Aorangi Range. Slopes are moderately steep and ridge crests usually broad. The hills nearest to the plains rise to only 250–300 m a.s.l.; further east maximum altitudes increase to c.600 m.

Eastward again, a narrower belt of moderately steep hills with broad-topped ridges, 300–450 m a.s.l., is formed of Upper Miocene, massive, calcareous siltstones and some sandstone and tuffaceous strata. It runs almost the length of the district, southward to a little beyond Wainuioru, abutting far older formations. In the northeast quarter, this Miocene formation forms most of the terrain to within 10 km of the coast. A narrow tongue then runs southward from about Tinui to reach the coast at Uruti Point and Flat Point.

In the central north the upper Tauweru catchment north of Carswell, and part of the Wainuioru catchment southeast of it, contain significant areas of often steep hills up to 540 m a.s.l. composed of Lower Mesozoic argillite and greywacke sandstone and muddy siltstone. The same formation occurs in the south as a 10 km wide belt, from the headwaters of the Pahaoa River to the coast. The highest point on steep and narrow ridges is Mt Adams at 663 m a.s.l. On the southwest side of this belt, over the Awhea and Opouawe catchments, are hills of the same formation and contemporary siltstones and sandstones with extensive crush zones.

Most of the hill country along the east side of the district, for 10–15 km inland as far south as the Pahaoa River mouth comprises lowest Tertiary and uppermost Mesozoic strata of commonly siliceous mudstones, siltstones, and tuffs, with some bentonic mudstones with limestone lenses. The relief is rather variable, with the hills ranging from moderately steep with rounded summits to very steep with narrow ridges, reaching 400–500 m a.s.l. at the most.

Exceptional areas of easy terrain (i.e. with the elevation changing no more than c.60 m) are widely scattered throughout much of the hill country. Three sub-types are apparent: gradually rising foothill slopes; mini-plateau between 200–400 m a.s.l.; and interspersed flats and low rises, most extensive in the upper Wainuioru and Pahaoa River catchments. Occasional flat to near flat surfaces at 100–150 m a.s.l. on the coastal hills between Flat Point and the Kaiwhata River are remnants of a marine bench, predating uplift of the land roughly 80 000 years ago. The highest terraces to the north, above Riversdale Beach, and lower ones between Whareama River mouth and Castle Point, may also be of marine origin.

Along most of the coast, steep hill faces lie close or extremely close to the shore, but a prograded lowland c.10 km long and 4–5 km wide, known as the Homewood

Plains, has replaced a former ocean embayment between the Kaiwhata River and Riversdale Beach. Dissected terraces 20–100 m high occur about the river, between Uruti Point and Riversdale, and along the inland foothills. Between those foothill terraces and the sea is a flood plain crossed by many streams, with low sand rises and marshy swales. An unusually wide (c.1 km) coastal plain to the south stretching c.15 km between Flat Point to near Honeycomb Light is known as Glenburn Plain.

Characteristically, a narrow to extremely narrow, often bouldery, platform separates the ocean and the hills of old, hard, Mesozoic or early Tertiary rock formations. Spectacular rocky reefs, exposed at low tide, commonly fringe the platform. In the southwest, the almost continuous beds of shingle on the Opouawe River and tributaries have created a mainly shingle beach fronting the coastal platform in this short section. Fine sandy to pebbly beaches occur only where the hinterland is formed of soft Tertiary strata and are therefore almost confined to the Homewood and Glenburn shorelines, although there are very local occurrences further north, e.g. at Castlepoint.

2.2 SPECIAL GEOLOGICAL FEATURES

Kenny & Hayward (1996) identified 20 special geological features in the ecological district. Of these, the Mangaopari paleomagnetic section is accorded international importance. Seven sites are of national importance, including the local attraction of a fossil forest at the Kaiwhata River mouth, and twelve sites are regionally significant (listed in Table 1).

Other special geological features include Honeycomb Rock, scenic limestone gorges (e.g. RAPs 106 and 128), the major East Wairarapa Fault and various minor faults running the length of the district, and the distinctive ‘taipos’. “Not all (taipos) are made up of the same kind or age of rock but in every case the feature is an outcropping fin of steeply dipping strata which, being distinctly harder than the surrounding rocks, has been worn down by erosion more slowly.” Taipo is a Maori term meaning an evil spirit or other sinister influence, perhaps applied because the landforms are so unusual (Clark 1989: 161). Taipo can also mean goblin.

2.3 CLIMATE

The following account is based on Thompson (1982).

The Wairarapa experiences sharp and sudden temperature changes and large daily variations in sheltered inland places, typical of eastern areas around New Zealand ranges. The area generally has relatively cold winter night-time minima of 1–3°C and warm summer afternoon temperatures of 20–23°C, although daytime temperatures occasionally rise above 32°C in summer. Mean monthly daytime temperatures range from c.6–18°C with mean annual temperatures around 11–14°C.

Variability in seasonal and annual rainfall is also typical of a New Zealand east coast area. The greatest variation occurs in summer and increases with distance away from the Tararua and Rimutaka Ranges to the west. These ranges create a wind- and rain-shadow effect most clearly distinguished in the Wairarapa Plains Ecological

TABLE 1. IMPORTANT GEOLOGICAL SITES AND LANDFORMS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT (FROM KENNY & HAYWARD 1996)

IMPORTANCE ¹ & VULNERABILITY ²	NAME	GRID REF.	RAP OR PROTECTED AREA ³
A3	Mangaopari Miocene-Pleistocene paleomagnetic section	S27 172845	-
B2	Pukemuri Stream uplifted marine benches	S28 180613	Tora Coastal Bush, Tora Coast, Oroi Stream, Tora Coastal Flats, Tora Road Duneland (RAPs 47, 48, 144, 281, 495)
B3	Big Hill earth pillars, rills and gullies	S28 182789	Nikorima Bush Remnant, Nikorima (RAPs 273 and 482)
B3	Castle Point Pleistocene sediments	U26 810280	Castle Point Scenic Reserve
B3	Huangaaru River cyclothems	S27 172872	-
B3	Huangaaru syncline flexural slip faults	S27 192928	-
B3	Kaiwhata River mouth fossil forest and Miocene flysch sequence	T27 609967	-
B3	McClouds Trig rock slump	T26 326392	-
C2	Kaiwhata Stream sills	T27 550045	-
C3	Alfredton fault	T25 522548	Alfredton Domain, Tree Hill Tiraumea (RAPs 5, 160)
C3	Carterton fault, Blairlogie Road trace	T26 544266	Rewanui and Rorokoro Gorge Bush (RAP 16)
C3	Castle Point marine terraces	U26 810286	Protected area (Castle Point Scenic Reserve) and/or coast slope (RAP 213)
C3	Dry River fault, White Rock Road scarp	S27 162908	-
C3	Glenburn dike	T28 457797	-
C3	Huangaaru fault	S27 195926	-
C3	Sunnyside Miocene conglomerate	S27 181838	-
C3	Te Kaukau Point Paleocene Amuri Group sediments	S28 124572	Tora Coast (RAP 48)
C3	Three Kings cuestas	U25 815560	Rara Bush (RAP 3)
C3	Whakataki Miocene flysch	U26 825327	-
C3	White Rock Amuri limestone	S28 098570	White Rock Beach (RAP 49)

¹ Importance rankings (Kenny & Hayward 1996:6) are:

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

² Vulnerability rankings (Kenny & 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 necessarily by human activity).

³ Only part of the geological site or landform might occur in the RAP or protected area listed.

District, but still effective over Eastern Wairarapa Ecological District. Annual figures range from 970 mm at Castle Point to 1600 mm in the northern areas of the district (for the period 1941-1970).

Temperatures are ameliorated by maritime influences near the long coastline resulting in less extreme temperatures and reduced temperature variation, although it is exposed to high winds. Northwesterly and southerly winds are the most frequent over the district throughout the year until spring, when northwesterlies predominate. In spring and summer dry foehn winds are common and drier areas usually experience dry spells or droughts of varying severity at least annually. The Wairarapa also receives a high number of sunshine hours. Frost occurs least on the northern and coastal areas. Snow affects higher areas in winter and early spring.

2.4 HISTORICAL VEGETATION COVER

The Eastern Wairarapa Ecological District hill country was once dominated by rimu (*Dacrydium cupressinum*) and northern rata (*Metrosideros robusta*), emergent over a canopy of tawa (*Beilschmiedia tawa*). Although, northern rata was probably not that prominent in the dry eastern parts of the district as it is unlikely it established, along with the other epiphytes. On dry spurs and ridges, hard beech (*Nothofagus truncata*) and black beech (*N. solandri* var. *solandri*) were prominent, especially on the drought-prone soils in the east. Hard beech is now a localised element of the vegetation. Here, summer drought limited the extent of broadleaved species; totara-rich podocarp forest grew on the lower hills while tawa, northern rata, kohekohe (*Dysoxylum spectabile*), pukatea (*Laurelia novae-zelandiae*), and kamahi (*Weinmannia racemosa*) were conspicuously absent. Kowhai (*Sophora microphylla*) and ngaio (*Myoporum laetum*) were a major component of forest fringes in the district (Sawyer *et al.* 1998b).

Most Wairarapa forests were lost to widespread fires around the seventeenth century. By the mid-nineteenth century the resulting cover was still predominantly rarahu (bracken) and low scrub or shrubland, although forest occurred on the hills furthest from the coast, and probably in scattered pockets elsewhere (Hill 1962, 1963; Fyfe 1990; Figure 2). The “hills near Whareama were mainly fern-clad, but with a good deal of aniseed (*Gingidia* sp.) and grass amongst the fern, and at Castle Point the hills were mainly in grass with small quantities of toetoe (*Cortaderia fulvida* and *C. toetoe*), manuka (*Leptospermum scoparium*) and fern.” The generally narrow river valleys held grass and sedgeland, while some wider valleys (e.g. along the Whareama River) contained substantial areas of swamp (Hill 1962:11).

The coastal duneland was probably dominated by pingao (*Desmoschoenus spiralis*) and spinifex (*Spinifex sericeus*) with sand sedge (*Carex pumila*), hinarepe (sand tussock; *Austrofestuca littoralis*), *Calystegia soldanella*, *Pimelea* aff. *arenaria*, *Coprosma acerosa*, taupata (*Coprosma repens*), and other species also present.

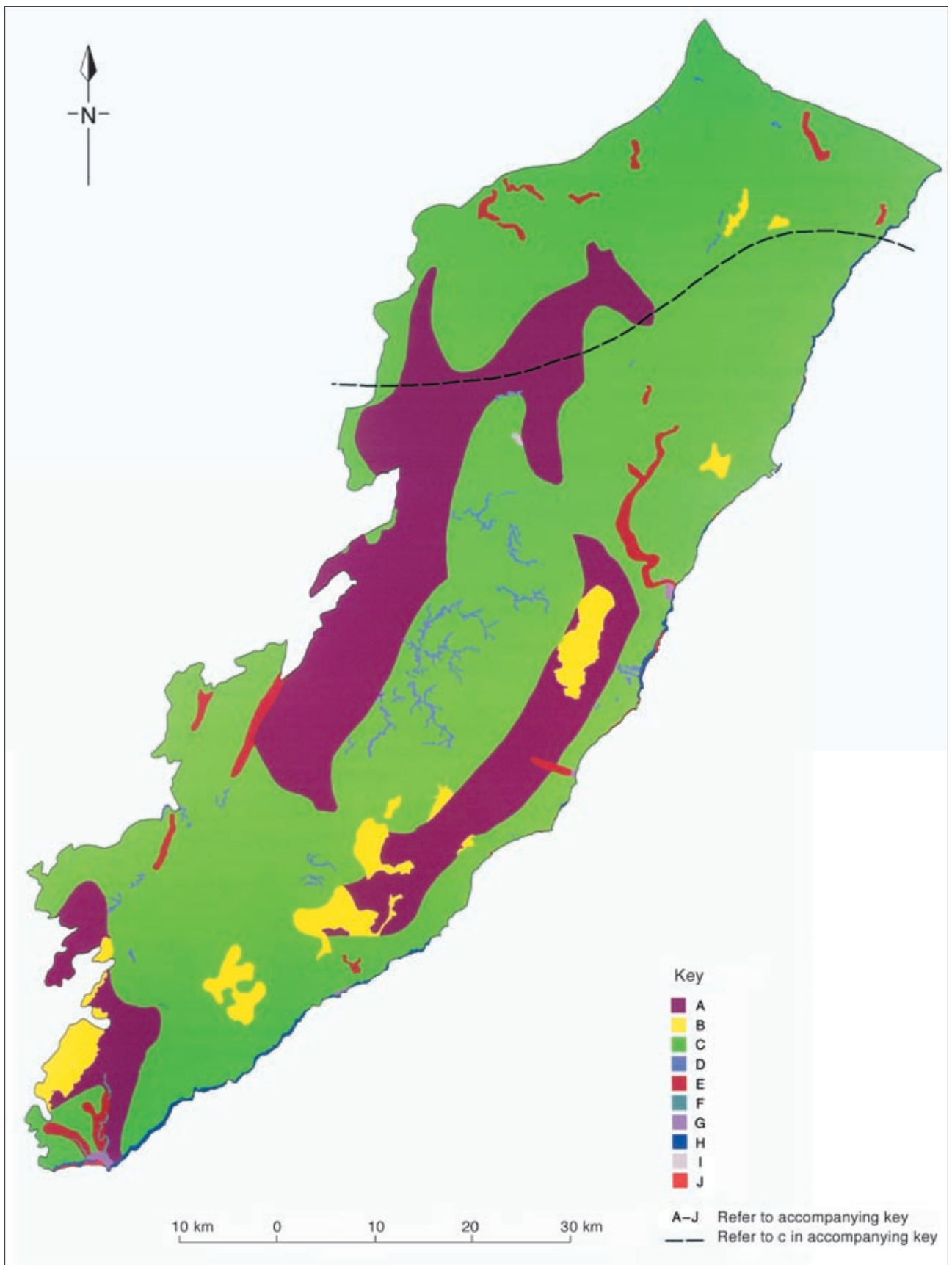


Figure 2. Vegetation of the Eastern Wairarapa Ecological District c. 1853.

Key for Figure 2: Vegetation History Map of Eastern Wairarapa Ecological District c.1853

- A Mixed podocarp-broadleaf forest. Rimu and northern rata over tawa. Totara forest predominant in the more drought-prone east. Kowhai and ngaio at forest fringes, karaka toward the coast. Greatly reduced in extent by fires c.200 years before.
- B Predominantly beech forest, beech-podocarp-hardwood mixture; also greatly reduced by fires. Black beech and hard beech dominant on drier, less fertile, or steep areas. Elsewhere beech was less dominant and more likely to grow in local associations, including rewarewa, maire, kanuka, black beech; rimu, miro, matai, totara, kabikatea, binau, rewarewa, and black beech; and tawa, binau, rewarewa, and black beech, with local hard beech.
- C A mosaic of rarahu (bracken) fernland, sbrubland (especially taubinu, manuka and/or kanuka) and grassland (Agrostis, Poa, Rytidosperma, and Festuca spp. with tutu, spaniard and Gingidia) of varying proportions. 'Extensive Maori cultivation' noted by Smith (1853) on hills near Masterton. Occasional small stands of forest, and an increasing proportion of broad-leaved shrubs and trees in older sbrublands. Small wetlands around river bends, hillside basins, and seepages. Much of the area north of the dashed line may have been forested by "Seventy Mile Bush", however accounts differ (Ropiba 1994 mapped as it bush, c.f. Hill 1962).
- D Incised gullies probably held mostly scrub with patches of beech and mixed podocarp-broadleaved forest, and cliff vegetation in steeper parts. Cliff vegetation also at Castlepoint.
- E Large areas of freshwater wetland and grassland along broad river valleys in the lower reaches of the Opouawe and Kaiwhata Rivers, less extensive areas in small river valleys. Sedges, rushes, native grasses, toetoe.
- F Shingle river beds predominantly unvegetated but with grasses and scattered shrubs likely on the more stable areas.
- G Estuarine wetlands. Around the mouths of the Whareama, Kaiwhata, Pabaoa and Opouawe Rivers, including turfs and saltmarsh (oioi, sea rush, marsh ribbonwood).
- H A mosaic of duneland vegetation (see duneland type below; also with taupata, Muehlenbeckia astonii, marsh ribbonwood), tussockland and coastal wetland (raupo, harakeke, rushes, sedges).
- I Cliff vegetation (wbarariki, toetoe, grasses and herbs).
- J Unvegetated intertidal flats merging into duneland dominated by pingao and spinifex, with binarepe, Calystegia soldanella, Pimelea aff. arenaria, Coprosma acerosa, Muehlenbeckia complexa and other species.

Sources: Smith 1853, Hill 1962, 1963; Nicholls 1974; Ropiba 1994; Sawyer et al. 1998.

3. Flora

3.1 GENERAL

Checklists of vascular plant species recorded in the Eastern Wairarapa Ecological District have been compiled (Appendices 1 and 2), based on information held by New Zealand herbaria, on plant checklists (Sawyer 2001) and on information provided by local botanists. In total 607 indigenous plant species have been recorded from the District, and 223 adventive plant species.

3.2 THREATENED AND LOCAL PLANTS

In Eastern Wairarapa Ecological District 45 plant species of national conservation concern have been recorded (Hitchmough 2002; see Table 2). They include threatened species and those that are naturally rare. Some, including *Alepis flavida*, *Juncus holoschoenus* var. *holoschoenus*, *Peraxilla tetrapetala* and *Simplicia laxa*,

are already thought to be extinct in the Ecological District (Sawyer *et al.* 1998b). New populations of some species continue to be discovered (e.g. *Tupeia antarctica* in RAP 24; G. Foster pers. comm. and *Pimelea tomentosa* in RAP 36).

TABLE 2. PLANTS OF NATIONAL CONSERVATION CONCERN IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT.

SCIENTIFIC NAME	COMMON NAME	NATIONAL STATUS (HITCHMOUGH 2002)
<i>Alepis flavida</i>	Yellow mistletoe	Gradual Decline
<i>Amphibromus fluitans</i>		Nationally Endangered
<i>Anemethele lessonii</i>		Sparse
<i>Anogramma leptophylla</i>	Jersey fern	Gradual Decline
<i>Austrofestuca littoralis</i>	Shore tussock	Gradual Decline
<i>Botrychium bifforme</i>		Sparse
<i>Brachyglottis compacta</i>	Castle Point groundsel	Range Restricted
<i>Brachyglottis pentacopa</i>	Mount Percy daisy	Range Restricted
<i>Brachyglottis sciadopbila</i>		Gradual Decline
<i>Celmisia spectabilis</i> subsp. <i>lanceolata</i>		Range Restricted
<i>Cbionochloa beddiei</i>		Range Restricted
<i>Coprosma pedicellata</i>		Gradual Decline
<i>Coprosma wallii</i>		Gradual Decline
<i>Cordyline australis</i>	Cabbage tree	Gradual Decline
<i>Crassula mataikona</i>		Data deficient
<i>Crassula peduncularis</i>		Nationally Endangered
<i>Daucus glochidiatus</i>	New Zealand carrot	Serious Decline
<i>Desmoschoenus spiralis</i>	Pingao	Gradual Decline
<i>Doodia squarrosa</i>		Gradual Decline
<i>Genoplesium nudum</i>		Sparse
<i>Gratiola nana</i>		Gradual Decline
<i>Hypolepis dicksonioides</i>	Giant hypolepis	Sparse
<i>Isolepis basilaris</i>		Serious Decline
<i>Juncus holoschoenus</i> var. <i>holoschoenus</i>		Nationally Endangered
<i>Korthalsella salicornioides</i>	Dwarf/leafless mistletoe	Sparse
<i>Leptinella tenella</i>		Sparse
<i>Mazus novaezeelandiae</i> subsp. <i>novaezeelandiae</i>	Dwarf musk	Serious Decline
<i>Meliccytus crassifolius</i>	Thick-leaved mahoe	Sparse
<i>Mimulus repens</i>	Maori musk	Sparse
<i>Muehlenbeckia astonii</i>	Shrubby tororaro	Nationally Vulnerable
<i>Olearia gardneri</i>		Nationally Critical
<i>Peraxilla tetrapetala</i>	Red mistletoe	Gradual Decline
<i>Pimelea</i> aff. <i>arenaria</i>	Sand daphne	Serious Decline
<i>Pimelea tomentosa</i>		Serious Decline
<i>Pittosporum obcordatum</i>		Nationally Endangered
<i>Pterostylis porrecta</i>		Data deficient
<i>Ranunculus macropus</i>	Swamp buttercup	Gradual Decline
<i>Rytidosperma petrosum</i>		Range Restricted
<i>Simplicia laxa</i> ¹		Nationally Endangered
<i>Stegostyla atradenia</i>		Sparse
<i>Tetragonia tetragonioides</i>	New Zealand spinach	Sparse
<i>Teucrium parvifolium</i>		Gradual Decline
<i>Tbelymitra</i> aff. <i>ixioides</i>		Sparse
<i>Tupeia antarctica</i>	White mistletoe	Gradual Decline
<i>Urtica linearifolia</i>	Swamp nettle	Gradual Decline

¹ *S. laxa* was historically found on the north side of Haurangi forest in limestone river beds (see Townsend *et al.* 1998a), however it is not clear whether it was within the Eastern Wairarapa Ecological District.

Thirty-six regionally threatened plant species have been recorded (Empson & Sawyer 1996; listed in Appendix 3). These are species that may be more abundant elsewhere in the country, but in Wellington Conservancy are so rare or in decline that their survival in the region is in doubt. Some of these species, such as *Carex buchananii*, are already believed to have gone extinct in the district. Some species, although not considered nationally or regionally threatened, are known from only a very few sites in the Ecological District. Examples include *Potentilla anserinoides*, *Clematis quadribraactiolata*, *Nertera scapanioides*, *Myosotis pygmaea*, *Olearia furfuracea* and *Pseudowintera axillaris* (Sawyer *et al.* 1998).

The *national status* of plants used above was derived from a recent report by the Department of Conservation (Hitchmough 2002). The terms used are defined in the following document: Molloy *et al.* 2002. Classifying species according to threat of extinction: A system for New Zealand. Department of Conservation. Wellington, New Zealand.

3.3 DISTRIBUTION LIMITS AND ENDEMIC PLANTS

Many species reach their distribution limit in the Eastern Wairarapa Ecological District. The relatively large population of *Muehlenbeckia astonii* at Honeycomb Light (RAP 41) is the northern limit for this species, as is the population of *Brachyglottis greyi* in RAP 17. *Olearia furfuracea* also reaches its southernmost limit in the district (Sawyer *et al.* 1998b).

Some species are endemic to the District. These include *Brachyglottis compacta* (the Castlepoint groundsel—endemic to Castlepoint) and *Brachyglottis pentacopa* (the Mount Percy daisy—endemic to Mount Percy). The grass *Chionochloa beddiei* is endemic to the southern Wairarapa (including Aorangi and the southern part of the Eastern Wairarapa).

4. Fauna

Wildlife in Eastern Wairarapa Ecological District was historically more diverse and abundant than at present. Subfossil moa bones have been found at Castle Point, Mataikona and at coastal sites elsewhere. Those sites are sometimes associated with early Polynesian campsites. There are significant subfossil cave deposits of birds at Ruakokoputuna which indicate that the present bird fauna is greatly reduced from that of the past (McEwen 1987). Early writers noted kereru and high numbers of kaka in Wairarapa forests, as well as kakariki (parakeet), huia, weka, and tui. Rivers and wetlands harboured a diverse range of birds (Hill 1962).

Subfossil records for large species of lizard also indicate a much broader range over the North Island than their present, relict island populations. Skeletal material of *Cyclodina alani* and *Hoplodactylus duvaucelii* has been found in several North Island caves including the Haurangi caves near Martinborough (Worthy 1987). Marine mammals were once common along the coast of the Eastern Wairarapa

Ecological District until harvesting in the 19th century substantially reduced their numbers (Sawyer *et al.* 1998b).

Several introduced animal pests are present, including red deer, feral cat, Norway rat, ship rat, mice, hedgehog and mustelids.

Introduced 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 around the northwest of the district.

Wildlife species recorded from Eastern Wairarapa Ecological District are listed in Appendix 4. The 21 species of national conservation concern in the district (15 birds, 4 fish, 1 mammal and 1 reptile) are listed in Table 3. Regionally threatened animals recorded in Eastern Wairarapa Ecological District are listed in Appendix 5 (32 birds, seven reptiles, one invertebrate species).

TABLE 3. NATIONALLY THREATENED ANIMALS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT (HITCHMOUGH 2002)

COMMON NAME	SCIENTIFIC NAME	NATIONAL STATUS (HITCHMOUGH 2002)
Birds		
Australasian bittern	<i>Botaurus poicoptilus</i>	Nationally Endangered
Banded dotterel	<i>Charadrius bicinctus</i>	Gradual Decline
Black-billed gull	<i>Larus bulleri</i>	Serious Decline
Black-fronted dotterel	<i>Charadrius bicinctus bicinctus</i>	Gradual Decline
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	Sparse
Caspian tern	<i>Sterna caspia</i>	Nationally Vulnerable
Grey duck	<i>Anas superciliosa superciliosa</i>	Serious Decline
New Zealand dabchick	<i>Poliiocephalus rufopectus</i>	Sparse
New Zealand falcon	<i>Falco novaeseelandiae</i>	Gradual Decline
New Zealand pigeon	<i>Hemiphaga novaeseelandiae novaeseelandiae</i>	Gradual Decline
Reef heron	<i>Egretta sacra</i>	Nationally Endangered
Spotless crane	<i>Porzana tabuensis plumba</i>	Sparse
Spur-winged plover	<i>Vanellus miles</i>	Coloniser
Welcome swallow	<i>Hirundo tabitica neoxena</i>	Coloniser
White-fronted tern	<i>Sterna striata</i>	Gradual Decline
Fish		
Brown mudfish	<i>Neobanna apoda</i>	Gradual Decline
Giant kokopu	<i>Galaxias argenteus</i>	Gradual Decline
Lamprey	<i>Geotria australis</i>	Sparse
Longfinned eel	<i>Anguilla dieffenbachii</i>	Gradual Decline
Shortjawed kokopu	<i>Galaxias postvectis</i>	Gradual Decline
Reptiles		
Spotted skink	<i>Oligosoma lineocellatum</i>	Gradual Decline
Mammals		
Long-tailed bat	<i>Chalinolobus tuberculata</i>	

The *national status* of animals was derived from a recent report by the Department of Conservation (Hitchmough 2002). The terms used are defined in the following document: Molloy *et al.* 2002. Classifying species according to threat of extinction: A system for New Zealand. Department of Conservation. Wellington, New Zealand.

4.1 BIRDS

A total of 47 indigenous bird species and 19 introduced bird species have been recorded, including 15 species that are priorities for conservation management by the Department of Conservation (see Table 3) and 31 species identified as being regionally threatened (DOC 1996a) (listed in Appendix 5).

4.2 REPTILES

Eleven reptile species have been recorded in the Ecological District including records of one of national conservation concern (spotted skink) and five regionally threatened lizard species (see Appendix 5). Eastern Wairarapa Ecological District is the stronghold of the North Island population of spotted skink (see Table 3).

4.3 FISH

Six freshwater species of fish have been recorded, of which five (giant kokopu, longfin eel, brown mudfish, shortjaw kokopu and lamprey) are priorities for species recovery work because of their national status. The record of brown mudfish from Eastern Wairarapa is old and the species now may not be present there.

4.4 INVERTEBRATES

The katipo spider (*Latrodectus katipo*) is classed as regionally threatened (DOC 1996a). It is believed to be in danger of regional extinction due to competition for habitat with the South African spider (*Steatoda capensis*).

4.5 MAMMALS

Long-tailed bats occur in the Alfredton area (G. Foster pers. comm.) and are now listed as a nationally threatened species (see Table 3). The rare Hector's dolphin has been reported in the Wairarapa (DOC 1996a), however this record is considered to be a vagrant movement of a species more generally confined to higher latitudes, and it is therefore not included on the list of nationally threatened species for the district. There have also been sightings from the coast, of Andrew's beaked whale, elephant seal, and leopard seal. New Zealand fur seals have recently started breeding at Honeycomb Light (B. Dix pers. comm.).

5. Human history and land use

The Wairarapa was home to the Ngati Kahungunu, about 780 of whom lived here in 1849, most on the Wairarapa Plains. Elsewhere in the Wairarapa, villages were situated at the mouths of river valleys along the east coast, not all of which were permanently inhabited.

“The Maori economy was based largely on subsistence crops such as kumara (*Ipomoea batatas*) and the semi-cultivated fern root supplemented by hunting and collecting. Karaka (*Corynocarpus laevigatus*), tawa, tutu (*Coriaria arborea*), titoki (*Alectryon excelsus*), and fuchsia (kotukutuku; *Fuchsia excorticata*) trees all bore edible berries that were highly prized. Ducks in the lake (Lake Wairarapa, to the west), birds in the forest and pigs in the scrub 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). Parts of the hill country toward the northern Wairarapa Plains were cultivated by Maori by the mid-1800s (Smith 1853).

“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 spaniard) 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*), 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, exotic fish and numbers of invertebrates 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 selected 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 (by cattle) 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 also had significant effects on the species composition within areas to which they had access, rapidly reducing the distribution of various plant species, particularly *Aciphylla* and *Gingidia* (Hill 1963:46).

Today sheep stations cover large areas of the district, with smaller areas of cattle farming and increasing numbers of large radiata pine forestry blocks.

5.1 THREATENING PROCESSES

The major threats to the indigenous ecosystem and habitats of the Eastern Wairarapa Ecological District are habitat destruction (such as drainage 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 (*Clematis vitalba*), Cape ivy (*Senecio angulatus*), marram (*Ammophila arenaria*), and wilding pines (*Pinus* spp.) are a severe, often insidious threat to indigenous communities and populations. Effects include competition, predation and habitat alteration. Many forest and scrub remnants are unfenced and grazed by stock or feral animals that deplete or eliminate the understorey and damage trees and shrubs. Over time, species diversity has reduced and canopy health has deteriorated as gaps have not been replaced by new growth. If the causal factors continue to operate, these areas will eventually be reduced to treelands. The Eastern Wairarapa Ecological District contains many remnants at this stage of deterioration that will 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 coastal protection works, coastal residential and lifestyle development, water pollution, soil erosion, and physical damage to plant communities and their substrate by visitors and recreational vehicles (DOC 1996a). Active management is often required to protect indigenous habitats, in addition to legal protection. Regular inspections of habitats may also be necessary to monitor change.

5.2 RELATION TO ADJOINING ECOLOGICAL DISTRICTS

The Eastern Wairarapa Ecological District is bordered by the following ecological districts (Thompson 1982; McEwen 1987a & b):

Aorangi Ecological District (Aorangi Ecological Region) to the southwest

A steeply dissected greywacke and argillite range reaching 983 m, cut by approximately northeast faults, and draining into the Ruamahanga River and the sea. Large tracts of indigenous vegetation ranging from coastal forest, scrub, and grassland in the south to higher stature vegetation and black beech (*Nothofagus solandri* var. *solandri*), red beech (*Nothofagus fusca*) and silver beech (*Nothofagus menziesii*) forests in the north, with localised areas affected by logging, fires, and revegetation. The district is frequently swept by strong winds with torrential rain.

Wairarapa Plains Ecological District (Wairapa Plains Ecological Region) to the west

Low-lying Pleistocene and Holocene alluvial terraces and plains between the ranges and hill country of surrounding districts, developed by marine and alluvial deposition. The southern portion is dominated by Lake Wairarapa, its associated wetlands, and Lake Onoke. The Ruamahanga River drains the length of the plains toward the small area of sand and shingle beach within the district, fed by predominantly gravel-bed streams. The area is dry with very warm summer and moderate winter temperatures and is largely sheltered from wind in the north, and more exposed to frequent strong winds in the south. The original size and extent of forest and shrub remnants and wetlands have been substantially reduced.

Puketoi Ecological District (Pahiatua Ecological Region) to the northwest

A long narrow inland district of low ranges and dissected hills, generally above 300 m a.s.l., that includes the steep Puketoi Range bordering Eastern Wairarapa. The area is 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. Small amounts of black beech and red beech are found in riparian situations in the northwest only.

Eastern Hawkes Bay Ecological District (Eastern Hawkes Bay Ecological Region) to the north

A large, warm, summer-dry ecological district of low hills (most <600 m a.s.l) and terraces, extending to coastal dunes with a largely adventive cover over wave-cut platforms with rocky headlands. Mixed forests throughout the Ecological District, and black beech in the south, have mostly been cleared and modified for farming.

6. Outline of survey methods

6.1 RECONNAISSANCE PHASE

The reconnaissance phase of the Eastern Wairarapa Ecological District PNAP survey was initiated in 1988, but principally carried out between 1993–1996. During this phase, 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. Data was collected on the “Phase 1” plot sheet in Appendix 12 and presented in a reconnaissance report which included maps of identified sites and a preliminary table of protected areas (Sawyer *et al.* 1998). Subsequent information on potential and existing study sites and protected sites was incorporated into this report as it became available.

6.2 ECOLOGICAL DISTRICT BOUNDARIES

The Ecological District was originally distinguished by McEwen (1987b) using criteria of topography, geology, climate and vegetation (specifically the absence of tawa, however this species occurs at several sites in the district; refer to Sections 7 and 8). These boundaries were published at 1:500 000 scale and have been refined on the basis of landform for the more detailed maps used in this report. In addition, the boundary with Aorangi Ecological District has been simplified by following the 500 m contour, switching to the Haurangi Forest Park boundary in the north (Nicholls 1997b) (Figure 1). The Ecological District boundary was digitised into the Geographic Information System (GIS) at Wellington Conservancy Office, Department of Conservation.

6.3 BIOCLIMATIC ZONES

Three broad bioclimatic zones have been identified for the Eastern Wairarapa Ecological District (refer to Figure 3).

Coastal

Extending approximately 1-2 km inland from the sea coast.

Semi-Coastal

All other land up to 300 m a.s.l. or a little less, over narrow shaded valleys.

Lowland

Occasional exposed areas of varying size over 300 m a.s.l., amounting to about 15% of the district.

The bioclimatic zone boundaries were digitised into the GIS at the Wellington Conservancy Office, Department of Conservation.

6.4 GEOLOGICAL AND LANDFORM UNITS

The Ecological District has been stratified into 13 landform units as illustrated in Figure 4. These units were used in conjunction with bioclimatic zones (see above), and vegetation type information, to classify study sites into comparable ecological units for the assessment of representativeness. Brief descriptions of the landform units are provided below.

1. *Sand beaches*

Relatively short sections of the coastline, wherever abundant supplies of fine alluvia have been carried by rivers and streams from the few hinterland areas of comparatively soft Tertiary rock formations.

2. *Shingle beaches*

These are confined to the southernmost coast, where an abundant supply of coarse gravel is delivered by the Opouawe River.

3. *Estuarine channels*

These are within the area of salt water influence (shown by vegetation, salt water fauna, or brackish water) and extend up the seaward stretches of rivers.

4. *Coastal platforms*

A narrow (to extremely narrow) ocean strand comprising most of the coastline, variably bare or bouldery except for some small fans at stream mouths. Commonly fringed by rock reefs on the seaward side. Narrow strips of sandy beach often found along the coastal platform have not been mapped due to considerations of scale.

5. *Wetlands*

Rare and small; generally confined to coastal flats.

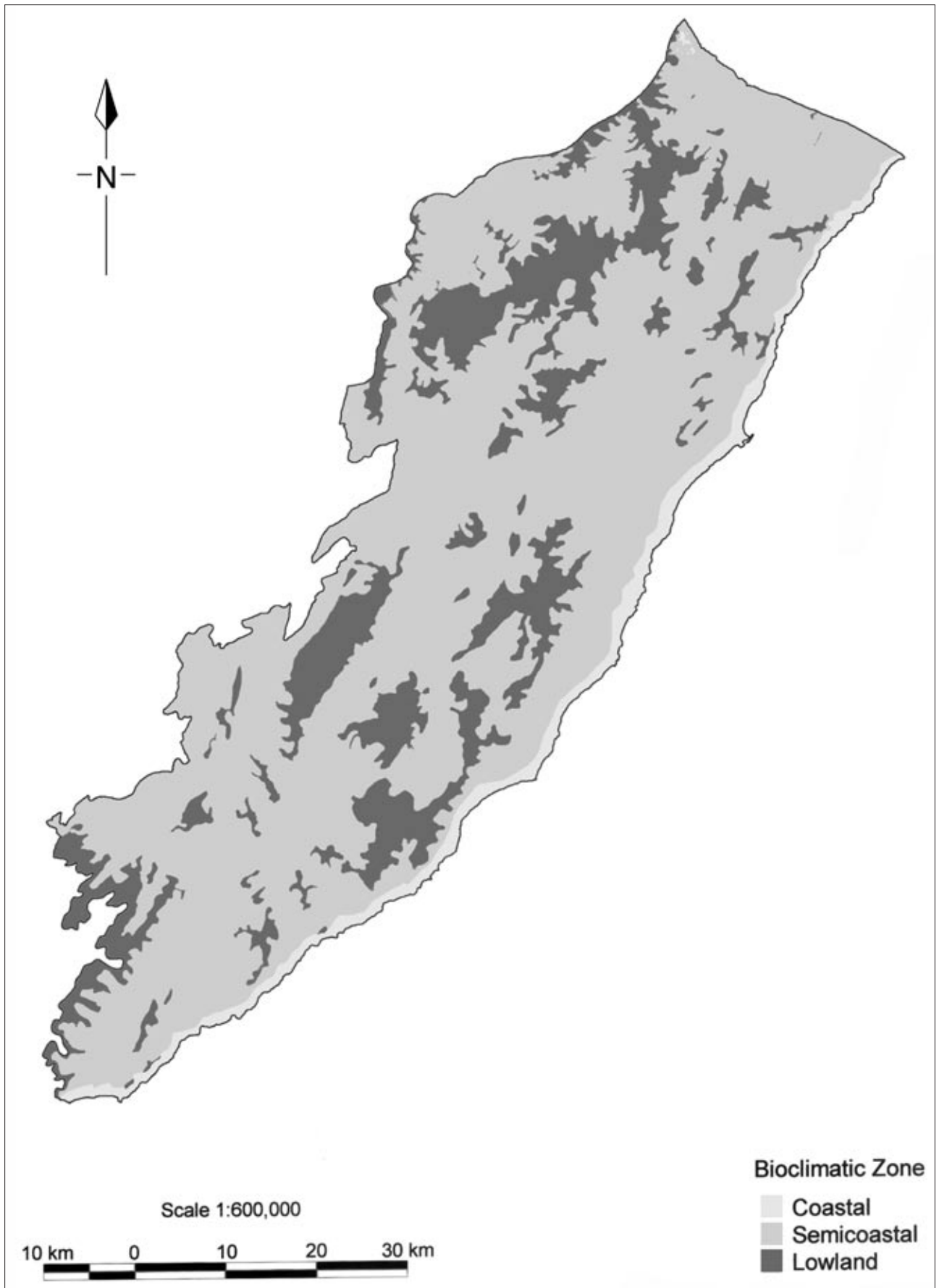


Figure 3. Bioclimatic zones of the Eastern Wairarapa Ecological District.

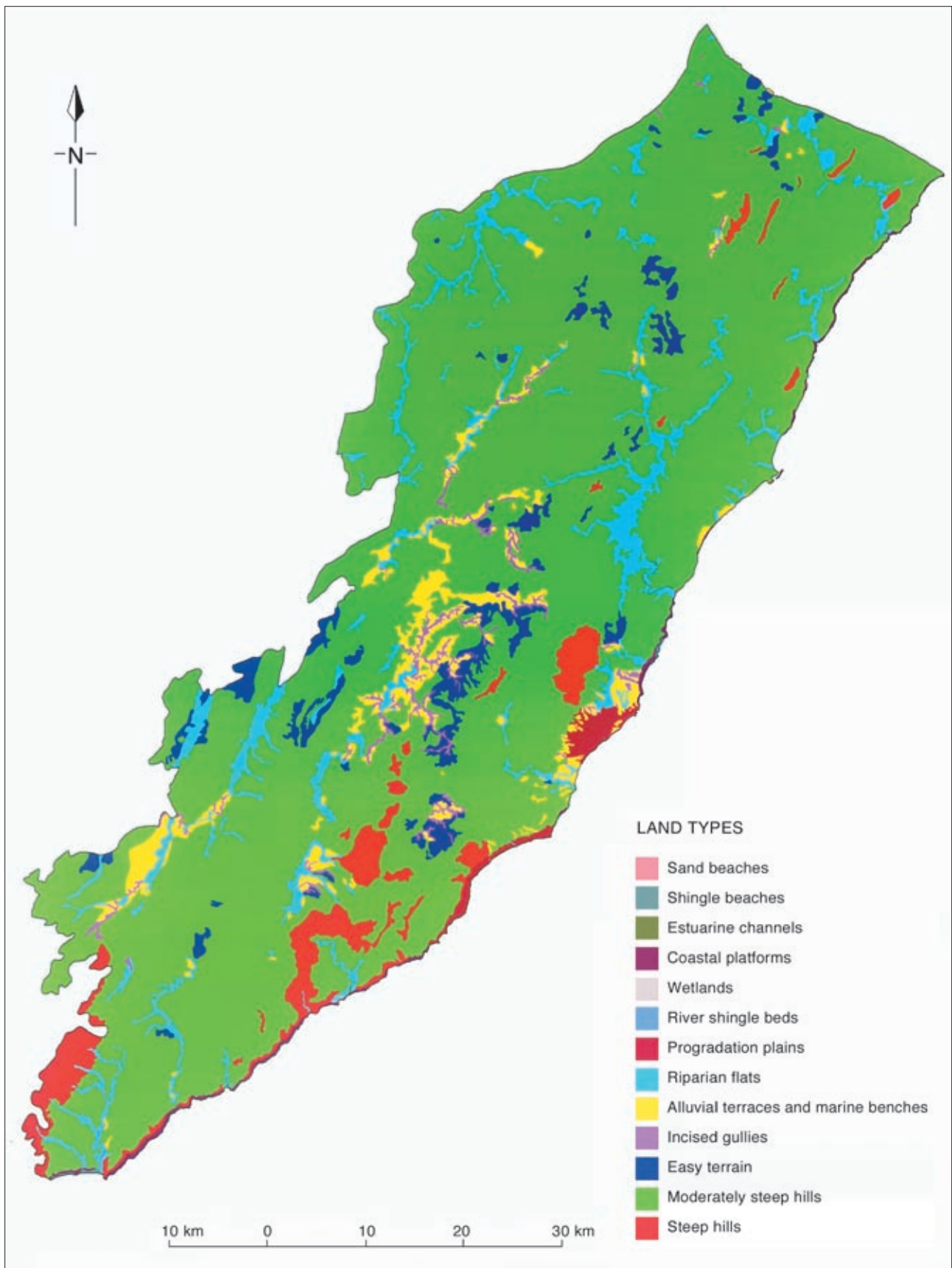


Figure 4. Land types of the Eastern Wairarapa Ecological District.

6. *River shingle beds*

The Awhea and Opouawe river and tributaries have nearly continuous bed loads of coarse gravels derived from erosion of greywacke and other indurated rocks with extensive crush zones.

7. *Progradation plains*

The only substantial area occurs in the coastal area between the Kaiwhata River and Riversdale Beach, a lowland resulting from the infilling of a former ocean embayment. A central flood plain is fringed inland by terraces and seaward by low sand rises (former dunes). A lesser coastal plain occurs a short distance away to the south.

8. *Riparian flats*

More-or-less flat, fairly extensive flood plains border reaches of the Mataikona and Whareama Rivers, in the northwest. Riparian flats of other rivers have become limited in area because of pronounced entrenchments.

9. *Alluvial terraces and marine benches*

The common dissection of riparian flats has led to a range of extensive to fragmented steep-sided terraces, lining most rivers and large streams. The majority occur adjacent to the Tauweru, Huangarua, Wainuioru, and upper Pahaoa Rivers, and some tributaries.

Flat to nearly flat surfaces at 100–150 m a.s.l. on coastal hills between Flat Point and the Kaiwhata River, and possibly others at a lower altitude further north, on or near the coast, are remnants of marine planation and deposition of gravels preceding uplift of the land.

10. *Incised gullies*

Narrow, deep, and in places tortuously aligned gullies are usually the result of river and stream entrenchment during a phase of lowering regional river base level.

11. *Easy terrain*

Occasional, exceptional areas of subdued relief, with an altitudinal range of no more than 60 m, at the most. They occur variously as foothills, elevated plateau-like terrain amid the hills or interspersed flats, undulating terrain and low rises. The latter sub-type is common in the upper Wainuioru and Pahaoa catchments.

12. *Moderately steep hills*

The greater part of the hill country is composed of moderately to very locally steep terrain. Though ranging from a mere 250 m or so up to occasional altitudes of c.600 m a.s.l., ridge crests and high point summits are characteristically broad. Mainly composed of relatively soft Pleistocene and upper Tertiary sedimentary strata and well veneered with loess, they are very prone to slipping and slumping during periods of heavy rain.

13. *Steep hills*

The hills in the east and south of the ecological district are predominantly hard Miocene or early tertiary rock formations. This has commonly resulted in fairly steep terrain, especially on uppermost faces where crests become narrow. Mount Adams (663 m a.s.l.) is the highest peak in the district. Boundaries of the above units were digitised into the GIS, Wellington Conservancy, Department of Conservation.

6.5 VEGETATION AND HABITAT CLASSES

The vegetation of the Eastern Wairarapa was classified into fifteen vegetation and habitats classes (Beadel *et al.* 1998a).

Vegetation classes present in each study area were determined from interpretation of the reconnaissance site information, combined with checking of aerial photographs and discussions with DOC staff.

TABLE 4. INDIGENOUS VEGETATION AND HABITAT CLASSES IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT

VEGETATION AND HABITAT CLASS	APPROXIMATE EXTENT IN 1853 (HA)	APPROXIMATE EXTENT IN 1998 (HA)	1998 AREA AS % OF 1853 AREA
Primary forest	107 480	3 280	3
Modified primary forest	0	8 000	-
Secondary forest	0	6 230	-
Secondary scrub and shrubland	145 520	25 340	17
Treeland	0	1 070	-
Cliffs	316	40	13
Freshwater wetland (non-forest)	4 250	207	5
Intertidal flats (unvegetated)	74	-	0
Duneland	990	786	80
Exotic vegetation	0	57	-
Estuarine wetlands or saline wetlands	437	1	0.2
Tussockland	147 250	21	0.01
River shingle beds	270	10	4
Estuarine channels	0	1	-
Unvegetated	0	50	-
Total indigenous vegetation	407 000	45 093	11

6.6 EVALUATION

The maps (1:50 000 scale)¹ produced in the reconnaissance stage of the study, showed the extent of indigenous vegetation in the Ecological District (Sawyer *et al.* 1998). These were compiled into a single base map for the ecological district.

Maps showing boundaries of bioclimatic zones and geological and landform units were printed from the GIS at the same scale and overlain onto 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 v.4.0), and used to derive tables showing the extent of natural vegetation of each class on different land types in the coastal, semi-coastal and lowland bioclimatic zones when compared with estimated

¹ A small number of additional unprotected natural areas were identified from DOC staff reports or personal observation and added to the existing study sites (e.g. Homewood Road Bush; RAP 30).

historical vegetation¹. An indicative estimate could be 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 (Beadel *et al.* 1998b).

The data were used in conjunction with site information (as represented in the reconnaissance report and any subsequent information) to assess the relative ecological values 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 remaining 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 that are essentially compact are preferable to areas that are highly convoluted or fragmented.
6. *Surrounding landscape.* The degree to which the area is protected/buffered by the surrounding landscape.
7. *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).
8. *Representativeness.* The most important criterion. One or more of the best examples of the characteristic (i.e. previously common) communities within relevant land types in each bioclimatic zone were identified as natural heritage sites. Each site was compared with all other sites containing any of the same ecological units for area and quality of habitat.

(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; 1998b).

Other Criteria

The presence of special or rare features and the area's rating as a fauna habitat was also assessed. Refer to page 2 of the Ecological Assessment Sheet

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

Assessment Form

An assessment form (see below) was designed using these criteria (based on Whaley *et al.* 1995; see also Beadel *et al.* 1996a, b; 1998b). High, medium and low values were defined for each criterion.

Status of Recommended Areas for Protection

Each significant site was assigned to one of five categories, reflecting its relative condition and importance in terms of the criteria described above. Some sites were found, on the basis of existing information, to be either fully protected; no longer present; comprised predominantly of exotic or adventive species; outside the Ecological District boundary; or otherwise too small or poor quality for inclusion. Those sites were excluded from the classification.

Recommended Area for Protection

These sites are the best quality, largest 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. Only these sites are described and mapped in this report.

High

These sites are good quality representative examples of vegetation and/or wildlife habitat that complement RAPs, 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 represented in protected areas or RAPs, 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 harmful agents.

Moderate-High

These sites are often smaller than RAPs or “High” sites, with interesting or special features, although the ecological unit(s) is (are) usually in a lower quality condition.

Moderate

These sites include natural areas that contain features represented in the above categories. These areas are often smaller, and may be considerably modified, but are nevertheless worthy of protection.

Unprotected natural areas not ranked as RAPs 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 - Eastern Wairarapa 1997

Site no.
Area
Altitudinal range

Grid reference
Ecological district
Date

	Primary
	Modified primary
	Secondary
	Exotic
	Induced

Landscape Diversity

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

EVALUATION CRITERIA	L	M	H
<p>Present versus past extent: Relative extent of vegetation class remaining in ecological district compared with that in 1853 reconstruction.</p> <p>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</p>			
<p>Landscape and ecological diversity:</p> <p>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)</p>			
<p>Naturalness: Involves the assessment of the degree to which 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.</p> <p>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</p>			
<p>Size of area (ha)¹: Compared to mean size of remaining natural areas in Ecological District.</p>			
<p>Shape of area (ha) :</p> <p>H Primarily compact, no major constrictions M Irregular or convoluted L Highly convoluted or discontinuous</p>			
<p>Surrounding landscape :</p> <p>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</p>			
<p>Fragility and threat :</p> <p>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</p>			
<p>Representativeness¹: Combination of above criteria; above rankings used as guide to evaluate representativeness.</p> <p>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.</p>			

¹ 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

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

Threatened and local plants

Cameron *et al.* (1995)

Notes:

Class:	No:
<i>Extinct</i>	
<i>Critical</i>	
<i>Endangered</i>	
<i>Vulnerable</i>	
<i>Rare</i>	
<i>Insufficiently known</i>	
<i>Local</i>	

Wildlife

Molloy *et al.* (1994)

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

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

Category

Justification

RAP

High

Moderate-high

Moderate

X

<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

The classification of sites into categories was reviewed and approved in a meeting with local Department of Conservation technical specialists, including discussion of all potential RAPs, and non-RAP sites, before the field survey commenced. High, Moderate-High and Moderate sites were later reviewed individually by DOC staff and their status confirmed or altered.

6.7 FIELD SURVEY

Field survey of 75 sites was undertaken (RAPs 1-49 and sites 431, 502a, 507, 513, 1443, 1517, 1803, 2003a, 2003b, 2003c, 2326, 2409, 2410, 2445, 2446, 2510, 2806, 2916, 3412, 3413, 3415, 3427b, 3428, 3501, 3802b, 3902) in 1998. Data was collected using the plot sheet in Appendix 11 (from Beadel 1994). Vegetation types were determined and mapped in the field onto aerial photographs. Significant features, conditions and threats to those sites were identified.

The above process identified 49 probable RAPs (comprising 98 study sites¹), and 18 study sites that could not be conclusively accorded RAP status on the basis of existing information. Field survey of all these sites was then undertaken. As the survey progressed, landowners were visited or contacted to obtain permission for access to their property. A letter outlining the reasons for the survey was given to the landowners visited. Access to part or all of six study sites was denied and descriptions and maps for these study sites have been prepared partially or wholly from existing sources. Twenty-six sites initially classed as RAPs were assigned to other categories following field survey.

Landowners denied access for field survey to a number of sites. Some of those sites have been listed as RAPs. They are: RAP 1 (Meech Pongaroa Bush); RAP 12 (Mt. Percy); RAP 29 (Wainuioru River Bush); RAP 34 (Rocky Hills Extension) and RAP 35 (Flat Point Dunelands).

In general High, Moderate-High and Moderate (see above section) ranked sites were not assessed during the 1998 field survey. Further field assessment is required to determine the final status of these sites. Some current classifications may require modification as some sites may no longer contain indigenous habitat, or may be of a different size or quality than perceived from available information.

¹ In several instances, several study sites were later combined to form a single RAP.

7. What natural vegetation remains?

The historical context provided under the heading Historical Vegetation Cover (see Section 2.5) was used to calculate the approximate extent and proportion of different vegetation/habitat classes previously present on the various land types in each bioclimatic zone. The baseline with which to compare present vegetation used is 1853 rather than the more commonly used 1840, because of the availability of historical information (e.g. Smith 1853; Hill 1962, 1963; Ropiha 1994).

Much of the 1853 vegetation cover had been affected by, or resulted from widespread fires that occurred c. 200 years previously, and, if allowed, would have continued to develop into different communities, such as forest. Maori were also settled along the coast in the 1850s and early European squatter farms were established, although it was still the eve of most European settlement and the radical changes to come (refer to Section 2.8; Hill 1962).

The Eastern Wairarapa Ecological District now retains little of its former natural cover (c. 45 000 ha or 11% of the land area). And of this only 1% occurs in protected natural areas. Most remnants are small, often fragmented, commonly with a grazing-depleted understorey, and many are secondary; however collectively they support a diverse flora and fauna (Appendices 1 and 3).

The greatest losses, in terms of indigenous vegetation cover, have been (in order of decreasing magnitude of loss): lowland and semi-coastal tussockland; semi-coastal freshwater wetlands; lowland forest; semi-coastal forest; and semi-coastal scrub and shrubland. Most of these vegetation classes now occupy less than 10% of their estimated extent in 1853. The semi-coastal bioclimatic zone has particularly suffered with less than 4% of indigenous vegetation cover remaining on many land types, including the substantial areas of riparian flats, alluvial terraces, marine benches, and easy terrain (each occupying greater than 10 000 ha). Only c. 12% of moderately steep hills (which at c. 238 452 ha comprises most of the land area in this zone) retains indigenous vegetation. The same land type comprises most of the lowland bioclimatic zone, also with only around 12% indigenous cover left.

The percentage cover of indigenous vegetation within land types of the coastal bioclimatic zone varies considerably. Within the six largest land types, those around 1 000 ha or more in extent, five (progradation plains, riparian flats, alluvial terraces, moderately steep hills and steep hills) have an indigenous vegetation cover of less than 10%. Of these five, riparian flats and alluvial terraces are the most denuded, each with 2% indigenous vegetation cover. However, one of the six largest land types (coastal platforms) has over 21% cover of indigenous vegetation. Of the six remaining land types, five (sand beaches, shingle beaches, estuarine channels, wetlands and river shingle beds) have between 12–58% indigenous cover, while one (incised gullies) has no indigenous vegetation cover.

Scrub and shrubland comprise the most common remaining indigenous vegetation (c. 25 300 ha; Table 4), consisting mainly of low grazed kanuka, tauhinu, and manuka, with varying proportions of other species. Some remnants are diverse and show excellent potential for continued development with suitable management, while

others exhibit less diversity and tend toward monocultures, but could potentially provide a nursery cover for other species.

Secondary forest totals c.6200 ha representing a range of states of development, condition, and size. Primary forest now covers only c.3200 ha, also in various states of condition and modification (Table 4). Black beech is widespread in the district whereas hard beech (*Nothofagus truncata*) and red beech are very local. There are small areas of podocarp forest and extensive areas of secondary forest without podocarps, beech species or tawa. Kamahi-dominant forest is notably absent from the Eastern Wairarapa Ecological District.

Stands of karaka become frequent nearer the coast although few are regenerating. Tall taupata, kohekohe and wharangi (*Melicope ternata*) also occur in the coastal zone and provide a transition to the beach cliff and sand dune communities.

Approximately 207 ha (Table 4) of freshwater wetlands remain; mainly in the semi-coastal zone, and c.807 ha of duneland and tussockland, most along the coast. Hill country taipos (such as Rocky Hills and Pahaoa Gorge) are floristically varied and provide a reservoir for non-forest species, while the forest and shrub remnants of the Mount Percy area are some of the most varied and important of the coastal part of the Ecological District (McEwen 1987).

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 PNAs in the Eastern Wairarapa Ecological District amount to 4466 ha, c.1% of the total area. These are described briefly in Appendix 6 and their locations marked on Figure 5 and include reserves administered by the Department of Conservation, QEII National Trust covenants and sites protected under the Tasman Accord. They exclude areas protected specifically for reasons other than wildlife conservation (e.g. recreation reserves, marginal strips).

QEII covenants total c.1312 ha of the protected areas in Eastern Wairarapa Ecological District. The majority of protected areas in the District is administered by the Department of Conservation.

The largest protected areas (>100 ha) are located in moderate to steep hill country in the upper semi-coastal and lowland bioclimatic zones. Rewa Bush Stewardship Area is the largest at c.1288 ha and includes both podocarp and beech forests, and broadleaved scrub. It is described as the “best remnant of Eastern Wairarapa forest types” (DOC 1996a: 297). The podocarp forest includes rimu, kahikatea (*Dacrycarpus dacrydioides*), miro (*Prumnopitys ferruginea*), matai (*Prumnopitys taxifolia*), totara (*Podocarpus totara*), and rewarewa (*Knightsia excelsa*) (Sawyer *et al.* 1998).

Tora Bush Scenic Reserve (549 ha) protects the largest black beech remnant in south Wairarapa outside the Aorangi Range (DOC 1996a); also included are areas of mixed broadleaved forest and scrub. The reserve is described and mapped in Wassilieff, Clark & Gabites (1986).

The Rocky Hills Sanctuary Area (400 ha) is the only protected area managed by DOC which supports indigenous forest on a taipo landform. Forest types found at Rocky Hills include podocarp (totara, miro, rimu), podocarp-broadleaved, and broadleaved forests, all of which are now uncommon in the Ecological District. These three protected areas (above) are believed to be sufficiently large to provide long-term viability of their plant communities (Sawyer *et al.* 1998). The Rocky Hills Sanctuary area also benefits from the contiguous Rocky Hills QEII covenant (108 ha).

The Tinui Covenant covers 440 ha comprising five fragments of black beech-broadleaved forest. Substantial areas of black beech are also protected in the Ruamahanga Covenant (181 ha) and the Lindis Bush and Mt Percy Bush QEII covenants (124 ha and 203 ha respectively). The latter includes the only site of the endemic Mt Percy daisy, *Brachyglottis pentacopa*.

The Tauweru Stewardship is noteworthy for its uncommon rimu-tawa-miro-kamahi forest type (Sawyer *et al.* 1998). Castle Point Scenic Reserve (61.2 ha) includes the largest protected coastal community in the Eastern Wairarapa and features spectacular landforms (a limestone promontory, reef, coastal lagoon, and sheer-sided hill) as well as Nationally Endangered plants including the endemic Castle Point groundsel (*Brachyglottis compacta*). The high use and popularity of the area, in conjunction with the fragile dune habitat, indicate potential conflicts of land use (Sawyer *et al.* 1998).

Representativeness

The current protected area network in the Eastern Wairarapa Ecological District covers less than 1% of the former extent of many ecological units and requires substantial additions of carefully chosen areas. This is not possible for some vegetation classes such as tussockland (formerly widespread) because there are insufficient remaining areas of this cover type.

Scrub and shrubland continues to be the most common vegetation class but protected examples are not adequately represented for any bioclimatic zone or land type. This is particularly so for the coastal zone where only 0.4% (29 ha) of the previous extent of this vegetation class is protected. Forest also previously covered a large total area in the semi-coastal and lowland bioclimatic zones, although less than scrub and shrubland. A greater proportion of this (c.2.5% and c.4.3% in the semi-coastal and lowland bioclimatic zones respectively, including secondary and modified forest) is protected in both zones, but further representation is required for all previously forested land types.

Remaining semi-coastal freshwater wetlands (158 ha) amount to only c.4.5% of their former area and unless irreversibly degraded, should be protected and managed for restoration. At present only c.9.4 ha are protected for conservation purposes. In the coastal zone, only 0.1 ha of estuarine wetland are currently protected, which is less than 0.1% of the historical total (370.5 ha). Coastal duneland also requires further protection; at present c.5% of the former area of duneland (987.9 ha) is protected.

While a slight difference in the proportion of the total area protected is evident for the various bioclimatic zones, the figures are all extremely low: coastal 1.1%; semi-coastal 0.8%; and lowland 2.1%.

9. What values need protection?

Forty-nine RAPs totalling 12 786 ha were identified using the information gathering process and evaluation criteria detailed in Section 3. That is approximately 11% of the total area still covered by native vegetation in the District. The selection process emphasises selection of vegetation types and land type units inadequately protected in each of the bioclimatic zones, particularly where the greatest loss of these 'ecological units' has occurred. Some disparities could not be addressed as insufficient, or no areas of some ecological units have survived.

9.1 COASTAL BIOCLIMATIC ZONE

In the coastal zone, indigenous vegetation covers less than 25% of the main land types (i.e. those c.1 000 ha or greater). Of these, riparian flats (2% native cover; e.g. Whakataki River Mouth), alluvial terraces and marine benches (2%; e.g. Uruti Point Dunes, Glenburn Station Bush, Honeycomb Light/Kahu Rock Headland, Pahaoa, and Tora Coast) had their indigenous cover most depleted, and remaining remnants should be a priority for protection. Coastal tussockland (Mataikona Tussockland and Flat Point Dunelands) is now extremely rare. Freshwater wetlands (Whakataki River Mouth, Uruti Point Dunes, Waimoana Wetland, and Pahaoa) have been reduced by 93.3% and are very much depleted. No primary forest remains in the coastal bioclimatic zone and it is therefore worthy of restoration.

Increased protection of coastal forest, scrub, shrubland, duneland and saline or estuarine wetlands (e.g. Mt Percy Bush, Whareama River Mouth, Uruti Point Dunes, Flat Point Dunelands, Glenburn Station Bush, Tora Coast, and White Rock Beach) are warranted to improve their representation in the protected area network. Other important features include NZ fur seal haulouts and breeding areas, and habitats that support endangered or local species and do not currently have adequate protection.

9.2 SEMI-COASTAL BIOCLIMATIC ZONE

Since 1853, freshwater wetlands have been reduced by 95%. All remaining freshwater wetlands (Lagoon Hills-Heights, Bankview, Bush Stream Wetland, Makara River Bush Remnants, Castle River) warrant protection.

Protection of all remaining primary forest areas (Mt Percy Bush, Ngaumu Bush, Mt Adams-Pahaoa River, Lagoon Hills-Heights) is also warranted as based on the 1853 cover only 3% remains in the semi-coastal zone, and 4% in the lowland bioclimatic

zone. Substantial areas of scrub and shrubland should also be protected, particularly on riparian flats, alluvial terraces and marine benches, easy terrain, and moderate to steep hills (e.g. Mt Percy Bush, Kuamahanga Bush, Wainuioru River Bush, Pukunui Bush, Mt Adams–Pahaoa River).

Riparian flats, progradation plains, easy terrain, and especially alluvial terraces and marine benches retain a minimal amount of indigenous habitat (4%, 6%, 3% and 2% respectively)—urgent action is necessary to protect remaining areas. RAPs identified on these land types are Meech Pongaroa Bush, Turnberry Flats, Tauweru River Banks, Rewanui and Rorokoro Gorge Bush, Ngaumu Bush, Kuamahanga Bush, Wainuioru River Bush, Homewood Road Bush, Pukunui Bush, and Lagoon Hills–Heights.

9.3 LOWLAND BIOCLIMATIC ZONE

The comparatively small proportion of remaining lowland primary forest (only 4%) represents the only remnants of extensive tracts that covered most of this zone in the 1850s. To attain protection of c.9% of the former area will require the protection of all remaining examples of primary and secondary forest (see the following RAPs: Mokiri Bush, Patitapu Bush, Mt Percy Bush, Rocky Hills Extension, Pukunui Bush, Mt Adams–Pahaoa River, Lagoon Hills–Heights).

Scrub and shrubland (e.g. Neds Hill Bush–Tauweru Extension, Pukunui Bush, Mt Adams–Pahaoa River) is more extensive but is inadequately represented in protected areas. Tussockland was not found in the lowland zone during the current survey. If present, it would be a high priority for legal protection as it was a formerly extensive landscape component.

9.4 PRIORITIES FOR PROTECTION

In addition to the above specific ecological units, the eastern hills contain some large blocks of primary and regenerating vegetation. These have the potential to form the backbone of a semi-continuous natural habitat extending nearly the length of the Ecological District, to the forested Aorangi Range in the south. They are a particularly valuable ecological resource for the maintenance and restoration of some of the district's natural character. Several RAPs have been proposed to complement the existing protected natural network in this area (including Mt Percy Bush, Rewa Bush Extension, Rocky Hills Extension, Pukunui Bush, Mt Adams–Pahaoa River, Lagoon Hills–Heights).

The Wellington Conservancy Conservation Management Strategy (DOC 1996a) identified the following priorities for protection in the Wairarapa Area (that were incorporated in the evaluation of RAPs):

- natural vegetation in wetlands;
- riparian zones;
- significant habitats for threatened species or geological features;
- regenerating areas with links to larger areas of native vegetation;
- areas with some pre-European vegetation.

Forty-nine RAPs (12 786 ha) have been identified and mapped for the Eastern Wairarapa Ecological District. These areas are considered the highest priority for protection because they are the largest or best examples of unprotected indigenous vegetation in the district, or the largest or best areas of inadequately protected vegetation types on particular landforms in each bioclimatic zone, or they complement existing protected areas. However, even if all RAPs are secured, the sum total of protected areas would still represent only 11%, 10% and 12% of the indigenous vegetation in the coastal, semi-coastal and lowland bioclimatic zones respectively.

Ninety-five sites of High (13 750 ha), 139 sites of Moderate-High (7 236 ha) and 214 sites of Moderate biological importance (4 508 ha) were identified from the site information provided in Appendix 7, using the criteria in Section 6.6. While not necessarily the best or largest examples of their type, these sites are identified as significant indigenous vegetation or wildlife habitats and their protection is strongly recommended to improve the representativeness of the protected natural area network in the Eastern Wairarapa Ecological District.

The site information and comments in Appendix 7 have been reproduced from the draft PNAP reconnaissance report (Sawyer *et al.* 1998). Further information on existing and new study sites, from publications, reports, or discussion with DOC staff, has been incorporated where applicable. However most of the content has not been subsequently verified by field checking, and is reported 'as provided' with only minor editing.

Information presented on the 796 reconnaissance sites and subsequent additions includes their geographic location, size and dominant species, and in many cases includes comments on the ecological significance of the site. Information from Sawyer *et al.* (1998) for sites that are not Recommended Areas for Protection or of High, Moderate-High or Moderate biological importance is also provided (see Appendix 8).

10. Recommended areas for protection

Refer to Appendix 7 for information about other sites of High, Moderate-High or Moderate biological importance in the Eastern Wairarapa Ecological District.

RECOMMENDED AREAS FOR PROTECTION

1. Meech Pongaroa Bush
2. Turnberry Flats
3. Rara Bush
4. Ihuraua River
5. Alfredton Domain

6. Neds Hill Bush-Tauweru Extension
7. Mokiri Bush
8. Patitapu Bush
9. Mataikona Tussockland
10. Rahui Station Bush
11. Tinui River Bush
12. Mt Percy Bush
13. Springhill Station
14. Tauweru River Banks
15. Whakataki River Mouth
16. Rewanui and Rorokoro Gorge Bush
17. Mangapakeha Taipos Bush
18. Otahoua Swamp
19. Waipapa Stream Bush
20. Rewa Bush Extension
21. Whareama River Mouth
22. Makahaka Stream
23. Whakatahine River Remnants
24. Kourarau Valley & Pukemangamana
25. Ngaumu Bush
26. Uruti Point Dunes
27. Bankview
28. Kuamahanga Bush
29. Wainuioru River Bush
30. Homewood Road Bush
31. Te Wharau Bush
32. Moetapu Bush
33. Bush Stream Wetland
34. Rocky Hills Extension
35. Flat Point Dunelands
36. Pukunui Bush
37. Mt Adams-Pahaoa River
38. Waiekinno Stream Bush
39. Waimoana Wetland
40. Glenburn Station Bush
41. Honeycomb Light/Kahu Rock Headland
42. Honeycomb Rock Terrace
43. Makara River Bush Remnants
44. Lagoon Hills-Heights
45. Pahaoa
46. Castle River
47. Tora Coastal Bush
48. Tora Coast
49. White Rock Beach

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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 Fan Refer to Landform.

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. Three bioclimatic zones (coastal, semi-coastal and lowland) are recognised within the Eastern Wairarapa Ecological District. Refer to text.

Buffer A zone surrounding a natural area which 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.

Communities 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 (e.g. within an ecological region or ecological district).

Cretaceous Geological period (q.v.) c 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 measureable rainfall (Thompson 1982).

Dry Spell At least 15 consecutive days of <1 mm rain per day (Thompson 1982).

Dune Hollow Refer to Landform.

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 types (or suite of interrelated types), plus the landform it occurs on, for examples, kahikatea forest on riparian flats, tawa-kamahi forest on hill country-moderately steep to steep slopes. Other important attributes of the unit, such as the bioclimatic zone (for example, montane, coastal), may be added to the name. 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 in the survey phase to determine the biological and physical composition of the study areas.

Endangered Refer to Threatened Species.

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

Estuarine Refer to Hydrological Class.

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

Exotic Introduced from abroad.

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 Tertiary 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 Palaeogene. The Cambrian and all subsequent periods are known as the Phanerozoic; the pre-Cambrian as the Cryptozoic. The Upper Palaeozoic is Devonian to Permian, the Lower is Cambrian to Silurian, inclusive.

Gorge Refer to Landform.

Grass/Sedge/Rushland Refer to Vegetation Structural Class.

Gully Refer to Landform.

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

Herbfield Refer to Vegetation Structural Class.

Hillslope Refer to Landform.

Holocene 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.

Estuarine—Tidal and non-tidal saline wetlands associated with a coastal body of water with a free connection to the open sea and where fresh water, derived from land drainage (usually rivers), is mixed with seawater (Allaby 1994).

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. bracken 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 PNA Programme, classification of a landform emphasises its ecological significance rather than its geomorphological or geological significance.

Landform Definitions (after Moore (1969), 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 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 sand dunes, may have groundwater at surface.

Foredune—A coastal sand 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 as a result of fluvial action.

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

Rear Dune—A coastal sand dune parallel to the shoreline landward of the foredune.

Ridge—The top (often acute angled) 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 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.

Lowland Zone See Bioclimatic Zone.

Mesozoic This era (the age of great reptiles) occurred c.225–65 million years ago.

Miocene Geological epoch (q.v.), sub-division of Tertiary, occurring from c.25–7 million years ago.

Native Not known to have been introduced by human agency.

Natural Area A place characterised by indigenous species or ecosystems, or a place or landform not or scarcely modified from an indigenous condition. Some natural areas will be identified as suitable for evaluation of ecological quality and representativeness, and hence will also be study areas. Some of these may be of sufficient quality to become Recommended Areas for Protection. In some instances, one natural area may embrace more than one study area.

Natural Diversity Refer to Recommended Area for Protection Selection Criteria.

Naturalness 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 their pre-human condition, i.e. their character before the arrival of humans (and their associated, exotic plants and animals) in New Zealand. Areas which have remained in or returned to this state, and those in the process of returning to it, tend to be the main focus of nature conservation strategies.

Palustrine See Hydrologic Class.

Pattern Refer to Recommended Area for Protection Selection Criteria.

Pleistocene Geological epoch (q.v.); occurring c.1 million–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 between c. 7–1 million years ago.

Primary Native vegetation which has never been logged or cleared in any part.

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.

Rapid Field Inventory Refer to Recommended Area for Protection Selection Criteria.

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 example or good examples of its type or class of natural ecosystem and/or landscape in an ecological district. More than one area may require identification in certain circumstances. A RAP is intended to be the basis for a proposal for a new protected natural area that 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 Selection criteria are used for identifying Recommended Areas for Protection in the PNA Programme: representativeness, diversity and pattern, rarity and special features, naturalness, long-term ecological viability, size and shape, and buffering and surrounding landscape. The identification and evaluation of the key representative natural areas in all ecological districts is the principal objective of the PNA Programme.

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 a “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 modifying 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-site or near-site inspection of sites identified as study areas, to describe the indigenous cover present.

Site—An area of land surface for which a specific statement can be made of aspect, slope, exposure, ground water, underlying geological material and vegetation. The size of a site may vary depending on the degree of uniformity required for sampling.

Reedland Refer to Vegetation Structural Class.

Representativeness Refer to Recommended Area for Protection Selection Criteria.

Ridge Refer to Landform.

Riverine Refer to Hydrologic Class.

Sand dune Refer to Landform (foredune and reardune).

Sandfield Refer to Vegetation Structural Class.

Scrub Refer to Vegetation Structural Class.

Secondary Secondary native vegetation, seral regrowth after destruction or disturbance.

Seepage Swamp Refer to Landform.

Semi-coastal 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, with indigenous vegetation, delineated as suitable for survey in rapid field inventory in order to identify the ecological patterns and the natural diversity of an ecological district. It is an arbitrary unit, defined appropriate to circumstances—it may be defined by the boundary of a remnant forest stand, a catchment, a legal title, or, in largely undifferentiated environments, by grid squares or other manageable, arbitrarily bound areas.

Succession The process of change in the appearance, composition, and structure of a community, usually over a number of years. Change may occur as a result of biotic factors, site factors, or both.

Surrounding Landscape Refer to Recommended Area for Protection Selection Criteria.

Taipo A prominent, serrated, dark-coloured hill or ridge of steeply dipping strata which contrasts with the surrounding low-lying, lighter-coloured, more eroded rocks, and more moderate slopes, individually named (e.g. Oterei Taipo) and collectively called taipos. Taipo is a Maori term meaning an evil spirit or other sinister influence, perhaps applied because of landforms are so unusual (Kamp 1982; Clark 1989).

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. For *national status* categories see Molloy *et al.* 2002.

Regionally threatened species are those whose regional presence in the wild is threatened and which are in danger of regional extinction. For *regional status* categories see Appendix 3.

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 in the canopy, most of this being trees.

Treeland—20–80% trees in the canopy. Treeland is often degraded forest.

Scrub—More than 80% trees and shrubs in the canopy, most being shrubs.

Sbrubland—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/Rusbland—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. :

(tawa) Less than 5 percent cover of the bracketed species.

tawa 5–20% cover of species listed.

tawa (one underline) 20–50% cover of species underlined.

tawa (double underline) 50–100% cover of species underlined.

e.g. (rimu)/tawa-rewarewa-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. Terms used in this section (from Sawyer *et al.* 1998).

ED Ecological District

WERI Wetland of Ecological and Representative Importance. Rankings used by this database are:

- 0 insufficient information
- 1 nothing special
- 2 local significance (within the ecological district)
- 3 regional significance
- 4 national significance
- 5 international significance

SSWI Sites of Special Wildlife Interest. Rankings used by this database are; potential, moderate, moderate-high, high, outstanding (Moore *et al.* 1984).

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*n.d.= no date

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Appendix 1

INDIGENOUS VASCULAR PLANTS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT

The following list was completed from information collected during the PNAP survey. Reference was made to a database of plant checklists held by the Department of Conservation in Wellington (Sawyer 2001). Reference was also made to Sawyer and Keenan 1997; Ogle *et al.* 1990a; Druce 1971a & b, 1990; Hill 1962; Mason 1951). Information was also used from field excursions by the authors, often with members of the Wellington Botanical Society. In addition, Pat Enright and Tony Silbery helped with and provided advice for the preparation of this list.

Abbreviations used:

- aff. affinities with
- agg. aggregate, comprising more than one species.
- auct. of authors
- 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

<i>Dacrydium cupressinum</i>	rimu
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Podocarpus hallii</i>	Hall's totara
<i>Podocarpus totara</i>	totara
<i>Prumnopitys ferruginea</i>	miro
<i>Prumnopitys taxifolia</i>	matai

Monocot. trees

<i>Cordyline australis</i>	ti kouka
<i>Cordyline australis</i> × <i>C. banksii</i>	
<i>Cordyline banksii</i>	ti ngahere, forest cabbage tree
<i>Rhopalostylis sapida</i>	nikau

Dicot. trees and shrubs

<i>Alectryon excelsus</i> subsp. <i>excelsus</i>	titoki
<i>Alepis flavida</i> ¹ (CHR82231)	
<i>Aristotelia serrata</i>	makomako, wineberry

<i>Beilschmiedia tawa</i>	tawa
<i>Brachyglottis greyi</i> (incl. <i>B. laxifolius</i>)	
<i>Brachyglottis greyi</i> × <i>Brachyglottis lagopus</i>	
<i>Brachyglottis compacta</i>	
<i>Brachyglottis pentacopa</i>	
<i>Brachyglottis repanda</i> s.s.	rangiora
<i>Carmichaelia australis</i>	makaka, maukoro
<i>Carmichaelia odorata</i> var. <i>odorata</i> (incl. <i>C. odorata</i> var. <i>pilosa</i>)	
<i>Carpodetus serratus</i>	putaputaweta
<i>Coprosma acerosa</i> (incl. <i>C. brunnea</i>)	
<i>Coprosma areolata</i>	
<i>Coprosma crassifolia</i>	
<i>Coprosma grandifolia</i>	kanono
<i>Coprosma linariifolia</i>	
<i>Coprosma lucida</i> s.s.	karamu
<i>Coprosma microcarpa</i> (Druce 1972)	
<i>Coprosma pedicellata</i>	
<i>Coprosma propinqua</i> subsp. <i>propinqua</i>	
<i>Coprosma propinqua</i> × <i>C. robusta</i>	
<i>Coprosma repens</i>	taupata
<i>Coprosma repens</i> × <i>C. rhamnoides</i>	
<i>Coprosma rhamnoides</i>	
<i>Coprosma rigida</i>	
<i>Coprosma robusta</i>	karamu
<i>Coprosma rotundifolia</i>	
<i>Coprosma rubra</i>	
<i>Coprosma tenuicaulis</i>	
<i>Coprosma virescens</i>	
<i>Coprosma wallii</i>	
<i>Coriaria arborea</i>	tutu
<i>Coriaria kingiana</i>	
<i>Coriaria sarmentosa</i>	
<i>Corokia cotoneaster</i> var. <i>cotoneaster</i>	
<i>Corynocarpus laevigatus</i>	karaka
<i>Cyathodes juniperina</i>	prickly mingimingi
<i>Discaria toumatou</i>	matagouri
<i>Dracophyllum longifolium</i> var. (incl. <i>D. filifolium</i> and <i>D. oliveri</i>)	
<i>Elaeocarpus dentatus</i> (incl. <i>E. d.</i> var. <i>obovatus</i>)	hinau
<i>Elaeocarpus hookerianus</i>	pokaka
<i>Fuchsia excorticata</i>	fuchsia
<i>Fuchsia excorticata</i> × <i>F. perscandens</i>	
<i>Gaultheria antipoda</i>	tawiniwini
<i>Gaultheria antipoda</i> × <i>G. rupestris</i>	
<i>Gaultheria rupestris</i>	
<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>	hangehange
<i>Griselinia littoralis</i>	broadleaf, puka
<i>Griselinia lucida</i>	kapuka

<i>Hebe stricta</i> var. <i>atkinsonii</i>	
<i>Hebe stricta</i> var. <i>macroura</i>	koromiko
<i>Hebe stricta</i> var. <i>stricta</i>	koromiko
<i>Hebe venustula</i>	
(incl. <i>H. brachysiphon</i>) (Druce 1972)	
<i>Hebe parviflora</i>	
<i>Hebe</i> sp. (b) (<i>Veronica squalida</i>)	
<i>Hedycarya arborea</i>	porokaiwhiri, pigeonwood
<i>Helichrysum aggregatum</i>	niniaio
<i>Hoheria angustifolia</i>	narrow-leaved lacebark
<i>Hoheria sexstylosa</i>	
(<i>H. populnea</i> var. <i>lanceolata</i>)	houhere, lacebark
<i>Hoheria angustifolia</i> ×	
<i>H. sexstylosa</i> (Druce 1992)	
<i>Ileostylus micranthus</i>	
<i>Knightia excelsa</i>	rewarewa
<i>Korthalsella lindsayi</i> s.s.	
<i>Korthalsella salicornioides</i>	
<i>Kunzea ericoides</i> var. <i>ericoides</i>	kanuka
<i>Laurelia novae-zelandiae</i>	pukatea
<i>Leptospermum scoparium</i>	manuka
<i>Leucopogon fasciculatus</i>	mingimingi
<i>Leucopogon fraseri</i> s.s.	patotara
<i>Lophomyrtus bullata</i> (Druce 1992)	
<i>Lophomyrtus obcordata</i>	rohutu
<i>Lophomyrtus bullata</i> × <i>L. obcordata</i>	
<i>Macropiper excelsum</i> subsp. <i>excelsum</i>	kawakawa
<i>Melicope simplex</i>	poataniwha
<i>Melicope ternata</i>	wharangi
<i>Melicytus</i> aff. <i>alpinus</i> (AK 230826)	
<i>Melicytus crassifolius</i> var. <i>crassifolius</i>	
(Druce 1972)	
<i>Melicytus micranthus</i> (incl.	
<i>M. micranthus</i> var. <i>microphyllus</i>)	
<i>Melicytus micranthus</i> × <i>M. ramiflorus</i>	
<i>Melicytus</i> aff. <i>obovatus</i>	
(Roberts 1941; CHR 59 372)	
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>	mahoe
<i>Metrosideros robusta</i>	northern rata
<i>Muehlenbeckia astonii</i>	Shrubby tororaro
<i>Myoporum laetum</i>	ngaio
<i>Myrsine australis</i>	mapou
<i>Myrsine divaricata</i>	mapou
<i>Myrsine salicina</i>	toro
<i>Myrsine divaricata</i> × <i>M. australis</i>	
<i>Myrsine divaricata</i> × <i>M. salicina</i>	
(Druce 1992)	
<i>Neomyrtus pedunculata</i>	rohutu
<i>Nestegis cunninghamii</i>	black maire
<i>Nestegis lanceolata</i>	white maire

<i>Nestegis montana</i>	
<i>Nothofagus fusca</i>	red beech
<i>Nothofagus solandri</i> var. <i>solandri</i>	black beech
<i>Nothofagus solandri</i> var. <i>solandri</i> × <i>N. fusca</i>	
<i>Nothofagus truncata</i>	hard beech
<i>Olearia arborescens</i>	
<i>Olearia furfuracea</i> s.s. (incl. <i>O. f.</i> var. <i>angustata</i>)	akepiro
<i>Olearia gardneri</i>	
<i>Olearia paniculata</i>	
<i>Olearia rani</i> var. <i>colorata</i>	heketara
<i>Olearia solandri</i>	
<i>Olearia virgata</i> subsp. <i>virgata</i> (incl. <i>O. virgata</i> var. <i>ramuliflora</i>)	
<i>Ozothamnus leptophyllus</i>	tauhinu
<i>Pennantia corymbosa</i>	kaikomako
<i>Pimelea</i> aff. <i>arenaria</i> (AK 216133)	
<i>Pimelea gnidia</i>	
<i>Pimelea prostrata</i>	pinatoro
<i>Pimelea tomentosa</i>	
<i>Pimelea urvilleana</i>	
<i>Pittosporum cornifolium</i>	karo
<i>Pittosporum divaricatum</i>	
<i>Pittosporum eugenioides</i>	tarata; lemonwood
<i>Pittosporum obcordatum</i>	Heart-leaved kohuhu
<i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>	kohuhu
<i>Plagianthus divaricatus</i>	
<i>Plagianthus regius</i> var. <i>regius</i>	ribbonwood
<i>Pomaderris</i> aff. <i>phyllicifolia</i>	
<i>Pseudopanax arboreus</i>	whauwhaupaku, five finger
<i>Pseudopanax crassifolius</i>	horoeaka, lancewood
<i>Pseudowintera axillaris</i>	horopito
<i>Pseudowintera colorata</i>	horopito
<i>Raukawa anomalus</i>	
<i>Raukawa edgerlyi</i>	
<i>Schefflera digitata</i>	pate
<i>Solanum aviculare</i> var. <i>aviculare</i>	poroporo
<i>Solanum laciniatum</i>	poroporo
<i>Sophora microphylla</i>	kowhai
<i>Sophora microphylla</i> × <i>S. tetraptera</i>	
<i>Sophora tetraptera</i>	kowhai
<i>Streblus heterophyllus</i>	turepo
<i>Syzygium maire</i> (Druce 1992)	maire tawake, swamp maire
<i>Teucrium parvifolium</i> (incl. <i>T. parvifolium</i> var. <i>luxurians</i>)	
<i>Tupeia antarctica</i>	
<i>Urtica ferox</i>	ongaonga
<i>Weinmannia racemosa</i> var. <i>racemosa</i>	kamahi

Monocot. lianes

<i>Freycinetia banksii</i>	kiekie
<i>Ripogonum scandens</i>	kareao, supplejack

Dicot. lianes

<i>Brachyglottis sciadophila</i>	
<i>Calystegia sepium</i>	pohue
<i>Calystegia soldanella</i>	
<i>Calystegia tuguriorum</i>	
<i>Clematis afoliata</i>	
<i>Clematis afoliata</i> × <i>C. foetida</i> (Druce 1972)	
<i>Clematis foetida</i>	akakaiku
<i>Clematis forsteri</i>	poananga
<i>Clematis paniculata</i>	puawananga
<i>Clematis quadribacteolata</i>	
<i>Fuchsia perscandens</i>	
<i>Metrosideros colensoi</i>	rata
<i>Metrosideros diffusa</i>	rata
<i>Metrosideros fulgens</i>	rata
<i>Metrosideros perforata</i>	aka
<i>Muehlenbeckia australis</i>	
<i>Muehlenbeckia axillaris</i>	
<i>Muehlenbeckia complexa</i>	pohuehue
<i>Parsonsia capsularis</i>	akakiore
<i>Parsonsia heterophylla</i>	akakaikiore, New Zealand jasmine
<i>Parsonsia capsularis</i> × <i>P. heterophylla</i> (Druce 1992)	
<i>Passiflora tetrandra</i>	kohia, New Zealand passion flower, passionvine
<i>Rubus australis</i>	tataramoa
<i>Rubus cissoides</i>	tataramoa
<i>Rubus schmidelioides</i> var. <i>schmidelioides</i>	akatataramoa, bush lawyer
<i>Rubus squarrosus</i>	
<i>Rubus australis</i> × <i>R. schmedelioides</i>	
<i>Scandia geniculata</i>	
<i>Tetragonia trigyna</i>	

Psilopsids and Lycopods

<i>Huperzia variua</i>	Whiri-o-Raukatauri
<i>Lycopodium scariosum</i>	matukutuku
<i>Lycopodium volubile</i>	waewaekoukou
<i>Tmesipteris elongata</i>	
<i>Tmesipteris tannensis</i>	

Ferns

<i>Adiantum aethiopicum</i> (Druce 1972)	
<i>Adiantum cunninghamii</i>	huruhuru tapairu, maidenhair fern

<i>Adiantum diapbanum</i>	huruhuru tapairu, maidenhair fern
<i>Anarthropteris lanceolata</i>	
<i>Anogramma leptophylla</i>	
<i>Arthropteris tenella</i>	
<i>Asplenium appendiculatum</i>	
subsp. <i>appendiculatum</i>	
<i>Asplenium appendiculatum</i>	
subsp. <i>martimum</i>	
<i>Asplenium bulbiferum</i>	
<i>Asplenium flabellifolium</i>	
<i>Asplenium flaccidum</i>	makawe
<i>Asplenium gracillimum</i>	petako-paraharaha
<i>Asplenium hookerianum</i>	petako-paraharaha
<i>Asplenium lyalli</i> (CHR 158849)	
<i>Asplenium oblongifolium</i>	huruhuru whenua, shining spleenwort
<i>Asplenium polyodon</i>	
<i>Asplenium</i> aff. <i>trichomanes</i>	
<i>Asplenium bulbiferum</i> × <i>A. hookerianum</i> (Druce 1972)	
<i>Asplenium flaccidum</i> × <i>A. hookerianum</i>	
<i>Asplenium flaccidum</i> × <i>A. gracillimum</i>	
<i>Asplenium flaccidum</i> × <i>A. lyalli</i>	
<i>Asplenium flaccidum</i> × <i>A. appendiculatum</i> subsp. <i>appendiculatum</i> (Druce 1972)	
<i>Asplenium gracillimum</i> × <i>A. hookerianum</i>	
<i>Asplenium hookerianum</i> × <i>A. appendiculatum</i> subsp. <i>appendiculatum</i> (Druce 1972)	
<i>Asplenium oblongifolium</i> × <i>A. appendiculatum</i> subsp. <i>appendiculatum</i>	
<i>Asplenium oblongifolium</i> × <i>A. sp.</i>	
<i>Azolla filiculoides</i>	floating water fern
<i>Blechnum blechnoides</i> (Park 1967)	
<i>Blechnum chambersii</i>	rereti
<i>Blechnum discolor</i>	petipeti, crown fern
<i>Blechnum filiforme</i>	panako
<i>Blechnum fluviatile</i> agg.	kiwikiwi
<i>Blechnum membranaceum</i>	
<i>Blechnum montanum</i>	
<i>Blechnum novae-zelandiae</i> (dryland form)	kiokio
<i>Blechnum novae-zelandiae</i> (wetland form)	swamp kiokio
<i>Blechnum penna-marina</i>	
<i>Blechnum procerum</i>	
<i>Blechnum triangularifolium</i>	
<i>Blechnum vulcanicum</i>	korokio
<i>Blechnum procerum</i> × <i>B. novae-zelandiae</i>	
<i>Botrychium australe</i> (Druce 1972)	
<i>Botrychium biforme</i>	
<i>Cheilanthes distans</i>	
<i>Cheilanthes humilis</i>	

<i>Ctenopteris heterophylla</i>	
<i>Cyathea cunninghamii</i>	punui
<i>Cyathea dealbata</i>	ponga
<i>Cyathea medullaris</i>	mamaku
<i>Cyathea smithii</i>	katote
<i>Dicksonia fibrosa</i>	wheki-ponga
<i>Dicksonia squarrosa</i>	wheki
<i>Diplazium australe</i>	
<i>Doodia australis</i>	
<i>Doodia squarrosa</i>	
<i>Grammitis billardierei</i>	
<i>Grammitis ciliata</i> (Druce 1972)	
<i>Gleichenia microphylla</i> (Druce and Park 1991)	
<i>Histiopteris incisa</i>	matata
<i>Hymenophyllum bivalve</i>	mauku
<i>Hymenophyllum cupressiforme</i>	
<i>Hymenophyllum demissum</i>	irirangi
<i>Hymenophyllum dilatatum</i>	matua mauku
<i>Hymenophyllum flabellatum</i>	mauku
<i>Hymenophyllum flexuosum</i>	mauku
<i>Hymenophyllum minimum</i> (Druce 1972)	mauku
<i>Hymenophyllum multifidum</i>	mauku
<i>Hymenophyllum pulcherrimum</i>	
<i>Hymenophyllum rarum</i>	mauku
<i>Hymenophyllum revolutum</i>	mauku
<i>Hymenophyllum sanguinolentum</i> agg.	piripiri
<i>Hymenophyllum scabrum</i>	mauku
<i>Hypolepis ambigua</i>	
<i>Hypolepis dicksonioides</i>	
<i>Hypolepis distans</i>	
<i>Hypolepis lactea</i> (Druce 1972)	
<i>Hypolepis rufobarbata</i>	
<i>Hypolepis ambigua</i> × <i>H. rufobarbata</i>	
<i>Lastreopsis glabella</i>	
<i>Lastreopsis hispida</i>	
<i>Lastreopsis microsora</i>	
<i>Lastreopsis velutina</i>	
<i>Leptolepia novae-zelandiae</i>	
<i>Leptopteris hymenophylloides</i>	heruheru
<i>Lindsaea linearis</i> (Druce 1972)	
<i>Microsorium pustulatum</i>	kowaowao
<i>Microsorium scandens</i>	mokimoki
<i>Ophioglossum lusitanicum</i> agg.	
<i>Paesia scaberula</i>	matata
<i>Pellaea rotundifolia</i>	tarawera
<i>Pellaea</i> aff. <i>rotundifolia</i>	
<i>Pneumatopteris pennigera</i>	pakau
<i>Polystichum richardii</i>	pikopiko
<i>Polystichum silvaticum</i>	

<i>Polystichum vestitum</i>	puriru
“ <i>Polystichum</i> deep purple”	
<i>Pteridium esculentum</i>	rarahu, bracken
<i>Pteris macilenta</i>	
<i>Pteris tremula</i>	turawera
<i>Pyrrosia eleagnifolia</i>	
<i>Rumobra adiantiformis</i>	
<i>Trichomanes endlicherianum</i>	
<i>Trichomanes reniforme</i>	konehu
<i>Trichomanes venosum</i>	

Orchids

<i>Acianthus sinclairii</i>	
<i>Adenochilus gracilis</i>	
<i>Aporostylis bifolia</i>	
<i>Cladenia atradenia</i>	
<i>Caladenia carnea</i> var. <i>minor</i> (Druce 1967)	
<i>Caladenia chlorostyla</i>	
<i>Caladenia lyallii</i> (Druce and Park 1991)	
<i>Corybas cheesemanii</i>	
<i>Corybas iridescens</i>	
<i>Corybas macranthus</i>	
<i>Corybas oblongus</i>	
<i>Corybas orbiculatus</i>	
<i>Corybas trilobus</i> s.s.	
<i>Corybas</i> aff. <i>trilobus</i> (“C. Trotters”)	
<i>Cyrtostylis reniformis</i> s.s. (Druce 1972)	
<i>Drymoanthus adversus</i>	
<i>Earina autumnalis</i>	raupeka
<i>Earina mucronata</i> s.s.	peka-a-waka
<i>Gastrodia cunninghamii</i>	huperei
<i>Genoplesium nudum</i>	
<i>Microtis unifolia</i>	onion-leaved orchid
<i>Microtis</i> aff. <i>parviflorum</i>	
<i>Nematoceras longipetala</i> (<i>Corybas</i> “Waiouru”)	
<i>Orthoceras novae-zeelandiae</i>	maikaika
<i>Prasophyllum colensoi</i> (Druce 1972)	
<i>Pterostylis alobula</i>	
<i>Pterostylis banksii</i>	tutukiwi
<i>Pterostylis cardiostigma</i>	
<i>Pterostylis foliata</i>	
<i>Pterostylis graminea</i>	
<i>Pterostylis irsoniana</i> (Druce 1972)	
<i>Pterostylis montana</i> s.s.	
<i>Pterostylis porrecta</i>	
<i>Pterostylis trullifolia</i> (Druce 1972)	
<i>Pterostylis</i> sp. (unnamed aff. <i>montana</i>).	
<i>Simpliglottis cornuta</i>	
<i>Thelymitra hatchii</i> (Druce 1972)	

<i>Thelymitra intermedia</i>	
<i>Thelymitra longifolia</i>	maikuku
<i>Thelymitra nervosa</i>	
<i>Thelymitra pauciflora</i>	
" <i>Thelymitra</i> aff. <i>ixioides</i> "	
<i>Winika cunninghamii</i>	

Grasses

<i>Amphibromus fluitans</i>	
<i>Anemantbele lessoniana</i>	
<i>Chionochloa beddiei</i>	
<i>Cortaderia fulvida</i>	toetoe
<i>Cortaderia toetoe</i>	toetoe
<i>Dichelachne crinita</i>	plume grass
<i>Dichelachne inaequiglumes</i>	
<i>Echinopogon ovatus</i>	
<i>Elymus solandri</i>	
<i>Elymus multiflorus</i> (Druce 1972)	
<i>Festuca multinodis</i> (Druce 1972)	
<i>Hierochloe redolens</i>	karetu
<i>Lachnagrostis billardieri</i>	perehia
<i>Lachnagrostis filiformis</i>	
<i>Lachnagrostis littoralis</i> subsp. <i>littoralis</i>	
<i>Lachnagrostis lyalli</i> (Druce 1972)	
<i>Lachnagrostis pilosa</i> subsp. <i>pilosa</i> (Druce 1972)	
<i>Lachnagrostis striata</i> (Druce 1992)	
<i>Microlaena avenacea</i>	bush rice grass
<i>Microlaena polynoda</i>	
<i>Microlaena stipoides</i>	patiti
<i>Poa anceps</i> subsp. <i>anceps</i>	
<i>Poa cita</i>	silver tussock
<i>Poa colensoi</i> (Druce 1972)	
<i>Poa imbecilla</i>	
<i>Poa mathewsii</i>	
<i>Poa pusilla</i>	
<i>Poa anceps</i> × <i>P. cita</i> (Druce 1972)	
<i>Puccinellia stricta</i> (Druce 1972)	
<i>Rytidosperma buchananii</i> (Druce 1972)	
<i>Rytidosperma clavatum</i> (Druce 1972)	
<i>Rytidosperma gracile</i>	
<i>Rytidosperma merum</i> (Druce 1972)	
<i>Rytidosperma petrosum</i> (de Lange and Crowcroft 1993)	
<i>Rytidosperma unarede</i>	
<i>Simplicia laxa</i> ¹	
<i>Spinifex sericeus</i>	kowhangatara
<i>Trisetium arduanum</i>	
<i>Trisetium lepidum</i>	
<i>Zoysia minima</i>	

Sedges

<i>Apodasmia similis</i>	oioi, jointed sedge
<i>Baumea juncea</i>	
<i>Baumea rubiginosa</i> (Druce 1972)	
<i>Baumea tenax</i> (Druce 1972)	
<i>Bolboschoenus caldwellii</i> (Druce 1972)	
<i>Bolboschoenus fluviatilis</i>	ririwaka, Purua grass
<i>Carex breviculmis</i>	
<i>Carex buchananii</i> (CHR 59229 1947 Record)	
<i>Carex colensoi</i> (Druce 1972)	
<i>Carex diandra</i> (1966 record, WELT number not known)	
<i>Carex dissita</i>	
<i>Carex flagellifera</i>	manaia
<i>Carex forsteri</i>	
<i>Carex geminata</i> s.s.	
<i>Carex inversa</i>	
<i>Carex lambertiana</i>	
<i>Carex lessoniana</i> (Druce 1972)	
<i>Carex maorica</i>	
<i>Carex pumila</i>	sand carex
<i>Carex raoulii</i>	
<i>Carex resectans</i> (Druce 1972)	
<i>Carex secta</i> s.s.	purei
<i>Carex solandri</i>	
<i>Carex testacea</i> s.s.	
<i>Carex virgata</i>	purei
<i>Cyperus ustulatus</i>	
<i>Desmoschoenus spiralis</i>	pingao
<i>Eleocharis acuta</i>	sharp spike sedge
<i>Eleocharis gracilis</i>	slender spike sedge
<i>Gabnia pauciflora</i>	takahikahi
<i>Gabnia setifolia</i>	mapere
<i>Isolepis basilaris</i>	
<i>Isolepis cernua</i>	
<i>Isolepis distigmatosa</i>	
<i>Isolepis nodosa</i>	wiwi, club rush
<i>Isolepis pottsii</i> (Druce 1972)	
<i>Isolepis reticularis</i>	
<i>Isolepis subtilissima</i>	
<i>Lepidosperma australe</i>	
<i>Morelotia affinis</i>	
<i>Schoenoplectus pungens</i>	three square
<i>Schoenoplectus tabernaemontani</i>	kapungawha
<i>Schoenus apogon</i>	
<i>Schoenus maschalinus</i>	
<i>Uncinia banksii</i>	matau
<i>Uncinia ferruginea</i>	matau
<i>Uncinia gracilentia</i>	matau
<i>Uncinia laxiflora</i>	
<i>Uncinia leptostachya</i>	

<i>Uncinia rupestris</i>	
<i>Uncinia scabra</i>	matau
<i>Uncinia uncinata</i>	
<i>Uncinia</i> sp. (cf. <i>U. rupestris</i>) (Druce 1972)	

Rushes

<i>Juncus australis</i>	wiwi
<i>Juncus caespiticius</i>	
<i>Juncus distegus</i>	
<i>Juncus edgariae</i>	wiwi
<i>Juncus boloschoenus</i> var. <i>boloschoenus</i> ¹ (CHR189748)	
<i>Juncus kraussii</i> var. <i>australiensis</i>	sea rush
<i>Juncus novae-zelandiae</i> (Druce 1972)	
<i>Juncus pallidus</i>	wiwi
<i>Juncus planifolius</i>	
<i>Juncus pusillus</i> (Druce 1972)	wiwi
<i>Juncus sarophorus</i>	wiwi
<i>Luzula banksiana</i> s.s. (Druce 1972)	
<i>Luzula picta</i> var. <i>limosa</i>	
<i>Luzula picta</i> var. <i>picta</i>	
<i>Luzula subclavata</i>	

Monocot. herbs (other than orchids, grasses, sedges, rushes)

<i>Arthropodium candidum</i>	
<i>Arthropodium cirratum</i>	
<i>Astelia fragrans</i>	kakaha
<i>Astelia solandri</i>	kowharawhara
<i>Collopermum hastatum</i>	kahakaha
<i>Dianella nigra</i>	turutu
<i>Lemna</i> sp. (<i>L. minor</i> auct.)	duckweed
<i>Libertia grandiflora</i>	mikoikoi
<i>Libertia ixioides</i>	mikoikoi
<i>Phormium cookianum</i>	
<i>Phormium tenax</i>	harakeke, flax
<i>Potamogeton cheesemanii</i> (Druce 1972)	pondweed
<i>Potamogeton pectinatus</i>	pondweed
<i>Potamogeton suboblongus</i>	
<i>Ruppia polycarpa</i> (WELT 10692, 1940 record)	
<i>Triglochin striata</i>	arrow grass
<i>Typha orientalis</i>	raupo

Composite herbs

<i>Anaphalioides bellidioides</i>	
<i>Anaphalioides trinervis</i> (Druce 1972)	puatea
<i>Anaphalioides subrigidum</i> (Druce 1972)	
<i>Anaphalioides bellidioides</i> × <i>Helichrysum lanceolatum</i> (Druce 1972)	
<i>Anaphalioides keriensis</i> × <i>A. subrigidum</i>	
<i>Brachyscome radicata</i> var. <i>radicata</i>	

<i>Brachyglottis lagopus</i>	
<i>Celmisia gracilentata</i> var.	pekapeka
<i>Celmisia spectabilis</i> subsp. <i>lanceolata</i>	
<i>Celmisia gracilentata</i> × <i>C. spectabilis</i> (Druce 1972)	
<i>Centipeda aoteorana</i>	
<i>Cotula australis</i>	
<i>Cotula coronopifolia</i>	bachelor's button
<i>Craspedia minor</i> var. <i>minor</i> (incl. <i>C. major</i>)	
<i>Craspedia uniflora</i> var. <i>grandis</i>	
<i>Craspedia viscosa</i> (Druce 1992)	
<i>Euchiton audax</i>	cudweed
<i>Euchiton gymnocephalus</i>	
<i>Euchiton involucratus</i>	cudweed
<i>Euchiton limosus</i> s.s. (Druce 1972)	cudweed
<i>Euchiton ruabiniensis</i>	
<i>Euchiton sphaericus</i>	
<i>Euchiton</i> sp. (unnamed, included in <i>E. paludosus</i> , as var. <i>polylepis</i> by Drury, 1972) (Druce 1965)	
<i>Helichrysum filicaule</i>	
<i>Lagenifera pumila</i>	papataniwharuwha
<i>Lagenifera strangulata</i>	
<i>Leptinella pusilla</i>	
<i>Leptinella squalida</i> s.s.	
<i>Leptinella tenella</i> (Druce 1972)	
<i>Microseris scapigera</i>	
<i>Pseudognaphalium</i> aff. <i>luteoalbum</i>	pukatea
<i>Raoulia glabra</i>	
<i>Raoulia tenuicaulis</i> (incl. <i>R. t.</i> var. <i>dimorpha</i> and <i>R. t.</i> var. <i>pusilla</i>)	
<i>Raoulia</i> sp. (<i>R. australis</i> agg.)	
<i>Senecio banksii</i> var.	
<i>Senecio biserratus</i>	
<i>Senecio glomeratus</i>	fireweed
<i>Senecio hispidulus</i>	fireweed
<i>Senecio lautus</i> subsp. <i>lautus</i>	
<i>Senecio minimus</i>	fireweed
<i>Senecio rufiglandulosus</i>	
<i>Senecio quadridentatus</i>	
<i>Sonchus kirkii</i> (Sawyer and Keenan 1997)	
<i>Vittadinia australis</i> s.s.	

Dicot. herbs (other than composite)

<i>Acaena anserinifolia</i>	piripiri
<i>Acaena juvenca</i>	
<i>Aciphylla colensoi</i>	
<i>Aciphylla squarrosa</i> s.s.	
<i>Apium prostratum</i>	New Zealand celery
<i>Australina pusilla</i>	
<i>Callitriche muelleri</i>	

Callitriche petrei subsp. *petrei*
Cardamine sp. (a) (*C. debilis* agg.)
 (“Narrow Petal” of Pritchard 1957)
 (Druce 1972)
Cardamine sp. (b) (*C. debilis* agg.)
 (“Long Style” of Pritchard)
 (Druce 1972)
Cardamine sp. (c) (*C. debilis* agg.)
 (“Glossy Leaf” of Pritchard)
 (Druce 1972)
Centella uniflora
Colobanthus muelleri (Druce 1972)
Colobanthus strictus (Druce 1972)
Crassula mataikona
Crassula peduncularis
Crassula sieberiana
Crassula tetrameria
Daucus glochidiatus
Dichondra brevifolia
Dichondra repens agg.
Dichondra sp. (unnamed)
 (plant slender, flowers small)
Disphyma australe subsp. *australe* horokaka
Drosera peltata
Einadia triandra
Epilobium alsinoides s.s. (Druce 1972)
Epilobium atriplicifolium s.s.
 (Druce 1972)
Epilobium billardioreanum s.s.
 (Druce 1972)
Epilobium brunnescens s.s. (Druce 1972)
Epilobium chionanthum
Epilobium insulare willow herb
Epilobium komarovianum (Druce 1972) willow herb
Epilobium microphyllum (Druce 1972)
Epilobium nerterioides
Epilobium nummulariifolium willow herb
Epilobium pedunculare
Epilobium pubens
Epilobium rotundifolium
Euphrasia cuneata
Galium propinquum mawe
Geranium microphyllum
Geranium potentilloides
 var. *potentilloides*
Geranium retrorsum (Druce 1972)
Geranium sessiliflorum
 var. *novae-zelandiae* (Druce 1972)
Geranium solanderi var. “large petals”
Geranium aff. *trilobum*

<i>Gingidia montana</i> (Druce 1972)	
<i>Glossostigma elatinoides</i> (Druce 1972)	
<i>Gonocarpus aggregatus</i>	
<i>Gonocarpus incanus</i> (incl. <i>G. montanus</i>) (WELT 6879, 1940 record)	piripiri
<i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>	
<i>Gratiola nana</i> (A.P. Druce pers. comm.)	
<i>Gunnera monoica</i> (incl. <i>G. albocarpa</i> and <i>G. strigosa</i>) (Druce 1972)	
<i>Haloragis erecta</i> subsp. <i>erecta</i>	toatoa
<i>Hydrocotyle elongata</i>	
<i>Hydrocotyle heteromeria</i>	
<i>Hydrocotyle hydrophila</i> (Druce 1972)	
<i>Hydrocotyle microphylla</i> (Druce 1972)	
<i>Hydrocotyle moschata</i>	
<i>Hydrocotyle novae-zelandiae</i> s.s.	
<i>Hydrocotyle sulcata</i>	
<i>Hypericum japonicum</i>	
<i>Leptostigma setulosa</i> (Druce 1972)	
<i>Lilaeopsis novae-zelandiae</i>	
<i>Lilaeopsis ruthiana</i> (Druce 1972)	
<i>Linum monogynum</i>	
<i>Lobelia anceps</i>	shore lobelia
<i>Mazus novaezeelandiae</i> subsp. <i>novaezeelandiae</i>	
<i>Mimulus repens</i>	
<i>Myosotis pygmaea</i> (Druce & Park 1991)	
<i>Myosotis spathulata</i> (incl. <i>M. s. var. radicata</i>) (Druce 1972)	
<i>Myosotis</i> .sp. (cf. <i>M. forsteri</i>) (Druce 1972)	
<i>Myriophyllum propinquum</i>	water milfoil
<i>Nertera depressa</i> (incl. <i>N. cunninghamii</i>)	
<i>Oreomyrrhis ramosa</i>	
<i>Oxalis exilis</i>	
<i>Oxalis magellanica</i>	
<i>Parabebe diffusa</i> (Druce 1972)	
<i>Parietaria debilis</i>	
<i>Pelargonium inodorum</i>	kopata
<i>Plantago lanigera</i>	
<i>Plantago raoulii</i>	kopakopa
<i>Plantago spathulata</i> subsp. <i>spathulata</i>	
<i>Potentilla anserinoides</i>	kowai
<i>Pratia angulata</i>	panekenake
<i>Ranunculus acaulis</i>	sand buttercup
<i>Ranunculus amphitrichus</i>	kawariki
<i>Ranunculus glabrifolius</i>	
<i>Ranunculus multiscapus</i>	
<i>Ranunculus reflexus</i>	maruru
<i>Rumex flexuosus</i>	
<i>Samolus repens</i> var. <i>repens</i>	makaokao

<i>Sarcocornia quinqueflora</i>	
<i>Schizeilema trifoliolatum</i>	
<i>Scleranthus biflorus</i>	
<i>Scleranthus uniflorus</i> (Druce 1972)	
<i>Selliera radicans</i>	remuremu
<i>Spergularia media</i>	
<i>Stellaria decipiens</i> (incl. <i>S. minuta</i> and <i>S. parviflora</i>)	kohukohu
<i>Stellaria gracilentia</i>	
<i>Tetragonia tetragonoides</i>	kokihi
<i>Urtica incisa</i>	stinging nettle
<i>Urtica linearifolia</i>	
<i>Viola cunninghamii</i> (Druce 1972)	
<i>Viola filicaulis</i>	
<i>Wahlenbergia ramosa</i>	
<i>Wahlenbergia rupestris</i>	
<i>Wahlenbergia violacea</i>	

Appendix 2

ADVENTIVE VASCULAR PLANTS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT

Gymnosperms

<i>Araucaria heterophylla</i>	Norfolk Island pine (planted)
<i>Cryptomeria japonica</i>	Japanese cedar
<i>Cupressus macrocarpa</i>	macrocarpa
<i>Pinus pinaster</i>	maritime pine
<i>Pinus radiata</i>	radiata pine

Dicot. trees and shrubs

<i>Acacia melanoxylon</i>	Tasmanian blackwood
<i>Acacia mearnsii</i> (Sawyer <i>et al.</i> 1998)	black wattle
<i>Banksia</i> sp.	banksia
<i>Berberis glaucocarpa</i>	barberry
<i>Chamaecytisus palmensis</i>	tree lucerne
<i>Cotoneaster glaucophylla</i>	
<i>Cotoneaster lacteus</i>	cotoneaster
<i>Crataegus monogyna</i>	hawthorn
<i>Cytisus scoparius</i>	broom
<i>Erica lusitanica</i>	Spanish heath
<i>Eucalyptus</i> sp.	eucalypt
<i>Lavatera arborea</i>	tree mallow
<i>Leycesteria formosa</i>	Himalayan honeysuckle
<i>Lupinus arboreus</i>	lupin
<i>Lycium ferocissimum</i>	boxthorn
<i>Malus × domestica</i>	apple
<i>Myoporum insulare</i>	Tasmanian ngaio
<i>Paraserianthes</i> sp.	wattle
<i>Pittosporum ralphii</i>	
(native but not to the district)	
<i>Populus alba</i> var. <i>nivea</i>	silver poplar
<i>Populus nigra</i> cv. <i>Italica</i>	Lombardy poplar
<i>Prunus laurocerasus</i>	
<i>Rosa rubiginosa</i>	sweet brier
<i>Salix cinerea</i>	grey willow
<i>Salix fragilis</i>	crack willow
<i>Sambucus nigra</i>	elder
<i>Teline monspessulana</i>	Montpellier broom
<i>Tropaeolum majus</i>	garden nasturtium
<i>Ulex europaeus</i>	gorse

Dicot. lianes

<i>Clematis vitalba</i>	old man's beard
<i>Hedera helix</i>	ivy

<i>Lonicera japonica</i> (Druce 1972)	Japanese honeysuckle
<i>Senecio angulatus</i>	Cape ivy
<i>Vinca major</i>	periwinkle

Grasses

<i>Agropyron pungens</i>	sea couch
<i>Agrostis capillaris</i>	brown top
<i>Agrostis stolonifera</i>	creeping bent
<i>Aira caryophyllea</i> (Druce 1972)	silvery hair grass
<i>Aira praecox</i>	early hair grass
<i>Ammophila arenaria</i>	marram
<i>Anthoxanthum odoratum</i>	sweet vernal
<i>Arrhenatherum elatius</i>	tall oat grass
<i>Bromus diandrus</i>	ripgut brome
<i>Bromus bordaceus</i> (Druce 1972)	soft brome
<i>Bromus sterilis</i> (Druce 1972)	barren brome
<i>Bromus willdenowii</i>	prairie grass
<i>Cortaderia jubata</i>	pampas
<i>Cortaderia selloana</i>	pampas
<i>Cynodon dactylon</i>	Indian doab
<i>Cynosurus cristatus</i>	crested dogstail
<i>Dactylis glomerata</i>	cocksfoot
<i>Digitaria sanguinalis</i>	summer grass
<i>Echinochloa crus-galli</i>	barnyard grass
<i>Elymus rectisetus</i> s.s. (Druce 1972)	blue wheat grass
<i>Festuca nigrescens</i> (Druce 1972)	chewing fescue
<i>Festuca rubra</i>	red fescue
<i>Glyceria declinata</i> (Druce 1972)	floating sweetgrass
<i>Glyceria fluitans</i>	floating sweetgrass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Holcus mollis</i>	creeping fog
<i>Hordeum murinum</i>	barley grass
<i>Lagurus ovatus</i>	hare's tail
<i>Lolium perenne</i>	perennial rye grass
<i>Paspalum dilatatum</i>	paspalum
<i>Pennisetum clandestinum</i>	kikuyu grass
<i>Phalaris aquatica</i>	phalaris
<i>Poa annua</i>	annual poa
<i>Poa pratensis</i>	Kentucky blue grass
<i>Polypogon monspeliensis</i>	beard grass
<i>Rytidosperma laeve</i> (Druce 1972)	danthonia
<i>Rytidosperma penicillatum</i> (Druce 1972)	danthonia
<i>Rytidosperma racemosum</i>	danthonia
<i>Schenodorus phoenix</i>	tall fescue
<i>Sporobolus africanus</i>	ratstail
<i>Stenotaphrum secundatum</i>	buffalo grass
<i>Vulpia bromoides</i>	vulpia hair grass

Sedges

Carex divulsa
Carex birta (Druce 1972)
Carex ovalis
Carex sylvatica (Druce 1972)
Cyperus eragrostis
Isolepis marginata (Druce 1972)
Isolepis sepulcralis

Rushes

Juncus articulatus jointed-leaved rush
Juncus bufonius toad rush
Juncus conglomeratus
Juncus effusus soft rush
Juncus inflexus
Juncus subnodulosus

Monocots (other than grasses, sedges, and rushes)

Agapanthus praecox agapanthus
Iris foetidissima stinking iris
Yucca gloriosa yucca

Composite herbs

Achillea millefolium yarrow
Bellis perennis lawn daisy
Carduus tenuiflorus winged thistle
Centipeda cunninghamii sneezeweed
Cirsium arvense Californian thistle
Cirsium vulgare Scotch thistle
Conyza albida fleabane
Conyza canadensis fleabane
Crepis capillaris hawksbeard
Erigeron karvinskianus Mexican daisy
Gazania linearis coastal daisy
Gnaphalium coarctatum cudweed
Hypochoeris radicata catsear
Lactuca serriola prickly lettuce
Leontodon taraxacoides hawkbit
Leucanthemum vulgare oxeye daisy
Mycelis muralis wall lettuce
Picris echioides ox tongue
Senecio bipinnatisectus Australian fireweed
Senecio elegans purple groundsel
Senecio jacobaea ragwort
Silybum marianum (Druce 1972) variegated thistle
Sonchus asper prickly sowthistle
Sonchus oleraceus puha, sowthistle
Tanacetum parthenium feverfew
Taraxacum officinale dandelion

Dicot. herbs (other than Composites)

<i>Acaena agnipila</i>	Australian burrweed
<i>Acaena novae-zelandiae</i> (Druce 1972)	bidibid
<i>Alyssum alyssoides</i>	small alyssum
<i>Amaranthus deflexus</i>	mat amaranth
<i>Amaranthus powellii</i>	redroot
<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Aphanes inexpectata</i>	parsley piert
<i>Arctotheca calendula</i>	cape weed
<i>Arctotis stoechadifolia</i>	arctotis
<i>Atriplex patula</i>	orache
<i>Brassica oleracea</i>	wild cabbage
<i>Cakile maritima</i>	sea rocket
<i>Callitriche stagnalis</i>	starwort
<i>Cardamine flexusosa</i>	
<i>Cardamine hirsuta</i> (Druce 1972)	bitter-cress
<i>Carpobrotus edulis</i>	ice plant
<i>Centaurium erythraea</i> (Druce 1972)	centaury
<i>Cerastium fontanum</i> subsp. <i>vulgare</i> (Druce 1972)	mouse-eared chickweed
<i>Cerastium glomeratum</i> (Druce 1972)	annual mouse-ear chickweed
<i>Chenopodium album</i>	fathen
<i>Chenopodium murale</i>	nettle-leaved fathen
<i>Coronopus didymus</i>	twin cress
<i>Cotyledon orbiculata</i>	pig's ear
<i>Datura stramonium</i>	thorn apple
<i>Daucus carota</i>	wild carrot
<i>Digitalis purpurea</i>	foxglove
<i>Erodium cicutarium</i> (Druce 1972)	storksbill
<i>Erodium moschatum</i> (Druce 1972)	musky storksbill
<i>Euphorbia peplus</i>	milkweed
<i>Foeniculum vulgare</i>	fennel
<i>Galium aparine</i>	cleavers
<i>Galium palustre</i>	marsh bedstraw
<i>Geranium molle</i>	dove's foot cranesbill
<i>Glaucium flavum</i>	horned poppy
<i>Hypericum humifusum</i> (Druce 1972)	trailing St John's wort
<i>Lepidium pseudo-tasmanicum</i>	narrow-leaved cress
<i>Linum bienne</i>	
<i>Linum tryginum</i>	
<i>Lotus pedunculatus</i>	lotus
<i>Lychnis coronaria</i>	rose campion
<i>Lytbrum hyssopifolia</i>	loosestrife
<i>Malva neglecta</i>	dwarf mallow
<i>Marrubium vulgare</i>	horehound
<i>Matthiola incana</i>	hoary stock
<i>Melilotus indica</i>	King Island melilot
<i>Mentha pulegium</i>	pennyroyal
<i>Mimulus moschatus</i>	
<i>Myosotis discolor</i>	forget-me-not

<i>Myosotis laxa</i> subsp. <i>caespitosa</i> (Druce 1972)	water forget-me-not
<i>Nepeta catarina</i> (Druce 1972)	cat mint
<i>Nymphaea mexicana</i>	Mexican water lily
<i>Orobanche minor</i>	broomrape
<i>Osteospermum fruticosum</i>	dimorphotheca
<i>Oxalis corniculata</i>	
<i>Oxalis</i> sp. (rootstock tuberous; fls yellow)	oxalis
<i>Parentucellia viscosa</i> (Druce 1972)	tarweed
<i>Petroselinum crispum</i>	wild parsley
<i>Plantago australis</i>	swamp plantain
<i>Plantago coronopus</i>	buck's-horn plantain
<i>Plantago lanceolata</i>	narrow-leaved plantain
<i>Plantago major</i>	broad-leaved plantain
<i>Polycarpon tetraphyllum</i>	allseed
<i>Polygonum aviculare</i>	wireweed
<i>Polygonum hydropiper</i>	water pepper
<i>Polygonum persicaria</i>	willow weed
<i>Portulaca oleracea</i>	portulaca
<i>Prunella vulgaris</i>	selfheal
<i>Ranunculus parviflorus</i> (Druce 1972)	small-flowered buttercup
<i>Ranunculus repens</i>	creeping buttercup
<i>Ranunculus sardous</i>	hairy buttercup
<i>Ranunculus sceleratus</i>	celery-leaved buttercup
<i>Rorippa microphylla</i>	one rowed watercress
<i>Rorippa nasturtium-aquaticum</i>	watercress
<i>Rumex acetosella</i>	sheep's sorrel
<i>Rumex conglomeratus</i>	clustered dock
<i>Rumex crispus</i>	curled dock
<i>Rumex obtusifolius</i>	broad-leaved dock
<i>Rumex sagittatus</i>	climbing dock
<i>Sagina procumbens</i>	pearlwort
<i>Sanguisorba minor</i> (Druce 1972)	salad burnet
<i>Sherardia arvensis</i> (Druce 1972)	field madder
<i>Silene gallica</i>	catchfly
<i>Sisymbrium officinale</i>	hedge mustard
<i>Solanum chenopodioides</i>	Jerusalem cherry
<i>Solanum nigrum</i>	black nightshade
<i>Stachys sylvatica</i>	hedge stachys
<i>Stellaria alsine</i>	bog stichwort
<i>Stellaria media</i>	chickweed
<i>Torilis nodosa</i> (Druce 1972)	hedgehog parsley
<i>Trifolium arvense</i> (Druce 1972)	haresfoot trefoil
<i>Trifolium dubium</i>	suckling clover
<i>Trifolium micranthum</i>	lesser suckling clover
<i>Trifolium pratense</i>	red clover
<i>Trifolium repens</i>	white clover
<i>Trifolium striatum</i>	striated clover
<i>Trifolium subterraneum</i>	subterraneum clover
<i>Verbascum creticum</i> (Druce 1972)	Cretan mullein

<i>Verbascum thapsus</i>	woolly mullein
<i>Veronica arvensis</i>	field speedwell
<i>Veronica persica</i>	scrambling speedwell
<i>Veronica serpyllifolia</i> (Druce 1972)	turf speedwell
<i>Vicia hirsuta</i> (Druce 1972)	hairy vetch
<i>Vicia sativa</i>	narrow-leaved vetch
<i>Vicia tetrasperma</i>	four-seeded vetch

Appendix 3

REGIONALLY THREATENED PLANTS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT

SCIENTIFIC NAME	COMMON NAME	REGIONAL MAINLAND STATUS (EMPSON AND SAWYER 1996*)
<i>Atribopodium cirratum</i>	Rengarenga lily	Vulnerable
<i>Asplenium lyallii</i>		Susceptible
<i>Asplenium appendiculatum</i> subsp. <i>appendiculatum</i>		Low risk
<i>Baumea juncea</i>		Indeterminate
<i>Botrychium australe</i>	Parsley fern	Vulnerable
<i>Botrychium bifforme</i>	Parsley fern	Susceptible
<i>Brachyglottis greyi</i> var. <i>greyi</i>		Low risk
<i>Carex buchananii</i>		Vulnerable
<i>Carex diandra</i>		Vulnerable
<i>Carex resectans</i>		Indeterminate
<i>Celmisia spectabilis</i> var. <i>lanceolata</i>		Low risk
<i>Chionochloa beddiei</i>		Indeterminate
<i>Clematis afoliata</i>	Leafless clematis	Susceptible
<i>Coprosma acerosa</i>	Sand coprosma	Endangered
<i>Coprosma virescens</i>		Vulnerable
<i>Craspedia uniflora</i> var. <i>grandis</i>		Indeterminate
<i>Discaria toumatou</i>	Matagouri	Vulnerable
<i>Doodia media</i>		Low risk
<i>Elymus multiflorus</i>		Susceptible
<i>Genoplesium nudum</i>		Susceptible
<i>Gonocarpus incanus</i>		Indeterminate
<i>Hymenophyllum cupressiforme</i>		Indeterminate
<i>Hymenophyllum minimum</i>		Low risk
<i>Hypolepis dicksonioides</i>	Giant hypolepis	Low risk
<i>Juncus pusillus</i>		Indeterminate
<i>Kortbalsella lindsayi</i>	Mistletoe	Susceptible
<i>Leptinella pusilla</i>		Endangered
<i>Leptinella tenella</i>		Susceptible
<i>Melicytus</i> aff. <i>obovatus</i>		Vulnerable
<i>Morelotia affinis</i>		Vulnerable
<i>Myosotis spathulata</i>	Forget-me-not	Indeterminate
<i>Pimelea urvilleana</i>		Susceptible
<i>Pterostylis foliata</i>		Susceptible
<i>Rubus squarrosus</i>	Leafless lawyer	Susceptible
<i>Scandia geniculata</i>		Vulnerable
<i>Schoenus apogon</i>		Indeterminate

* The categories are (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.

Susceptible: 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

WILDLIFE SPECIES RECORDED IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT (FROM SAWYER *et al.* 1998)

Mammals

Native

Andrew's beaked whale	<i>Mesoplodon bowdoinii</i>
elephant seal	<i>Mirounga leonina</i>
long-tailed bat	<i>Chalinobus tuberculata</i>
New Zealand fur seal	<i>Arctocephalus forsteri</i>

Introduced (feral)

cat	<i>Felis catus</i>
cow	<i>Bos taurus</i>
ferret	<i>Mustela furo</i>
hare	<i>Lepus sp.</i>
hedgehog	<i>Erinaceus europeaeus occidentalis</i>
horse	<i>Equus caballus</i>
leopard seal	<i>Hydrurga lepterix</i>
mouse	<i>Mus musculus</i>
pig	<i>Sus scrofa</i>
possum	<i>Trichosurus vulpecula</i>
rabbit	<i>Oryctolagus cuniculus cuniculus</i>
rat	<i>Rattus sp.</i>
red deer	<i>Cervus elaphus scoticus</i>
sheep	<i>Ovis aries</i>
stoat	<i>Mustela erminea</i>

Birds

Native

Australasian gannet	<i>Sula bassana serrator</i>
Australasian harrier	<i>Circus approximans gouldi</i>
banded dotterel	<i>Charadrius bicinctus</i>
bellbird	<i>Anthornis melanura</i>
black-billed gull	<i>Larus bulleri</i>
black-fronted dotterel	<i>Charadrius melanops</i>
black shag	<i>Phalacrocorax carbo</i>
Buller's shearwater	<i>Puffinus bulleri</i>
Caspian tern	<i>Hydroprogne caspia</i>
fantail	<i>Rhipidura fuliginosa</i>
fluttering shearwater	<i>Puffinus garia</i>
giant petrel	<i>Macronectes sp.</i>
grey duck	<i>Anas superciliosa</i>
grey warbler	<i>Gerygone igata</i>

little shag	<i>Phalacrocorax melanoleucos</i>
long-tailed cuckoo	<i>Eudynamys taitensis</i>
Morepork	<i>Ninox novaeseelandiae</i>
New Zealand dabchick	<i>Podiceps rufopectus</i>
New Zealand falcon	<i>Falco novaeseelandiae</i>
New Zealand kingfisher	<i>Halcyon sancta vagans</i>
New Zealand pigeon	<i>Hemiphaga novaeseelandiae</i>
New Zealand pipit	<i>Anthus novaeseelandiae</i>
New Zealand shoveler	<i>Anas rhynchotis</i>
paradise shelduck	<i>Tadorna variegata</i>
pieb shag	<i>Phalacrocorax varius</i>
pieb stilt	<i>Himantopus himantopus leucocephalus</i>
pieb tit	<i>Petroica macrocephala</i>
pukeko	<i>Porphyrio porphyrio melanotus</i>
red-billed gull	<i>Larus novarhollandiae scopulinus</i>
reef heron	<i>Egretta sacra</i>
rifleman	<i>Acanthisitta chloris</i>
shining cuckoo	<i>Chrysococcyx lucidus</i>
silveryeye	<i>Zosterops lateralis</i>
sooty shearwater	<i>Puffinus griseus</i>
South Island pieb oystercatcher	<i>Haematopus ostralegus finschii</i>
Southern black-backed gull	<i>Larus dominicanus</i>
spotless crake	<i>Porzana tabuensis</i>
tui	<i>Prothemadera novaeseelandiae</i>
variable oystercatcher	<i>Haematopus unicolor</i>
wandering albatross	<i>Diomedea exulans</i>
welcome swallow	<i>Hirundo tabitica neoxena</i>
white-faced heron	<i>Ardea novaehollandiae</i>
white-fronted tern	<i>Sterna striata</i>
whitehead	<i>Moboua albicilla</i>

Introduced

Australian magpie	<i>Gymnorhina tibicen</i>
blackbird	<i>Turdus merula</i>
black swan	<i>Cygnus atratus</i>
California quail	<i>Lophortyx californica</i>
Canada goose	<i>Branta canadensis</i>
cape pigeon	<i>Daption capense</i>
chaffinch	<i>Fringilla coelebs</i>
feral pigeon	<i>Columba livia</i>
goldfinch	<i>Carduelis carduelis</i>
greenfinch	<i>Carduelis chloris</i>
hedge sparrow	<i>Prunella modularis</i>
house sparrow	<i>Passer domesticus</i>
mallard	<i>Anas platyrhynchos</i>
redpoll	<i>Carduelis flammea</i>
rook	<i>Corvus frugilegus</i>
skylark	<i>Alauda arvensis</i>
song thrush	<i>Turdus philomelos</i>
spur-winged plover	<i>Vanellus miles novaehollandiae</i>

starling
turkey
yellowhammer

Sturnus vulgaris
Meleagris gallopavo
Emberiza citrinella

Reptiles

Lizards

common gecko
common skink
forest gecko
ornate skink
spotted skink
Wellington green gecko

Hoplodactylus maculatus
Oligosoma nigriplantare polychroma
Hoplodactylus granulatus
Cyclodina ornata
Oligosoma lineocellatum
Naultinus elegans punctatus

Fish

banded kokopu
brown trout
giant bully
giant kokopu
inanga
koaro
lamprey
red-finned bully

Galaxias fasciatus
Salmo trutta
Gobiomorphus. gobioides
Galaxias argenteus
Galaxias maculatus
Galaxias brevipinnis
Geotria australis
Gobiomorphus buttoni

Appendix 5

REGIONALLY THREATENED ANIMALS IN THE EASTERN WAIRARAPA ECOLOGICAL DISTRICT

(From Department of Conservation 1996a)

COMMON NAME	SCIENTIFIC NAME	REGIONAL MAINLAND STATUS (DOC 1996A)
Birds		
Australasian harrier	<i>Circus approximans gouldi</i>	Low risk
Bellbird	<i>Anthornis melanura</i>	Susceptible
Black-fronted dotterel	<i>Charadris melanops</i>	Susceptible
Black shag	<i>Phalacrocorax carbo</i>	Vulnerable
Fantail	<i>Rhipidura fuliginosa</i>	Low risk
Fluttering shearwater	<i>Puffinus gavia gavia</i>	Low risk
Grey warbler	<i>Gerygone igata</i>	Susceptible
Little shag	<i>Phalacrocorax melanoleucos</i>	Vulnerable
Long-tailed cuckoo	<i>Eudynamis taitensis</i>	Vulnerable
Marsh crake	<i>Porzana pusilla affinis</i>	Indeterminate
Morepork	<i>Ninox novaeseelandiae novaeseelandiae</i>	Low risk
New Zealand kingfisher	<i>Halcyon sancta vagrans</i>	Low risk
New Zealand pipit	<i>Antbus novaeseelandiae</i>	Susceptible
New Zealand shoveler	<i>Anas rhynchotis variegata</i>	Low risk
North Island rifleman	<i>Acanthisitta chloris granti</i>	Susceptible
Paradise shelduck	<i>Tadorna variegata</i>	Low risk
Pied shag	<i>Phalacrocorax varius</i>	Susceptible
Pied stilt	<i>Himantopus himantopus leucocephalus</i>	Low risk
Pied tit	<i>Petroica macrocephala macrocephala</i>	Susceptible
Pukeko	<i>Porphyrio porphyrio melanotus</i>	Low risk
Red-billed gull	<i>Larus novaezeelandiae scopulinus</i>	Low risk
Shining cuckoo	<i>Chrysococcyx lucidus lucidus</i>	Low risk
Silvereye	<i>Zosterops lateralis lateralis</i>	Low risk
Sooty shearwater	<i>Puffinus griseus</i>	Extinct
South Island pied oystercatcher	<i>Haematopus ostralegus finschii</i>	Susceptible
Southern black-backed gull	<i>Larus dominicanus</i>	Low risk
Spotless crake	<i>Porzana tabuensis plumbea</i>	Indeterminate
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Low risk
Tui	<i>Prosthemadera novaeseelandiae</i>	Susceptible
Welcome swallow	<i>Hirundo tabitica neoxena</i>	Low risk
White-faced heron	<i>Ardea novaehollandiae novaehollandiae</i>	Low risk
Whitehead	<i>Moboua albicilla</i>	Susceptible
Reptiles		
Common gecko	<i>Hoplodactylus maculatus</i>	Low risk
Forest gecko	<i>Hoplodactylus granulatus</i>	Susceptible
Wellington green gecko	<i>Naultinus elegans punctatus</i>	Indeterminate
Ornate skink	<i>Cyclodina ornata</i>	Low risk
Spotted skink	<i>Oligosoma lineocellatum</i>	Susceptible
Invertebrate		
Katipo spider	<i>Latrodectus katipo</i>	Endangered

Appendix 6

COMMON PLANT NAMES USED IN THE TEXT

akakiore	<i>Parsonsia capsularis</i>
akeake	<i>Dodonea viscosa</i>
arrow grass	<i>Triglochin striata</i>
Australian ngaio	<i>Myoporum insulare</i>
bachelor's button	<i>Cotula coronopifolia</i>
barberry	<i>Berberis glaucocarpa</i>
beech	<i>Nothofagus</i> species
beggar's tick	<i>Bidens frondosa</i>
black beech	<i>Nothofagus solandri</i> var. <i>solandri</i>
black maire	<i>Nestegis cunninghamii</i>
blackberry	<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)
boneseed	<i>Chrysanthemoides monilifera</i>
buck's-horn plantain	<i>Plantago coronopus</i>
buddleia	<i>Buddleja davidii</i>
bush rice grass	<i>Microlaena stipoides</i>
Cape ivy	<i>Senecio angulatus</i>
cathedral bells	<i>Cobaea scandens</i>
catsear	<i>Hypochoeris radicata</i>
celery leaved buttercup	<i>Ranunculus scleratus</i>
centella	<i>Centella uniflora</i>
corkscrew willow	<i>Salix matsudana</i>
cotoneaster	<i>Cotoneaster glaucophyllus</i> f. <i>serotinus</i>
crack willow	<i>Salix fragilis</i>
creeping buttercup	<i>Ranunculus repens</i>
curled dock	<i>Rumex crispus</i>
English ivy	<i>Hedera helix</i>
eucalyptus	<i>Eucalyptus botryoides</i>
flax	<i>Phormium</i> sp.
giant umbrella sedge	<i>Cyperus ustulatus</i>
gorse	<i>Ulex europaeus</i>
Hall's totara	<i>Podocarpus hallii</i>
hangehange	<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>
harakeke, flax	<i>Phormium tenax</i>
hard beech	<i>Nothofagus truncata</i>
harestail	<i>Lagurus ovatus</i>
hawthorn	<i>Crataegus monogyna</i>
heketara	<i>Olearia rani</i>
Himalaya honeysuckle	<i>Leycesteria formosa</i>
hinarepe, sand tussock	<i>Austrofestuca littoralis</i>
hinau	<i>Elaeocarpus dentata</i>
hook sedge	<i>Uncinia uncinata</i>
horned poppy	<i>Glaucium flavum</i>
horoeka, lancewood	<i>Pseudopanax crassifolius</i>
houhere	<i>Hoheria populnea</i>

hupiro	<i>Coprosma foetidissima</i>
hukihuki	<i>Coprosma tenuicaulis</i>
huruhuru whenua	<i>Asplenium oblongifolium</i>
ice plant	<i>Disphyma australe</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Jersey fern	<i>Annogamma leptophylla</i>
jointed rush	<i>Juncus articulatus</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kaikomako	<i>Pennantia corymbosa</i>
kamaha	<i>Weinmannia racemosa</i>
kamu	<i>Uncinia uncinata</i>
kanono	<i>Coprosma grandifolia</i>
kanuka	<i>Kunzea ericoides</i> var. <i>ericoides</i>
karaka	<i>Corynocarpus laevigatus</i>
karamu	<i>Coprosma robusta</i>
kareao	<i>Ripogonum scandens</i> , supplejack
kawakawa	<i>Macropiper excelsum</i> var. <i>excelsum</i>
kiekie	<i>Freycinetia baueriana</i> subsp. <i>banksii</i>
kiwikiwi	<i>Blechnum fluviatile</i>
kohekohe	<i>Dysoxylum spectabile</i>
kohia	<i>Passiflora tetrandra</i>
kohuhu	<i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>
kopakopa	<i>Plantago raoulii</i>
koromiko	<i>Hebe stricta</i> var. <i>stricta</i> and <i>Hebe salicifolia</i>
kotukutuku	<i>Fuchsia excorticata</i>
kowaowao	<i>Phymatosorus pustulatus</i>
kowhai	<i>Sophora tetraptera</i>
leafless lawyer	<i>Rubus squarrossus</i>
leafless rush	<i>Juncus edgarae</i> , <i>J. sarophorus</i>
lotus	<i>Lotus pedunculatus</i>
lupin	<i>Lupinus arboreus</i>
mahoe	<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>
maire	<i>Nestegis</i> species
maire tawake, swamp maire	<i>Syzygium maire</i>
mamaku	<i>Cyathea medullaris</i>
manuka	<i>Leptospermum scoparium</i>
mapou	<i>Myrsine australis</i>
maritime pine	<i>Pinus pinaster</i>
marram	<i>Ammophila arenaria</i>
marsh bedstraw	<i>Galium palustre</i>
marsh ribbonwood	<i>Plagianthus divaricatus</i>
matai	<i>Prumnopitys taxifolia</i>
Mercer grass	<i>Paspalum distichum</i>
Mexican daisy	<i>Erigeron karvinskianus</i>
mingimingi	<i>Leucopogon fasciculatus</i>
miro	<i>Prumnopitys ferruginea</i>
mountain beech	<i>Nothofagus solandri</i> var. <i>solandri</i>
mountain rohutu	<i>Neomyrtus pedunculata</i>
narrow-leaved maire	<i>Nestegis montana</i>

New Zealand jasmine	<i>Parsonsia capsularis</i> ; <i>Parsonsia heterophylla</i>
ngaio	<i>Myoporum laetum</i>
nikau	<i>Rhopalostylis sapida</i>
niniaio	<i>Helicbrysum lanceolatum</i>
northern rata	<i>Metrosideros robusta</i>
oioi	<i>Apodasmia similis</i>
ongaonga	<i>Urtica ferox</i>
pampas	<i>Cortaderia selloana</i>
pate	<i>Schefflera digitata</i>
patotara	<i>Cyathodes fraseri</i>
pennyroyal	<i>Mentha pulegium</i>
petipeti	<i>Blechnum discolor</i>
pingao	<i>Desmoschoenus spiralis</i>
poataniwha	<i>Melicope simplex</i>
pohuehue	<i>Muehlenbeckia australis</i>
ponga	<i>Cyathea dealbata</i>
poplar	<i>Populus</i> species
porokaiwhiri, pigeonwood	<i>Hedycarya arborea</i>
poroporo	<i>Solanum laciniatum</i>
prickly mingimingi	<i>Cyathodes juniperina</i>
puka, broadleaf	<i>Griselinia</i> sp.
pukatea	<i>Laurelia novae-zelandiae</i>
pukio	<i>Carex secta</i>
purei	<i>Carex virgata</i>
putaputaweta	<i>Carpodetus serrata</i>
radiata pine	<i>Pinus radiata</i>
rangiora	<i>Brachyglottis repanda</i>
rarahu, bracken	<i>Pteridium esculentum</i>
raukawa	<i>Raukawa edgerleyii</i>
raupo	<i>Typha orientalis</i>
red beech	<i>Nothofagus fusca</i>
rereti	<i>Blechnum chambersii</i>
rewarewa	<i>Knightsia excelsa</i>
ribbonwood	<i>Plagianthus regius</i>
rimu	<i>Dacrydium cupressinum</i>
rohutu	<i>Lophomyrtus obcordata</i>
sand pimelea	<i>Pimelea</i> aff. <i>arenaria</i>
sand sedge	<i>Carex pumila</i>
Scotch thistle	<i>Cirsium vulgare</i>
searocket	<i>Cakile</i> sp.
sea rush	<i>Juncus kraussii</i> var. <i>australiensis</i>
shining karamu	<i>Coprosma lucida</i>
shining spleenwort	<i>Asplenium oblongifolium</i>
shore lobelia	<i>Lobelia anceps</i>
small-leaved pohuehue	<i>Muehlenbeckia complexa</i>
soft rush	<i>Juncus effusus</i>
Spanish heath	<i>Erica lusitanica</i>
sphagnum	<i>Sphagnum cristatum</i> and <i>S. falcatum</i>
spike sedge	<i>Eleocharis acuta</i>
spinifex	<i>Spinifex sericeus</i>

swamp kiokio	<i>Blechnum novae-zelandiae</i> (swamp form)
swamp millet	<i>Isachne globosa</i>
sweet brier	<i>Rosa rubiginosa</i>
tall fescue	<i>Festuca arundinacea</i>
tarata, lemonwood	<i>Pittosporum eugenioides</i>
tauhinu	<i>Ozothamnus leptophyllus</i>
taupata	<i>Coprosma repens</i>
tawa	<i>Beilschmiedia tawa</i>
tawiniwini	<i>Gaultheria antipoda</i>
ti kouka	<i>Cordyline australis</i>
titoki	<i>Alectryon excelsus</i>
toetoe	<i>Cortaderia fulvida</i> and/or <i>C. toetoe</i>
totara	<i>Podocarpus totara</i>
tradescantia	<i>Tradescantia fluminensis</i>
turepo	<i>Streblus heterophylla</i>
turutu	<i>Dianella nigra</i>
tutu	<i>Coriaria arborea</i>
waewaekoukou	<i>Lycopodium volubile</i>
watercress	<i>Rorippa nasturtium-aquaticum</i>
water pepper	<i>Polygonum hydropter</i>
weeping mapou	<i>Myrsine divaricata</i>
wharariki	<i>Phormium cookianum</i>
whauwhaupak, fivefinger	<i>Pseudopanax arboreus</i>
wheki	<i>Dicksonia squarrosa</i>
wheki ponga	<i>Dicksonia fibrosa</i>
white maire	<i>Nestegis lanceolata</i>