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Botany of northern Horowhenua lowlands, North Island, New Zealand

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Abstract The study region covers a farming district with coastal dunes, alluvium and peat, terraces of older sediments and low hills at the foot of the Tararua Range. Small communities of native plant species remain in a diversity of habitats. Four hundred and seventy-eight native and 503 alien taxa are recorded with information on their abundance, distribution and habitat, together with historical notes on the vegetation. It is considered that about 418 of the aliens are fully naturalised.

Keywords forest; wetland; dunes; native flora; naturalised flora; abundance; habitat; history

INTRODUCTION

There are few botanical records of the Horowhenua lowlands. The account of the vegetation of the Tararua Range (Zotov et al. 1939) included the foothills but made no specific mention of the Horowhenua foothills. The most comprehensive early botanical description of the lowlands was by Cockayne (1909) and included an account of dune plant associations of western Wellington. Aston (1910), in an account of native plants of the Wellington Province, made reference to plants in Otaki. Some early settlers and visitors described salient features of the local vegetation, but in little detail. Later botanists collected specimens and recorded plant localities in the region.

My study began in earnest in 1941 after the formation of the Levin Native Flora Club, a group of people anxious to extend their knowledge of native plants. Botany Section, later Botany Division, DSIR, under Dr H. H. Allan, had recently been established in Wellington, and Wellington Botanical Society had just been formed. Members of these groups shared activities, and Botany Division members and others provided instructive programmes and accompanied the clubs in the field. By 1950 it was apparent that some plants seen earlier were becoming lost. My early recollections and notes on the native plants from 1929, and records of the naturalised plants from the 1950s, provide the basis for this account of the wild plants of the Horowhenua lowlands.

THE ENVIRONMENT

Horowhenua is a region on the western margin of the Wellington Province (Fig. 1). The northern Horowhenua lowlands covered in this study are centred on the town of Levin (Fig. 2). They extend south from Tokomaru and the lower reaches of the Manawatu River to include the banks of the Otaki River as far upstream as the Otaki Forks and a little beyond in the Waiotauru valley. The eastern margin runs along the lower slopes of the Tararua Range mostly below 350 m. From the eastern margin the land slopes down the lower flanks of the Tararua Range and marine terraces to the alluvial plain and the belt of coastal sand which created Lakes Horowhenua and Papaitonga.

On the moderately steep slopes of the Tararua Range the soils are thin, friable or granular silt loams. Pockets of rolling land have a heavy coating of volcanic ash. Much of the native forest has been cleared from the hills and replaced with low quality pasture and radiata pine plantations.

The terraces sloping gently from the greywacke uplands are formed of marine deposits of silt, sand and gravel, and are capped with loess. In parts, particularly near Tokomaru and Shannon, they are

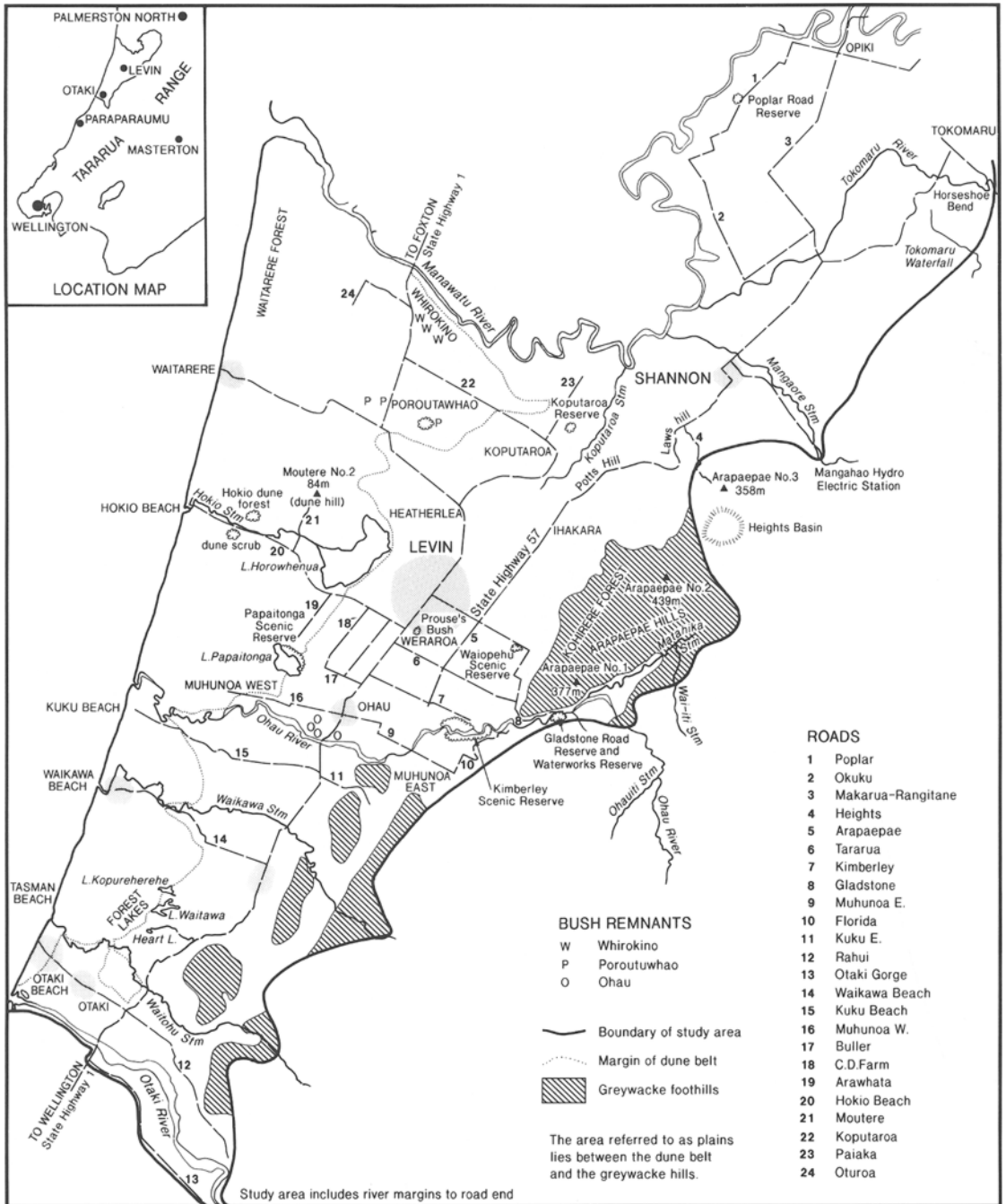


Fig. 1 Map of the northern Horowhenua lowlands. The eastern boundary is mostly under 350 m above sealevel. The plain (terraces, alluvium, and peatland) is bordered by the dune belt on the west and the greywacke hills to the east.

deeply dissected by flat-bottomed steep-sided valleys. Gravel is carried down those streams which have headwaters in the greywacke mountain range. Sandstone outcropping on the western margin from Koputaroa to Otaki is formed from windblown sand deposited much earlier than the coastal sands. Soils of the terraces are silt loams requiring topdressing and drainage for satisfactory sheep and cattle farming, dairying, and cropping.

The Ohau and Otaki Rivers, and the large streams between them, deposit large quantities of gravel from the Tararua Range on their immediate flood plains. Further from the streams on lower land, finer sediments form sandy loams and silt loams requiring drainage to realise their full potential for intensive farming and horticulture around Levin, Ohau, Kuku, Manakau, and Otaki. The extensive Makerua swamp near Opiki created peaty soils which are now mostly drained for cropping and pastoral farming.

Sand from the prograding shore has blown inland to form a belt about 6 km wide but reaching 11 km wide at one point. The character of the sand deposits depends partly on time since stabilisation, the oldest generally being further inland. The dune sands near the beach are thinly vegetated with spinifex (*Spinifex sericeus*) and marram grass (*Ammophila arenaria*). Old sand has adequate topsoil to support poor pasture, tree lupin (*Lupinus arboreus*), and bracken fern (*Pteridium esculentum*). Further inland on more rolling topography the black topsoil is up to 30 cm deep, less erodable, and carries drought-prone pasture of better quality with fewer shrubby weeds.

Transient sand plains near the shore with a partial cover of small rhizomatous herbs become invaded by *Leptocarpus similis* and *Scirpus nodosus*, and later by toetoe (*Cortaderia toetoe*) and tall fescue (*Festuca arundinacea*) which more effectively annihilate the small herbs. Damp parts sheltered by toetoe are invaded by *Eleocharis acuta* and *Potentilla anserinoides*. Older plains carry pasture that requires drainage where the water table is high. On the low-lying plains extensive peat swamps of flax (*Phormium tenax*), and patches of semi-swamp have been more difficult to drain for farming and retain some native vegetation.

In this paper the three major geological zones are referred to as the foothills (of which the Arapaepae hills are a major part), the plain (which includes terraces, alluvium, and peatland), and the dune belt. These are shown in Fig. 1 in a general way only

because of the complex interfingering of their boundaries.

Horowhenua has a moist, windy climate with warm summers and mild winters. Figures quoted below are from New Zealand Meteorological Service (1983). The mean annual rainfall is 899 mm on the coast at Hokio and 1120 mm at Levin. At Levin, February is the driest month with 70 mm of rain, and July the wettest with 116 mm. Mean temperatures in these months are 17.4°C and 9.1°C. Air frosts occur on 10.7 days per year between April and October (28.4 at Waitarere and 22.0 at Hokio). Sunshine hours are 2054 per year. Wind run is less than in districts to the north and south of the study region. West to north-west directions prevail. Dry spells are not a regular feature but the 1969–70 drought had effects on native forest similar to those near Palmerston North reported by Atkinson & Greenwood (1972). In this and other droughts, gaps caused by the death of trees exposed the forest interior to further drying winds and windborne salt. A series of long, hot summers in the 1980s have caused the ageing forests of the plain to deteriorate considerably. The water table on parts of the dune belt and plain buffers the effects of drought to some extent. On the coast some communities of plants are obliterated by moving sand in dry periods. The climate of the region is reviewed by Coulter (1966). Zotov et al. (1939) mention the devastating 1936 gale.

THE NATIVE VEGETATION

Horowhenua lowlands, like many other parts of New Zealand, received little early attention from botanists and there were only brief accounts of the vegetation by other visitors. Sawmilling from the 1840s, and drainage from the 1890s, changed the face of the land. Sand country vegetation remained intact a little longer because it was less exploitable and contained habitats not so readily colonised by alien plants. An attempt is made here to construct an image of the early plant cover, to record the changes, and to describe the scant relics of vegetation of the sand country, the wetlands, and the forests. In this paper, forest is mostly referred to as bush, the vernacular for native vegetation over 4 m tall containing little or no *Kunzea* or *Leptospermum*. Where the canopy is fairly open the term light bush is used.



Fig. 2 Aerial view of the town of Levin and environs. The Ohau River leaves the Taranaki Range and forms a large gravel fan (centre) at the end of the low, cleared Arapaepae hills (left). Levin lies on a marine terrace. Lake Horowhenua is ponded by sand dunes in the foreground, and swamp vegetation has developed on its margins. Whites Aviation. May 1951.

Vegetation of the sand country

For hundreds of years before the advent of white settlers in the 1840s the sandy coastal strip was inhabited by Maori tribes, who must have utilised and modified the coastal vegetation, particularly the flax, toetoe, raupo (*Typha orientalis*), manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*), and bracken fern. Pingao (*Desmoschoenus spiralis*), spinifex, *Coprosma acerosa*, tauhinu (*Cassinia leptophylla*), shore bindweed (*Calystegia soldanella*), *Tetragonia trigyna*, and *Scirpus nodosus* all helped to clothe and stabilise the littoral dunes (foredunes) at that time. The plants observed in my life time are some guide to the vegetation of the past.

Wet banks beside the estuaries have *Scirpus caldwellii*. In some places there is *Juncus maritimus* var. *australiensis*. Adjacent wet flats have *Scirpus pungens*, sometimes *Lilaeopsis novae-zelandiae*, *Limosella lineata*, and always much *Triglochin*

striatum, the estuarine form of *Selliera radicans* (Ogden 1974), and *Samolus repens*. This is the habitat of *Leptinella dioica* ssp. *monoica*, a sub-species confined to estuaries from the Manawatu River to the Makara Stream near Wellington. Not by any means plentiful, the plant is easily crowded out, but springs up where there is no competition. Where the ground is clear, there may be runners of *Ranunculus acaulis*, *Schoenus nitens* var. *nitens*, *Apium prostratum* (mainly the more lax form), some *Lobelia anceps* and much *Scirpus cernuus*, its form differing with habitat conditions. *Epilobium billardioreanum* ssp. *billardioreanum* formerly at Hokio seems to have disappeared. Ohau and Waikawa estuaries have drifts of *Mimulus repens* and rather small salicornia (*Sarcocornia quinqueflora*). Various other chenopods abound at all high tide levels where, except at Hokio, there are bushes of *Plagianthus divaricatus*. Where the ground surface is becoming

drier, drifts of *Carex pumila* help to anchor the sand, the ripe fruit dropping and germinating copiously after rain. Low plants on more sheltered flats are *Ranunculus acaulis*, *Gunnera dentata*, the dune form of *Selliera radicans*, *Epilobium komarovianum*, and some rather inconspicuous sedges such as *Eleocharis neozelandica* and small moss-like tufts of *Scirpus basilaris*.

Hollows east of these littoral dunes are constantly changing and from 1940 to the 1960s carried a host of low sand plants of a great many species, some bordering temporary or permanent lagoons. *Ophioglossum petiolatum* is a notable plant of such a situation (Brownsey 1985). Drier flats had manuka, kanuka, matagouri (*Discaria toumatou*), *Pomaderris phyllicifolia* var. *ericifolia*, *Pimelea arenaria*, *P. prostrata*, *P. tomentosa*, *Vittadinia australis*, *Raoulia hookeri*, *Linum monogynum*, and many terrestrial orchids. There were the grasses *Zoysia minima*, danthonia (*Rytidosperma* spp.) and *Microlaena stipoides*, with rushes and sedges, and colonies of *Leptocarpus similis*. *Libertia peregrinans* covered the ground in large patches, and there were occasional plants of *Spiranthes sinensis* ssp. *australis* on damp flats, and drifts of *Sebaea ovata* where the vegetation was sparse. Tufts of *Austrofestuca littoralis* were conspicuous on the damp flat beside Hokio estuary. Many of these have disappeared or become rare (see annotated species list for details).

On the older dunes the occurrence of tree and shrub species can be assumed from Maori place names (Adkin 1948) and from remnants of light forest and scrub growing on ridges and flats up to recent times. Among species noted in and near Hokio dune forest (Fig. 1), only a small remnant of a much larger area of bush, are kowhai (*Sophora microphylla*), totara (*Podocarpus totara*), matai (*Prumnopitys taxifolia*), miro (*P. ferruginea*), rewarewa (*Knightia excelsa*), three species of *Nestegis*, akeake (*Dodonaea viscosa*), lancewood (*Pseudopanax crassifolius*), cabbage tree (*Cordyline australis*), *Olearia paniculata*, and shorter species such as *Corokia cotoneaster*, mingimingi (*Cyathodes fasciculata*), *C. juniperina*, and *C. fraseri*. The mistletoes *Ileostylus micranthus* and *Korthalsella salicornioides* have been seen here too. Among the numerous orchids inhabiting dune forest and scrub are *Pterostylis alobula*, *Corybas trilobus*, *C. aconitiflorus*, *Acianthus fornicatus* var. *sinclairii*, *A. reniformis*, *Drymoanthus adversus*, and the compact form of *Earina mucronata*. The two latter species may now have vanished. *Corybas aconitiflorus* and *Acianthus reniformis* disappeared

from Hokio in the 1960s after protective shrubs (*Cyathodes juniperina*) and moss around them were killed by drought.

Subfossil wood of totara has been found on a damp flat, and in 1922 the Manawatu River near its mouth exposed 40 or 50 stumps in situ, identified tentatively as Hall's totara (*Podocarpus hallii*), kanuka, and a species of *Nothofagus* (Adkin 1948). More recently a bole of matai was exposed about 4 m below the surface of a dune during road alignment for a bridge over Hokio Stream. It was lying on clay over which water was trickling. Buried fruits of karaka (*Corynocarpus laevigatus*), a species believed to have been introduced into the region by Maoris for food, have been found at various places amongst the dunes, even just inland from the littoral dunes. It was a common tree beside the major lakes. The largest karaka tree is beside Waikawa Beach Road (Adkin 1948). The trunk bore Maori dendroglyphs up till about 1970 when the bark healed over. Adkin recorded giant northern rata (*Metrosideros robusta*) on the south end of Lake Horowhenua, and noted the place name Nga Rata on a dune salient west of Manakau.

Parts of the dunes were grassy. In 1856 Hector McDonald settled at Hokio at a time when a coach service travelled along this sandy coast twice weekly between Wellington and Wanganui. The horses were changed and rested near stream mouths. R. A. McDonald, son of Hector, and a co-author (McDonald & O'Donnell 1929) told of a grassed area beside the mouth of the Hokio Stream, now just a patch of loose sand. They also stated "... the narrow strip of grassed sandhill country for an average of some two miles in width followed the coastline from Manawatu to Otaki, and lying between that and the mountain tops was an unbroken stretch of bush". The estimated width of the sand hills suggests that the eastern flank of the dune belt was more forested than we know it today. This observation is borne out by the position of forest remnants and stands of trees. Some kahikatea trees (*Dacrydium dacrydioides*) growing there would have been in swamps. Some patches of bush at Poroutawhao and Whirokino (Fig. 1) seem to owe their persistence to small springs in the sand.

In describing grassed sandhill country, McDonald and O'Donnell elaborated "... easy grassed hills, not over clean perhaps, there being whole ridges covered with fern as high as a horseman, and tutu of treelike dimensions... On the grassed flats, or many of them, the flax and toetoe grew high in sheltered places ... Later we cleared much of the country, felling the tutu

and burning off fern and toetoe, but I am sure that the flats ran less stock thereafter, whilst the destruction of the cover on the ridges aided the breaking up of the sandhills which has so altered the appearance of the country". The tutu referred to is *Coriaria arborea*.

Vegetation of the sand country is in a constant state of flux beside estuaries and on damp sand flats because of drifting sand and changing courses of streams. Until the early 1870s the Ohau River and Waikawa Stream shared a common mouth, a broad channel navigable for nearly 2 km by coastal sailing vessels. In 1852 Thos. Bevan Snr. established a ropewalk at the head of this channel making cordage for ships. A number of mills sprang up to utilise the abundance of flax. After the 1870s, when the Ohau broke a direct channel through to the sea, a broad silt flat remained where formerly the two rivers flowed towards each other east of the littoral dunes. In 1942, when the Levin Native Flora Club visited the flat, it was vegetated by a very diverse native flora which must have been representative of the former vegetation of the damp sand country. A very waterlogged strip had large stretches of *Hydrocotyle hydrophila* and *Mimulus repens* with *Myriophyllum pedunculatum* at the margin of a shallow drain. The sward on damp sand contained *Mazus pumilio*, *Pratia perpusilla* and *Gunnera prorepens* with two colour forms of drupe, yellow and red, growing in intertwined colonies. More open damp sand was being actively colonised by *Gunnera dentata*, *Selliera radicans*, *Samolus repens*, *Limosella lineata*, *Ranunculus acaulis*, *Gratiola sexdentata*, *Glossostigma elatinoides*, *Lilaeopsis novae-zelandiae*, *Pratia perpusilla*, and a number of rushes and sedges. Two small lagoons had *Ranunculus amphitrichus*, *R. macropus*, *Myriophyllum propinquum*, and *M. triphyllum*. They were particularly rich in the duckweeds *Lemna minor*, *Spirodela punctata* and *Wolffia australiana*. *Leptinella dioica* ssp. *monoica*, *L. dispersa*, *L. squalida* and *Ophioglossum* sp. (presumably *O. petiolatum*) have all been found there. *Matagouri* and *Pernettya macrostigma* grew on a dry dune nearby.

Exotic plantations at Waitarere have provided a habitat for native plant species which may have grown in native forest in the region. Planting began there in 1948 to stabilise drifting sand, and the forest was not logged for 30 years. During this time an interesting flora developed on the forest floor, almost exclusively of fungi, ferns, and orchids. Ferns growing under pines and not seen elsewhere in the region were terrestrial *Asplenium flaccidum* ×

oblongifolium where both parents were plentiful, *A. terrestre* ssp. *terrestre*, and another tentatively identified as *A. terrestre* ssp. *maritimum*. Ferns occurring in some other places as well were *A. bulbiferum* × *flaccidum*, and extensive sheets of *A. flabellifolium* grew in all parts of the pine forest. *Gastrodia sesamoides* grew here and on a damp sand flat at Hokio. Under *Cupressus macrocarpa* there was a small colony of the terrestrial form of *Lycopodium varium*, a form not seen elsewhere in the region.

Wetland vegetation

Wetland was very extensive. The dunes caused ponding of water on their landward side where they interfingered with swamps extending from the lakes to the north-east across to Opiki and Tokomaru where the Makerua swamp was periodically flooded by the Manawatu River.

Buick (1903) gave a glimpse of the vegetation along the shores of the Manawatu River as noted by the first European colonists. It had been the intention of the New Zealand Company to establish a town at Paiaka on the river bank (near the present Koputaroa). In 1842 Kebbell brothers commenced the building of a sawmill to utilise the timber which grew so luxuriantly along the river banks for 50 km. The settlement of Paiaka became a trading post. Coastal schooners were able to sail up the river to trade with the Maoris and take pigs, potatoes, wheat, and flax to Wellington. Rope making was carried out beside the river. In 1840 a small cutter of 33 tonnes was built 2 km from the river mouth. This is within the dune belt where totara would be growing. Matai would also have been there. Two more vessels of 44 tonnes were built in 1851–52 for the local trade. Buick states "The staple product of the district in the early days of European settlement was flax ... The greater part of the flax was used for wool lashing in Australia ... There was considerable demand for large and small cordage ... used for running lines for whalers and small craft".

The town of Paiaka, probably on both sides of the river, had a number of reasonably substantial buildings by 1855 when a severe earthquake twisted and wrenched them and caused the settlement to be abandoned. The forests along the river bank would have largely consisted of kahikatea and pukatea (*Laurelia novae-zelandiae*) with some rimu (*Dacrydium cupressinum*) as well as smaller trees. It appears that kowhai was plentiful, also *Hoheria angustifolia* and cabbage trees. Raupo grew where flood water ponded behind the levees.

The Makerua swamp had earlier been a forest, but was mostly filled with raupo when the first attempts at drainage in the 1890s unexpectedly promoted flax which became the basis of a large industry. This declined soon after World War I because of low prices for fibre and the incidence of yellow-leaf disease. Land was then further drained (some of it over-drained) for dairying and cropping of potatoes and onions. Tree stumps still become exposed as the peat decomposes and subsides. The semi-swamp forest is now represented by kahikatea trees standing alone in paddocks except in the Poplar Road reserve where an aggregation of trees and associated plants has been fenced off. As well as having small-leaved shrubs, sedges, ferns and some alien plants, there is regeneration of kowhai and *Hoheria populnea* ssp. *lanceolata*, both much more plentiful in the past. There is also some *Carmichaelia flagelliformis* var. *corymbosa*. Species are listed in Esler (1962) under SF98. At Koputaroa a small remnant of very depleted bush has been set aside as a wildlife reserve. It contains mainly free-standing kahikatea, a few mature kowhai and *Hoheria angustifolia*. Of the 31 native species counted most are represented by very few individuals. However, the kahikatea, pukatea, kowhai, *Hoheria angustifolia*, kaikomako (*Pennantia corymbosa*), putaputaweta (*Carpodetus serratus*), tarata (*Pittosporum eugenioides*), *Fuchsia perscandens*, and *Coprosma propinqua* show the kind of bush which was formerly present.

Downriver from Paiaka, amongst consolidated dunes, there are local seepages at Poroutawhao and Whirokino with forest remnants. The floras of these small patches of forest are similar to the Koputaroa reserve but are richer because some are fenced and some contain dune species such as ngaio (*Myoporum laetum*), titoki (*Alectryon excelsus*) and *Tetragonia trigyna*. A remnant at Poroutawhao which was fenced about 1970 has filled the understorey with smaller trees, tall shrubs and ferns. Of the 56 species within the bush, there are only six aliens. In other remnants *Pterostylis nana*, *Caladenia catenata*, *Viola lyallii*, and *Myosotis forsteri*, have been recorded but are now all gone. Some *Schizeilema trifoliolatum* still persists.

There are still some relics of flax swamps. Species associated with flax vary according to local conditions. *Gahnia xanthocarpa*, *Carex secta*, and toetoe with some cabbage trees are the conspicuous large monocots. Some *Astelia grandis* grows where the water level is constant. *Hebe stricta* and rather spindly manuka are common. *Coprosma tenuicaulis*

and karamu (*C. robusta*) are also there, the latter hybridising with *C. propinqua*. The swamp lawyer (*Rubus australis*) is plentiful in some places. The native pink *Calystegia sepium*, common near the coast, is being smothered by the alien *C. sylvatica*. *Cyperus ustulatus*, *Olearia solandri*, and *O. virgata* are present on somewhat drier margins. The fern *Hypolepis distans* grows on exposed peat. Forms of *Hydrocotyle novae-zeelandiae* are common. In some places, perhaps more commonly in the past, *H. pterocarpa* and *Nertera scapanioides* have been found. *Urtica linearifolia*, once common, is now quite rare. *Epilobium pallidiflorum* is conspicuous when flowering amongst flax at the water's edge.

At Hokio, a seasonally wet area has flax and toetoe, *Eleocharis acuta*, *E. gracilis*, *Hydrocotyle novae-zeelandiae*, *Centella uniflora*, and a considerable amount of *Potentilla anserinoides*. Tall fescue usually invades seasonally waterlogged situations such as this. *Cyperus ustulatus* can persist when other swamp plants are destroyed. After the first clearance, and before adequate draining, blackberry (*Rubus fruticosus*) covered vast areas in the 1920s and 1930s in the Arawhata and Poroutawhao districts where there are now fertile pastures.

Sphagnum bogs occur at the eastern boundary of the sand country, and in open sunny situations in the foothills. Beside Heart Lake, which lies within a circle of grassed or forested sand ridges, the southern shore abruptly borders the deep water with a platform about 6 m wide. This waterlogged ledge developed a sphagnum community first seen by me in 1928. It persisted almost unchanged for 30 years before being destroyed by cattle. The moss was full of *Drosera binata* and some tall, spindly manuka which sheltered various orchids, notably cream-flowered *Caladenia catenata*. There was some *Gaultheria antipoda*, *Gleichenia microphylla* and *Lycopodium volubile*, and a small cluster of *Tmesipteris* sp. growing upright amongst the moss and litter. Lancewood trees, when last seen about 1970, were overtopping the manuka. Some flax and cabbage trees with a little burr-reed (*Sparganium subglobosum*) were conspicuous plants on the western shore where cattle had formed a track to the water.

Other areas of sphagnum, mostly small patches, occur in the foothills. In some, *Pratia angulata* is prevalent but does not flower much in this situation. Elsewhere *Epilobium chionanthum* weaves rather inconspicuously amongst the moss. At flowering time the bronze shoots stand erect bearing showy

white flowers. *Eleocharis acuta* and *E. gracilis* are plentiful, and *Leptinella tenella* is present in small amounts.

Forest

A majestic forest of giant timber trees stretched from the lakes to the mountains. Early observers described the trees as having boles "100 feet to the first branch". Kahikatea grew in semi-swamp forest near the Manawatu River, west of Manakau and around the lakes; totara on the terraces; matai often associated with totara on the stony terraces and on the gravel plain around Levin; and rimu on the fertile terraces north and east of Levin, especially on the foothills. Giant northern rata, plentiful on the plain and foothills, seems to have been appreciated mainly for firewood. In the early days of the building of the Wellington–Manawatu railway, around 1880, short lengths of timber were stockpiled every 3 km as fuel for wood-burning locomotives. Any available timber was used for this, including matai. Stands of kohekohe (*Dysoxylum spectabile*) were frequent where not overshadowed by taller trees on or by the western base of the foothills and by the lakes. Tawa (*Beilschmiedia tawa*) was plentiful, and dominant in some places.

By the 1890s the destruction of the bush was actively and ruthlessly pursued. From north of Levin to Ohau the two largest sawmillers, Bartholomew and the Prouse brothers, milled alternate strips from the railway line to the lower hills. Other millers worked similarly south of Ohau. The Government purchased 360 ha for the town and rural sections of Levin for sale to settlers in 1888, a condition being that the settlers must clear their sections and build on them within two years.

Clearings had earlier been created by Maori occupants, some as places of refuge, others mostly near lakes and streams for cultivation. The Weraroa clearing occupied practically the entire south-west quarter of the present town of Levin. This area was the subject of a letter to the Levin "Chronicle" (8.8.53) by R. A. Prouse whose people, the sawmillers, came to Levin in 1891. He recounted the extent of the burn and its origins – "The following information was supplied in 1892 or 1893 by the late Mrs J. C. Retter, (she) ... said that the name originated from a great fire in the district. Believed to have been started by lightning, the fire spread from a rata tree to several neighbouring ratas. It extended over a considerable acreage and all undergrowth was destroyed before the fire ceased. The ratas continued to burn until there was none left, and the duration of

the fire could have run into years, this being not unusual with burning rata trees. From this the name is derived, "wera" pertaining to the fire, and "roa" long. When did this fire occur? The years can only be estimated by the length of time it takes for nature to cover such scars. In the late 1880s this area was growing native grasses, and flax, tutu, bracken, stunted manuka and a little koromiko". The burn had barely spilled over Queen Street, but veered to its southern boundary beside Hokio Beach Road, leaving a fairly broad strip of bush at the margin of Lake Horowhenua.

Bush remnants at the southern side of Hokio Beach Road near the town end, as observed in 1974, contained mature examples of tawa, rewarewa, titoki, totara, ngaio, mahoe, kanuka, mapou (*Myrsine australis*), kohuhu, narrow-leaved maire (*Nestegis montana*), *Lophomyrtus* hybrids, *Coprosma areolata*, *C. rhamnoides*, cabbage tree, and mamaku (*Cyathea medullaris*). The trees were all young enough to have grown up since the 1880s and would be in the area affected by the Weraroa burn.

The other burn, Te Wera Whango, was on a low gravel terrace adjoining the Ohau River between the river and the crossroads at Ohau. There seems to be no historical information about it apart from the name.

Significant smaller trees of the forests of the plain were tawa, karaka, mahoe (*Meliccytus ramiflorus*), rewarewa, black maire (*Nestegis cunninghamii*), white maire (*N. lanceolata*), hinau (*Elaeocarpus dentatus*), pokaka (*E. hookerianus*), and nikau palm (*Rhopalostylis sapida*). More open forest and forest margins had kowhai, titoki, ngaio, pigeonwood (*Hedycarya arborea*), kohuhu (*Pittosporum tenuifolium*), and tarata. Open swamp was the habitat for cabbage trees while swamp maire (*Syzygium maire*) grew with kahikatea and pukatea. The chief trees of second growth after milling have been tawa, titoki, and karaka, with some rewarewa, hinau, lancewood, mahoe, and many *Coprosma* spp. and other small-leaved shrubs which had been there formerly, though now in less diversity.

The interior of the tall forest, avoided for the most part by the early Maori, was dark and gloomy. Among the many vines were tangles of supplejack (*Ripogonum scandens*), kiekie (*Freycinetia baueriana* ssp. *banksii*), and bush lawyer (*Rubus cissooides*). (Many more kinds of climbers clung to the forest margins and trees in open forest – *Passiflora tetrandra*, and species of *Clematis*, *Muehlenbeckia*, and *Parsonsia*.) Epiphytes abounded – the massive shining broadleaf (*Griselinia lucida*), fans of

Collospermum hastatum and *Astelia solandri*, orchids and ferns, particularly filmy ferns. Ground ferns, tree ferns, and the nikau palm were plentiful in the more open parts.

Forest remnants preserve some of these features. Papaitonga bush has a forest of depleted kohekohe, titoki, tawa, rewarewa, ngaio, hinau, and karaka on the sandstone spurs (Duguid 1985a). Remnant semi-swamp forest of kahikatea, pukatea, swamp maire, and kiekie grow in the gullies, though much of the swamp maire died in the 1980s when the water table fell. An endangered plant in Horowhenua is *Astelia grandis* growing amongst flax, toetoe, and *Gahnia xanthocarpa*. There is a lake margin community of raupo and tall sedges, including two good colonies of *Baumea articulata* not noted elsewhere in the region. A feature of this bush is the luxuriance and diversity when viewed from the gullies. Numerous vines, especially the red rata vine (*Metrosideros fulgens*), and kiekie swathe the tall trees almost to their tops, and there are vigorous epiphytes, notably shining broadleaf, *Pittosporum cornifolium*, and *Collospermum hastatum*. Unfortunately Papaitonga bush since the 1870s is not so rich in fern species.

Kimberley scenic reserve consists of two narrow strips of bush remnants bordering the Ohau River. It is on several levels of river terrace, much of it on the former floodplain, and some as narrow bluffs at a higher level. The access from Kimberley Road runs along a narrow, cliffed terrace with bush containing tawa, rewarewa, hinau, titoki, and small trees and shrubs, including much kawakawa (*Macropiper excelsum*), *Coprosma grandifolia*, *Melicope simplex*, pigeonwood, mahoe, and kaikomako. There are some depleted kohekohe stands. Most notable in this area is a mixed-age group of *Mida salicifolia*. The only protection from wind is provided by tall bracken, pate (*Schefflera digitata*) and five-finger (*Pseudopanax arboreus*), with tangles of vines especially *Muehlenbeckia australis*, red rata vine, *Passiflora tetrandra*, and two species of *Parsonsia*. On the lower terrace are totara trees. *Collospermum hastatum* and shining broadleaf are epiphytic on marginal trees, with occasional *Astelia solandri*, the various perching ferns associated with them, and some *Earina* orchids, mostly *E. mucronata*. A damp, sheltered area near the river has kahikatea and pukatea with drifts of the fern *Diplazium australe*. There are various smaller trees including rare ribbonwood (*Plagianthus regius*) which was formerly plentiful.

A fenced area of drier bush is almost entirely composed of totara with massive short trunks, and a closed canopy that discourages ground plants. On

the warm margins of this stand mahoe and *Dicksonia squarrosa* have epiphytic shining broadleaf and northern rata. By the river a mixed collection of native trees had their horizontal branches obscured by heavy growth of *Earina mucronata*, with *Collospermum hastatum* and associated ferns. A splendid northern rata at the riverside has carried a very diverse collection of epiphytes, now reduced to shining broadleaf, *Collospermum hastatum* and *Asplenium polyodon*, all well able to withstand the increasing exposure as the supporting tree becomes taller. This rata developed on a mahoe, and both trees grew together for a number of years. Several large rotting rata stumps testify to the past presence of giant rata trees. A rata log was found under about 10m of gravel further upstream.

On a low gravel terrace further downstream was a conspicuous stand of mature beeches (*Nothofagus* spp.). They were mixed hybrids of hard beech (*N. truncata*) and black beech (*N. solandri* var. *solandri*) with some signs of red beech (*N. fusca*) in their parentage. They died in the 1940s when a flood left a pool at their roots. A similar collection of beech trees not far away, growing with totara trees on an undercut bluff, has been reduced to a few trees by cattle. The stand was noted by the Maoris who gave the knoll the name of Puketowai. When flowering, the red staminate flowers gave it a red glow conspicuous from Kimberley Road a kilometre away.

Waiopahu Scenic Reserve, on the margin of Koputaroa Stream near the Arapaepae hills, is a relic of a rimu-northern rata forest (Duguid 1985c). The 1936 gale brought down the last northern rata. Now mounds of rotten wood mark the places where giant trees grew. One moribund rimu remains. Tawa abounds, and rewarewa and hinau are conspicuous on the droughty gravel on the northern edge. Smaller trees include mahoe, lancewood, five-finger, pate, kaikomako, *Streblus heterophyllus*, kawakawa, hangehange (*Geniostoma rupestre* var. *ligustrifolium*), and species of *Coprosma*, notably *C. grandifolia*. The swampy southern side has kahikatea, pukatea, and a little swamp maire. In parts of the reserve which are not too shaded, fern species are plentiful including very tall *Lastreopsis hispida*, and epiphytic plants of *Asplenium bulbiferum* × *flaccidum*. *Elatostema rugosum* grows beside the stream, and tree ferns and nikau palms spring up in the light pools. Among the smaller plants are *Pratia angulata*, *Cardamine debilis* (two forms), drifts of *Hymenophyllum demissum*, and patches of *Hydrocotyle* spp. Some native trees and shrubs from other districts have been planted here, and there are

infestations of banana passionfruit (*Passiflora mollissima*) and Japanese honeysuckle (*Lonicera japonica*).

Prouse's bush was preserved as a sample of matai forest. When the Prouse brothers came to Levin in 1891 they built a homestead and mill just east of Levin railway station in a stand of giant matai, some of which was donated to Levin Borough. Over the years the large trees died and huge matai stumps remained. There have been many other trees, especially tawa and other low-growing species, but in the now dry and windswept remnant there has been little regeneration. Latterly the shrubs are mostly kawakawa and a few species of *Coprosma*. A large sheet of *Bulbophyllum pygmaeum* was noted in the 1940s and a patch of *Hymenophyllum flexuosum* in 1970. They were killed by drought. Weeds have taken hold, chiefly *Robinia pseudacacia*, wandering Jew (*Tradescantia fluminensis*) and *Cobaea scandens*. Many ferns which thrived on the matai stumps have fallen victim to the ubiquitous wandering Jew.

There used to be a conspicuous stand of semi-swamp forest at the northern end of Lake Horowhenua. About 1931 the lake was artificially lowered, killing most of the trees. The shallow lake embayment in the vicinity has become a flax swamp with toetoe and many other associated species.

Three remnants of low totara-matai forest north-west of the Ohau railway station are now much reduced by farm animals (Duguid & Druce 1966). Other trees noted here were titoki, lancewood, kohuhu, mahoe, kaikomako, cabbage tree, ribbonwood, kowhai, and three species of *Nestegis*. When I first saw these remnants the trees were small, possibly being regeneration after milling or a fire. The composition was unusual because of the number of small-leaved shrubs – *Coprosma* spp., *Pseudopanax anomalus*, *Melicytus micranthus*, *Streblus heterophyllus*, and a number of juvenile forms of large trees. *Ileostylus micranthus* was common here, also *Botrychium australe* and *B. bifforme*. Nearby thick litter from predominantly kanuka scrub encouraged a selection of terrestrial orchids and herbaceous creeping plants. The development of a particularly varied terrestrial flora was cut short by grazing animals. The bush contained the only recorded *Doodia squarrosa* in the district. *Urtica ferox* and matagouri were growing near some low totaras, while near the river amongst very tall mixed trees were very large coils of *Rubus cissoides* and *Passiflora tetrandra* still sending out shoots when last seen. A small patch of native trees and

shrubs beside the railway bridge contains the only specimens of *Metrosideros colensoi* ssp. *colensoi* to survive into modern times, though there are plenty of places where they probably grew formerly.

The nature of the early forests of the foothills is known with less certainty, but there are more community relics, albeit rather degenerate, that indicate the range of species. The emergent trees were undoubtedly rimu, miro, kamahi (*Weinmannia racemosa*), and northern rata over a canopy of tawa with some hinau, white maire, black maire, and rewarewa. Hall's totara also grew on these hills. Nikau palms have been abundant, and still are in the damaged or fairly open bush. Conspicuous in regenerating bush of hillsides are rewarewa, hinau, and heketara (*Olearia rani*) with groves of mamaku and *Dicksonia fibrosa* grading to *D. squarrosa* in areas of seepage. Another tree fern, *Cyathea smithii*, favours margins of hilltop bush. Totara and northern rata find habitats on rocky hillsides with shrub-size kamahi blooming and seeding around the steep banks beside the river. *Brachyglottis kirkii* perch high in the trees, and there are festoons of red rata vine and *Clematis paniculata* and other climbers. *Astelia fragrans* and Prince-of-Wales feather (*Leptopteris superba*) line the shady banks of the Makahika valley. Ferns of many kinds have been abundant including filmy ferns, mainly epiphytic.

The broken terrain provided a diversity of habitats. On stream banks grew *Fuchsia excorticata*, *Jovellana repens*, *Cordyline banksii*, *Carmichaelia odorata*, heketara, and more locally *Olearia cheesemani*. Exposed bluffs had white- and pink-fruited snowberry (*Gaultheria antipoda*) and long streamers of *Lycopodium volubile* and *L. scariosum*. There are likely to have been major changes since the observations were made some years ago.

Gladstone Road reserve is little more than a bathing pool and picnic spot beside the Ohau River by the outfall of Makaretu Stream and just within the foothills. The bush is open and sparse. One of the two pukatea trees has no flanges, indicating a deposit of gravel around its base. Some shorter tree species also grow there. Epiphytes and vines are plentiful. An unusual form of *Metrosideros diffusa* seen only here has pale pink petals and pink stamens. The usual form has pale pink petals and white stamens. Adjoining this unofficial reserve to the east, a tract of forest known locally as a waterworks reserve contains rimu, northern rata, kamahi, and small stands of kohekohe above a small area of semi-swamp forest with kahikatea, pukatea, and swamp maire. I recall that at the time of my last visit several

decades ago the forest was in good condition though it had been milled earlier. The giant rata vines annotated under *Metrosideros perforata* grew here.

Only fragments of beech forest grew in the foothills. Photographs by G.L. Adkin about 1914 show “burning of the birch (sic) block, Leighton’s spur”. It appears that this was the steep hillside at the eastern flank of Makahika Stream. “Birch” is interpreted as beech, though there is no indication of which species it would be. Black beech is found at the western end of the lower Otaki Gorge on a steep, more or less undercut terrace, and was seen up to the 1930s associated with red beech on a similar undercut promontory at the confluence of the Ohau River and Ohau-iti Stream. Two stands of hard beech reported by Greenwood (1959) grew in similar conditions in the Ohau and Otaki catchments. Small, present-day stands of red beech on the low hills flanking the Waiotauru valley in the Otaki catchment have been reported to me by I. Cooksley. The beeches recorded earlier in this paper in Kimberley Scenic Reserve are not on the foothills.

THE FLORA

This paper records 424 native species, subspecies, varieties, and hybrids growing in moderate to good numbers, 23 with very low populations, and 29 possibly no longer to be found in the region. Seven other native species growing in a wild or semi-wild state are from other regions. The identity of another 4 cannot be confirmed. Not all the known hybrids in the Horowhenua flora are listed. The 478 native entities (referred to as species for convenience) comprise 93 ferns and allies, 6 gymnosperms, 139 monocots, and 240 dicots.

There are 418 species considered to be naturalised, 40 others existing in limited patches near sources of propagules, a further 24 apparently transitory, and 21 recorded as growing spontaneously but not now to be found. Only 3 of the 418 naturalised species are ferns or fern allies. There are 3 gymnosperms, 86 monocotyledons, and 326 dicotyledons. A comprehensive set of specimens has been deposited in the DSIR herbarium (CHR).

It is difficult to assess the naturalisation status of species which have been observed for a short period or which occur in low numbers. Many aliens which are annotated in this paper are not truly naturalised but at least the record indicates that they have arrived in the region. No mention is made of wildlings which grow sporadically in gardens away from the source

(*Actinidia deliciosa*, *Araujia sericifera*, *Betula pendula*, *Celastrus orbiculatus*, *Dracunculus vulgaris*, *Dendrobenthamia capitata*, *Euonymus europaeus*, *Ribes sanguineum*, *Tecomaria capensis*, *Tolmiea menziesii*, *Vitis vinifera*). Some others establish around parent plants from suckers (*Rhus typhina*), or from other vegetative parts or seeds (*Castanea sativa*, *Lapeirousia laxa*). Others such as *Borago officinalis* tend to be clustered around the place where they originated as garden outcasts. These are not all truly naturalised either. Others had a temporary wild existence after being spilt on the way to the refuse tip – *Iberis* sp., *Iris tingitana* cv., *Ixia maculata*, *Lathyrus odoratus*, *Pericallis ×hybrida*, *Petunia ×hybrida*, *Watsonia marginata*. As well as these there are spillages of farm seeds – oats (*Avena sativa*), barley (*Hordeum vulgare*), wheat (*Triticum aestivum*), maize (*Zea mays*), peas (*Pisum sativum*). There are always a few strays from cultivation which turn up in unexpected places, such as marrow (*Cucurbita pepo*) and pumpkin (*Cucurbita maxima*), and the tamarillo (*Cyphomandra betacea*) seedling found in a small bush reserve.

In the following annotated list of vascular plants a species is assumed to be in moderate numbers and moderately well distributed unless otherwise stated. The study area is regarded as a region, and named localities with undefined boundaries within it are referred to as districts.

The botanical names of native gymnosperms and angiosperms follow the volumes of “Flora of New Zealand”, and some of the revisions outlined in Connor & Edgar (1987). Orchid names follow those of “Flora of New Zealand” Vol. III except for *Caladenia catenata* (Smith) G. C. Druce for *C. carnea*, *Corybas acuminatus* M. Clements et Hatch for *C. rivulatus*, and *C. rivularis* (A. Cunn.) H. G. Reichb. for *C. orbicularis*. The names of ferns and allied plants are those used by Brownsey & Smith-Dodsworth (1989). Volume IV of “Flora of New Zealand” provides names of the introduced dicotyledons and gymnosperms. These species are indicated by an asterisk.

PSILOTOPSISIDA

Psilotaceae

Tmesipteris elongata

Common on tree ferns in the foothills, in semi-swamp forest of the plain and occasionally where this forest extends within the dune belt. A plant 63 cm long was seen in the foothills.

Tmesipteris tannensis

C. A. J. Cockburn reported plants at the foot of a rimu on the Arapaepae hills which he felt were different from the common species. A barren plant, probably of this species, was seen on a mahoe on the foothills east of Ohau. A little group of upright *Tmesipteris* amongst sphagnum on the margin of Heart Lake (Forest Lakes) was seen several times up to about the late 1960s when grazing stock were destroying the vegetation.

LYCOPSIDA

Lycopodiaceae

Lycopodium cernuum

Known to grow in the foothills and on the plain. A few colonies on sandstone banks may no longer exist. An extensive shaded patch on Laws Hill cutting was damaged by roadside trimming and was eliminated by self-sown pines. A small plant on a roadside cutting east of Levin from 1963 also died. First its main root succumbed when the bank became too wet, then drought and smothering grasses killed the remaining rooted branches.

Lycopodium scariosum

Common in the foothills on banks, cuttings and open places, usually with *L. volubile*.

Lycopodium varium

Common in moist bush. The most plentiful form is long, pendulous, and epiphytic – often on tree ferns and *Collospermum hastatum*. It can survive in the open. A plant on the foothills east of the Ohau River in 1930 was 3 m long. Another with 200–300 stems about 1.5 m long grew on nikau and *Collospermum hastatum* beside Otaki Gorge Road in 1964. It disappeared soon afterwards, probably removed for decorations. The short, upright terrestrial form grew under macrocarpa trees at Waitare from 1971 till shaded out in 1976. The short, leafy epiphytic form grows on tree ferns, usually beside streams or in moist bush. Both epiphytic forms sometimes occupy the same trunk, both fertile.

Lycopodium volubile scrambling lycopodium
Formerly common on banks and bush margins on the plain and foothills, now much less plentiful because of road widening and bank trimming. At Heart Lake some scrambled through sphagnum. In response to a request from Botany Division, DSIR, considerable quantities of fertile strobili were collected in 1941 by the Levin Native Flora Club for research into the antiseptic properties of the spores.

Selaginellaceae

**Selaginella kraussiana*

Several small colonies have been noted. Some grows in Waiopēhu Scenic Reserve, beside a mill road in the foothills east of Shannon, and in fenced bush beside Lake Waitawa (Forest Lakes). Becomes rampant in gardens but seems to be contained in these places.

FILICOPSIDA

Aspleniaceae

Asplenium bulbiferum ssp. *bulbiferum*

hen and chicken fern
Widespread and plentiful in light bush and shaded undisturbed places near native bush. Most abundant on the plain. For observations on the development of bulbils see Duguid (1976a).

Asplenium bulbiferum ssp. *gracillimum*

Occasional in bush on the plain, particularly Papaitonga bush. Two forms are present corresponding to *A. bulbiferum* var. *tripinnatum* and *A. bulbiferum* var. *laxum* of Cheeseman (1925) and depicted in Dobbie & Crookes (1951).

Asplenium bulbiferum × *flaccidum*

Throughout the region in good numbers, less common in the foothills. It grows mainly in tall vegetation such as pine forest at Waitare and native bush at Papaitonga, but also seen on roadside banks. It is terrestrial in dry bush, here paralleling the *A. bulbiferum* parent in its habitat. In the foothills where the rainfall is higher, the hybrids more closely resemble the epiphytic parent and, like it, cannot tolerate much wet at the root.

Asplenium bulbiferum × *oblongifolium*

Two plants have been found in light bush, on dry ridges at Hokio and Poroutawhao.

Asplenium flabellifolium necklace fern
Fairly common in the dune belt, in the shelter of native scrub and trees at Hokio and Whirokino, and under pines and macrocarpa at Waitare.

Asplenium flaccidum drooping spleenwort
Plentiful in bush and pine forest throughout. It is very variable in form though usually epiphytic, and may sometimes be terrestrial or rupestral. Some luxuriant terrestrial plants have been seen in Waitare pine forest.

Asplenium flaccidum ssp. *flaccidum* × *hookerianum*

A frond collected from Papaitonga in 1954 may be from this hybrid (P. J. Brownsey pers. comm.).

Asplenium flaccidum ssp. *flaccidum* × *oblongifolium*

Occasional as terrestrial plants in Waitarere pine forest where a frond of a large plant reached 96.5 cm long. A pendulous epiphyte in Kimberley Scenic Reserve noted in 1967 resembled the *A. flaccidum* parent.

Asplenium hookerianum

Grows in dry bush in many places on the plain and in the dune belt. It is rare in the foothills, the habitats being generally too wet for this little fern of dry situations. It often grows on dry banks, and amongst tree roots, especially where the normal undergrowth has been destroyed by grazing stock. It takes on many forms in dune scrub, some of which may be hybrids. A few fit the description of *A. colensoi*.

Asplenium oblongifolium shining spleenwort
Common in warm bush of the foothills and plain, occasional in the dune belt except in pine forest at Waitarere, where it is plentiful. It is terrestrial and epiphytic, often growing on tree ferns and *Collospermum hastatum*.

Asplenium polyodon

Common in bush on the foothills and plain, often on tree fern trunks, and in clumps of *Collospermum hastatum*, also at Waitarere where drainage is provided by rotting branches and by pine litter. Fronds have been measured up to 1.6 m long. Occasionally in tall dune scrub.

Asplenium terrestre ssp. *maritimum*

A specimen without sori collected in 1971 from Waitarere pine forest is tentatively identified as this.

Asplenium terrestre ssp. *terrestre*.

One plant was seen in a damp hollow in Waitarere pine forest in 1987.

Blechnaceae*Blechnum chambersii*

Mostly in the foothills on shaded banks in the bush, sometimes in the open. Some grows on the plain where there are suitable conditions, occasionally in semi-swamp forest of the older dunes.

Blechnum colensoi

Occasional on wet, shaded banks in the bush on the foothills.

Blechnum discolor

Plentiful, often in pure colonies, in open parts of damaged bush, and on bush margins in the foothills. Some grows on damp banks and in ditches on the plain, rarely under pines at Waitarere.

Blechnum filiforme

Plentiful in damp bush on the plain, a little in the foothills. The juvenile form often persists around tree roots in damaged bush.

Blechnum fluviatile

Common in damp bush, mostly beside streams in the foothills, less common now on the plain.

Blechnum membranaceum

Occasional within foothill bush, but in drier sties than those favoured by *B. fluviatile*. Occasional on the plain, and some amongst trees at the foot of Moutere dune hill.

Blechnum minus

Common throughout on swampy ground and muddy stream sides.

Blechnum nigrum

Grows on very damp, shaded banks and streamsides within foothill bush.

Blechnum penna-marina

Grows in cleared sites in many places and diverse habitats – in a pile of boulders in Kimberley Road, on a roadside cutting north of Levin, under a fenceline on unploughed ground at Ohau, under a flax bush beside a lagoon in the dune belt, and in a sphagnum bog in Waitotara valley (Otaki catchment) in the foothills.

Blechnum procerum

Fairly widespread, though not plentiful, in rather open bush and on shaded banks in the foothills. Rare in similar habitats on the plain.

Blechnum vulcanicum

Some on warm banks on the foothills and plain.

Blechnum unnamed (*B. capense* in “Flora of New Zealand” Vol. I.)

Plentiful throughout in flax swamps, on damp banks and cuttings, in ditches, and overhanging foothill streams, often with fronds more than 2 m long.

Doodia media ssp. *australis*

A few plants have been seen under macrocarpa trees at Waitarere. Sporelings, probably of this species, have been seen by a deep drain near Levin, and in a damp shaded place behind a shed at Ohau.

Doodia squarrosa

A cluster grew in damaged bush on a low river terrace at Ohau in the 1940s. Offsets of this plant are still growing in a Levin garden.

Cyatheaceae

Cyathea dealbata ponga, silver tree fern
Common in bush throughout and most plentiful on

the plain. It is an early coloniser after bush is destroyed. Often in shaded ditches in fairly open country.

Cyathea medullaris mamaku
Plentiful on the foothills and plains, rare in the dune belt. It grows on damp banks and sides of ditches, and frequently becomes dominant on cleared hillsides in the foothills. For description of an unusual form of mamaku see Duguid (1985d).

Cyathea smithii
Forming many small groves on bush margins in the foothills. Sporelings are found on the plain, but only in very damp, sheltered sites.

Davalliaceae

Arthropteris tenella
Formerly abundant in every piece of bush on the plain. During a very dry season about 1970 the plants died. Some have come back in Papaitonga bush, in a damp bush remnant at Poroutawhao, and in a few other places on the plain.

Dennstaedtiaceae

Histiopteris incisa water fern
Common in the foothills as a coloniser of disturbed ground in moderate shade, and on the plain on damp bush margins, in damp shelter of buildings and on newly cut drainsides. It grows occasionally on margins of semi-swamp forest in the dune belt. In the Arapaepae hills fronds have been measured up to 183 cm.

Hypolepis ambigua
Fairly widespread and plentiful in a range of habitats – rather open, warm bush, behind sheds, on warm, shaded banks, sphagnum mounds in swamps, and under pines at Waitarere. Some reached 122 cm high on a sandy, shaded bank bordering a swamp.

Hypolepis distans
Occasional at the base of flax bushes in swamps, on peat at the edge of swamps, and on damp rotten logs. A plant was found recently in Levin as an epiphyte on a *Phoenix canariensis*.

Hypolepis rufobarbata
Common throughout in damp bush, but plants mostly small. One in the foothills, however, had a frond 114 cm long.

Leptolepia novae-zelandiae
A few seen in forest on the foothills and plain.

Lindsaea linearis
One very small colony associated with *Raoulia glabra* was seen on a dry roadside bank at Mangaore.

Lindsaea trichomanoides
Small colonies grow on warm banks in bush in the foothills.

Paesia scaberula ring fern
A common problem weed in poor pastures in the foothills, forming extensive colonies. Some small plants grow on damp slopes on the plain, and also amongst scrub on consolidated dunes.

Pteridium esculentum bracken fern
Throughout on bush margins and rural roadsides, but mostly in infertile soil such as disturbed dunes, roadside banks, gravel terraces, and steep hillsides. Bracken provides valuable shelter on bush margins where it filters harsh winds.

Dicksoniaceae

Dicksonia fibrosa wheki ponga
Widespread in forest but common only in the hills. Young plants are found far from sources of spores, e.g., in the dune belt and on the sides of deep ditches. Early photographs show that this tree fern was plentiful near Levin. It is likely that the fibrous trunks were cut for various purposes in the region, such as rat-proofing Maori storehouses and, more recently, for ornamental fences and craftwork. For records of growth of fronds see Duguid (1978a).

Dicksonia squarrosa wheki
Grows in abundance in the foothills in fairly shaded places in bush, on bush margins and following clearance of the bush, especially in seepages, and beside water courses. Groves are very common. On the plain this tree fern grows in all but the driest of bush remnants, on roadside cuttings, streamsides and on the margins of rural drains. In the dune belt a few grow in moist bush, and in Waitarere pine forest.

Dryopteridaceae

Deparia petersenii ssp. *congrua*
A few plants came up in a shaded corner at Levin Horticultural Research Station where a topdressing of Hauraki peat had been used. A plant appeared in a planter box of P. Gardiner's nursery where another species brought from Rotorua was growing (Duguid 1978b).

Diplazium australe
Common in bush on banks, usually of alluvial silt, beside rivers of the foothills and extending out to the plain. It grows also near lakes and on the sides of deep drains. A few grew under trees at Waitarere in 1972 but were later destroyed.

**Dryopteris filix-mas* male fern
The appearance of several plants around Levin since 1988 suggests the possible naturalisation of this species in the region.

Lastreopsis glabella
Common in dry bush of the plain, a few in the foothills and dune belt.

Lastreopsis hispida
Common in forest on the foothills and on the plain, occasional in the dune belt. A plant in Waiopehu Scenic Reserve grew a frond 145 cm long with a blade 71 cm long.

Lastreopsis microsora ssp. *pentangularis*
Occasional in rather dry bush on the plains, some in the foothills. A luxuriant colony beside Heart Lake in 1969 was grazed by cattle and recovered spectacularly when stock were fenced out.

Lastreopsis velutina
There is a colony on a steep, eroded bank of a gravel terrace in a dry, shaded place amongst tree roots in Kimberley Scenic Reserve. A few grow in bush at Whirokino and beside Lake Waitawa.

Polystichum richardii
Common in warm bush throughout, especially near the coast. Frond form varies.

Polystichum silvaticum
Becoming rare in bush remnants and rather open bush in all parts. There are some large plants in a sheltered hollow in pine forest at Waitare.

Polystichum vestitum
Common in the foothills where it grows on forest margins and persists in the open as the bush deteriorates. On the plain sporelings appear on damp banks, margins of ditches, and in shade behind sheds.

Rumohra adiantiformis
Common in the foothills growing on tree ferns and rotten logs. Many grow on *Phoenix canariensis* in Levin, becoming luxuriant after a wet season. Not all persist. Occasional plants grow under pines at Waitare.

Gleicheniaceae

Gleichenia microphylla
Seen on a damp roadside bank on the plain, and in the dune belt in swamps, usually near lakes, as at Lake Waitawa and in the sphagnum bog at Heart Lake.

Sticherus cunninghamii umbrella fern
Fairly common in the foothills in colonies on bush margins and in bush where there are well drained banks with occasional sunshine.

Grammitidaceae

Anarthropteris lanceolata
A common epiphyte on the foothills and plain growing on the underside of branches and the sheltered side of trunks where the air is moist.

Ctenopteris heterophylla
Occasional in the foothills on rocks and trees, and often on branches overhanging streams. An exceptionally large plant beside Makahika Stream had fronds 32.7 cm long. In the late 1920s this fern grew with *Parahebe catarractae* ssp. *diffusa* in cracks in a large rock in the Tokomaru riverbed.

Grammitis billardieri
Occasional in the foothills, less often on the plain, growing as an epiphyte in damp bush.

Grammitis ciliata
Occasional in the foothills on shady banks and the undersides of branches.

Hymenophyllaceae

Hymenophyllum bivalve
Common in the foothills in fairly dry, sheltered bush, occasional on the plain in bush on sandstone terraces, rare in Hokio dune forest. Normally epiphytic but sometimes terrestrial in the foothills.

Hymenophyllum demissum
Plentiful in bush in all areas. Terrestrial except where the air is very moist. For observations on growth of fronds of filmy ferns see Duguid (1969a).

Hymenophyllum dilatatum
Occasional in damp, shaded bush on the Arapaepa hills. The blade of a measured frond here was 42 cm long. Rare on the plain, and in the dune belt, where it grows in semi-swamp forest.

Hymenophyllum ferrugineum
Common in the foothills in shaded bush with damp air. It is epiphytic amongst moss and other filmy ferns, usually on the sheltered sides of trunks of trees and tree ferns. On the plain it is rare, though sometimes it is found where the air is damp.

Hymenophyllum flabellatum
Plentiful in the foothills in damp bush, generally on the shaded side of trunks. It is occasional in damp bush on the plain, and rare in semi-swamp forest in the dunes.

Hymenophyllum flexuosum
Rare, but in diverse bush habitats – beside Wai-iti Stream in the foothills, on a dry river terrace, in Prouse's bush, and north of Lake Horowhenua in the dune belt. The Prouse's bush colony was about 4 m

across in 1970, but was killed by severe drought in 1973. The plant growing on a dune ridge flanked by a swamp was recorded by me in 1950 as "*H. australe*" and seems likely to have been *H. flexuosum*.

Hymenophyllum multifidum

Common in bush in the foothills, occasional on the plain in bush with moist atmosphere, and rare in Hokio dune forest. It is mostly epiphytic.

Hymenophyllum rarum

Rare in the foothills where there were once extensive sheets of this fern growing as an epiphyte, less often on rocks.

Hymenophyllum revolutum

Plentiful in the foothills on tree ferns, usually with *H. ferrugineum*, and rare on the plain and in the dune belt. Fronds of plants in the foothills are very variable in size, even the smallest being fully fertile.

Hymenophyllum sanguinolentum

Common in bush in the foothills, rare on the plain and in the dune belt. Mostly epiphytic or terrestrial, some rupestral in the foothills.

Hymenophyllum scabrum

Seen occasionally in the foothills growing as an epiphyte.

Trichomanes colensoi

Seen in 1944 in very damp bush in the foothills near Ohau River. Recorded for the Tararua Range by Buchanan (1874) and Zotov et al. (1939).

Trichomanes elongatum

Seen on a damp, heavily-shaded bank of a minor tributary of Ohau River.

Trichomanes reniforme kidney fern
Common in the foothills growing in more or less horizontal epiphytic colonies, often as extensive terrestrial drifts, and occasionally as a rupestral plant. Kidney fern is occasional in shaded bush remnants on the plain, and in the dune belt.

Trichomanes venosum

Plentiful in the foothills as an epiphyte where the air is moist, usually on the shaded side of trunks, and occasional in similar habitats elsewhere.

Ophioglossaceae

Botrychium australe, *B. biforme* parsley fern
These two ferns, usually growing in association, were once common on low gravel terraces in rather dry, light bush, and occasional elsewhere. Seldom seen since the 1960s.

Ophioglossum coriaceum adder's tongue
Occasional in the foothills on damp, grassy banks beside rivers.

Ophioglossum petiolatum

Found by A. P. Druce on a damp coastal flat south of Hokio, and rediscovered by the Wellington Botanical Society beside a coastal lagoon in good numbers in the same area in 1982 (Brownsey 1985). My sighting of an *Ophioglossum* on a damp silt flat south of the Ohau estuary in the 1940s was probably of this species.

Osmundaceae

Leptopteris hymenophylloides single crepe fern
Common in bush on the foothills, occasional on the plain and rare in the dunes.

Leptopteris superba Prince-of-Wales feather
Grew plentifully until about 1950 on roadside banks on the shady side of the Arapaepae hills. A few still present on the summit where the bush is little disturbed. Fronds there measure up to 117 cm long.

Polypodiaceae

Phymatosorus diversifolius hound's tongue
Plentiful in bush on the plain in rather dry conditions on trees, rocks and on the ground, and often on exotic trees. Occasional in the foothills and on the dune belt where it grows in light bush and scrub. It is locally dominant in warm, well lit places in pine forest at Waitarere.

Phymatosorus scandens

Common in sheltered, fairly dry bush on the plain as an epiphyte, sometimes on rocks or on the ground. It grows also in the foothills and dune belt.

Pyrrosia eleagnifolia

Plentiful throughout in dry situations as an epiphyte on native and exotic trees. Some plants grow on rocks and on the ground.

Pteridaceae

Adiantum cunninghamii common maidenhair
Common at the base of trees and on warm banks in rather dry places in partial shade. Mostly on the plain.

Adiantum formosum

Grows in a bush remnant beside Lake Horowhenua. The house on the property was built in 1891, and owners from 1910 onwards remember a large drift of this fern. By 1980 the lakeside colony was much depleted owing to a dense canopy of karaka. It is found nowhere else in the region except for a languishing plant transferred to Muhunoa East. It is unlikely to be native to the region, and could have been brought from the Manawatu.

Adiantum hispidulum

A number of sporelings of the “*pubescens*” form came up spontaneously in my garden, and continue to thrive. This is the form propagated by local nurserymen and sold under the name of *A. hispidulum*. Neither form occurs in the region in the wild. I suspect that my garden plants originated from spores in soil from plant pots which was thrown on the garden.

Pellaea rotundifolia

Widespread in rather dry sites, often at the base of trees in damaged bush. Sporelings appear beside concrete paths and in garden rockeries. Occasionally there are extra lobes on the lower pinnae.

**Pteris cretica*

Has been seen growing wild under nursery benches and in soil around potted plants.

Pteris macilenta

Grows in fairly open, warm bush from the coast to the foothills. On the plain it has been seen on sides of drains and around buildings. Roots are generally in the shade while the foliage may be in full sun. Fronds to 109 cm long have been recorded at Waitarere.

Pteris tremula

Fairly common in the dune belt in forest, and on the plain in rather dry bush, on sides of drains and in many other shaded and damp places. It is rare in the foothills. It springs up quickly, but is rather shortlived.

Salviniaceae*Azolla filiculoides*

Common on still waters throughout but transient.

Thelypteridaceae*Pneumatopteris pennigera*

Common in damp bush throughout, usually on the edges of streams and margins of semi-swamp forest. It is also an early coloniser on drains and ditches where there is sufficient shade. It is particularly luxuriant on the shaded sides of new roads on the Arapaepae hills. Trunks up to 90 cm tall have been seen in Waiopehu Scenic Reserve, and fronds to 2.9 m near Heart Lake.

SPERMATOPSIDA**GYMNOSPERMAE****Araucariaceae***Agathis australis*

kauri

Seedlings have appeared regularly since the mid 1970s near two kauris planted in Levin about 1920.

Disturbance of the soil has prevented them from establishing.

Cupressaceae

**Chamaecyparis lawsoniana* Lawson cypress
Plants have established on roadside banks in several places north of Levin.

**Cupressus macrocarpa* macrocarpa
Seedlings have been seen at Opiki, Shannon, and Ihakara.

Pinaceae**Pinus radiata*

Wild seedlings perpetuate the species where they have a chance to survive.

Podocarpaceae

Dacrycarpus dacrydioides kahikatea
Grows in good numbers in semi-swamps and partially drained areas on the plains and in the dune belt and beside rivers and streams in the foothills. Large trees were milled by Waikawa Stream at Manakau and in many other places from an early date. Possibly the largest in the region now is about 1.5 m in diameter and is growing at Forest Lakes.

Dacrydium cupressinum rimu
Has been an abundant and valuable timber tree, especially in the foothills where it was the chief species milled. A few with trunks to 1.5 m in diameter still grow there. There is regeneration on bush margins. On the gravel plains at Levin and Manakau, rimu has not been present except where there is a band of clay. Giant rimu was milled from 1888 from the terrace north of Levin where the sandstone is topped with about 2 m of clay. On the eastern margin of the dune belt, rimu grows beside semi-swamp forest.

Podocarpus hallii Hall's totara
Common in forest on the foothills.

Podocarpus totara totara
Grew on sand country, plains and foothills, but was particularly abundant on alluvial gravel terraces on the plains and foothills. In some of these areas it has regenerated freely after logging. In my childhood patches of light-coloured, infertile soil growing hard mosses before the land was cultivated were explained as places where totara had grown. From as early as 1840, local totara produced very valuable timber for buildings, bridges, railway sleepers, and shingles. Totara is still well represented on the plain and can still be found in the foothills, but has almost

disappeared from the dune belt. See Duguid & Druce (1966).

Prumnopitys ferruginea miro
Plentiful in forest on the foothills, occasional on the plain, and rare on stabilised sand. It is usually associated with matai, but is less tolerant of dry conditions.

Prumnopitys taxifolia matai
Has grown on the foothills and dunes, and was especially abundant on gravel plains where it grew with totara, reaching diameters of 1.4 m. It is uncommon on the dunes but still fairly plentiful elsewhere in a few bush remnants though little regeneration is seen. Large matai trees on the site of the town of Levin provided much of the early timber there.

ANGIOSPERMAE

MONOCOTYLEDONES

Agavaceae

Cordyline australis cabbage tree
Plentiful and widespread on the sand country and plain, especially in swamps and damp ground near rivers and lakes. Few in the foothills. For notes on unusual forms see Moar (1953) and Duguid (1976c).

Cordyline banksii ti ngahere
Overhangs banks beside streams in the foothills. Formerly more plentiful.

Cordyline indivisa broad-leaved cabbage tree
The single plant on the crest of Arapaepae foothills has been destroyed.

Phormium cookianum ssp. *hookeri*
A few reported in the foothills, but not seen by me.

Phormium tenax New Zealand flax
Formerly extensive in swamps and harvested commercially for fibre. The swamps are now mostly drained and farmed, but flax survives beside lakes, rivers, and streams in the dunes and in some inland swamps.

Alismataceae

**Alisma lanceolata* water plantain
Occasional in shallow water, usually at margins of lakes, ponds, and estuaries.

Alstroemeriaceae

**Alstroemeria aurantiaca*
A colony has established from garden refuse in Gladstone Road.

Amaryllidaceae

**Amaryllis belladonna* belladonna lily
Grows in a roadside hedge at Koputaroa. In other places it is obviously planted.

**Crinum* cf. *powellii*
Several colonies from garden outcasts flourish on the side of Kawi Road, Levin. First noticed flowering in 1977 and have flowered regularly since then, and increased considerably.

**Leucojum aestivum* snowflake
Several roadside colonies in the Levin district from garden outcasts.

**Narcissus* × *medioluteus*
Seen as garden outcasts beside roads, and persisting in paddocks in many places.

**Narcissus pseudonarcissus* daffodil
A few on country roadsides and persisting in a paddock near Levin.

Araceae

**Arum italicum* Italian arum
Common on many roadsides and in old gardens and paddocks around Levin and Ohau.

**Colocasia esculenta* taro
Several colonies from garden outcasts. Plants on Kawi Road were first seen flowering in 1977, but by 1980 were being overwhelmed by *Calystegia silvatica*. It also grows on the edge of Lake Horowhenua.

**Zantedeschia aethiopica* arum lily
Fairly widespread and increasing in moist soil on the plain. Planted in some places and possibly established from seed or garden outcasts in others.

**Zantedeschia elliotiana* yellow calla
Established from garden outcasts in several places in the Levin district.

Areaceae

**Phoenix canariensis* phoenix palm
Young plants have established in Levin as offspring from plantings.

Rhopalostylis sapida nikau
Formerly abundant in warm forest on the foothills and plain, and still fairly common. Some have become exposed by the removal of surrounding bush, and survive in the open in pasture.

Cannaceae

**Canna* × *generalis* canna
Springly naturalised in several small colonies in the Levin district from garden outcasts.

Commelinaceae

**Tradescantia fluminensis* wandering Jew
A very troublesome weed in forest and shrubberies on the plain and eastern part of the dune belt.

Cyperaceae*Baumea articulata*

Several colonies on the eastern edge of Lake Papaitonga.

Baumea huttonii

Grew in a roadside hollow near Hokio Beach until about 1969.

Baumea rubiginosa

Grows in swampy hollows on lake margins and damp flats near the coast, and inland north of Levin.

Baumea tenax

Rare in the dune belt in a hollow beside Hokio Beach Road, and on the margin of damaged bush at Poroutawhao.

Baumea teretifolia

Grew in a damp hollow beside Hokio Beach Road until 1969.

Carex breviculmis

Tolerating wet and dry sites in short pasture on the sand country, on a river terrace at Ohau and sandstone at the base of Shannon Heights Road. Not seen in the foothills.

Carex dipsacea

Recorded from a damp hollow beside Hokio Beach Road in 1966, the edge of Lake Horowhenua in 1969, Poroutawhao in 1971, and on a wet margin of bush on Kuku East Road in 1984. It may have been overlooked in other places. Also occurs near Tokomaru (C. C. Ogle pers. comm.).

Carex dissita

Widespread throughout in fairly open bush and on damp banks. Utricle colours suggest that there are two variants in the region.

**Carex divulsa* grey sedge
First seen in Kimberley Scenic Reserve in 1970, now growing in Levin and some other places, mainly in bush remnants.

**Carex flacca* glaucous sedge
An extensive area seen on grassed dunes in Muhunua West Road in 1947.

Carex geminata

Common in open, wet, and swampy places throughout, particularly away from the coast.

Carex inversa

Fairly plentiful in damp grassy places and hollows

throughout, either in tufts or forming a low sward. Easy to overlook when not seeding.

**Carex inyx*

Has been growing in pastures south of Manakau for 50 years or more, but not recognised until the 1960s (M. D. Hampton pers. comm.).

Carex lambertiana

Occasional in damp bush in all areas.

Carex lessoniana

Plentiful in extensive colonies on wet, open ground, particularly near the coast.

Carex litorosa

A small colony was seen near Otaki River mouth in 1969.

**Carex longibrachiata* Australian sedge

Grows on land now occupied by forest on the Arapaepae foothills, also near Ihakara. The Newell family took up the Arapaepae farm in 1929, and the sedge was there then. It was thought to have been brought to the farm in Australian grass seed. While cattle were run on the hilly part, they kept the sedge in check, but when the farm was changed to a dairy unit, intermittent grazing on the hills allowed the sedge to get away. During World War II, the farm was run by a manager while the sons were overseas. When they returned the sedge was so rampant that the hill part was useful for forestry only.

Carex maorica

Common in poorly drained pasture and on lake margins.

**Carex muricata* prickly sedge
Several stout clumps at Ohau known in 1962 were destroyed. A further infestation nearby in 1975 was also destroyed.

**Carex ovalis*

Widespread in damp pastures.

Carex pumila

Common as an early coloniser on damp sand, mostly beside estuaries.

Carex secta var. *secta* niggerhead
Common in swamps and lake margins throughout. Many former habitats are now drained.

Carex solandri

Common in the foothills on damp bush margins and shaded banks, some in semi-swamp forest on the plain.

Carex testacea

Common on dry scrub dunes in shade or open places, a few plants on warm banks on the edge of Papaitonga bush.

Carex virgata

Common throughout on margins of streams and lakes, and other swampy ground.

**Carex vulpinoidea* fox sedge

One large clump on the eastern shore of Lake Horowhenua found by E. F. A. Garner in 1970 persisted until 1985 when it became covered by more rampant vegetation. In 1987 it was found on the margin of bush and swamp at Koputaroa.

**Cyperus* sp.

A very tall and vigorous ornamental sedge, (possibly *C. involucratus*) often grown beside ponds, was well established at Ohau when recorded in 1981.

**Cyperus eragrostis*

Plentiful throughout in rather damp places such as roadside hollows and beside lakes and streams, less commonly by estuaries.

Cyperus ustulatus

Plentiful in damp areas beside lakes and swamps, and near estuaries.

Desmoschoenus spiralis pingao

Once fairly common on unstable coastal dunes, now less plentiful.

Eleocharis acuta

Widespread and plentiful on poorly drained land throughout, including sphagnum bogs in the foothills.

Eleocharis gracilis

Commonly associated with *E. acuta*.

Eleocharis neozelandica

An occasional early coloniser of damp sand on coastal flats and estuary margins which disappears when other plants invade. It established in a bowling green at Waitarere and has become a nuisance there.

Eleocharis sphacelata

Occasional as an emergent plant on the margins of lakes and lagoons in water about 45 cm deep.

Gahnia pauciflora

Occasional on partly shaded banks and rocks, mostly in the foothills, but some in bush on the river terraces.

Gahnia setifolia

Grows in bush mainly on the foothills, some on sunny banks on the river terraces where protected by bush.

Gahnia xanthocarpa

Formerly common in flax swamps and other wet land before draining. Now less plentiful, some persisting in the open.

Lepidosperma australe four-square

In small colonies on wet or damp coastal flats, sparingly beside estuaries, but more extensive on more stable flats further inland.

Schoenus apogon var. *apogon*

Rather local on open boggy ground near Ohau Gorge, on the Arapaepae hills, and on the plain.

Schoenus maschalinus

Widespread in waterlogged pastures, bogs, and on margins of lakes and water races.

Schoenus nitens var. *nitens*

Grows in extensive drifts on damp, coastal flats beside estuaries, sparingly in damp pastures at Whirokino.

Scirpus antarcticus (*Isolepis marginata*)

Seen on flats beside Ohau River mouth in 1968, on a grassed flat at Hokio in 1979, and at Waitarere in 1972.

Scirpus basilaris (*Isolepis basilaris*)

This inconspicuous species was seen on a fairly dry sand flat at Hokio in 1972.

Scirpus caldwellii (*Bolboschoenus caldwellii*)

A small colony was seen beside Waikawa estuary in 1963, and another beside the Hokio estuary in 1967. Since then it has spread to other estuaries.

Scirpus cernuus (*Isolepis cernua*)

Plentiful on all damp flats beside estuaries, damp flats behind the foredunes, and gravel beside Lake Horowhenua where it may have been introduced in fill. Very variable according to local conditions. Young plants, for instance, in rather dry sites, or those which have germinated late, run up to seed quickly and their leaves are much shorter than usual.

Scirpus fluviatilis (*Bolboschoenus fluviatilis*)

Grows in streams near their estuaries and a little further inland beside several lagoons and lakes. It does not extend as far downstream as *S. caldwellii*. In Hokio Stream, one of its main sites, it grows freely where competing weeds have been cleared.

Scirpus inundatus (*Isolepis inundata*)

Grows on waterlogged ground in the foothills, and beside water races at Ohau.

Scirpus lacustris (*Schoenoplectus validus*)

Plentiful in shallow water on margins of lakes and lagoons, some beside estuarine meanders.

Scirpus nodosus (*Scirpoides nodosa*) club rush

Plentiful on dry sand hills and flats near the coast, and extending well inland on grassed dunes.

**Scirpus platycarpus* (*Isolepis platycarpa*)

Single plants were found on damp sand flats beside Ohau estuary in 1968, and Hokio estuary in 1962, 1968, and 1969.

Scirpus pottsii (*Isolepis pottsii*)

Specimens have been collected from a tributary of

the Ohau River in 1944, from a bank at Manakau in 1967 and from Otaki Gorge.

Scirpus prolifer (*Isolepis prolifer*)

Plentiful throughout on wet ground on the margin of ditches, drains, slow streams, estuaries, and lakes. In permanently wet soil it forms continuous colonies by vivipary. Where the soil dries out after germination the plants remain as single seeding tufts.

Scirpus pungens (*Schoenoplectus pungens*)

three-square

Many colonies on the coast on estuary margins and wet sand flats. It is readily suppressed by other plants but survives by migrating to open ground.

Scirpus reticularis (*Isolepis reticularis*)

Plentiful in wet or muddy places within the bush in the dune belt and on the plain and foothills. Spreads by vivipary to form patches.

**Scirpus setaceus* (*Isolepis setacea*)

A few plants grow on exposed sand on estuary flats, roadsides and lake margins, some in the foothills.

Scirpus sulcatus var. *distigmatus* (*Isolepis distigmata*)

Seen in a roadside hollow at Hokio in 1969, and near Lake Waitawa in 1970.

Uncinia banksii

Occasional in forest in the foothills and Papaitonga bush on a sandstone headland.

Uncinia clavata

A few on a lakeside headland in Papaitonga bush.

Uncinia ferruginea

Possibly the most common species of *Uncinia* in the foothills. Grows in bush also on the plain and in the dune belt.

Uncinia gracilentia

Seen in the Arapaepae hills in 1972.

Uncinia rupestris

Seen in the foothills east of Ohau River in 1967 and the Arapaepae hills in 1972.

Uncinia scabra

Noted at Poroutawhao in 1953, and in warm bush beside Lake Papaitonga in 1964.

Uncinia uncinata

Plentiful and widespread in bush from the dune belt to the foothills.

Hydrocharitaceae

**Elodea canadensis* Canadian pondweed
Known to be in Lake Horowhenua, but could be more widespread.

**Ottelia ovalifolia* swamp lily
Grows in still waters in small lakes, slow streams and river cut-offs.

Iridaceae

**Crocasmia Xcrocasmiflora* montbretia
There are many colonies beside rivers and on margins of damaged bush where it spreads rampantly. In these places, and on roadsides, it has spread from garden outcasts. Plants have been seen at Papaitonga Scenic Reserve with golden-yellow flowers.

**Homeria collina* Cape tulip
Grew in a Levin garden but now eliminated.

**Iris foetidissima* stinking iris
Plentiful throughout in gardens, around old settlements, and on roadsides. Seeds are spread by birds. Both mauve and pale yellowish-flowered plants grow around Levin.

**Iris orientalis*
There is a large colony on a damp roadside at Manakau, and another near Levin.

**Iris spuria*
Spreading along roadsides near Horseshoe Bend.

Libertia grandiflora New Zealand iris
Grows on the foothills near the Otaki River.

Libertia ixioides New Zealand iris
Small colonies are widespread on sheltered banks and stream margins in the foothills, and in lakeside bush on the plain. Up to 1936 there were many plants on steep hills flanking the Tokomaru waterfall, and may still be there. These plants were conspicuous because of their golden leaves in full sun in open pasture.

Libertia peregrinans
Grows on damp coastal flats at Hokio and Ohau where it was once extensive, but now restricted by sand drifts. Now seldom seen at Hokio, though there are reports from Wellington Botanical Society of colonies further south.

**Sisyrinchium iridifolium*
Grows on dry country roadsides and banks where other vegetation is sparse.

**Sisyrinchium* sp. ("blue" of "Flora of New Zealand" Vol. III.) blue-eyed grass
First noticed on the eastern shore of Lake Horowhenua by E. F. A. Garner in 1976 where there were only a few plants. It is now plentiful there in a damp mown strip about 200 m long and 20 m wide.

Sisyrinchium sp.
Yellow-flowered plants with capsules 5 mm long

and leaves 2 mm wide were collected by E. F. A. Garner near Levin in 1979.

**Sparaxis tricolor*

Persisting from garden refuse at Ohau Beach and on a roadside near Levin.

**Watsonia bulbifera*

There are large, spreading colonies at Heatherlea near the railway and small infestations in Muhunua East Road and Buller Road.

**Watsonia meriana*

Plants with white flowers on a Manakau roadside were first recorded in 1975, and with pink flowers on both sides of Hokio Beach Road in 1979.

Juncaceae

**Juncus acutus* sharp rush

Since first seen in 1969 at Hokio and Ohau Beaches, this rush has increased considerably beside estuaries and near the coast.

**Juncus ambiguus*

Seen by L. B. Moore at Hokio Beach in 1947.

**Juncus articulatus* jointed rush

Plentiful and very widespread from the coast to the foothills in wet situations along stream courses, on sand flats, on roadsides, in disturbed soil and in pastures.

Juncus australis

Widespread and often associated with *J. gregiflorus* in pastures.

**Juncus bufonius* toad rush

A widespread annual rush of disturbed, seasonally moist open soil.

**Juncus caespiticus*

Since first noticed on the Ohau estuary flat in 1968, has been seen there in larger numbers. Also on damp flats behind the foredune at Hokio. Some grows at Waitarere and in a bog beside Otaki Gorge Road.

**Juncus effusus*

Widespread in boggy pastures, on margins of lakes and streams, and in other waterlogged ground. It is often associated with *J. sarophorus*.

Juncus gregiflorus

A plentiful rush of pastures, in some places growing on rather dry soil.

Juncus maritimus var. *australiensis* sea rush

Restricted to margins of estuaries of Ohau River and Waikawa and Waitohu Streams.

Juncus pallidus

In small numbers from the coast to the foothills.

Juncus planifolius

An annual rush which is plentiful in open, wet soil throughout, often in seasonally wet, muddy places.

Juncus sarophorus

Plentiful in poorly drained pastures where it is the main rush.

**Juncus tenuis* slender rush

Common in damp roadside hollows throughout, and on open, damp tracks in the foothills. Flowers open in the morning only.

**Luzula congesta*

Common on damp roadsides, in hollows and on banks in the foothills and on sandstone terraces.

**Luzula multiflora*

Common in habitats favouring *L. congesta*, but not quite so widespread.

Luzula picta var. *limosa*

Recorded from a damp, rocky bank by Otaki Gorge Road.

Luzula picta var. *pallida*

Common in damp or shade, mostly in the foothills. Some at Kimberley Scenic Reserve and in the dune belt.

Luzula picta var. *picta*

Widespread in dry places in light bush, on sand or gravel terraces, and rocky or clay banks.

Juncaginaceae

Triglochin striatum

Plentiful on wet estuary flats, occasionally inundated. Also noted beside Lake Horowhenua and Lake Papaitonga, also at Whirokino.

Lemnaceae

Lemna minor duckweed

Widespread and plentiful in still, open water, some in swampy pools. It is the only duckweed in the foothills. Tolerates more water movement than *Spirodela*.

**Spirodela punctata* purple-backed duckweed

My local survey in 1945–1950 showed this plant to be widespread throughout the plain and dune belt in still or slow-running waters, and on margins of lakes, lagoons, and estuaries. The colonies are transient. It is not as common as formerly, often giving way to raupo.

Wolffia australiana watermeal

Has been widespread on lakes and lagoons, particularly near the coast. As it is at the water surface only in summer, and is so small, its presence

is not always obvious. No recent attempt has been made to determine its frequency. It is often associated with the duckweeds, but seemingly not with *Lemna* alone. Some time in the 1950s wind collected a thick deposit truly resembling a vast spillage of meal, on the northern side of a shallow lagoon which then existed south of the Ohau estuary.

Liliaceae

**Agapanthus orientalis*

A garden outcast flowering amongst grass on a country roadside bank near Levin.

**Allium neapolitanum* Naples onion
Noticed flowering in four places on neglected town sections around Levin.

**Allium triquetrum* three-cornered garlic
Plentiful throughout in old gardens, damaged bush, waste land, and riverside refuse dumps.

Arthropodium candidum

Grows on the forest floor often amongst tree roots, on gravel terraces around Ohau, by Lake Horowhenua, and in the Hokio dune forest. The only foothill habitat known to me is in a pine plantation beside Makahika Stream where it was seen in 1969. It can persist among tree roots where stock graze.

**Asparagus asparagoides* smilax
A little grows under an old hedge in Levin.

**Asparagus scandens*
Several minor infestations around Levin.

**Asparagus setaceus* asparagus fern
Seedlings appear in Levin gardens.

Astelia fragrans

Common in the foothills in damp bush and on shaded bush margins. Mostly the leaves have a reddish rib on each side of the midrib.

Astelia grandis

Grows in sheltered swamps and swampy gullies beside lakes. Less common than formerly because of drainage of swamps.

Astelia solandri kowharawhara
Common on trees and tree ferns on the plain and foothills, often near rivers, streams and lakes. Some plants grow on sheltered rocks. This *Astelia* which requires partial shade, has a narrower range of tolerance than *Collospermum hastatum* with which it is often associated.

Collospermum hastatum kahakaha
Most plentiful where the air is moist—in the foothills and beside rivers, lakes, and swamps. It grows in forest in exposed and sheltered places, sometimes

on rocks, but not in deep shade. Long-established plants with moist, spongy bases usually support secondary epiphytes such as ferns, lycopods, orchids, and shrubs.

Collospermum microspermum

An occasional epiphyte in the foothills.

Dianella nigra

blueberry
Plentiful in light bush on banks, rotting stumps, and forest litter. Not so plentiful on the plain, where it grows in full light in some places. It is well represented in sphagnum beside Heart Lake.

**Lilium formosanum*

An article in the Levin "Chronicle" dated 27.2.82 recorded the presence of this plant in the region thus: "Amongst sand dunes south of Hokio rivermouth, about a mile and inland about half a mile... hundreds... grow... pure white trumpet variety swaying on stems 6–7 feet high, carrying 1 or 2–6 or 7 blooms". I have not seen these.

**Muscari armeniacum* grape hyacinth
A few persist on garden refuse and grow in former gardens, and occasionally increase in grassy berms around Levin.

**Nothoscordum inodorum*

For a number of years before 1960 a few appeared in gardens, apparently in the soil of nursery-grown plants. It became much more common from about 1970 because it was not recognised as a nuisance, or control efforts were not adequate.

**Scilla non-scripta*

bluebell
Many colonies on roadsides and riversides from garden refuse. As well as blue, there are white, and pale pinkish-heliotrope forms.

Orchidaceae

Acianthus fornicatus var. *sinclairii* gnat orchid
Formerly very common in dune scrub. Still present there and some in Waitarere pine forest. It has disappeared from the margin of depleted totara bush on a low gravel terrace at Ohau. In the dunes it grows in rather moist moss in sheltered hollows.

Acianthus reniformis

Two small colonies known at Hokio up to about 1960, one under kanuka in a sheltered hollow near the dune forest, the other under kanuka with sheltering shrubs of *Cyathodes juniperina*. A drought in the early 1960s killed the *Cyathodes*, and the orchid did not survive in the changed habitat.

Bulbophyllum pygmaeum

Usually grows high on tall forest trees and seldom seen unless the trees fall, or pieces are removed in

storms or by birds. It is fairly widespread on the foothills and plain, rare in the eastern part of the dune belt. A plant in Prouse's bush was about 30 cm across.

Bulbophyllum tuberculatum

Grows in the same habitat as *B. pygmaeum*, though more usually near lakes. A number of fairly large colonies on kahikatea beside Lake Kopureherehe (Forest Lakes) in 1983 were reported to me by I. Townsend and I. Cooksley.

Caladenia catenata

Grows in forest and open sites from the dune belt to the foothills. Three forms with different flower colours are noted – pink in the foothills (rotten log near Ohau Gorge) and near the coast (dry, grassed dune near Hokio dune forest); cream in the foothills (bush margins and damp banks) on the plain (sphagnum bog beside Heart Lake); greenish a little higher in the foothills (damp bush margin near Tokomaru No. 3 dam outside the study area).

Chiloglottis cornuta

Grows in various places and habitats across the region as diverse as pine forest in litter, and light bush in Kimberley Scenic Reserve in moss. It can be found, especially near rivers, on the foothills and plain. A few plants grow in Hokio dune forest. It is plentiful in Waitarere pine forest.

Corybas aconitiflorus

A small colony grew under manuka on a dune ridge at Hokio up to about the 1960s when the changed habitat could no longer support it.

Corybas acuminatus

Reported from the Ohau Track by I. Townsend.

Corybas oblongus

Several colonies in the foothills near the Ohau River.

Corybas rivularis

Fairly numerous on roadside banks in the foothills in very damp and shaded places, or where there is seepage.

Corybas trilobus

Numerous in drifts in forest on the foothills, plain, and dunes. Formerly particularly plentiful in scrub and forest on the dunes.

Dendrobium cunninghamii

Occasional in the foothills and plain, mostly in well lit places in moist bush near rivers and lakes. Formerly more plentiful. A plant in Papaitonga bush carrying hundreds of blooms in the summer of 1942–43 was about 1.8 × 1.25 m. It died when the canopy about it thickened. Another gigantic plant was noted by K. Davey in bush in the foothills near Kuku East Road in 1978.

Dryomoanthus adversus

Formerly common in all riverside and lakeside bush, but very seldom seen since 1970. In 1930 it grew on a cabbage tree near where the Hokio Stream issues from Lake Horowhenua.

Earina autumnalis

Occasional on trees in damp bush, especially near rivers and lakes, mostly on the foothills and plain. Plants in the foothills are often very long, 1.8 m being common. The longest measured was 3.45 m.

Earina mucronata

Formerly abundant on trees in riverside bush, now in smaller numbers near rivers and lakes. Two forms often grow side by side. One has very long, limp, pendulous stems, and roots extending widely. The other, matching plants known as *E. aestivalis*, has shorter stems spreading out rather stiffly, and more localised roots. The forms remain distinct in cultivation, the more compact form being easier to keep in a garden.

Gastrodia cunninghamii

Occasional in damp bush on the foothills and plain.

Gastrodia minor

Seen in dry places in scrub on dunes at Hokio, and on dunes at Whirokino.

Gastrodia sesamoides

A colony in flood detritus in Kimberley Scenic Reserve under observation from 1930 to 1932 had very tall stems reaching 71 cm and bearing more than 30 livid green flowers. A flood destroyed the habitat and the orchids. Others found by E. F. A. Garner about 1971 were observed for several years on a damp flat at Hokio associated with *Leptocarpus*, a connection verified by E. O. Campbell. These were overwhelmed by an influx of *Cortaderia toetoe*. Another colony in Waitarere pine forest was destroyed when the forest was felled. The flowers of these coastal orchids were cream streaked with brown, and each flower was rather shorter than the green ones noted above.

Microtis unifolia

Plentiful throughout in short turf, bare ground, banks and cuttings on sandstone, clay and gravel, and on damp coastal flats.

Orthoceras strictum

Mostly on the plain on roadside banks and cuttings, rare in the foothills. More plentiful in some years than others. Flowers in the region are all the red form.

Prasophyllum colensoi

Rare on swampy ground in the foothills, some near

lagoons south of Ohau estuary in the 1940s. The habitat became unsuitable for this orchid, but there are other places where it may still exist.

Prasophyllum nudum

Quite common in the foothills beside the Waikawa Stream and in scattered colonies in pasture containing many native species, particularly on dry banks beside former mill tracks. A few plants first noticed in 1947 were in pasture near Ohau Gorge.

Pterostylis alobula

In good numbers, mostly under scrub on dunes, some under macrocarpa trees at Waitarere. A few growing on a low river terrace up to about 1963 were destroyed by farm animals.

Pterostylis banksii

Formerly common in light bush on the plain, now only occasional, tending to die out when the canopy becomes dense.

Pterostylis graminea

Occasional in forest in the foothills, some on the plain, and possibly also in the dune belt.

Pterostylis montana

Formerly common on banks and in light bush in the foothills. Also grew on the plain and on sand at Hokio under scrub. Now rare in the region.

Pterostylis nana

A small patch under scrub on a grassed dune at Poroutawhao was destroyed by farm animals about 1950.

Spiranthes sinensis ssp. *australis*

Rare on damp to wet sand flats about 1 km inland at Hokio. Flowers pink.

Thelymitra longifolia

Fairly common on roadside banks on the foothills and plains and on sandy ground near the coast. Flowers mostly white, some mauve inland, and pink on the coast.

Thelymitra pauciflora

Occasional on roadsides on sandstone, and on gravel banks on the fringe of the foothills. The flowers are clear mauve and well spaced.

Pandanaceae

Freycinetia baueriana ssp. *banksii* kiekie
Plentiful in damp bush throughout, especially beside rivers, lakes, and swamps. Though usually climbing, the plants often sprawl against shaded banks. Seeds germinate in mud, or sometimes on trunks of *Dicksonia squarrosa*.

Poaceae

**Agrostis capillaris* browntop
Plentiful in pastures and on some roadsides.

**Agrostis stolonifera* creeping bent
Plentiful on lake margins and damp estuary flats, particularly at Hokio.

**Aira caryophylla* silvery hairgrass
Occasional in dry gravel and sand throughout the region.

**Alopecurus geniculatus* kneed foxtail
Grows in open, muddy places and beside pools.

**Alopecurus pratensis* meadow foxtail
Common on damp roadsides, often in slight hollows.

**Ammophila arenaria* marram grass
Undoubtedly planted at an early period but well established and spreading freely on some coastal dunes.

**Anthoxanthum odoratum* sweet vernal
Widespread and plentiful especially where fertility is low, as on the sand country.

**Arrhenatherum elatius* tall oat grass
Plentiful and widespread on railway margins, roadsides and unused grassy places about towns. I remember this along fencelines and in town spaces at least as far back as 1915.

Austrofestuca littoralis sand tussock
Formerly conspicuous on Hokio sand flats. L. B. Moore collected a specimen from there in 1946, and it probably persisted up to about 1950.

**Avena fatua* wild oat
Seen by the railway in Levin in 1980. It was sprayed with herbicide and did not reappear.

**Briza maxima* quaking grass
Rather uncommon. A plant seen at Rangiuru Beach in 1961 was thought to have come in garden refuse. Seen again in 1975 at Waitarere.

**Briza minor* shivery grass
Occasional on roadsides and damaged bush margins.

**Bromus diandrus* ripgut brome
Seasonally common on dune sands and beach roadsides.

**Bromus fonkii* narrow-leaved brome
First noticed about 1974, and since then has become common at edges of lawns and berms, and in urban waste spaces.

**Bromus hordeaceus* soft brome
Plentiful in damp places in pastures, lawns, on roadsides, and in gardens.

- **Bromus willdenowii* prairie grass
Plentiful in pastures and roadsides, particularly under trees.
- Cortaderia fulvida* toetoe
Plentiful on roadsides and streams in the foothills, and beside rivers and streams nearby on the plain.
- **Cortaderia selloana* pampas grass
Seeding from plantings, particularly around Shannon roadsides. A few on coastal sand flats.
- Cortaderia toetoe* toetoe
Plentiful in flax swamps, on lake margins, and damp sand at the beaches and on estuary flats.
- **Cynodon dactylon* Indian doab
Plentiful on sand, and on dry paths and in lawns on the plains.
- **Cynosurus cristatus* crested dogstail
Common on rather dry roadsides and in some pastures.
- **Dactylis glomerata* cocksfoot
Common on roadsides and in pastures.
- Deyeuxia billardierei*
Grows on damp or dry coastal sand flats and on dunes, sometimes in estuaries.
- Dichelachne crinita* plume grass
Grows on warm, dry banks in the foothills.
- **Digitaria ischaemum* smooth summer grass
Plentiful in gardens, cultivated ground and depleted lawns. Possibly sometimes mistaken for *D. sanguinalis*.
- **Digitaria sanguinalis* summer grass
Very aggressive in cultivated soil, gardens and open lawns. Germination is in November, before *D. ischaemum*, though in damp weather a continuous crop of seedlings appears in the following months.
- **Echinochloa crus-galli* barnyard grass
Small colonies on railway land, roadsides, and urban waste spaces.
- Echinopogon ovatus* hedgehog grass
Grows under trees in small numbers in rather dry bush remnants on the dune country, the plain and edge of foothills.
- **Ehrharta calycina*
Increasing slowly near Waitarere since noticed in 1963.
- **Ehrharta erecta* veld grass
Has spread quite rapidly throughout Levin gardens and streets after being seen in small numbers at Hokio in 1970.
- **Eleusine indica* crowfoot grass
Seen near the Levin railway station in 1975, and since then has appeared in small numbers on disturbed soil in Levin, at Whirokino, and elsewhere. Unlikely to become a nuisance because it seems to require dry open ground and hot summers to flourish.
- **Elymus rectisetus* blue wheat grass
Seen on stabilised and grassy dunes inland from Hokio.
- **Elytrigia pungens* sea couch
Seems to be spreading on damp estuarine flats near Hokio, Waikawa, and Otaki Beaches since first noted in 1969.
- **Elytrigia repens* couch
Invasive and plentiful in cultivated ground, and in pastures, particularly where these are overstocked.
- **Eragrostis brownii* bay grass
Grows mostly in sandy pastures and other short, open swards, mainly in the sand country.
- **Festuca arundinacea* tall fescue
Plentiful on damp, coastal flats and in grassy places inland. A hybrid with *Lolium perenne*, was seen on an Ohau roadside in 1962.
- **Glyceria declinata* floating sweetgrass
Plentiful on the sides of water races and estuaries.
- **Glyceria maxima* reed sweetgrass
First seen in a swamp beside Forest Lakes Road in 1969. A colony in Hokio above the estuary has increased considerably since 1976, and pieces have become established downstream.
- **Glyceria plicata* plicate sweetgrass
A large colony about 30m across in 1979 beside the Hokio estuary developed from plants seen there in 1966. In dry seasons there is very little to be seen. Noted in 1987 at Koputaroa in shallow water between raupo and a forest remnant.
- **Holcus lanatus* Yorkshire fog
Widespread and plentiful in damp places in pastures, on roadsides and in waste land.
- **Hordeum murinum* barley grass
A widespread and troublesome weed of trampled areas around trees, holding yards, and light pasture.
- Isachne globosa* swamp millet
Specimens in CHR were collected from swampy land at Lake Horowhenua by N. T. Moar in 1949, and R. Mason at Forest Lakes in 1953. I have seen it only at Forest Lakes.
- Lachnagrostis filiformis*
A few plants were seen on the eastern shore of Lake Horowhenua in 1969 and 1973, possibly introduced in fill.

- **Lagurus ovatus* haretail
Common on the coast on sand, usually near estuaries.
- **Lolium multiflorum* Italian ryegrass
Grows on roadsides and sometimes on unoccupied land in Levin.
- **Lolium perenne* perennial ryegrass
Sown as a major pasture component, and thoroughly naturalised on roadsides and other grassy places.
- **Lolium perenne* × *multiflorum* ryegrass
Sown in pastures and widely naturalised.
- Microlaena avenacea* bush rice grass
Common in well lit places in bush on older dunes, the plain and foothills.
- Microlaena stipoides*
Grows plentifully throughout in dry situations on the margins of light bush, around trees, and in pastures and lawns.
- Oplismenus imbecillis*
I have recorded this only in Papaitonga bush where it is plentiful, but is possibly overlooked in other places. It grows in fairly dry bush in semi-shade. Plants introduced into my garden for observation have spread aggressively.
- **Parapholis incurva* sickle grass
Grows on damp estuarine flats of the Ohau River and the Waikawa Stream.
- **Paspalum dilatatum* paspalum
Plentiful on many roadsides, in lawns and along railway lines where it increased spectacularly in the 1970s to become a widespread weed.
- **Paspalum distichum* Mercer grass
Common on wet margins of Lake Horowhenua and near Hokio estuary. It also grows beside a small drain at Koputaroa.
- **Pennisetum clandestinum* kikuyu grass
Invasive from lawn plantings at coastal settlements. In Levin there is a solid invasive mat, probably planted, but extending its range in 1987.
- **Phalaris aquatica* phalaris
Thick along roadsides and adjacent drains on Makerua-Rangitane Road in 1972 where it may have been planted. It was later poisoned with herbicide.
- **Phalaris arundinacea* reed canary grass
Grows in abundance on the stream banks and extends far beyond on Hokio Stream at Moutere Road. It may have been planted to stabilise the sandy banks when the bridge was built, but has naturalised aggressively, and is restricting the flow of the stream. It is less vigorous in dry seasons. Four small colonies were noted on the eastern shore of Lake Horowhenua in 1987. A colony of var. *picta* (ribbon grass) from garden refuse beside Muhunoa East bridge is now several metres across.
- **Phalaris canariensis* canary grass
A few plants found in two Levin gardens, some apparently from birdseed.
- **Phalaris minor* lesser canary grass
Some seen in Levin in 1975 beside the saleyards.
- **Phleum pratense* timothy
A few plants seen by the side of Moutere Road in 1973.
- Poa anceps* ssp. *anceps*
Plentiful throughout on warm, dry banks, often at the margin of bush or scrub, and on roadside banks under trees.
- **Poa annua*
Plentiful in open ground in gardens, waste places, on paths and on roadsides. A slender form with glabrous florets has been dispersed in firewood from Waitarere.
- Poa breviglumis*
This fine, inconspicuous grass was seen forming a turf with *Leptinella squalida* ssp. *squalida* beside the Tokomaru River at Horseshoe Bend.
- **Poa pratensis* Kentucky bluegrass
Recorded on estuary road at Waikawa in 1963 and on stream margin, roadside, and estuary at Hokio in 1973. Probably overlooked in other places.
- Poa pusilla*
Locally common on damp sand flats at Hokio amongst *Leptocarpus similis* and *Scirpus nodosus*.
- **Polypogon monspeliensis* beard grass
Common on estuary flats. First seen by Waikawa estuary about 1968. By 1972 it had become plentiful there and beside Hokio and Ohau estuaries.
- **Pseudosasa japonica*
A bamboo thought to be this species spread from garden refuse and became difficult to contain. Some planted about the 1950s beside the Hokio estuary to deflect the stream formed an extensive colony. About 1983 it flowered then died.
- Puccinellia stricta* salt grass
Seen by E. C. Parsons in the 1940s, probably at Hokio. Near the outer edge of the flat beside Ohau estuary in 1973 it grew in a narrow band, but has not been seen elsewhere by me.
- Rytidosperma clavatum*
Grows in well lit situations throughout – on roadside banks of rock, clay, or gravel, in dry, open pasture, on margins of light bush in the foothills, on a

sandstone cutting on the plain north of Levin, and in sandy pasture at Whirokino and fixed dunes at Hokio.

Rytidosperma gracile

Common in habitats suitable for *R. clavatum*, and often associated with it.

**Rytidosperma penicillatum*

Common in the foothills on dry, rocky banks and depleted pasture, and on shingle of the floodplain of the Ohau River.

**Rytidosperma racemosum*

Grows in the foothills on rocky banks and in pasture on clay, on the plain on exposed sandstone, and seen at Poroutawhao on a dry hummock.

Rytidosperma unarede

Grows in the foothills on rocky banks and in pastures on clay, and seen on a low gravel terrace on the plain.

**Setaria geniculata* knot-root bristle grass

First noticed on a sandy roadside at Waitarere in 1975, but probably had been in the district much earlier. By 1981 it was widespread in the region on roadsides, in pastures, and in gardens.

**Setaria italica* foxtail millet

Seen in a Levin garden in 1970, thought to have come from birdseed.

**Setaria pumila* yellow bristle grass

Seen in a Levin garden in 1972.

**Setaria viridis* green bristle grass

Seen in a Levin garden in 1970, possibly from birdseed, and in waste land in 1972.

**Sorghum halepense* Johnson grass

Appeared by the railway north-east of Levin in 1975 (M. D. Hampton pers. comm.).

**Spartina anglica*

Has been seen since 1968 beside all estuaries, usually as small patches, but not all have persisted. Some large patches have been extensively altered by flooding and few remained by 1985. There may have been some *S. ×townsendii* as it was known to occur at Foxton.

Spinifex sericeus silvery sand grass

Grows on foredunes in abundance.

**Sporobolus africanus* ratstail

Common mainly in dry places near the coast on roadsides and in pastures.

**Stenotaphrum secundatum* buffalo grass

Planted on the coast and now growing there in the wild state and spreading.

**Vulpia bromoides* vulpia hair grass

Widespread and plentiful in dry places on roadsides particularly.

**Vulpia myuros* vulpia hair grass

Has been seen at Hokio.

Zoysia minima

Was quite common on damp coastal flats at Ohau and Hokio up to about 1962 but, being intolerant of drought and competition, seems to have disappeared.

Potamogetonaceae

Potamogeton cheesemani pondweed

Grows in cut-off meanders, slow streams, and ponds.

**Potamogeton crispus* curled pondweed

Plentiful in enriched lakes, in open water near estuaries, and in slow streams.

Potamogeton pectinatus pondweed

Found in 1969 in a cut-off pond beside the Hokio estuary. In the summer of 1970–71 the pond filled with sand and dried up.

Restionaceae

Leptocarpus similis

Common on damp, coastal sand flats, but gives way to *Cortaderia toetoe* and tall fescue. Much more plentiful formerly.

Ruppiaceae

Ruppia megacarpa horse's mane weed

Seldom seen though abundant in places about 1970 in a drain beside Ohau estuary and filling a temporary pond at Ohau Beach. Pieces have been found floating downstream to the Ohau and Waikawa estuaries. E. F. A. Garner found pieces which he identified as *R. polycarpa*.

Smilacaceae

Ripogonum scandens supplejack

Plentiful in damp bush on the plain and foothills forming ubiquitous tangles. A little grows in a very sheltered hollow in the Hokio dune forest.

Sparganiaceae

Sparganium subglobosum bur reed

Grew on the margin of Heart Lake from 1930 to about 1960 when farm animals destroyed the habitat. C. C. Ogle found a good colony on the margin of Lake Papatonga about 1974.

Typhaceae

Typha orientalis raupo

Plentiful in swampy hollows, on margins of lakes, and in slow streams and estuaries. Extends well

down the Hokio estuary influencing the course of the stream with its growth. Small colonies in open damp hollows in the foothills are probably not part of the original vegetation there.

Zingiberaceae

**Hedychium gardnerianum* kahili ginger
A few garden outcasts are sparingly naturalised among grass on country roadsides around Levin. These flowered from 1980 onwards.

DICOTYLEDONES

Acanthaceae

**Acanthus mollis* bear's breeches
A few garden outcasts are naturalised near Levin.

Aceraceae

**Acer pseudoplatanus* sycamore
Invasive in many places among trees and shrubs.

Aizoaceae

**Carpobrotus edulis* ice plant
Spreading from outcasts on Hokio dunes.

Tetragonia tetragonioides New Zealand spinach
Grows only as a garden outcast on the margins of Prouse's bush.

Tetragonia trigyna New Zealand spinach
Fairly common in coastal scrub.

Alseuosmiaceae

Alseuosmia pusilla
Common in forest on foothills about 100 m above sea level.

Amaranthaceae

**Amaranthus deflexus* prostrate amaranth
Abundant on footpaths, margins of roads and railway and other dry places about Levin.

**Amaranthus lividus*
In cultivated soil in Levin. Plants fitting the description of ssp. *polygonoides* were seen in 1981 and 1983.

**Amaranthus powellii* redroot
Widespread in disturbed soil.

Apiaceae

**Angelica pachycarpa*
Naturalised since about 1979 in a commercial lane of Levin from planted specimens originally. By 1988 it was very widespread thereabouts.

**Apium graveolens* wild celery
A few plants grew in open, semi-damaged swamp forest at Whirokino in 1978, but did not persist.

**Apium nodiflorum* water celery
A small colony grew at Waikawa Beach in 1950, but the weed was known previously in the region to Department of Agriculture. The colony disappeared but from 1968 more was seen in a deep drain there. From 1973 it was rampant and widespread throughout waterways of the beaches and western side of the plain, soon becoming out of control. In 1979 it was seen in fair amounts in Waitohu Stream at the base of the foothills near Otaki. Noted in 1987 in a shallow drain at Koputaroa.

Apium prostratum New Zealand celery
Common on damp flats beside estuaries, often scrambling amongst sedges and driftwood at beaches.

Centella uniflora
Common in damp, open swards, and bush margins throughout.

**Conium maculatum* hemlock
Widespread and plentiful on disturbed ground on roadsides and in damaged bush.

**Daucus carota* wild carrot
Widespread in rural areas, mostly on roadsides amongst grass.

**Foeniculum vulgare* fennel
Grows on open ground and along roads, railway, and rivers. Seems to be distributed in road gravel but does not establish readily.

Hydrocotyle elongata
Usually in fairly open bush throughout, but mostly on the plain. It grows in drier places than those favoured by *H. heteromeria*.

Hydrocotyle heteromeria
Fairly plentiful in bush, often where the ground is muddy or trampled, but also in other damp and shaded places. A form with small shiny leaves introduced into a Levin garden from the southern Ruahine Range has now taken over a lawn in full sun.

Hydrocotyle hydrophila
Formerly abundant on waterlogged ground between the Ohau River and Waikawa Stream before being drained. Some on wet flats south of Hokio.

Hydrocotyle microphylla
Common in the foothills in open swards and on bush margins, rare on Ohau River terrace and Hokio sand flats.

Hydrocotyle moschata

Fairly plentiful from dunes to the foothills in dry places in lawns and on bush margins mainly. A form with more deeply cut leaves has been seen occasionally in the foothills.

Hydrocotyle novae-zeelandiae

Plentiful on boggy ground amongst rushes and sedges. A form with small, slightly bronze leaves with rather angular lobes is widespread in wet ground as occurs beside lakes. A large-leaved, almost glabrous, green form with crenate lobes grows in many places. This and intermediates grow with the bronze form.

Hydrocotyle pterocarpa

Identified in 1969 from Forest Lakes from a plant with seeds, but other large-leaved plants in the swamp may also have been this.

Lilaeopsis novae-zelandiae

Grows on very damp ground beside estuaries and on coastal flats, occasionally submerged. Seen occasionally on lake margins. Some patches disappear under windblown sand and taller vegetation.

Oreomyrrhis ramosa

Many plants grow in the foothills in pasture and on fairly dry banks.

Oreomyrrhis sp.

Seen on damp, coastal flats south of Ohau estuary about the mid 1940s but no specimen taken. It was identified as *O. andicola*, that being the only name in use then.

**Pastinaca sativa* parsnip
Occasional on roadsides and railway margins, probably from spillages. Seen too in market gardens which earlier grew parsnip.

**Petroselinum crispum* wild parsley
A few plants establish from seeds in garden refuse.

Schizeilema trifoliolatum

Rarely seen under kanuka and other small trees on a dune near swamp at Poroutawhao until 1953 before it was destroyed by farm animals.

**Torilis japonica* hedge parsley
First collected in 1975 by E. F. A. Garner, and has increased on roadsides and a picnic area beside Ohau River. It has been seen at Horseshoe Bend also.

**Torilis nodosa* hedgehog parsley
Recorded at lower Otaki Gorge on a roadside in 1964, near the Ohau River in a forest reserve in 1967 and at Horseshoe Bend under trees in 1975.

Apocynaceae

Parsonsia capsularis var. *capsularis*

Some in damp forest at Whirokino and Poroutawhao, and possibly on Hokio dunes. Formerly common on roadsides and bush margins near foothills and on Otaki Gorge Road. Var. *ochracea* noted first in 1941 trailing over kanuka in a warm hollow on the margin of Hokio dune forest has not been seen recently.

Parsonsia heterophylla New Zealand jasmine
Abundant on bush margins and in open bush on the plain. Less common in the foothills. Hybrids with *P. capsularis* have been seen at Kimberley and Ohau.

**Vinca major* periwinkle
Extensive colonies on some roadsides.

Aquifoliaceae

**Ilex aquifolium* holly
On roadsides and among trees at Ihakara and many other rural areas, some now cleared. Yellow-fruited wildings about Levin are from trees in the Public Gardens.

Araliaceae

**Hedera helix* ivy
Grows rampantly from plantings and garden refuse to become a nuisance.

Pseudopanax anomalus

Seen on bush margin in Makahika valley and in light bush on low river terraces at Ohau.

Pseudopanax arboreus five-finger
In forest remnants throughout, but rare in the dune belt. Many seedlings become established on tree ferns, rotting logs and stumps, and on rocky banks. Possum damage has been noted in Waiopahu Scenic Reserve.

Pseudopanax crassifolius lancewood
Abundant and reproducing freely in open forest throughout and occasional on swamp margins. Juveniles with ascending leaves on a bush margin at the north end of Lake Horowhenua were last seen in 1958. Possible hybrids not growing naturally in Horowhenua have been noted as garden escapes. Offspring of plants sold as "var. *trifoliatus*" grow on the side of Buller Road near Papaitonga bush and elsewhere around Levin.

Pseudopanax edgerleyi raukawa
In forest remnants in the foothills, more common at higher altitudes. Grows mainly on tree ferns.

Pseudopanax simplex haumakaroa
Some seen in the 1940s at about 250 m above sea level. Usually at higher altitudes.

Schefflera digitata pate
Common on stream and bush margins, mostly on the plain and foothills.

**Tetrapanax papyriferus* rice-paper plant
Established on a roadside at Manakau.

Asteraceae

**Achillea millefolium* yarrow
Widespread on roadsides, in lawns, and in cultivated soil.

**Ageratina riparia* mist flower
Seedlings were seen in a neglected garden in Levin.

**Ambrosia absinthium* ragweed
Seen growing in a market garden fenceline at Rangiuuru in 1972.

Anaphalis trinervis
Common in the foothills on wet banks, on stream margins and in seepages, some on the plain at Muhunua East near the Ohau River.

**Anthemis cotula* stinking mayweed
Throughout on bared ground on roadsides, farm tracks, holding yards, and in other similar places.

**Arctium minus* burdock
Common on margins of damaged bush on the plain and foothills.

**Arctotheca calendula* Cape weed
Occurs in several places, but locally abundant in only a few of them. It was seen in 1974 on a new forestry road on the Arapaepae hills, in 1975 in Kimberley Scenic Reserve, near the Waitarere motor camp, and from 1980 onwards in Levin. Cape weed grows mostly on gravel and sand.

**Aster subulatus* sea aster
Occasional on dry ground, but locally plentiful on the site of the former railway yards at Tokomaru, elsewhere mainly where soil has been stripped from margins of roads or the railway.

**Aster novi-belgii* hybrid Michaelmas daisy
Occasional colonies from garden refuse — Hokio swamp margin, Arapaepae Road south, and on Kawiū Road outside Levin.

**Bellis perennis* lawn daisy
Widespread in damp lawns and other grassy places.

**Bidens frondosa* beggars' ticks
Plentiful on margins of lakes, streams, swamps, and ditches throughout.

Brachyglottis kirkii kohurangi
Epiphytic and on rotting logs in the foothills. Now seldom seen.

Brachyglottis repanda rangiora
Widespread on bush margins, roadside banks and slip faces though now mostly in the foothills. The large-leaved form on some banks on Gladstone Road appears to have originated from gardens as it is not native to this region. It is freely naturalised along the northern fenceline of Waiopēhu Scenic Reserve where some was planted in 1925.

**Calendula officinalis* marigold
Persists for a while as a garden escape on waste land and margins of roads and railway.

**Carduus nutans* nodding thistle
Reliably reported to have been seen in the region, but not noted on the survey.

**Carduus tenuiflorus* winged thistle
Throughout on disturbed ground.

**Carthamus lanatus* saffron thistle
Two plants noted in the 1956–57 summer in an orchard where poultry pens had been. The seed was probably an impurity in grain supplied by a Palmerston North firm. Esler (1978) made a similar record at this time in the Manawatu.

Cassinia leptophylla tauhinu
Widespread on dry, open ground except where the land is intensively used.

**Chrysanthemoides monilifera* boneseed
Locally plentiful on waste land adjacent to a rubbish tip near the Otaki River mouth. Some has been planted in a garden at Waitarere.

**Chrysanthemum segetum* corn marigold
Seen in the 1979–80 summer on stockpiled soil in Tirotiro Road, Levin. In the following season it was more plentiful.

**Cichorium intybus* chicory
Widespread on roadsides.

**Cirsium arvense* Californian thistle
Common in pastures throughout.

**Cirsium palustre* marsh thistle
Abundant in damp, open places in the foothills, occasionally by water races on the plain.

**Cirsium vulgare* Scotch thistle
Throughout, mostly in pastures.

**Conyza albida* broad-leaved fleabane
Abundant throughout in disturbed soil in urban and rural areas.

**Conyza parva* smooth fleabane
One plant noted in 1963 beside State Highway 1 near Kimberley Road railway crossing.

Cotula australis

Throughout in a wide range of open, disturbed habitats.

Cotula coronopifolia

bachelor's button

Plentiful on damp sand and mud on margins of coastal flats, streams, lakes and lagoons. Noted trapping debris and sand among the roots beside Hokio estuary in 1969. Later a flood detached rafts of these plants, floating them down to shallows where they grounded and re-established.

Craspedia minor

Known from damp banks of Makahika Stream and its tributaries up to 1968. Recorded from Otaki Gorge in 1978.

**Crepis capillaris*

Widespread and plentiful in many open habitats.

**Dahlia excelsa*

tree dahlia

Grows at Ohau between railway and State Highway 1, probably as a garden reject.

**Dahlia cultivars*

On a bank between State Highway 1 and railway line at Ohau, flowering June 1988.

**Erigeron karvinskianus*

Mexican daisy

Grows wild on a roadside bank near Mangaore and in cracks in footpaths and roads near plantings in towns.

**Galinsoga parviflora*

galinsoga

Grows on cultivated soil and disturbed waste land.

**Gnaphalium americanum*

A specimen was collected by H. H. Allan from Otaki Gorge in the 1930s, and recorded by C. C. Ogle (pers. comm.) in 1983 near Tokomaru.

**Gnaphalium coarctatum*

purple cudweed

Abundant throughout in grassy places. Very troublesome in lawns.

Gnaphalium delicatum

Seen once in bush on Arapaepae hills.

Gnaphalium gymnocephalum

Common in open bush from the coast to the foothills.

Gnaphalium involucratum

Throughout in wet, open habitats.

Gnaphalium limosum

Grows on the swampy edge of gully forest at Papaitonga, and in damp places on roadsides and stream margins.

Gnaphalium sphaericum

Grows on river shingle, lake margins, and damp roadsides.

**Gnaphalium subfalcatum*

Locally plentiful in gravel by railway in Levin.

**Helianthus tuberosus*

Jerusalem artichoke

Persistent, spreading colonies from garden refuse grow on roadsides.

Helichrysum bellidioides

A few plants have been seen at Kimberley Scenic Reserve on sand, and at Otaki Gorge. Occurs in greater abundance at higher altitudes outside the study area.

Helichrysum filicaule

Widespread on dry banks and unploughed pastures, but inconspicuous when not in flower.

**Hieracium sp.*

A few plants reported from Levin saleyards by K. Davey were destroyed and others have not appeared in the region.

**Hypochoeris radicata*

catsear

Widespread in pastures, gardens and waste land, and on roadsides.

**Lactuca virosa*

acrid lettuce

For many years confined to dry ridges and roadsides in the dune belt. Noted in Levin in 1979 and since then has spread explosively along the railway line and in the commercial area.

Lagenifera pumila

Throughout, but decreasing. Grows in open places in the foothills and in shade near Moutere dune hill, but no longer on margins of lagoons and on damp sand flats.

**Lapsana communis*

nippewort

Fairly common on disturbed soil on roadsides and elsewhere.

**Leontodon taraxacoides*

hawkbit

Plentiful throughout the region on both moist and dry open sites. Plants on dry roadsides and in pastures are smaller. Plants quite deeply covered in sand on dunes near estuaries send leaves to the surface.

Leptinella dioica ssp. *monoica* (*Cotula dioica* ssp. *monoica*)

On damp silty soil on estuary margins. Because the plants have a lengthy period of winter dormancy, and are readily overwhelmed by white clover and creeping bent, the colonies do not persist. The Manawatu estuary is the northern limit of this subspecies.

Leptinella dispersa (*Cotula dispersa* ssp. *dispersa*)

There are a few records of the species on coastal flats. A specimen was collected by R. Mason south of the mouth of the Waikawa River.

Leptinella squalida ssp. *squalida* (*Cotula squalida* ssp. *squalida*)

Noted on river banks at Horseshoe Bend. Formerly on a lagoon margin at Ohau River mouth.

Leptinella tenella (*Cotula membranacea*)

Uncommon in damp places in the foothills. A specimen was collected by A. P. Druce in 1968 from Hokio.

**Leucanthemum vulgare* oxe-eye daisy
Plentiful in grassy places on poor soils on roadsides and foothills.

**Leucanthemum maximum* Shasta daisy
Garden discards have formed colonies on some roadsides.

**Matricaria discoidea* rayless chamomile
Plentiful on disturbed and trampled soil, and roadside gravel.

**Mycelis muralis* wall lettuce
Grows in damaged bush. Has been noticed in the region since the 1930s, but is not increasing much.

Olearia arborescens

Noted on a rock wall above a stream, Arapaepae hills at 240 m above sea level. It may have been more plentiful earlier.

Olearia cheesemanii

Long known in the Otaki Gorge area. One plant seen by me.

Olearia lacunosa lancewood tree daisy
A single tree noted by I. Cooksley in the Waiotauru valley (Otaki catchment).

Olearia paniculata akiraho
Known from the Hokio dune forest and scrubland, and from dunes at Waitarere.

Olearia rani heketara
Grows with trees and shrubs in the foothills, now much less plentiful. Die-back is prevalent when it loses the shelter from other plants.

Olearia solandri
Common on some open, swampy coastal flats, less plentiful in the foothills.

Olearia virgata
Throughout on margins of swamps and streams, and some other moist, open places.

**Picris echioides* oxtongue
Widespread in damp turf – Lake Horowhenua, Makerua-Rangitane Road margin, and margins of lowland swamps.

Pseudognaphalium luteoalbum

Throughout on dry, open ground, and on moist soil on the sand flats, on shaded dunes, and beside semi-swamp forest.

Raoulia glabra

Grows on dry banks and shingle by streams in the foothills. Grew on shingle islands of the Ohau River near Muhunua bridge in 1948, but was swept away by floods.

Raoulia hookeri

Formerly on a dry sand flat at Hokio.

Raoulia tenuicaulis var. *dimorpha*

On moist riverbed gravel, sometimes on damp banks in the foothills.

**Senecio aquaticus*

A specimen was collected from pasture at Ihakara by A. E. Esler in 1963. In 1972 there was a severe infestation over many hectares of waterlogged flats in the area. It was brought under control by 1977.

**Senecio bipinnatisectus* Australian fireweed
About 1960 this was rare in the region. It has since spread throughout the foothills, plain, and dune belt, particularly in disturbed soil and sand in sunny situations and on bush and scrub margins.

**Senecio elegans* purple groundsel
Common on all coastal dunes in the open and amongst tree lupin.

Senecio glomeratus

Widespread on disturbed soil, roadsides, and bush margins. It is soon replaced by grasses.

Senecio hispidulus

Mostly on dry stable dunes at Hokio, some on roadsides and burnt-over swamp at Ohau. A few in foothills. A foothills specimen examined by C. J. Webb bears his comment "Bracts few, leaves glabrous. Otherwise like *S. hispidulus*. Too dissected for *S. diaschides* hybrid".

**Senecio jacobaea* ragwort
Widespread. Abundant in the foothills.

**Senecio mikanioides* German ivy
Fairly common. Mostly on margins of damaged bush, especially near Ohau River.

Senecio minimus fireweed
Widespread, usually on disturbed soil and bush margins. It does not persist when pasture is established.

Senecio quadridentatus

A few plants seen under kanuka on the crest of a dune ridge at Hokio.

**Senecio skirrhodon* gravel groundsel
First seen near the railway at Ohau and Koputaroa in 1969. It is now abundant along the railway and up to 1 km on either side from Koputaroa to Te Horo (south of Otaki). Some has been seen beside Muhunua

East Bridge. Early in 1987 the Ohau River flooded across a Kuku farm on heavy loam about 2 km downstream from the railway. Gravel groundsel appeared in the strip of gravel left by the flood. A rayless plant has been seen.

**Senecio vulgaris* groundsel
Widespread and plentiful in disturbed soil.

**Silybum marianum* variegated thistle
Occasional in damp places near rivers, swamps, and lakes.

**Solidago canadensis* goldenrod
A fairly extensive roadside colony grew in Fairfield Road, Levin, until it was destroyed in 1977.

**Soliva pterosperma*
Reported from Shannon railway station (Healy 1953) but not seen on the survey.

**Soliva sessilis* Ohehunga weed
A plentiful weed growing with short grasses. It was known in the region before 1960 and is still increasing. A variant with winged achenes was seen at Waikawa Beach.

**Sonchus asper* prickly sowthistle
Widespread on disturbed ground and roadsides.

**Sonchus oleraceus* sowthistle
Widespread on disturbed and open ground.

**Tanacetum parthenium* feverfew
A garden escape but does not become a nuisance.

**Tanacetum vulgare* tansy
A rare garden escape.

**Taraxacum officinale* dandelion
Widespread in many kinds of open habitat.

Vittadinia australis
Noted on dry sandy flats south of Hokio in the 1940s, and earlier in scrub further inland.

**Xanthium spinosum* Bathurst bur
Noted at Whirokino by a stopbank in 1986 and reported by C. A. J. Cockburn from a similar habitat further upstream.

Basellaceae

**Anredera cordifolia* Madeira vine
Scrambling over supporting plants in Ohau and Levin. Generally flowers in April then collapses but late flowers seen in June 1988 in a neglected garden hedge in Levin.

Berberidaceae

**Berberis darwinii* Darwin's barberry
Common on the plain along fencelines and in

damaged forest and invading sawmill tracks in the foothills.

**Berberis glaucocarpa* barberry
Widespread under trees, on roadsides, along fencelines and in rough pasture.

Boraginaceae

**Borago officinalis*
Growing from garden refuse on roadsides about Levin.

**Echium plantagineum* Paterson's curse
Widespread on roadsides and waste land. Use of contaminated soil for fill has contributed to its spread around Levin.

**Echium pininana*
Scattered or numerous plants grow wild in hedges and shrubberies around Levin.

**Echium vulgare* viper's bugloss
On disturbed soil around Ohau and Levin.

**Lithospermum arvense* corn gromwell
A few plants appeared about 1963 in an orchard where poultry pens had been. The seed was probably an impurity in grain supplied by a Palmerston North firm. This agrees with the Manawatu record (Esler 1978) of "a cluster of plants at the edge of the railway line at Terrace End in 1962".

**Myosotis arvensis* field forget-me-not
Fairly widespread but in small numbers.

**Myosotis discolor* grassland forget-me-not
Seen in pastures on the Arapaepae hills in the 1950s.

Myosotis forsteri
Seen on damp grassy banks between 1941 and 1952 in the foothills beside the Ohau River and Wai-iti Stream, and the margin of a dune ridge bordering a swamp at Poroutawhao about 1962. Because it is an annual seen only seasonally, it may be more common than sightings suggest.

**Myosotis laxa* ssp. *caespitosa* water forget-me-not
Common throughout waterlogged soil on margins of swamps, lakes, and streams.

**Myosotis sylvatica* garden forget-me-not
Has spread from garden refuse in many places. It has been very plentiful beside the road to Papaitonga bush.

**Pentaglottis sempervirens* alkanet
Spread amongst tall grass on a vacant section in Levin until destroyed.

**Symphytum officinale* comfrey
Widespread on roadsides in and around Levin, spreading from garden refuse.

**Symphytum Xuplandicum* Russian comfrey
Growing in the wild state in 1977 beside Fairfield Road, Levin.

Brassicaceae

**Alyssum* cultivar

Escapes from gardens to cracks in streets and footpaths.

**Barbarea intermedia* winter cress
Widespread on damp, open ground in gardens and on the margins of roads, rivers, and lakes.

**Barbarea stricta*
Has been seen at Koputaroa growing with raupo in 1987.

**Brassica rapa* ssp. *sylvestris* wild turnip
Widespread on cultivated and other disturbed soil.

**Brassica tournefortii* Mediterranean mustard
Noted at Waitare on a sandy roadway in 1976 and is still persisting.

**Capsella bursa-pastoris* shepherd's purse
Widespread on cultivated soil and disturbed roadsides.

Cardamine debilis New Zealand bitter cress
Common in bush, usually at the base of trees. Three forms recognised by Pritchard (1957) have been noted – “glossy leaf” (plain and dune belt), “long style” (foothills, plain, and dune belt), “narrow petal” (foothills and plain). There are often several forms in the same locality.

**Cardamine flexuosa* wavy bitter cress
Plentiful in shade in gardens. Some plants growing in damaged bush are quite large with many stems from the base.

**Cardamine hirsuta* bitter cress
Plentiful in sunny and shaded places in gardens, sometimes flowering when only 1 cm high. In damaged bush it occupies drier parts than those favoured by *C. flexuosa*.

**Cardamine pratensis* cuckoo cress
Grows in waterlogged soil on the western and southern shores of Lake Horowhenua. It has increased considerably since it was first seen in 1981. This species has also been seen in damp soil beside an old mill track in the foothills east of Shannon and in a swamp near Tokomaru (C. C. Ogle pers. comm.).

**Coronopus didymus* twin cress
Plentiful on disturbed ground in gardens, on waste land and roadsides, and in places trampled by stock.

**Coronopus squamatus* wart cress
Occupies similar habitats to twin cress, but is less plentiful.

**Lepidium bonariense*
Widespread in dry places in cultivated soil and along margins of roads and railway.

**Lepidium pseudotasmanicum*
Mainly under trees such as single pines, less common on open roadsides.

**Nasturtium officinale* watercress
In most slow-flowing streams and water races, and on lake margins. Coastal colonies are the haunt of white butterflies.

**Raphanus raphanistrum* ssp. *maritimus* sea radish
One plant seen near the railway in Levin in 1980.

**Raphanus raphanistrum* ssp. *raphanistrum* wild radish
Plentiful on disturbed soil on the plain and dune belt. Flowers show this colour range on different plants – pale mauve, white, cream, and light yellow (the commonest).

Rorippa palustris
Common on damp soil beside lakes and estuaries.

**Rorippa sylvestris*
One plant found in Whirokino bush. It is probably established in the district as it is a weed near the Manawatu River further upstream (Esler 1978).

**Sisymbrium officinale* hedge mustard
Grows in dry, open places on roadsides and disturbed soil, also under hedges.

**Sisymbrium orientale* oriental mustard
Grows on disturbed soil by Lake Horowhenua and in Levin, also in a railway fenceline in Levin.

Buddlejaceae

**Buddleja davidii* buddleia
Many young plants grow on banks on margins of roads and railway.

**Buddleja globosa*
There is a small roadside colony at the south end of Koputaroa Road.

Callitrichaceae

Callitriche muelleri
On muddy tracks in open bush.

**Callitriche stagnalis* starwort
Widespread on damp ground and muddy margins of streams and lakes.

Campanulaceae

**Campanula rapunculoides* creeping bellflower
Escapes from gardens to grow freely nearby in cracks on footpaths and other such places.

Wahlenbergia gracilis New Zealand harebell
Throughout in dry, sunny places in pasture, on banks
and river shingle and in open scrub. Blue and white
forms are about equally abundant.

Cannabaceae

**Humulus lupulus* hop
Persists mainly near early habitations on the plain
and near the coast.

Caprifoliaceae

**Leycesteria formosa* Himalaya honeysuckle
Mainly on disturbed soil on the foothills.

**Lonicera japonica* Japanese honeysuckle
Causes severe damage in many places to hedges and
bush margins particularly.

**Lonicera nitida*
A few plants have established from garden refuse in
Levin and Ohau.

**Lonicera periclymenum*
A few wild plants were seen in Prouse's bush in 1975
and on an old settlement site on Otaki Gorge Road in
1974.

**Sambucus nigra* elder
Widespread in moderate numbers on roadsides and
among trees and shrubs.

Caryophyllaceae

**Cerastium fontanum* ssp. *vulgare*
Widespread and plentiful in gardens and on grassy
roadsides.

**Cerastium glomeratum* annual mouse-ear chickweed
Widespread in gardens and grassy places, usually
occupying drier soil than *C. fontanum*.

**Polycarpon tetraphyllum* allseed
Plentiful on dry margins of roads and rivers, and
sand flats.

**Sagina apetala* annual pearlwort
A common short-lived annual of dry, bare soil and
roadside shingle.

**Sagina procumbens* pearlwort
Widespread and aggressive in damp places,
particularly in paths and gardens and on gravel.

**Silene gallica* catchfly
Widespread and seasonally quite plentiful on
disturbed soil and roadsides.

**Spergula arvensis* spurrey
Vigorously colonises cultivated and other disturbed

soil, but does not persist in competition with
perennials.

**Spergularia rubra* sand spurrey
Grows in stony places.

**Stellaria alsine* bog stitchwort
Widespread in short vegetation in wet depressions
and drainage channels.

**Stellaria graminea* stitchwort
Widespread and abundant in long grass, particularly
on damp soils.

**Stellaria media* chickweed
Common in cultivated soil.

Stellaria parviflora (*S. decipiens*)
Throughout in open bush on shaded banks, and in the
open on stumps and rotting logs.

Celastraceae

**Euonymus japonicus* Japanese spindle tree
Grows in Levin, mainly along the railway. These are
green-leaved plants from variegated parents some
distance away.

Ceratophyllaceae

**Ceratophyllum demersum* hornwort
Found in swamp near Tokomaru in 1983 (C. C. Ogle
pers. comm.).

Chenopodiaceae

Atriplex prostrata orache
Appeared in a garden in Levin. Much smaller plants
have been seen at the mouths of Waitohu and Hokio
Streams.

**Chenopodium album* fathen
Common on cultivated soil and disturbed roadsides,
some on estuarine silt. Several forms are present in
the region.

**Chenopodium ambrosioides* Mexican tea
Noted on damp, silty sand by Hokio estuary in 1972–
73, but it did not persist. Recorded in 1986 on sand
at Whirokino.

**Chenopodium capitatum* strawberry blite
Recorded earlier (Kirk 1904) but not seen on the
survey.

Chenopodium glaucum
Has been seen beside the Waikawa estuary but
possibly not recognised in other places.

**Chenopodium murale* red fathen
On cultivated soil and disturbed roadsides at Levin.

**Chenopodium pumilio* clammy goosefoot
On waste and cultivated land, roadsides, and margins of estuaries.

Sarcocornia quinqueflora salicornia
On all damp estuary flats which are occasionally reached by high tides. The plants are usually rather small, and do not persist because of changes in their habitat.

Clusiaceae

**Hypericum androsaemum* tutsan
Formerly plentiful on roadsides particularly, but now less abundant except at Laws Hill.

**Hypericum humifusum* trailing St John's wort
Seen on a shaded bank at Ihakara in 1966 and 1972.

Hypericum japonicum swamp hypericum
Throughout on margins of bogs and swamps and in seepages.

**Hypericum perforatum* St John's wort
Spread by earthworks to become plentiful on roadsides.

**Hypericum pulchrum* slender St. John's wort
Seen on a sunny bank beside an old mill road in the foothills east of Shannon.

Cobaeaceae

**Cobaea scandens* cathedral bells
Not widespread, but rampant in Prouse's bush.

Convolvulaceae

**Calystegia sepium* bindweed
Widespread and prominent on the plain and dune belt. This weed species appears to be naturalised. There are a number of forms and some apparent hybrids showing a range of white or pink flowers. A form growing in swamps associated with the lakes and lower reaches of their streams appears to be native. The leaves are narrower and usually darker than the weed species. The flowers are very pale pink with white ribs. The fragile corollas have conspicuous obtuse lobes.

Calystegia soldanella shore bindweed
Locally plentiful on shaded or slightly damp sand on beaches.

**Calystegia sylvatica* greater bindweed
Abundant along roadsides climbing over fences and trees and shrubs. The corolla is large, pure white, and rotate. This species is often introduced in road metal and takes about three years to become troublesome.

Calystegia tuguriorum
Common on bush margins on the plain and eastern edge of the dune belt, usually where there is shade for part of the day. Occasional on warm parts of the foothills. The flowers in this district are all pure white.

**Convolvulus arvensis* field convolvulus
A few colonies grow in various places, mainly on roadsides.

**Cuscuta epithymum* clover dodder
Grew on colonies of *Raoulia tenuicaulis* var. *dimorpha* on damp sand by the Ohau River from Muhunoa East bridge to Gladstone Road. Floods carried away these plants and none have been seen since the 1950s.

Dichondra brevifolia
Appears to be throughout the region in various open habitats. None of the specimens have been assigned to *D. repens*.

**Dichondra micrantha*
Grows on lawns and gardens.

**Ipomoea indica* blue morning glory
Spreading rampantly in bush near the road entrance of Papaitonga Scenic Reserve from garden discards, and near Levin.

Coriariaceae

Coriaria arborea tutu
Plentiful as a coloniser on roadsides, river banks, and slip faces in the hills wherever there is abundant moisture at the roots. Some on river banks are almost tree-like in their dimensions. Tutu also grows in swamps in association with koromiko and flax. One plant was seen on sandy gravel near the mouth of the Otaki River. McDonald & O'Donnell (1929) describing the Hokio dunes in the 1860 tell of "tutu of tree-like proportions". This vegetation was cleared to improve the pasture but the dunes became unstable and the former vegetation has not returned.

Cornaceae

Corokia cotoneaster var. *cotoneaster* korokio
Locally common on the sheltered margin of dune forest at Hokio, and in a similar habitat at Oturoa.

Griselinia littoralis broadleaf
A few plants perch on rocky hillsides above streams in the foothills.

Griselinia lucida shining broadleaf
A feature of semi-swamp forest and bush on margins of lakes and streams. It is usually epiphytic except

when growing on rock faces or dry banks where it forms a compact shrub. Descending roots of epiphytes are commonly 60 cm in circumference, but two measured near Lake Kopureherehe in 1973 reached 110 and 89 cm.

Corynocarpaceae

Corynocarpus laevigatus karaka
Abundant in bush on the plain and in the dune belt. Some was seen in the foothills in 1950 by R. Lycette. Karaka is said to have been planted by the Maoris in the dune country and beside lakes as a source of food. By 1980 it had increased in bush remnants and is now shading out other vegetation beneath its heavy canopy.

Crassulaceae

**Crassula decumbens* Cape crassula
Widespread on roadside and river shingle and dry sandstone. First noticed in 1971, but probably in the district much earlier.

Crassula hunua
Seen on the muddy margin of an Ohau water race in 1953 and again about 1966.

Crassula sieberiana
Seen in open dry places on the Hokio dunes up till about 1950, and seen at Waitarere in 1975. It is easily overlooked and may have been missed in other places.

Cunoniaceae

Weinmannia racemosa kamahi
Many of small tree and shrub size were seen in the foothills on river banks, roadsides and cleared hillsides, and a few old trees in bush remnants. On the plain kamahi is occasional on road cuttings and sunny, lakeside banks. Seedlings are often epiphytic on *Dicksonia squarrosa*.

Dipsacaceae

**Dipsacus fullonum* teasel
There is a persistent colony beside a ditch on Makerua-Rangitane Road and a few plants appear at times in Levin.

Droseraceae

Drosera binata forked sundew
Locally many plants in the foothills in sphagnum bogs, on the plain in seepages on sandstone banks and sphagnum bog at Heart Lake, and in the dune belt in many wet places such as swamp margins.

Drosera peltata ssp. *auriculata* eared sundew
Noted in the dune belt with manuka and other shrubs, on the plain under scrub on gravel at Ohau, on sphagnum at Heart Lake, and in the foothills near Muhunua East.

Elaeagnaceae

**Elaeagnus Xreflexa* elaeagnus
Persists where planted in and around Levin.

Elaeocarpaceae

Aristotelia serrata wineberry, makomako
Common in the foothills in disturbed bush and where forest is re-establishing on hillsides, roadsides, and slips. Some grows on the plain in bush remnants, on roadsides and the steep margins of drains. It is rare beside semi-swamp forest in the dune belt.

Elaeocarpus dentatus hinau
Common in forest remnants on the foothills and plain, and some in the Hokio dune forest.

Elaeocarpus hookerianus pokaka
Throughout but in small numbers, more common in the foothills. It grows in damp bush and on swampy ground beside lakes and streams.

Epacridaceae

Cyathodes fasciculata (*Styphelia fasciculata*) mingimingi
Common in scrub and open forest on dunes, occasional further inland on swampy lake margins and low gravel terraces of the Ohau River. It is rare on banks near the western end of the lower Otaki Gorge.

Cyathodes fraseri (*Styphelia nesophila*) patotara
A turf-forming plant of dry, open places and manuka scrub. It is common on coastal dune flats and margins of scrub and dune forest, and occasional on sunny sandstone banks and low terraces of the Ohau River.

Cyathodes juniperina prickly heath
Occasional as an undershrub of kanuka and other scrubby dune vegetation at Hokio and Oturoa, rare on a dry bank on the edge of Papaitonga bush.

Dracophyllum longifolium var. *filifolium* grass tree
Usually montane to subalpine, but there are several small colonies where the rainfall is high at 150 m above sea level on rock bluffs on a cold eastern face beside Makahika Stream.

Ericaceae

**Calluna vulgaris* heather, ling
I. Cooksley reported to me the presence of a considerable amount on open hill country on the south side of Waikawa Stream.

**Erica lusitanica* Spanish heath
Has grown for more than 50 years on sandstone banks beside the railway line at Ohau and has not appeared elsewhere except for some on a dry sand flat near Ohau estuary and on a roadside bank at Ihakara.

Gaultheria antipoda snowberry
Common on rocky banks and cuttings in the foothills, some scrambling amongst sphagnum on the boggy western margin of Heart Lake. Fruits are white or rosy pink.

Gaultheria rupestris
Usually a plant of higher altitudes, but growing in small colonies at about 150 m above sea level on the cold, shaded side of the Arapaepae hills. It once grew on a shaded cutting on Laws Hill and a rocky bank west of Mangaore Stream at about 75 m above sea level. Plants at Mangaore and a tributary of Wai-iti Stream were seen in the 1940s.

Pernettya macrostigma
A few plants were known on a sand flat south of Ohau estuary, and on sheltered sand flats at Hokio up till about 1947. It was recorded for Otaki by Aston (1910).

Escalloniaceae

Carpodetus serratus putaputaweta, marbleleaf
Common on damp bush margins on the foothills, and occasional on the plains in similar situations. It is rare on semi-swamp margins in the dunes.

Euphorbiaceae

**Euphorbia characias* Wulfen spurge
Reported from Levin by Webb et al. (1988).

**Euphorbia helioscopia* sun spurge
Common on disturbed soil and beside railway lines.

**Euphorbia lathyris* caper spurge
A number of roadside colonies persist from garden refuse.

**Euphorbia peplus* common spurge
Common in disturbed soil and along railway lines.

**Ricinus communis* castor oil plant
Grows wild in a service lane in Levin.

Fabaceae

A. Faboideae

Carmichaelia flagelliformis var. *corymbosa*
native broom
Occasional and easily overlooked in forest and scrub of the dune belt, in dry forest at Ohau and in kahikatea remnants at Koputaroa and Opiki.

Carmichaelia odorata native broom
Common on river margins and gorges in the foothills at rather low altitude, especially at Otaki Gorge where the flowers have scented the whole valley.

**Chamaecytisus palmensis* tree lucerne
Occasional on roadsides, waste land, and in open bush.

**Cytisus scoparius* broom
Grows on many roadsides. Flowers mostly yellow, some paler. Plants with yellow and brown flowers (var. *andranus*) grow on Kawiu Road, Levin.

**Dipogon lignosus* dolichos
In 1981 seedlings appeared in large numbers on the site of a demolished building in Levin. These have now been destroyed.

**Galega officinalis* goat's rue
Found at times on estuary flats of Hokio Stream and Ohau River.

**Lathyrus latifolius* everlasting pea
Widespread and plentiful in fencelines, on roadsides and beside railway lines. Flowers normally magenta, but some pink on Muhunua West Road.

**Lathyrus tingitanus* Tangier pea
Found once beside railway line at Koputaroa.

**Lotus pedunculatus* lotus
Widespread, most conspicuous on damp roadsides and beside streams and estuaries.

**Lotus suaveolens* hairy birdsfoot trefoil
Widespread and plentiful in dry situations on open ground on roadsides and railway margins.

**Lupinus arboreus* tree lupin
Abundant on loose or lightly-grassed dunes, some in riverbed shingle, but ultimately replaced by grasses or swept away by floods. Seeds are transported in shingle to roadsides and gravel stockpiles, but it does not persist there. A pale-flowered form was noted by Waikawa Beach Road in 1973. There has been a decline in the amount of tree lupin since 1987.

**Medicago arabica* spotted bur medick
Widespread on roadsides, around buildings, and on disturbed urban ground.

**Medicago lupulina* black medick
Widespread on roadsides, around buildings, and on disturbed urban ground.

**Medicago nigra* bur medick
Common on dry and sandy soil on roadsides and beaches and near estuaries.

**Medicago sativa* lucerne
Seen at Hokio beside the stream, and beside Kuku Beach Road, but not persistent.

- **Melilotus alba* sweet clover
Some grew on a roadside at Hokio Beach in 1969 but has not persisted.
- **Melilotus indica* King Island melilot
A common weed of open ground, roadsides, railway yards, and similar habitats. Abundant on estuary flats of beaches.
- **Robinia pseudacacia* false acacia
Heavy infestations from seeds and suckers in Prouse's bush, the Rangiatea Maori cemetery (Otaki) and on some farms and roadsides.
- Sophora microphylla* kowhai
Grows on stony land beside Lake Horowhenua, on a bank of the Ohau River in a bush remnant west of Ohau, and on a sand ridge in the Hokio dune forest where there is some regeneration. There are seedlings and adults in the Poplar Road and Koputaroa reserves. It was probably plentiful formerly in other forested parts of Makerua swamp, and on alluvium between Ihakara and Koputaroa up to the 1920s with some remaining to about 1960. Kowhai on a sand terrace north of Otaki may be natural or seeded from a planted tree. It is reported to have grown beside Lake Papaitonga last century. For observations of seedlings on Hokio Beach see Duguid (1971a).
- **Teline monspessulana* Montpellier broom
Common on roadsides and railway banks at Levin and Ohau.
- **Trifolium arvense* haresfoot trefoil
Grows on dry roadsides and similar habitats, usually near the coast.
- **Trifolium campestre* hop trefoil
Many plants seen on bared sandstone at Koputaroa but not elsewhere.
- **Trifolium dubium* suckling clover
Widespread in dry, open, grassy places.
- **Trifolium fragiferum* strawberry clover
Locally plentiful on a sand flat near Ohau estuary and some other restricted areas near the coast.
- **Trifolium glomeratum* clustered clover
Fairly widespread in dry, stony places.
- **Trifolium hybridum* alsike clover
In small numbers in gardens, and cultivated and other disturbed soil.
- **Trifolium micranthum* lesser suckling clover
Common seasonally in lawns and disturbed areas.
- **Trifolium pratense* red clover
Widespread in gardens and grassy places. Plants with white flowers grew beside the Ohau River in 1979.
- **Trifolium repens* white clover
Sown in pastures, wild in most grassy places, in gardens and waste land, and damp flats beside estuaries. Plants with narrow, pink flowers and upright growth growing in Levin in 1980 seem to have been this species.
- **Trifolium striatum* striated clover
A single plant was seen in a Levin garden in 1978.
- **Trifolium subterraneum* subterranean clover
Though originally sown is now freely naturalised on dry soil in gardens, lawns, pastures, on waste land, and roadsides.
- **Ulex europaeus* gorse
Plentiful, formerly more widespread, now cleared from most accessible pasture land.
- **Vicia hirsuta* hairy vetch
Grows on dry roadsides, especially on exposed sandstone, also on dry river banks, and banks in the dunes.
- **Vicia sativa* common vetch
Widespread on disturbed soil and roadsides. The usual form is rather stout with flowers crimson-purplish with lighter standard. Another plant of similar stature and with very pale, pink flowers with darker wings and a widely-notched standard was seen in Levin and on a Koputaroa roadside in 1979. A narrower-leaved form that was known as "*V. angustifolia*" has dark, rosy-red flowers and variable leaves. It is fairly common.
- **Vicia tetrasperma* four-seeded vetch
Seen on dry roadsides in 1962 and 1979.
- B. Mimosoideae
- **Paraserianthes lophantha* (*Albizia lophantha*)
brush wattle
Small groves on roadsides at Levin and Ohau, and on a river margin at Manakau.
- **Racosperma dealbatum* (*Acacia dealbata*)
silver wattle
On roadsides and banks near established trees
- **Racosperma decurrens* (*Acacia decurrens*)
green wattle
Growing with other trees close to a parent tree in a paddock near lower Otaki Gorge.
- **Racosperma verticillatum* (*Acacia verticillata*)
prickly Moses
A few on roadsides and in mixed hedges.
- Fagaceae
- Nothofagus fusca* red beech
A diminishing species of the foothills and adjacent

plain. A 9 m tall tree reported by C. A. J. Cockburn in 1971 on the Arapaepae hills was destroyed when a forestry road was constructed. Two colonies of beech trees, mostly hybrids, grew beside the Ohau River about 1 km downstream from the entrance to Kimberley Scenic Reserve. One colony here at Puketowai was on the brink of an undercut gravel terrace. One of the few trees remaining showed characters of red beech. Another group, probably of hybrids, grew close by on the floodplain until destroyed by a flood about 1956. I. Cooksley reported to me small pockets of red beech in the Waiotauru valley (Otaki catchment).

Nothofagus solandri var. *solandri* black beech
Only a few trees remain in the region. This was a major component of the Puketowai and floodplain groups mentioned above. A stand of black beech lines the upper lip of the lower Otaki Gorge with some regeneration where stock cannot reach. Before 1936, on the narrow undercut promontory at the junction of the Ohau River and the Ohau-iti Stream (Blackwater) there were two species of beech, black and red, beside the old Ohau hut. They were probably destroyed in the 1936 storm.

Nothofagus truncata hard beech
Formerly a component of the beech stands, but its status in the region is now uncertain. R. M. Greenwood (1959) recorded hard beech in the western Tararua Range by the south branch of the Ohau River (beside the track to Girdlestone saddle), and in the Otaki valley near Waitewaewae Forks. For observations on flowering and leaf fall in *Nothofagus* spp. in Levin see Duguid (1968).

**Quercus ilex* holm oak
Seedlings are numerous and persistent near a hedge of holm oak at Horowhenua hospital, Levin.

**Quercus robur* oak
A few self-sown oaks grow on roadsides, usually near parent plants.

Fumariaceae

**Corydalis lutea* yellow fumitory
Appears unexpectedly in gardens. A white form is seen occasionally.

**Fumaria muralis* fumitory
Widespread in disturbed soil.

Gentianaceae

**Centaurium erythraea* common centaurium
Throughout on roadsides and banks. At Hokio it grows in sunny situations on dunes and dry flats.

Sebaea ovata

This short-lived annual, needing moisture for its early growth, grows on damp sand flats, often in quite extensive drifts. Centaury, which sometimes grows on the same flats, occupies higher and drier ground. *Sebaea* was first noted by Levin botanists in 1943 and was not seen again until 1962.

Geraniaceae

**Erodium cicutarium* common storksbill
Noted beside the road at Lake Horowhenua in 1978, and on a sandy roadside, Hokio Beach Road in 1980.

**Erodium moschatum* musky storksbill
A widespread, vigorous weed, occasionally in moist places, but usually on dry soil in gardens, waste land, and margins of roads and railway.

**Geranium dissectum* cut-leaved geranium
Occasional on roadsides and other rough grassy places.

Geranium microphyllum

Rare on the eastern flank of Moutere dune hill. It was known from a stable sand flat at Hokio from 1940 to about 1950. These were bronzed-leaved plants. A more hairy greyish-leaved plant also grew at the Hokio site.

**Geranium molle* dove's foot
A widespread weed of gardens, turf, and roadsides. Flowers of two different shades have been seen on a sand country roadside, Muhunua West.

Geranium potentilloides var. *potentilloides*

Occasional in rather open pine forest on the Arapaepae hills, in damaged forest remnants on the plain, and in open forest and open pasture on the dunes.

**Geranium robertianum* herb Robert
Widespread in low numbers in open bush on the foothills and plain, and under roadside shrubs on the outskirts of Levin.

Pelargonium inodorum

Common on roadsides, footpaths, in rough gardens and dry places, especially at Hokio, Waitarere, and Ohau.

Goodeniaceae

Selliera radicans

Plentiful near the coast. Plants on sand flats have orbicular leaves, and on estuaries they have spatulate leaves (Ogden 1974). Flowers with a regular corolla are reported by Duguid (1985f).

Gunneraceae

Gunnera dentata sand gunnera
Widespread on damp coastal flats, often in sheltered sites. It is an early coloniser that is soon replaced by other plants.

Gunnera monoica
Plentiful in the foothills in open but shaded places on damp banks, cuttings and seepages.

Gunnera prorepens
Grew on a damp coastal flat beside a lagoon south of the Ohau estuary up to about the 1950s. The population included the fruit colour variant formerly known as *G. flavida*.

Haloragaceae

Gonocarpus micranthus
Widespread in wet pastures and on sphagnum mounds.

Haloragis erecta
Common in open bush, on damp bush margins and stream banks. Since about 1970 it has become a weed of urban areas growing along fences, beside the railway and some roads, often in quite dry sites.

**Myriophyllum aquaticum* parrot's feather
Two small fragments of unknown origin appeared in the Hokio estuary in 1972. A large patch there on the edge of a raupo swamp in 1975–76 became covered by sand. An infestation in Arawhata drain near Lake Horowhenua was removed. A small quantity appeared at Hokio in 1979.

Myriophyllum pedunculatum
Abundant up to the 1950s on a waterlogged silt flat between the Ohau and Waikawa estuaries until it was drained and the colony destroyed.

Myriophyllum propinquum
Common in marshes, and on margins of lakes and sluggish watercourses, but seldom found since 1980 because of its replacement by other plants.

Myriophyllum triphyllum
Small quantities were seen in shallow coastal lagoons at Ohau up to about 1952.

Icacinaeae

Pennantia corymbosa kaikomako
Plentiful in damp, open bush and on bush margins, mostly in the foothills and near lakes. Some trunks reach 122 cm in circumference.

Juglandaceae

**Juglans ailantifolia* Japanese walnut
A small grove grows beside a stream at Ihakara.

**Juglans regia* walnut
Has been seen in a number of places where it does not seem to have been planted.

Lamiaceae

**Lamiastrum luteum* aluminium plant
This garden cover plant with silvery leaves occasionally spreads into hedges, and has established from garden refuse in Prouse's bush and Kimberley Scenic Reserve.

**Lamium album* white deadnettle
A few noted on a Levin farm in 1952 (A. E. Esler), in a Levin garden in 1956, and more around an old house there in 1972. In 1985 a small plant was found beside Lake Horowhenua.

**Lamium amplexicaule* henbit
Has been appearing in gardens and new lawns since 1978.

**Lamium purpureum* purple deadnettle
A vigorous and plentiful weed of disturbed soil. A white-flowered form with brick-red stamens occurs in Levin occasionally.

**Marrubium vulgare* horehound
Found in small quantities near old settlements up to about 1950.

**Melissa officinalis* lemon balm
Persisting in an old grazed orchard at Ohau where it possibly had been planted. A single plant was seen by the railway in Levin.

**Mentha ×piperita* peppermint
Widespread on the plain and dune belt on banks of streams, ditches, and the Ohau estuary. Some also in a few drier sites.

**Mentha pulegium* pennyroyal
Plentiful in damp pastures throughout. A few white-flowered plants seen.

**Mentha spicata* ssp. *spicata* spearmint
Seen in the wild state on the north side of Lake Horowhenua on the site of an early settlement. The variant known as winter mint is widespread and spreading from garden refuse, mostly on the plain, but there is some well up Otaki Gorge Road.

**Mentha suaveolens* apple mint
Widespread, mostly in places of early settlement where it is spreading extensively. On the Arapaepae hills it grows beside an old mill track, elsewhere in damp situations near streams.

**Plectranthus ciliatus*
A few colonies have established from garden refuse, mostly near the foothills.

**Prunella vulgaris* selfheal
Plentiful in damp situations in gardens, lawns, pastures, and roadsides. In 1972 this and three other forms were found growing together in pasture on the Arapaepae hills – a. leaves entire, flowers pink, seen also in Levin; b. leaves lobed, flowers purple, found in several places on the Arapaepae hills; c. leaves lobed, flowers pink.

**Stachys arvensis* staggerweed
Plentiful in gardens and roadsides on disturbed soil, often with *Lamium purpureum*.

**Stachys byzantina* lamb's ear
A few plants appear away from plantings, usually after deep digging, suggesting that seeds may be long-lived.

**Stachys palustris* swamp stachys
A few small colonies first seen in 1972 grew on the damp margin of Hokio Stream near the estuary and increased for several years until windblown sand altered the habitat about 1983.

**Stachys silvatica* hedge woundwort
Some fairly extensive colonies in old gardens and orchards, in open bush at Levin, Otaki and Manakau, and in semi-shaded waste land.

Lauraceae

Beilschmiedia tawa tawa
In forest throughout except on swampy land. On the plain it is sometimes dominant or co-dominant. A tree in Waiopahu Scenic Reserve has a circumference of 529 cm.

Linaceae

**Linum bienne* pale flax
Plentiful on dry, disturbed soil in gardens and on margins of roads and railway, but does not persist. Some more sturdy plants with dark blue flowers grew in Levin in 1977 beside the railway.

**Linum catharticum* purging flax
Common in dry places in gardens, on roadsides and on banks, particularly in the foothills.

Linum monogynum native flax
Up until about 1950 grew on dry scrub dunes and sand flats behind the foredune.

Lobeliaceae

Lobelia anceps shore lobelia
Many plants on damp sand flats, especially beside estuaries, and in smaller numbers on seepages on banks and cuttings as far inland as the lower foothills.

Pratia angulata

Throughout in the past, but now mainly in the foothills where it is still plentiful. It has been seen on bush margins, in open bush, on damp or shaded banks, in damp pastures, in some sphagnum bogs, and on rotting wood and rotting tree fern trunks, these occasionally outside the bush.

Pratia perpusilla

There have been a few sightings of this inconspicuous and elusive plant. It was seen by E. C. Parsons at Hokio in 1942, and by me beside Ohau estuary lagoon in 1946 and for a few years after. R. Mason (1950) recorded it from Lake Kopureherehe, and it was seen here in two places by I. Townsend in 1983. For note on growth form see Duguid (1976b).

Loganiaceae

Geniostoma rupestre var. *ligustrifolium*

hangehange
Plentiful on bush margins and in open bush on the plain, occasional in these habitats in the foothills and dune belt.

Loranthaceae

Ileostylus micranthus mistletoe
Formerly widespread in small numbers except in a bush remnant on a low terrace at Ohau where it was common on a number of different small-leaved hosts and totara (Duguid 1967). Seen about 1929 at Kimberley Scenic Reserve, and from about 1940 in Hokio dune forest, and a little in Papaitonga bush. Probably extinct in those places now.

Korthalsella salicornioides

Known on kanuka in Hokio scrub both north and south of the stream from the 1930s to 1953 but not seen recently.

Lythraceae

**Lythrum hyssopifolia* hyssop loosestrife
Plentiful on moist, open ground such as lake margins, stream edges, and roadside channels.

**Lythrum salicaria* purple loosestrife
Apparently restricted to the sides of Lake Horowhenua and Hokio Stream. About 1969 a small colony grew on an islet at the south end of the lake, and about five colonies along the banks of the stream. After 1971–72 when the stream sides were mechanically cleared of vegetation, purple loosestrife from upstream colonised the banks almost continuously. Seedlings beside Hokio estuary do not persist. The few small colonies on the eastern

shore of Lake Horowhenua in 1976 had, by 1988, become almost continuous along the eastern shore where the land was built up to form a lakeside park. See observations in Duguid (1971b).

Malvaceae

Hoheria angustifolia narrow-leaved lacebark
Now rare. Judging from scattered trees seen up to about 1955, this lacebark was formerly widespread over damp ground beside tributaries of the Koputaroa Stream and from Ihakara westwards to Whirokino. In 1987 there was some regeneration in a Whirokino bush remnant, and possibly in a waterlogged remnant between the railway line and the western base of the Ihakara terrace. In 1987 it was regenerating freely in a protected bush remnant at Koputaroa.

Hoheria populnea lacebark
A tree of var. *populnea* beside Buller Road appears to have come from garden refuse as it is not native here. A form agreeing with var. *lanceolata* of Kirk has been seen on bush margins on the Arapaepae hills. Young plants occur in the Poplar Road reserve. A reference to "the lacebark shrub" by McDonald & O'Donnell (1929) as being conspicuous beside Lake Horowhenua would probably be this. Two other variants have been collected in the region — a. With tough narrow leaves. Several trees at 137 m above sea level beside the Makahika Stream agree with some subalpine specimens from the Tararua Range, e.g., CHR7322 (Waiohineiti), CHR7321 (Herepai Ck), CHR125742 (Dundas Basin). b. With leaves very uniform in size and shape, about 2 × 1 cm with regular serrations. A small group of trees 3–4 m tall on the Arapaepae hills beside a stream at about 270 m above sea level. They did not appear to be juveniles. These trees were seen in the 1960s and early 1970s but had disappeared by 1977.

**Lavatera arborea* tree mallow
Widespread in urban and rural areas along roads and railway but not in high numbers.

**Lavatera cretica* Cretan mallow
Occasional at Levin and Shannon along roads and railway.

**Malva neglecta* dwarf mallow
Plentiful along roads and railway, in trampled areas on farms, and in a rough, grassy area beside Lake Horowhenua.

**Malva nicaeensis* French mallow
Occasional on stream banks at Hokio Beach and by the railway at Levin.

**Malva parviflora* small-flowered mallow
Occasional on Levin rural roadsides and on Lake Horowhenua lakeside reserve.

**Malva sylvestris* large-flowered mallow
Sporadic. Noted on Kuku Beach Road, Lake Horowhenua lakeside reserve, and in a hedge in Levin.

**Modiola caroliniana* creeping mallow
Widespread in grassy places.

Plagianthus regius ribbonwood
Was common on the plain in damp pastures, on margins of lakes and streams, and in semi-swamp forest of older dunes but little regeneration has occurred.

Plagianthus divaricatus shore ribbonwood
Grows in damp sand beside estuaries, usually at the upper spring tide line amongst driftwood. It is plentiful beside the Ohau estuary, but none at Hokio.

Meliaceae

Dysoxylum spectabile kohekohe
Dominant in some patches of bush south of Manakau and inland to western end of lower Otaki Gorge. Elsewhere north to Horseshoe Bend it is co-dominant in some warm, dry situations on the plain and lower foothills. Absent from the dune belt. North of Manakau and Forest Lakes it is rapidly declining as it is overshadowed by tawa and other tall trees, and is not regenerating. On the eastern side of Lake Papaitonga overcrowded saplings in the canopy gaps became diseased. Drought takes a heavy toll of these too. There is a record of kohekohe growing as an epiphyte given by Duguid (1985b).

Meliantaceae

**Melianthus major* Cape honey flower
An outcast from cultivation on a roadside at Tokomaru, and on waste land in Levin.

Monimiaceae

Hedycarya arborea pigeonwood
Common on the plain on margins of damp bush and near streams, uncommon in warmer parts of the foothills, some in the dune belt in bush around the lakes, and at Whirokino.

Laurelia novae-zelandiae pukatea
Once abundant throughout in forests on permanently wet soils, usually on alluvial flats, low river terraces, swampy hollows, and margins of streams and lakes. Semi-swamp forest dominated by pukatea and kahikatea was extensive on wet flats lying inland

from the dunes and extending to the Manawatu River. All sites are now reduced in area. Fluting on the lower trunk of large trees makes girth measurements difficult. One tree recorded by the Ohau River in 1964 had an estimated diameter of 3.6 m at breast height. Another further downstream was measured at 5 m diameter, the buttressed trunk apparently buried in flood debris. Some unusual trees have been noted, three trunks connected at ground level being recorded by Johnson (1950).

Moraceae

**Ficus carica* fig
A few on roadsides.

Streblus banksii (*Paratrophis banksii*) large-leaved milk tree
Often on terraces of sandstone or gravel, but also near rivers, lakes, and swamps. The best are on the Otaki gravel plain on the road to Otaki Gorge. The largest just over 200 cm in circumference, died in 1977. It was visible from the main highway north of the Ohau flyover. A small tree in Papaitonga bush flowered while still with juvenile leaves in the 1940s. It became overshadowed by karaka trees and died.

Streblus heterophyllus (*Paratrophis microphylla*) small-leaved milk tree
Common in bush on the plain, occasional in damp bush on the foothills, and in semi-swamp forest in the dune belt. At the north end of Lake Horowhenua a trunk measured 58 cm in circumference in 1974.

Myoporaceae

Myoporum laetum ngaio
Common in the dune belt and by lakes on the plain growing on bush margins and under a fairly low and open canopy. R. Lycette reported one in the foothills beside Waiopahu track (Ohau catchment) in 1950.

Myrsinaceae

Myrsine australis mapau
Plentiful throughout in open bush and on bush margins and where birds have carried seed to hedges, fencelines, and roadsides.

Myrsine salicina toro
Common in bush on the foothills, often in glades. A few grow on the plain and in the dune belt.

Myrtaceae

**Eucalyptus* sp.
Unidentified seedlings on the road to Hokio Beach grew from stringy bark parents nearby.

Kunzea ericoides kanuka
Formerly dominant over possibly a great proportion of stable dune ridges and flats, now remaining in pockets. It was associated with manuka on coastal flats. Occasional on the plain in warm bush of stony flats, e.g., "Weraroa clearing" at Levin. In the foothills a few kanuka grow on low gravel terraces on Makahika Stream and similar parts of the Ohau River margin.

Leptospermum scoparium manuka
In the foothills manuka grows on warm banks and hillsides where bush has been cleared, the cooler parts favouring tauhinu and *Paesia* fern. C. A. J. Cockburn found a double white-flowered form in the Wai-iti valley in 1950. Manuka is widespread on the plain on banks, drying swamps, and stony river terraces. It was formerly commonly associated with kanuka in the dune belt on open flats and stable dunes. Plants on sand ridges near Whirokino have pinkish flowers.

Lophomyrtus bullata ramarama
Widespread but in small numbers in open bush. A windthrown plant on the Arapaepae hills produced a hedge-like row of new leaders connected to each other, but individually rooted.

Lophomyrtus obcordata
Throughout, but mostly on river terraces amongst other small-leaved shrubs. Hybrids with ramarama occur where both parents are present.

Metrosideros colensoi
A colony of seven vines persists in a depleted bush remnant beside the Ohau River at Ohau.

Metrosideros diffusa
Plentiful throughout, the best growing on bush margins beside rivers, streams, and lakes. They have very pale pink petals with white stamens. One in Gladstone Road by the Ohau River has smokey pink petals and matching stamens.

Metrosideros excelsa pohutukawa
Not native to the region, but north of Otaki and at Mangaore seedlings have established freely on roadside banks near planted trees.

Metrosideros fulgens red rata vine
Widespread, growing especially beside lakes and rivers, climbing trees and tree ferns, but also on rocky banks as at Mangaore. Flower colour is variable from pale brick to strong vermilion, sometimes with several tints in one area. The golden form occurs in the southern foothills at Kuku East in association with the red form. A white sport of the red-flowered form has been reported in Waitohu

valley. A giant vine in the bush adjoining Gladstone Road reserve is mentioned below.

Metrosideros perforata

Widespread and plentiful, usually climbing up trees and banks, but sprawling down a hill at Mangaore, and a tumbled shrub in open sites. On the hillside near Gladstone Road reserve, a large rimu supported two giant vines, one of this species being 97 cm in circumference. The other with a circumference of 193.5 cm appeared to be *M. fulgens*.

Metrosideros robusta

northern rata

Formerly one of the chief forest trees of the foothills, river terraces, and plain; now still widespread, but in low numbers. Most began as epiphytes, a few in open sites are rupestral. Where the Ohau River leaves the foothills, several started as epiphytes on mahoe. Near Otaki Gorge a northern rata grew on kohehoke. A giant in Waiopahu Scenic Reserve fell in its old age in the 1936 storm (Duguid 1985c).

Neomyrtus pedunculata

Common in the foothills and occasional on the plain except on a low river terrace at Ohau where it was plentiful up to 1956. One plant reached 4.6 m in height in a sheltered position. In the dune belt the species has been seen on a ridge surrounded by swamp at Poroutawhao.

Syzygium maire

swamp maire

Locally plentiful in semi-swamp forests of the plain and eastern dune margin. Seen also on waterlogged soil on the lower foothills. A tree at Poroutawhao reached 142 cm in circumference.

Nyctaginaceae

**Mirabilis jalapa*

marvel of Peru

Has persisted on the roadside on Kuku Beach Road for many years. Small colonies elsewhere are all from garden outcasts.

Oleaceae

**Fraxinus excelsior*

ash

A few wild trees have been noted.

**Ligustrum lucidum*

tree privet

A few wild trees grow in shrubberies and in fencelines.

**Ligustrum sinense*

Chinese privet

A troublesome weed in gardens some distance from ornamental parent plants.

Nestegis cunninghamii

black maire

Apparently formerly plentiful in forests throughout, still common in the foothills, and grows elsewhere in small numbers.

Nestegis lanceolata

white maire

Common in the foothills, in smaller numbers elsewhere. Usually with black maire.

Nestegis montana

narrow-leaved maire

Throughout in bush, often in fairly dry situations, e.g., dune forest at Hokio, and low river terrace at Ohau.

Onagraceae

Epilobium alsinoides

Grows in damp places by roadsides in the foothills.

Epilobium billardioreanum ssp. *billardioreanum*

Grows on damp coastal flats at Hokio and Ohau, sometimes common as an early coloniser.

Epilobium billardioreanum ssp. *cinereum*

Found at Hokio on a damp flat near the estuary in 1962 and 1970, and on a damp grassy area on the edge of Lake Horowhenua in 1970.

Epilobium brunnescens

Common on damp banks and stream margins in the foothills, and on the plain on damp gravel at Kimberley Scenic Reserve and Lake Horowhenua.

Epilobium chionanthum

Grows in bogs in the foothills, conspicuous only when flowering.

**Epilobium ciliatum*

Widespread on the coast and plain on disturbed soil on roadsides and lake margins, and in cultivated places.

Epilobium insulare

Occasional throughout on damp and swampy ground near lakes and streams.

Epilobium komarovianum

Common formerly on coastal damp sand flats in the 1940s, now occasional. It does not compete well with introduced plants.

Epilobium nerteroides

Mostly in or near the foothills where it is common on wet silt and sand on margins of streams and rivers.

Epilobium nummulariifolium

Widespread. Plentiful on damp banks beside running water, particularly in and near the foothills.

**Epilobium obscurum*

Rare on the plain in moist places.

Epilobium pallidiflorum

Widespread in sunny situations in swamps on the plain, and in ponded streams in the foothills. Spectacular in flower.

Epilobium pedunculare

Common in the foothills on damp, shaded banks and stream margins, and in seepages.

Epilobium pubens

Common on semi-shaded, dry roadside banks in the foothills, rare on the plain on sandstone banks only.

Epilobium rotundifolium

Common on the foothills and plain on damp roadsides, shaded banks, and margins of water races and streams.

Fuchsia excorticata tree fuchsia

Common in the foothills in bush and on bush margins, often beside streams. It is less common on the plains, mainly because of diminished habitats. Some grows in semi-swamp forests of the plain and dune belt.

Fuchsia perscandens

Grows on margins of damp bush and semi-swamp forest on the plain and dune belt, usually in shade, but it persists on roadsides and in ditches. Hybrids with tree fuchsia have been seen.

**Fuchsia* cultivar

A large shrub about 1.5m tall with very small pink flowers thrives on some roadsides from garden outcasts.

**Ludwigia palustris* water purslane

Has been seen on swampy margins of Lake Horowhenua, occasional beside Hokio estuary.

**Oenothera glazioviana* evening primrose

Grows on sandy roadsides near the coast, and on a few roadsides at Levin.

**Oenothera stricta* sand primrose

Was seen on a dry sand flat on the south side of the Manawatu estuary in 1977.

Orobanchaceae**Orobanche minor* broomrape

Plentiful in gardens and on roadsides on many different host species.

Oxalidaceae**Oxalis articulata*

Widespread in old neglected gardens and on roadsides and railway margins.

**Oxalis corniculata*

Plentiful in gardens and waste ground, the creeping stems overtopping other low plants in summer. A bronze-leaved form remains slow growing until the soil becomes dry in early summer when it flowers and spreads where other plants do not thrive. This species grows in disturbed soil, in cracks in paths, and under shrubs.

**Oxalis debilis*

Seen in a neglected garden in Levin in 1975 and at Ohau 1977 as a garden outcast. Flowers whitish.

Oxalis exilis

Common in gardens, lawns, and damaged bush.

**Oxalis incarnata*

Widespread in gardens. It was grown as a house plant early this century. Flowers very pale, pinkish heliotrope.

**Oxalis latifolia* fishtail oxalis

Not seen until about 1970 but now common and persistent in gardens. Flowers bright pink-mauve.

Oxalis magellanica

Throughout in damp open sites on bush margins, in seepages, dune hollows, on river banks, and on sandstone under manuka at Ihakara.

**Oxalis pes-caprae* Bermuda buttercup

Widespread in gardens, often under hedges, and on neglected urban land and former gardens. Persists but does not spread unduly.

Oxalis rubens

This sturdy upright native plant with a thick rootstock is sometimes seen at Hokio and other beaches.

**Oxalis vallicola*

Grows in most gardens in the region where it actively suppresses small plants. Flowers are smaller than those of *O. latifolia*, very pale, almost white.

Papaveraceae**Papaver somniferum* opium poppy

Occasional wild plants have been seen in Levin.

Passifloraceae**Passiflora edulis* black passionfruit

Seedlings noted in a crack in a Levin footpath but later destroyed.

**Passiflora mollissima* banana passionfruit

Grows in many places where there are trees and shrubs to support it.

Passiflora tetrandra New Zealand passion vine

Formerly widespread and plentiful in warm situations on bush margins, now mostly destroyed. Large vines near Levin measured 58 cm and 53 cm in circumference.

Phytolaccaceae**Phytolacca octandra* inkweed

Mostly in much-damaged bush, but very common in pine forests on the foothills and dune belt.

Piperaceae*Macropiper excelsum* kawakawa

Plentiful in damaged bush where it survives in spite of browsing by farm animals. In the foothills

kawakawa grows in many places, but in low numbers. Seedlings appear in gardens.

Pittosporaceae

Pittosporum cornifolium

Often associated with *Collospermum hastatum* as an epiphyte where the air is moist beside lakes and rivers.

Pittosporum crassifolium karo
Not native to the region, but seedlings appear in shrubberies far from parent plants.

Pittosporum eugenioides tarata
Widespread on forest margins and in open bush on the foothills and plain.

Pittosporum tenuifolium var. *tenuifolium* kohuhu
Common in open bush on the plain and dune belt, occasional on bush margins in the foothills.

Plantaginaceae

**Plantago aristida*

Recorded from Weraroa by H. H. Allan (1940) but not seen on the survey.

**Plantago australis* swamp plantain
Abundant in restricted habitats such as waterlogged pastures and seepages in the Arapaepae hills and Makahika valley.

**Plantago coronopus* buck'shorn plantain
Abundant on damp, coastal flats, particularly by estuaries.

**Plantago lanceolata* narrow-leaved plantain
Throughout in grassy places in abundance.

**Plantago major* broad-leaved plantain
Common in damp places on roadsides, also on damp coastal flats beside estuaries.

Plantago raoulii

Common in the foothills in damp pastures and on grassy mill tracks. Some on damp coastal flats up till about 1950.

Polemoniaceae

**Navarretia squarrosa* Californian stinkweed
Seen on farms and roadsides in the sand country, and on roadside and river shingle inland.

Polygonaceae

**Emex australis* three-cornered Jack
Grew in a large patch with grasses for several years at Hokio until destroyed about 1972.

Fallopia convolvulus cornbind
Grows in crops and on other disturbed soil.

Muehlenbeckia australis

Common on bush margins and on low trees and hedges on the plain and dune belt and occasional in the foothills. Plants in the foothills have mostly trilobate leaves. Elsewhere the leaves are large. A flowering plant on the edge of Kimberley Scenic Reserve in 1975 had both kinds of leaves.

Muehlenbeckia complexa pohuehue
Plentiful in the dunes, usually forming tangled, shrub-like masses, occasional on the plain on gravel terraces, lake shores, and drain margins. It is rare in the foothills. Hybrids have been noted at Waikawa and Hokio Beaches.

**Polygonum aviculare* wireweed
Plentiful in dry, open places on roadsides, and in gardens and paddocks.

**Polygonum hydropiper* water pepper
Plentiful in swamps and ditches, on lake margins and in some temporary muddy hollows.

**Polygonum persicaria* willow weed
Plentiful on lake margins, in ditches and damp pastures.

Polygonum salicifolium

Plentiful in swamps and on margins of lakes and streams on the plain and dune belt, occasional in the foothills.

**Rumex acetosella* sheep's sorrel
Widespread in dry places, on roadsides and in poor soil in gardens, crops, and pastures.

**Rumex conglomeratus* clustered dock
Common on lake margins and swampy ground and in other wet places.

**Rumex crispus* curled dock
Noted on Levin roadsides, but probably more widespread.

**Rumex obtusifolius* broad-leaved dock
Widespread in coastal sand, damp turf, farm gateways, holding yards, and gardens.

**Rumex pulcher* fiddle dock
Common in turf, especially where rather damp.

**Rumex sagittatus* climbing dock
For many years confined to Waitarere roadsides where it is now abundant. First noted as a weed in Levin about 1978, then spread rapidly through the town on railway land, around commercial buildings, and in cracks in footpaths wherever the seeds could germinate. In 1984 it was spreading into the western margin of Hokio dune forest.

Portulacaceae**Montia fontana* ssp. *chondrosperma*

An occasional short-lived annual on vacant ground, in gardens, and on roadsides, often where a temporary puddle has dried out.

Montia fontana ssp. *fontana*

Occasional in the foothills on wet mud or at the margin of shallow ponds.

**Portulaca oleracea* portulaca

Widespread and seasonally plentiful in gardens, disturbed pasture, farm gateways and on dry roadsides.

Primulaceae**Anagallis arvensis* scarlet pimpernel

Plentiful in cultivated soil, sometimes on roadsides.

Samolus repens

Common in damp salt flats beside estuaries.

Proteaceae**Banksia integrifolia*

A number of well-grown shrubs have established from planted trees on the margin of Waitarere pine forest.

Knightsia excelsa rewarewa

Plentiful in bush on the foothills and plain, usually regenerating freely.

Ranunculaceae**Anemone ×hybrida* Japanese anemone

Spreads from gardens.

**Aquilegia vulgaris* columbine

The reverted granny-bonnet form persists and resows in neglected gardens.

Clematis foetida

Formerly abundant on bush margins and roadsides, particularly on the plain. Now only occasional, though many seedlings could grow to maturity if undisturbed.

Clematis forsteri

Occasional on bush margins on the dune belt near Hokio and on older dunes at Poroutawhao. Now rare because of grazing stock. Rare in the Arapaepae hills.

Clematis paniculata

Widespread in bush and many seedlings present.

**Clematis vitalba* old man's beard

Very widespread and abundant on bush margins, fencelines, and roadsides. It does not yet appear to be seriously affecting native bush, but is too widely

distributed to be ignored. Plants seem to be increasing in numbers though some have been destroyed with herbicide.

Ranunculus acaulis

Occasional on damp, coastal sand flats and beside estuaries. Less plentiful than formerly.

**Ranunculus acris* giant buttercup

Of limited distribution. Noted in Arapaepae hills pasture and along roadsides and ditches at Koputaroa in 1964, and in pasture near Kimberley Scenic Reserve in 1975.

Ranunculus amphitrichus waoriki

Common mostly near the coast in bogs, lagoons and lakes, usually on wet mud. Some grows in open, semi-swamp forest. More plentiful than *R. macropus* and often associated with it.

**Ranunculus bulbosus* bulbous buttercup

Seen in 1978 in old pasture on a low gravel terrace at Ohau. Observations on the growth of local plants are recorded in Duguid (1985e).

**Ranunculus ficaria* ssp. *ficariiformis* celandine

Seen in 1981 as a garden outcast on a roadside near Levin.

Ranunculus macropus

Fairly common in streams near the coast, occasional in lakes and bogs in the foothills. Usually in shallow water which may be only temporary.

**Ranunculus muricatus* spiny buttercup

Collected from a roadside at Manakau by A. E. Esler in 1959.

**Ranunculus parviflorus* small-flowered buttercup

Grows in Hokio dune forest, on roadsides, and sometimes in gardens.

Ranunculus reflexus

Common in warm, rather open bush, occasional on roadside banks.

**Ranunculus repens* creeping buttercup

Widespread and aggressive in damp soil in pastures and gardens, and on roadsides.

**Ranunculus sardous* hairy buttercup

Common on roadsides and other dry, waste ground.

**Ranunculus sceleratus* celery-leaved buttercup

Plentiful in shallow water and damp mud but survives to maturity on sites which dry out, as on some coastal sand flats. Plants on margins of lakes, estuaries, and water races may be quite large.

**Ranunculus trichophyllus* water buttercup

Grows on the coast in drains, streams and estuary streams, also further inland where the Hokio Stream leaves Lake Horowhenua.

Resedaceae****Reseda lutea***

Occasional plants appear in freshly disturbed urban soil from long-forgotten gardens, on railway margins, and at Hokio beside the estuary.

Rhamnaceae***Discaria toumatou* matagouri**

Formerly there were a number of small colonies on dry coastal sand flats and ridges from near the Manawatu River to near the Waikawa estuary, also on a low river terrace at Ohau. Seen since 1929 but it is doubtful if any remained after 1950.

Pomaderris phyllicifolia* var. *ericifolia

Sometimes associated with *Discaria* in scrub on a gravel terrace at Ohau, in a warm hollow near Hokio dune forest, and south of Hokio Beach settlement where plants were fairly numerous and regenerating. Present until about 1950.

****Rhamnus alaternus* evergreen buckthorn**

Common at the western end of Otaki Gorge Road where it seeded from some plantings on the gravel plain. A few plants have been seen on a road margin on the Arapaepae hills and near Levin.

Rosaceae***Acaena anserinifolia* bidibidi**

Widespread and plentiful, usually as a trailing plant on sunny banks, often associated with *A. novae-zelandiae*.

****Acaena agnipila* var. *tenuispica* (*A. ovina*)**

Australian sheep's bur

Occasional on dry roadsides and fencelines on sand, and near Levin. The hybrid with *A. anserinifolia* occurs sparingly where this species grows with the other parent.

***Acaena novae-zelandiae* bidibidi**

Plentiful, usually with *A. anserinifolia*. Also on damp sand near the coast.

****Aphanes inexpectata* parsley piert**

Occasional in dry lawns and gardens, on vacant land, and roadsides.

****Chaenomeles speciosa* japonica**

A few persist in cleared urban sections and on the site of a former settlement at Otaki Gorge.

****Cotoneaster glaucophyllus*, **C. lacteus***

Both species grow wild on margins of roads and railway.

****Cotoneaster simmonsii***

Freely naturalised but less common than the previous two species.

****Crataegus monogyna* hawthorn**

A few grow on roadsides, fencelines, and banks.

****Duchesnea indica* Indian strawberry**

Prevalent on some bush margins on the plain.

****Malus ×domestica* apple**

Common on roadsides, picnic spots, banks, and railway margins on the plain. Many trees crop quite heavily.

****Malus cultivar* crabapple**

A wild plant grows on a bank at Koputaroa.

***Potentilla anserinoides* silverweed**

Numerous plants seen on coastal flats at Hokio and Ohau which are occasionally waterlogged, also in swamp at Poroutawhao.

****Potentilla reptans* creeping cinquefoil**

In small numbers on open, damp flats in many places on the Arapaepae foothills from Heights Basin southwards towards Arapaepae No.1 trig. It also grows beside Lake Waitawa.

****Prunus cerasifera* cherry plum**

Occasional on roadsides and picnic spots, and in fencelines and hedges. Some bronze-leaved plants also grow wild.

****Prunus persica* peach, nectarine**

Single trees have established in many places, but produce few fruits.

****Prunus serrulata* Japanese flowering cherry**

Around Levin seedlings grow up along fencelines, hedges, and roadside banks.

****Pyracantha crenulata***

A single roadside colony at Koputaroa. Seedlings appear in gardens.

****Pyrus communis* pear**

One tree on a roadside bank at Koputaroa bears fruit.

****Rosa multiflora***

Several colonies are spreading on roadsides at Levin and Manakau, and seedlings in damaged bush at Levin.

****Rosa rubiginosa* sweet brier**

Formerly plentiful at Ohau. Was widespread but little remaining in the region by 1975.

****Rosa* cultivars**

Various rambling roses of *R. wichuraiana* or similar cultivars are wild in the region, mostly persisting from former cultivation, though about half of them are semi-naturalised, spreading and difficult to destroy, e.g., 'Dorothy Perkins', 'American Pillar', and a small single red with white centre. A different type of rose is an old-fashioned purplish-pink cabbage rose, very sweetly scented, with many short crumpled

petals. It seems to have been a rambler. Two spreading, sprawling heaps on both sides of Buller Road had been cast out of a nearby garden, probably about the 1920s and were well established on the roadside. They were cleared about 1984 or 1985.

Rubus australis swamp lawyer
Common in swamps and very muddy forest in the dune belt, plain, and wet gullies of the foothills.

Rubus cissoides bush lawyer
Formerly abundant throughout on roadsides and bush margins. By the 1980s it was still common in the foothills, but much reduced elsewhere.

**Rubus fruticosus* blackberry
Fairly plentiful throughout, and formerly abundant in some swamps which are now in pasture, e.g., Arawhata beside Hokio Beach Road, and at Whirokino.

**Rubus laciniatus* cut-leaved blackberry
Of similar distribution to *R. fruticosus* but less plentiful.

**Rubus phoenicolasius* Japanese wineberry
A few plants persist on old settlements as on Otaki Gorge Road.

Rubus schmidelioides bush lawyer
Common on bush margins especially on low river terraces. Widespread and plentiful on the plain, less so on the foothills. Also occurs in swampy bush of the dune belt. An old vine at Ohau near the river in the 1960s had stems 55 cm in circumference.

Rubus squarrosus
Very prickly plants with narrow leaf blades are common on bush margins and in damaged bush of the plain, usually near rivers. Forms with very reduced leaf blades ("leafless") have not been seen in the region.

Rubiaceae

Coprosma acerosa sand coprosma
Formerly common as an early coloniser of mobile dunes and flats, now less plentiful. Isolated plants persist on fixed dunes further inland.

Coprosma areolata
Plentiful in bush remnants on fixed dunes and the plain. It is unpalatable to stock. A plant in a damp forest remnant north of Lake Horowhenua in 1974 had a stem circumference of 68 cm.

Coprosma crassifolia
Occasional in Hokio dune forest in a damp, shaded valley, and at Whirokino. Formerly common in bush on a low terrace south-west of Ohau.

Coprosma foetidissima stinkwood
Occasional in open bush and on the margins in the foothills.

Coprosma grandifolia kanono
Common in open bush and on the margins throughout, mainly in damp or shaded sites. A few plants are epiphytic.

Coprosma lucida shining karamu
Grows in open bush and on the margins throughout in low numbers.

Coprosma propinqua var. *propinqua*
Common in damp, more or less swampy, open country throughout, but more common towards the coast. The variable hybrid with *C. robusta* is also common.

Coprosma repens taupata
Not native in the region, but birds distribute seeds from trees planted mainly at the beaches, thus resulting in wild plants at Rangiuuru, Tasman Beach, and Waitare. Some also beside Tararua Road, Levin.

Coprosma rhamnoides
Common in fairly open bush and scrub of the plain and dune belt, a few on rather dry banks low on the foothills. Unpalatable to farm animals.

Coprosma rigida
Not very widespread but in good numbers. Near the coast it grows in dune forest at Hokio and on the margin of heavier forest on older dunes at Whirokino. On the plain it occurs mostly on alluvium, but has been depleted in this area by browsing animals.

Coprosma robusta karamu
Plentiful on roadside banks, damp open places, and flax swamps throughout. Occasionally grows as an epiphyte.

Coprosma rotundifolia
Common throughout in open bush and on bush margins on poor, damp soil, damp river terraces on gravel, and in bush on damp, stabilised sand flats.

Coprosma tenuicaulis
In lakeside swamps at Lake Horowhenua and Papaitonga, and probably in similar conditions elsewhere.

**Galium aparine* cleavers
Seasonally abundant in gardens, hedges, on roadsides, and waste land where soil has been disturbed.

**Galium divaricatum* slender bedstraw
Beside lower Otaki Gorge Road in 1964.

**Galium palustre* marsh bedstraw
Plentiful on all low-lying, poorly drained ground and waterlogged paddocks.

Galium propinquum
Common throughout in open bush.

Nertera depressa
Plentiful in the foothills on damp shaded banks, many seepages, damp rotten logs, and in moss. Occasional in the dune belt and on the plain in moist habitats.

Nertera scapanioides
Rare on waterlogged peat beside Lake Waitawa and in scrub beside a lagoon and swamp west of Lake Papaitonga. It is possibly more widespread than these observations indicate.

Nertera setulosa
Locally plentiful throughout in dry pastures where other native plants grow, also on dry rotten logs, in turf beside bogs, and in sphagnum mounds. Such places vary from moist to very dry, but all have low fertility. In some places it grows under manuka and on exposed banks.

**Sherardia arvensis* field madder
Occasional in gardens, dry open places on roadsides, and cleared ground.

Rutaceae

Melicope simplex poataniwha
A common shrub of fairly open bush, also in scrub and light bush on the dune belt. Plants growing among tall trees may reach 9 m.

Melicope ternata wharangi
Grows with kohekohe in open bush and on bush margins in many places south of the Otaki River but only at Papaitonga and Forest Lakes in the north. Hybrids in many forms were seen at Heart Lake about 1970.

Salicaceae

**Populus nigra* cv. 'Italica' Lombardy poplar
Suckers freely along drains on two roadsides near Levin. Small plants of another species at one of these sites may be seedlings or suckers.

**Salix cinerea* grey willow
Spreads unmanageably where planted in boggy places as at Florida Road.

**Salix fragilis* crack willow
Spreads by detached twigs in streambeds.

Santalaceae

**Mida salicifolia*
Grows in small groves within bush in the foothills

east of Levin, and in Kimberley Scenic Reserve. One small plant was seen in Papaitonga bush in 1964. There are many forms between the typical plant and entities named var. *myrtifolia*.

Sapindaceae

Alectryon excelsus titoki
Fairly plentiful in open bush and on margins on the plain, less common on warm parts of the foothills, and on the eastern part of the dune belt. Seeds are carried by larger birds, but many are damaged by insects. Seedlings are unpalatable to stock and are fairly drought resistant. Mature trees survive where other species die from exposure to wind. A trunk at Muhunua East reached 195 cm in circumference. See Duguid (1961) for note on flowering.

Dodonaea viscosa akeake
Seems to be confined to scrub dunes adjacent to Hokio dune forest. Where the natural gas pipeline was put through the dunes a grove of akeake has appeared. The cultivated bronze-leaved form near Lake Horowhenua was the origin of seedlings there.

Scrophulariaceae

**Antirrhinum orontium* wild antirrhinum
A small colony by the railway at Levin persisted from 1974 well into the 1980s in spite of herbicide spraying. A single plant was seen near Hokio estuary. In 1987 there was a large infestation further inland beside the railway line.

**Cymbalaria muralis* ivy-leaved toadflax
A few plants grow against walls and in pavement cracks in Levin. First seen in 1975 and persisting. Formerly grown as a house plant.

**Digitalis purpurea* foxglove
Common in dry places in the foothills on riverbeds, roadsides and banks, rare elsewhere. G. L. Adkin who farmed a foothill property when there were still many logs from the former forest remaining, described to A. E. Esler the weed problem presented by foxglove in such country. Some land was rendered almost unfarmable by it.

Glossostigma elatinoides
From about 1970 this has been difficult to find on damp, muddy margins of lakes and lagoons because of competition from other plants. For observations on flower movements see Duguid (1969b).

Gratiola sexdentata
Some seen on wet ground, bogs, and margins of small lakes in the foothills, plain, and dune belt.

Hebe stricta var. *stricta* koromiko
Plentiful on banks, in flax swamps, and many other sunny positions. A narrow-leaved plant which seems to be a variant of var. *atkinsonii* is restricted to the Otaki Gorge area.

Jovellana repens
Rare on the lower edges of wet, shaded stream banks in the foothills.

**Kickxia elatine*
Appeared on railway gravel in Levin in 1987. Plants from successive seedlings flowered from November 1987 to April 1988.

Limosella lineata
Grows in the dune belt on wet flats, margins of estuaries and temporary lagoons, and in wet hollows on roadsides. Colonies are short lived where other plants invade, but new colonies develop from seeds where conditions are favourable.

**Linaria purpurea* purple toadflax
Grows mostly along the railway and on waste land in Levin.

**Linaria vulgaris* toadflax
Not seen for many years.

Mazus pumilio
Occasional on damp coastal flats from Hokio to south of the Ohau estuary, on swampy margins at Lake Horowhenua, and in wet pasture at Whirokino. Easily eliminated by taller plants. Recorded for Otaki by Aston (1910).

**Mimulus guttatus* monkey musk
Grows beside lakes, in drains and on stream margins, mostly in the foothills. Some was seen in a swamp at Koputaroa in 1987.

**Mimulus moschatus* musk
Rare in very wet ground beside lakes and drains. Also in wet hollows in the foothills. It was noted beside Lake Horowhenua in the 1930s.

Mimulus repens
Grows on damp ground beside the estuaries of the Waikawa Stream and Ohau River where it was formerly plentiful. Recorded "in brackish swamp at Otaki" by Aston (1920).

Ourisia macrophylla
Seen on a stream margin at the lip of the Tokomaru waterfall 225 m above sea level up to 1935 and may still be there. This is well below the usual altitude for this plant which is possibly var. *drucei*.

Parahebe catarractae ssp. *diffusa*
Grows on the foothills on banks and rocks beside rivers down to about 150 m above sea level at Horseshoe Bend.

**Parentucellia viscosa* tarweed
Grows on damp or wet open ground, but can also be found in many apparently dry situations after a wet spring.

**Paulownia tomentosa*
Plants arising around parents in Levin have resisted herbicide.

**Verbascum thapsus* woolly mullein
Fairly common on gravel on roadsides and railways tracks.

**Verbascum virgatum* moth mullein
Small colonies were seen on roadsides at Levin on Arapaepae Road in 1970, and Kimberley Road in 1981.

**Veronica anagallis-aquatica* water speedwell
Seen at times where suitable wet habitats have appeared on the margin of Lake Horowhenua and estuaries.

**Veronica arvensis* field speedwell
Plentiful in disturbed soil. Produces flowers and seeds after reaching 1 cm in height and has three or four generations through the summer with much larger plants in mid season.

**Veronica persica* scrambling speedwell
Plentiful in disturbed soil of gardens and waste ground, but less ubiquitous than field speedwell.

**Veronica serpyllifolia* thyme-leaved speedwell
Plentiful in lawns, pastures, roadsides, and gardens.

Solanaceae

**Brugmansia candida* angel's trumpet
Grows on bank of Waikawa Stream near State Highway 1. Seems to be from a garden outcast.

**Brugmansia sanguinea*
A roadside colony in Waikawa valley noted in 1979 seems to have originated from a specimen in a nearby garden.

**Cestrum fasciculatum* cv. 'Newellii' red cestrum
Persisting from an old settlement on Otaki Forks roadside, and at Florida Road where an extensive colony has developed from garden refuse.

**Datura stramonium* var. *stramonium* thorn apple
Seen in small numbers on disturbed soil near Levin in 1950, 1973 and 1986, and near Ohau in 1986.

**Lycium barbarum* Chinese boxthorn
A few plants grow along a fence at Ohau from plantings or seed introduced by birds.

**Lycium ferocissimum* boxthorn
Widespread, particularly on coastal dunes where its spread by birds and other agents is very effective.

**Nicandra physalodes* apple of Peru
Common from 1950 onwards in disturbed soil on streets, roadsides, cleared land, and some market gardens, but does not persist in the places where it appears. Large numbers are said to have appeared in the vegetable garden at Kimberley Hospital following topdressing with fowl manure.

**Physalis peruviana* cape gooseberry
Grows on bush margins and sometimes spontaneously in gardens.

Solanum americanum small-flowered nightshade
Grows plentifully in shelter and semi-shade on margins of damaged bush, in warm open bush remnants, and garden shrubberies from the coast to the foothills.

Solanum aviculare poroporo
Common on forest margins, mainly on the plain and foothills.

**Solanum chenopodioides* velvety nightshade
A single plant at Hokio in 1977, and another at Koputaroa in 1987 were considered to be casual. However, the species grows on sand country both north and south of Horowhenua, and may possibly be established in the region.

**Solanum diflorum* Jerusalem cherry
Numerous plants associated with *S. pseudocapsicum* occur in several bush remnants near the Manawatu River at Whirokino and Opiki.

**Solanum dulcamara* bittersweet
Occasional in disturbed swamps on the plain. Seen from 1930 in Arawhata swamp and Whirokino and similar wild habitats, some on the eastern side of the dune belt. Formerly more widespread.

**Solanum jasminoides* potato vine
A few wild plants have established from garden outcasts, and possibly from seeds.

Solanum laciniatum poroporo
Growing naturally in good numbers near the Waitohu Stream and near Otaki Gorge. Many which sprang up along the railways at Te Horo about the 1950s may have been introduced in shingle from Otaki River as ballast. Wild plants about Levin and Shannon may be from plantings.

**Solanum linnaeanum* apple of Sodom
Seen on Hokio Beach Road in the 1960s, and reported from Kimberley Road about the same time.

**Solanum mauritianum* woolly nightshade
The few plants which appeared in rural areas south of Levin, on Hokio Beach Road, Buller Road, and C. D. Farm Road were mostly destroyed by 1970, but others have been noted since.

**Solanum nigrum* black nightshade
Plentiful throughout gardens, in cultivated soil, and in waste places in the open and under shrubs and hedges.

**Solanum pseudocapsicum* Jerusalem cherry
Widespread in neglected gardens and shrubberies, damaged bush, and warm, open bush remnants where other plants do not succeed under trees. Formerly much grown in gardens, the long-lasting berries being valued for winter decorations. Birds ignore the ripe berries till late in the winter, but are the chief agents of their dispersal.

**Solanum tuberosum* potato
Short lived from garden refuse on roadsides.

Thymelaeaceae

Pimelea arenaria
In moderate numbers on sheltered sand flats inland of foredunes.

Pimelea prostrata
Some seen in the 1940s on a stable sand flat at Hokio before being destroyed by sand drifts.

Pimelea tomentosa
A few seen at Hokio in the 1940s.

Tropaeolaceae

**Tropaeolum majus* garden nasturtium
Grows from garden outcasts around Levin and persists for a while.

Ulmaceae

**Ulmus ×hollandica* suckering elm
Suckers appear, often at some distance from trees, and have persisted in Levin, and by a drain at Ihakara. Some dense thickets have developed.

Urticaceae

Australina pusilla
Grows in rather open, but muddy places within bush beside the Ohau River and tributaries from the foothills to Kimberley Scenic Reserve.

Elatostema rugosum parataniwha
Grows in sheltered, wet places in bush mostly on the foothills, and in a colony near Lake Papaitonga.

Parietaria debilis
Common on rather dry ground in open bush on the plain and dune belt.

**Urtica dioica* ssp. *dioica* perennial nettle
In small colonies in stockyards and larger expanding colonies on roadsides.

Urtica ferox ongaonga, tree nettle
Common in the 1920s near the eastern shore of Lake Horowhenua. Seen also near Otaki River, also by Ohau River where it grew on a low terrace until about 1965 or a little later. Possibly extinct now in the region.

Urtica incisa
Seen in open bush throughout the region.

Urtica linearifolia swamp nettle
Plants with leaves variable in width and shape grew on margins of lakes and small streams. Now seldom seen, though C. C. Ogle (pers. comm.) noted it growing in plenty locally at Tokomaru.

**Urtica urens* nettle
Seen rarely from 1965 in farm yards and beside Levin saleyards.

Valerianaceae

**Centranthus ruber* spur valerian
Plants on the hillside near the powerhouse at Mangaore probably spread from gardens.

Verbenaceae

**Verbena bonariensis* purple-top
Common on railway margins, roadsides, and waste places.

**Verbena litoralis* blue vervain
Has been seen in Prouse's bush.

**Verbena officinalis* vervain
Seen on a roadside at Hokio about 1938, and on a Levin roadside in 1973 and again some years later.

Violaceae

Melicytus lanceolatus narrow-leaved mahoe
Grows in forested valleys in the foothills down to about 120 m above sea level.

Melicytus micranthus
In good numbers in a few places – on a low river terrace near Ohau, and in light bush on dunes at Poroutawhao and Whirokino.

Melicytus ramiflorus mahoe
Throughout, but especially on the plain in light bush, or bush margins, and on banks. Hybrids with *M. micranthus* on a low river terrace were first seen in 1943, perhaps now destroyed. For notes on flowering see Duguid (1968).

**Viola arvensis* field pansy
Grows in weedy gardens.

Viola cunninghamii
Recorded on hummocks in a coastal bog south of the Ohau River mouth up until about 1950 before the land was drained.

Viola lyallii
Grows in boggy ground in depleted semi-swamp forest, mostly near lakes.

**Viola odorata* violet
A few plants have taken root from garden refuse and are spreading.

**Viola tricolor* heartsease
A few have been seen in cultivated soil.

Winteraceae

Pseudowintera axillaris horopito
Occasional and regenerating in light bush in the foothills and rare in bush on the plain in Papaitonga and Kimberley reserves.

Pseudowintera colorata pepper tree
Common in the foothills, especially on bush margins. Many seedlings present.

THE FUTURE

Native bush is regenerating well in the least accessible parts of the foothills but the bush area is diminishing as pine plantations are extended. On the plain and older dunes several small, moist, fenced remnants are in good order and likely to survive. Remnants by streams and lakes could remain in a reasonable state if farm stock do not have access. Many others which are small and devastated by periodic droughts have diminishing floras, often with only suppressive karaka flourishing.

Dune scrub which had remained more or less intact is becoming depleted by removal of firewood, planting of pines, and invasion by weeds. Some of this unstable sand country did not recover from the early influence of farming, and is still suffering from cattle damage. The estuaries and stream margins where native vegetation thrived are being taken over by weeds.

Increasing dryness is very apparent to those of us who have seen improved flood control, the lowering of swamp watertables and lake levels, and the increasing draw-off of water from the Ohau River for town supply and from bores for horticultural purposes. This drastically diminished the extent and altered the character of the native vegetation over a large area.

There have been some dramatic changes in the importance of alien plants. While gorse and

blackberry diminished, others with enormous weed potential like climbing dock and boxthorn have not been controlled. As water celery chokes waterways, many grasses reach weed proportions. Paspalum, which started modestly on rural roadsides, has joined knot-root bristle grass and the summer grasses infesting lawns and other grassy places. Veld grass is sweeping across the region occupying out of the way places and defying techniques which keep most other weeds in check.

An informed public awareness of the aggressive habits of these and other weeds is greatly needed. An understanding of the requirements of native plants is the first essential if examples of this diverse and fascinating vegetation are to be maintained.

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Note by A. E. Esler

Frances Cawood Duguid (nee Pyke) was born in Napier. She moved to Levin in 1913 and attended Levin primary school followed by three years secondary education at Napier Girls' High School. She then returned to Levin to assist her parents. Frances developed an early interest in plants, observing the wild plants of her district and building up a basic knowledge of their identity from the books then available by Laing and Blackwell, Cockayne and Phillips Turner, and Dobbie. Time was also found for church, welfare, cultural, and Girl Guide activities.

When the Levin Native Flora Club was formed in 1940, Frances was a farmer's wife with a young family so did not become a foundation member. The following year when Lucy Moore visited Levin the two botanists met and "clicked straight away". Thereafter they met frequently and corresponded. Lucy often spoke to the Native Flora Club and asked Frances to supply specimens from time to time for illustrating some of the early publications of Botany Division, or as needed for other purposes. In Levin, Frances enthusiastically shared her knowledge through the Club and regular displays of native plant material in the Levin Public Library. Her private herbarium provided discussion material for Club workshop programmes. Good observation, accurate field notes, adequate herbarium specimens, and a very clear memory enabled her to put this information on wild plants of Horowhenua on record for the enrichment of all who come afterwards.