

## WANGANUI CONSERVANCY

### Reporoa Bog (29)

**Location:** 39°35'30"S, 176°08'E. On the Mangaohane Plateau, northwest Ruahine Range, approximately 30 km east of Taihape, North Island.

**Area:** c.175 ha.

**Altitude:** 1,140 m.

**Overview:** This wetland is a raised montane bog in a high country basin with extremely important botanical values.

**Physical features:** Reporoa Bog is a natural, raised bog in a basin, with a major stream running out to the west and a smaller one to the east. The bog constitutes the headwater catchment of the Reporoa and Pokopoko Streams, both of which drain into the Rangitikei River. Water recruitment to the bog is derived from the northern slopes of the Ohutu Ridge. The geology is dominated by Cenozoic marine sediments, elevated as plateaux and mantled with andesitic ash. Ash showers from Taupo/Tongariro eruptions have had a major influence on soils. Water quality is high, and the bog is tapped at its western outlet for domestic and farm water supply. The climate is very wet, with an average annual rainfall of approximately 3,000 mm and about 250 days with rain per year.

**Ecological features:** The bog contains some 160 species of plants, 13 of which either occur nowhere else in the North Island or reach their southern limit in the North Island at Reporoa. The bog also harbours an unusual entomological fauna whose closest affinity is with that of Fiordland, in the South Island of New Zealand. This area, with its disjunctive distribution of both plants and insects, is important for giving clues to aid in the interpretation of New Zealand's geological past.

**Land tenure:** The wetland is private land, with 75% owned by Mangaohane Station and 25% by Maori people. Surrounding areas are private land.

**Conservation measures taken:** None.

**Conservation measures proposed:** The Department of Conservation is negotiating with the owners of part of this area over protection of the habitat.

**Land use:** The wetland forms part of the Erewhon Water Supply Scheme, and was fenced to keep domestic livestock out. A small agricultural community lives in the surrounding area.

**Possible changes in land use:** None known.

**Disturbances and threats:** The main threat to the area is the trampling and pugging of wetland areas by domestic livestock.

**Hydrological and biophysical values:** The wetland plays a significant role in the maintenance of water quality. Maintenance of water quality is important as the wetland is part of a water supply scheme. The bog plays a general role in recharge and discharge of groundwater, sediment trapping and flood control. It is of importance in supporting aquatic and terrestrial food chains.

**Social and cultural values:** The wetland forms part of the Erewhon Water Supply Scheme.

**Noteworthy fauna:** According to the Auckland Entomological Society, the bog supports an unusual array of insect species which have their closest affinities with insects of the Fiordland area in the South Island. Specific details are not available.

**Noteworthy flora:** A number of species found here are confined to the Mangaohane Plateau in the North Island, but are also found in parts of the South Island. These include an unnamed *Cardamine* (at its only North Island locality), *Euphrasia disperma* and *Myosotis tenericaulis*. Another plant of Reporoa Bog, the endemic *Ranunculus ternatifolius*, is known from only one other North Island locality. A number of other species are at their southern North Island limit;

these include *Luzula decipiens* and *Oreomyrrhis delicatula*. The anomalous distributions of these species is an expression of the geological history of the lower North Island since the Miocene, and can be regarded as fragments of an early Miocene flora. Other notable endemic species occurring in the bog include *Bulbinella hookeri*, *Carex coriacea*, *C. sinclairii*, *C. tahoata*, *C. secta* ssp., *Celmisia glandulosa* var. *glandulosa*, *C. gracilentia*, *Coprosma cheesemani*, *Epilobium brunnescens* ssp., *E. insulare*, *E. nerteroides*, *Galium perpusillum*, *Gnaphalium paludosum* ssp., *G. mackayi*, *Hydrocotyle microphylla* and *Olearia virgata*.

**Scientific research and facilities:** Some monitoring of the condition of the vegetation is undertaken by the Forest Research Institute and Department of Conservation.

**Conservation education:** None.

**Recreation and tourism:** None.

**Management authority:** There is no direct management authority as the land is privately owned. The Department of Conservation (Wanganui Conservancy) is responsible for the management of wildlife. The Manawatu/Wanganui Regional Council has statutory responsibilities for water resources under the Resource Management Act 1991.

**Jurisdiction:** Functional: Department of Conservation. Territorial: Manawatu/Wanganui Regional Council and Rangitikei District Council.

**References:** Department of Conservation (1987); Department of Conservation, Wanganui (1987-1991).

**Reasons for inclusion:**

- 1d Reporoa Bog is an example of an unusual type of wetland in New Zealand. The bog is remarkable because of its unusual associations of plants and insects, many of which show disjunctive distributions and have close affinities with species in the south of the South Island.
- 2b The wetland is of special value for maintaining the genetic and ecological diversity of the region. It supports 160 species of plants, 13 of which either occur nowhere else in the North Island or reach their southern limit in the North Island here. It also supports an unusual array of insects, many of which have their closest affinities with insects in the Fiordland area.
- 2d Reporoa Bog is of special value for its endemic plants, including several species with very restricted ranges in the North Island, notably an unnamed *Cardamine*, *Euphrasia disperma*, *Myosotis tenericaulis* and *Ranunculus ternatifolius*.

**Source:** W. Hutchinson

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### Makirikiri Tarns (30)

**Location:** 39°37'30"S, 176°10'E. On the Mangaohane Plateau, northwest Ruahine Range, approximately 30 km east of Taihape, North Island.

**Area:** c.43 ha.

**Altitude:** 1,140 m.

**Overview:** The Makirikiri Tarns are a complex montane mire which is, in part, an ombrogenous peat bog with ephemeral pools and higher fertility (limestone) sites. The area has been non-forested since the last glacial period, and contains remnants of open country flora. This is the only locality in the North Island for several plant species.

**Physical features:** The site comprises an area of peat bogs with sink holes, ephemeral wetlands and elevated tarns, including one large tarn with islands which escaped the widespread fires of the 1950s. The bogs are situated at the headwaters of the Waikotore

Stream, on a remnant of Cenozoic limestone plateau overlain by andesitic tephra and peat. Some karst topography occurs in the area.

**Ecological features:** The sphagnum bogs on the edges of the tarns are notable for the presence of the endemic *Euphrasia disperma*. Shallow sink holes have hard floors with native turf plants. Between the extremes of tarns and sink holes, there are various wet areas with peaty, silty or firm tephra substrates, which dry out for varying periods. Native turf plants which occur here include endemic species such as *Acaena rorida*, *Tetrachondra hamiltonii* and *Hypsela rivalis*.

**Land tenure:** The wetland is privately owned and the surrounding area is predominantly in private ownership. The nearby Forest Park (Ruahine Forest Park) is Crown land held for conservation purposes.

**Conservation measures taken:** None.

**Conservation measures proposed:** The Department of Conservation is currently negotiating for the protection of a large area of land of which this area forms a small part.

**Land use:** Intermittent grazing of cattle. The nearest human population of any significance is the town of Taihape. The nearby Ruahine Forest Park is used for recreational purposes by trampers and hunters.

**Possible changes in land use:** None known.

**Disturbances and threats:** The major threat to the area is the invasion of exotic weeds, especially *Hieracium pilosella*, which is probably threatening the rare and local endemic plant *Acaena rorida*. Exotic pasture grasses and clovers also pose a threat. Other problems include fires, cattle grazing and minor use of off-road vehicles.

**Hydrological and biophysical values:** The wetland is located in the headwaters of the Waiokotore Stream, and plays a significant role in the recharge and discharge of groundwater (particularly water storage) and maintenance of water quality. It also plays a general role in sediment trapping and flood control.

**Social and cultural values:** The area is part of a large block of Maori land, but the extent of its significance to these people is unknown.

**Noteworthy fauna:** No information.

**Noteworthy flora:** The flora of the tarns includes two species endemic to this region, *Acaena rorida*, a bidibid species endemic to the Makirikiri Tarns area, and an unnamed species of *Myosotis* (aff. *M. pygmaea*) endemic to the "Volcanic Plateau". Other notable species include *Tetrachondra hamiltonii*, found here at its only North Island locality, *Euphrasia disperma*, found only here and at Reporoa Bog in the North Island, and *Hypsela rivalis*, found at only a few localities in the North Island. The endemic *Ourisia modesta* is found nearby at Ruahine Corner in an area separated from the tarns by a piece of dry land. This is the only North Island locality for this species.

**Scientific research and facilities:** Some research and monitoring of *Acaena rorida* has been undertaken by the Forest Research Institute and the Department of Conservation.

**Conservation education:** None.

**Recreation and tourism:** None.

**Management authority:** The Manawatu/Wanganui Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources.

**Jurisdiction:** Territorial: Manawatu/Wanganui Regional Council and Rangitikei District Council.

**References:** Ogle (1991a).

**Reasons for inclusion:**

- 1d The Makirikiri Tarns are an example of an unusual type of wetland in New Zealand. The tarns are unusual because they support several plant species with disjunctive

distributions which also occur at several locations in the South Island. This is in part associated with the presence of limestone.

- 2b The Makirikiri Tarns are of special value for maintaining the genetic and ecological diversity of the region because of the presence of a number of rare and local plant species. Six species of plants are confined to this locality in the North Island, or occur at only a few other sites in the North Island.
- 2d The Makirikiri Tarns are of special value for their endemic plants, including *Acaena rorida*, *Tetrachondra hamiltonii*, *Euphrasia disperma*, an unnamed species of *Myosotis* and *Hypsela rivalis*.

**Source:** W. Hutchinson

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### Ahukawakawa Swamp (31)

**Location:** 39°15'30"S, 174°02'30"E. Within Egmont National Park; about 30 km south of New Plymouth, Taranaki, North Island.

**Area:** c.101 ha.

**Altitude:** 920 m.

**Overview:** Ahukawakawa Swamp is a large montane mire within the bounds of Egmont National Park. It contains a rich and diverse flora, with over 260 indigenous plant species, including two species which are endemic to this area and one species which has its only North Island location here. There are no major threats associated with the wetland.

**Physical features:** A large montane mire on poorly drained volcanic soils. The mire forms the headwaters of the Stony River. The climate is extremely wet, with an average annual rainfall of 2,500-3,000 mm.

**Ecological features:** In the mire proper, the most common plant is the Red Tussock *Chionochloa rubra*. Several sedges are also common, especially *Carex coriacea* and the Star Sedge *Carex echinata*. A tufted lily *Bulbinella hookeri* is also common. Plants of the ground layer include mosses, especially *Dicranoloma robustum*. Within the Red Tussock-dominated vegetation, there are small patches of other distinctive vegetation types such as sedge-land dominated by *Schoenus pauciflorus* and cushion bog dominated by Comb Sedge *Oreobolus pectinatus*.

The southern margins of the mire are dominated by Inaka *Dracophyllum longifolium* var. *filifolium*, but many other shrubs are common, especially *Coprosma* sp., *Hebe odora*, Mountain Tauhinu *Cassinia vauvilliersii* and Leatherwood *Olearia colensoi*. There are many more shrubs on the northern swamp margins, where Inaka is only a minor component. *Hebe* spp. are well represented, with *Hebe "egmontiana"*, *H. macrocarpa* var. *corriganii*, *H. venustula* and *H. odora* all common.

**Land tenure:** Crown land held as National Park.

**Conservation measures taken:** The wetland and surrounding area are part of Egmont National Park, established in 1900 to "preserve in perpetuity the scenery, ecological systems, or natural features which are unique or scientifically important and in the national interest" (National Parks Act 1980).

**Conservation measures proposed:** Not applicable.

**Land use:** Conservation of flora and fauna, and recreational use. Egmont National Park is a popular location for tramping. One of the main tramping routes dissects the wetland. Predominant land use in the area surrounding the National Park is pastoral agriculture. The human population in the surrounding area is approximately 80,000, and includes the city of

New Plymouth and the towns of Hawera, Inglewood and Stratford, as well as the associated rural communities.

**Possible changes in land use:** None.

**Disturbances and threats:** Hares *Lepus europaeus* browse a number of the plant species occurring in the mire, and there may be local impacts from trampers.

**Hydrological and biophysical values:** The wetland plays a general role in groundwater recharge and discharge, maintenance of water quality, erosion control and sediment trapping. It plays a specific role in relation to water retention, particularly in buffering extreme flows in the Stony River.

**Social and cultural values:** Mount Egmont, or "Te maunga taranaki", is of considerable spiritual and sacred significance to the Maori people. There are both fortification and occupation sites in the park area, once used for residence, refuge, and hunting and collecting activities. Since the arrival of Europeans, the social and cultural values have been extended to include climbing, tramping, skiing and hunting.

**Noteworthy fauna:** None recorded.

**Noteworthy flora:** Floristically, Ahukawakawa Swamp is extremely rich and diverse, compared with other parts of Egmont National Park. Over 260 indigenous plant species have been recorded, and several of these are not known elsewhere in the park. Among the most notable of these is a divaricating shrub endemic to Ahukawakawa, an as yet unnamed species of *Melicytus* related to Mahoe *Melicytus ramiflorus*. A subspecies of the Red Tussock *Chionochloa rubra* is endemic to Egmont National Park; this is one of the dominant plants at Ahukawakawa Swamp. Other plants of note include *Geum parviflorum* agg. which occurs at Ahukawakawa and has its only North Island locality in Egmont National Park.

**Scientific research and facilities:** A vegetation survey of the swamp was carried out in 1982 as part of a thesis study by M.A. Waters (Waters, 1982).

**Conservation education:** The National Park as a whole is extensively utilised for interpretive education, and there are three visitor centres providing information on the park. School parties frequently visit the park.

**Recreation and tourism:** The National Park is extensively used for both recreation and tourism. Specific activities include tramping, climbing, skiing and scenic tours.

**Management authority:** The Department of Conservation (Wanganui Conservancy) is responsible for management of the National Park and wildlife. The Taranaki Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources.

**Jurisdiction:** Functional: Department of Conservation. Territorial: Taranaki Regional Council.

**References:** Clarkson (1986); Department of Conservation (1988a); Department of Lands and Survey (1986); Waters (1982).

**Reasons for inclusion:**

- 1a Ahukawakawa Swamp is a particularly good representative example of a montane bog which is little modified and has no major threats.
- 2b The swamp is of special value for maintaining the genetic and ecological diversity of the region because of its rich and diverse flora. Over 260 indigenous plant species have been recorded, including two species which are endemic to the area, and one species for which this is the only locality in the North Island of New Zealand.
- 2d The wetland is of special value for its endemic plant species, including an unnamed species of *Melicytus* and a subspecies of *Chionochloa rubra* known only from Egmont National Park.

**Source:** W. Hutchinson

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### Hawkens Lagoon (32)

**Location:** 39°51'S, 174°41'E. On the true right bank of the Waitotara River, about 30 km west-northwest of Wanganui, North Island.

**Area:** c.191 ha.

**Altitude:** 10 m.

**Overview:** This area consists of a series of parallel dunes, damp dune hollows and a large area of open water. The area contains a diverse range of plant communities. Important conservation values include the presence of an endangered herb and a vulnerable sedge.

**Physical features:** The lagoon itself is a relatively shallow (2.5 m deep) dune lake. It has no inflows or outflows, and replenishment is from both groundwater seepage and rainfall. Levels fluctuate with the seasons.

**Ecological features:** The area encompasses a diverse range of plant communities from those representative of loose sand, with species such as *Spinifex spinifex sericeus*, Marram Grass *Ammophila arenaria* and Pingao *Desmoschoenus spiralis*, to communities representative of damp dune flats, with *Selliera radicans*, *Triglochin striata*, Jointed Wire Rush *Leptocarpus similis* and Club Sedge *Isolepis nodosa*, and communities typical of lake edge swamps, with Raupo *Typha orientalis*, Jointed Wire Rush *L. similis*, Kuta *Schoenoplectus validus* and submerged aquatic vegetation. The endangered herb *Sebaea ovata* and the vulnerable endemic sedge *Eleocharis neozelandica* are also present.

**Land tenure:** The wetland is Crown land held as Conservation area. Surrounding areas are private land.

**Conservation measures taken:** The wetland is Conservation area managed and administered by the Department of Conservation. The area is fenced to exclude domestic livestock, and there is some weed control (Boxthorn).

**Conservation measures proposed:** It has been recommended that the wetland be given formal reserve status under the Reserves Act 1977.

**Land use:** Conservation of plants and animals. Hawkens Lagoon is used for game-bird hunting during the open season. Some water courses associated with the wetland are used for whitebait fishing. Off-road vehicles use the dune areas. The predominant use of surrounding land is agricultural and pastoral farming. The population in surrounding areas is rural and numbers no more than a few hundred.

**Possible changes in land use:** None known.

**Disturbances and threats:** The area is threatened by invasion of exotic weeds, especially Boxthorn, Marram Grass and pasture grasses, and to a small extent by cattle grazing and off-road vehicles.

**Hydrological and biophysical values:** No information.

**Social and cultural values:** Game-bird hunting and whitebait fishing are the main social values associated with the area. The lagoon would have provided food resources (waterfowl, fish and plants) for Maori.

**Noteworthy fauna:** A wide variety of birds has been recorded at the wetland, including the Australasian Bittern *Botaurus poiciloptilus*, New Zealand Shoveler *Anas rhynchos variegata* and Black-fronted Dotterel *Charadrius melanops*.

**Noteworthy flora:** Notable species include the endangered herb *Sebaea ovata* and the endemic sedge *Eleocharis neozelandica*, while the locally important Pingao *Desmoschoenus spiralis* is present in the nearby dunes.

**Scientific research and facilities:** No significant research has been undertaken apart from regular monitoring of threatened species.

**Conservation education:** There are no formal education programmes.

**Recreation and tourism:** The main recreational pursuits are game-bird hunting and whitebait fishing.

**Management authority:** The Department of Conservation (Wanganui Conservancy) is responsible for management of Crown land and wildlife. The Taranaki Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources. The Taranaki Fish and Game Council manages sport fishing and game-bird hunting.

**Jurisdiction:** Territorial: Taranaki Regional Council and South Taranaki District Council. Functional: Department of Conservation and Taranaki Fish and Game Council.

**References:** Fechny *et al.* (1990); Ogle (1989b).

**Reasons for inclusion:**

- 1a Hawkens Lagoon and associated wetlands are good representative examples of a coastal lagoon and dune hollow wetlands, wetland types characteristic of New Zealand.
- 2a The wetlands support an assemblage of threatened species, including the herb *Sebaea ovata*, the sedge *Eleocharis neozelandica* and the Australasian Bittern *Botaurus poiciloptilus*.
- 2b The wetlands are of special value for maintaining the genetic and ecological diversity of the region because of the diverse range of plant communities that occur there, *i.e.* communities representative of loose sand, damp dune flats and lake edge swamps.
- 2d The wetlands are of special value for their endemic plants, including *Eleocharis neozelandica*, *Desmoschoenus spiralis* and *Leptocarpus similis*.

**Source:** W. Hutchinson

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### Whangaehu River Mouth Dune Hollows (33)

**Location:** 40°02'S, 175°06'E. On the true right bank of the Whangaehu River, 20 km east-southeast of Wanganui, North Island.

**Area:** c.250 ha.

**Altitude:** 10 m.

**Overview:** A complex of fore-dunes, swales and hind-dunes with extremely important ephemeral dune hollows. These ephemeral wetlands are submerged with water in winter but dry out in summer. The land itself is diverse, and includes saltmarsh, dunes and associated sand country and marine terrace remnants. Conservation values include the presence of threatened plant species.

**Physical features:** The site comprises a complex of natural freshwater wetlands in an area of sand dunes on marine terrace. The wetlands, which cover some 25-50% of the total area, are rain-fed and ephemeral, drying out as a result of evaporation during the summer months. The wetlands are no more than 50 cm deep at their wettest. The climate is temperate, with light frosts in winter and prevailing winds from the northwest.

**Ecological features:** The wetlands are nationally important because of the presence of one of only two known populations of the endangered herb *Sebaea ovata*. Other endemic plant species present include the herb *Mazus novae-zelandiae*, Sand Iris *Libertia peregrinans* and *Pimelea arenaria*. Other vegetation in the dune hollows ranges in stature from matted saltmarsh plants, dominated by *Selliera* sp. and *Samolus repens*, to taller jointed rush with Club Sedge *Isolepis nodosa*, *L. peregrinans* and *Schoenus nitens*. Some hollows contain taller shrubland of *Coprosma propinqua*, *Olearia solandri*, Toetoe *Cortaderia toetoe* and occasional Cabbage Trees *Cordyline australis*. The area has been modified somewhat by the presence of

domestic livestock, weeds and off-road vehicles, but still supports one of New Zealand's best remaining representative cross-sections of native dune communities. Marine terrace remnants are also present at this site.

**Land tenure:** The wetlands are on Crown land held as Scientific Reserve. The reserve itself is surrounded by land in private ownership, most of which is being used for production forestry.

**Conservation measures taken:** An area of 250 ha (including the ephemeral wetlands) is Crown land held as Scientific Reserve. It was gazetted as an open Scientific Reserve in 1991, *i.e.* open to public access without permit. The purpose of a Scientific Reserve is to "protect and preserve in perpetuity for scientific study, research, education, and for the benefit of the country, ecological associations, plant or animal communities, types of soil, geomorphological phenomena, and like matters of special interest". The reserve is fenced, although livestock can walk along the beach at low tide and enter the reserve via that route. Control of the spread of Pampas Grass, Boxthorn and Gorse is well advanced and continuing.

**Conservation measures proposed:** Control of off-road vehicles and production of an information pamphlet on the area.

**Land use:** Protection and preservation of ecological associations and plant and animal communities for scientific study, research and education and for the benefit of the country. A small rural population lives in the immediate area, and activities such as rabbit-shooting and walking are undertaken. The public have access to the area.

Land use in surrounding areas includes use of off-road vehicles and whitebait fishing. A pipeline carrying natural gas runs through the seaward part of the reserve.

**Possible changes in land use:** None known.

**Disturbances and threats:** Marram Grass *Ammophila arenaria*, an exotic species, threatens the naturalness of the area, while Pampas Grass *Cortaderia selloana* and other exotic grasses are present on the sand plain and in the ephemeral wetland. Boxthorn *Lycium ferocissimum*, another exotic species, occurs throughout the area. Cattle entering the reserve browse shrubs and pug the herb fields of *Sebaea ovata*, *Mazus novae-zelandiae*, Lady Tress Orchid *Spiranthes sinensis*, Sand Gunnera *Gunnera dentata* var. and other nationally or regionally threatened herbs.

Cattle, rabbits, off-road vehicles and maintenance of the gas pipeline are also problems in the area.

**Hydrological and biophysical values:** The wetland is of great importance in supporting plant communities associated with ephemeral wetlands.

**Social and cultural values:** The area was of significance to early Maori. Two middens have been identified within the site, while nearby there is an extensive system of coastal agricultural sites including pits and terraces for food storage. Adjoining and inter-fingered dunes have culturally significant areas of Pingao *Desmoschoenus spiralis*.

**Noteworthy fauna:** The wetlands provide good habitat for the North Island Fernbird *Bowdleria punctata vealeae*, and are used seasonally by shorebirds such as the Black-fronted Dotterel *Charadrius melanops*. The moth *Ericodesma aerodana* is present. This species, the larvae of which feed on *Pimelea arenaria*, has only been collected once before in the North Island (in 1880).

**Noteworthy flora:** The wetlands are of outstanding importance for their flora which includes the endangered herb *Sebaea ovata* and other endemic species such as *Mazus novae-zelandiae*, *Libertia peregrinans* and *Pimelea arenaria*. These plants are all associated with the ephemeral wetlands, while the endemic Pingao *Desmoschoenus spiralis* is present in the adjacent dunes.

**Scientific research and facilities:** No formal research has been undertaken apart from monitoring of the *Sebaea ovata* sites.

**Conservation education:** Nothing formal.

**Recreation and tourism:** Nothing significant.



**Management authority:** The Department of Conservation (Wanganui Conservancy) is responsible for the management of Crown land and wildlife. The Manawatu/Wanganui Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans.

**Jurisdiction:** Functional: Department of Conservation. Territorial: Manawatu/Wanganui Regional Council and Wanganui District Council.

**References:** Fechny *et al.* (1990); Given (1990); Ogle (1989a, 1991a, 1991b).

**Reasons for inclusion:**

- 1a The Whangaehu River Mouth Dune Hollows are a particularly good example of a complex of ephemeral dune hollows, a wetland type characteristic of New Zealand.
- 2a The wetlands support a number of threatened plant species, including *Sebaea ovata*, *Mazus novae-zelandiae*, *Libertia peregrinans* and *Pimelea arenaria*.
- 2b The wetlands are of special value for maintaining the genetic and ecological diversity of the region because of the presence of a number of rare species of plants, an interesting range of vegetation associations, and a very localized moth, *Ericodesma aerodana*.
- 2d The wetlands are of special value for their endemic plants, including *Sebaea ovata*, *Mazus novae-zelandiae*, *Libertia peregrinans*, *Pimelea arenaria*, *Gunnera dentata*, *Coprosma propinqua* and *Cortaderia toetoe*.

**Source:** W. Hutchinson.

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### Pukepuke Lagoon (34)

**Location:** 40°20'S, 175°16'E. In dune country on the Manawatu coast, about 30 km west of Palmerston North, North Island.

**Area:** c.82 ha.

**Altitude:** 6 m.

**Overview:** Pukepuke is a coastal dune lake with associated wetlands providing a diverse range of habitat for over 60 species of birds.

**Physical features:** Pukepuke is a freshwater, eutrophic lagoon enriched with nutrients from surrounding farmland. The lagoon lies in a system of coastal dunes comprising a series of four Holocene dune phases overlying the Foxton syncline. Two drains enter the wetland at the eastern end, and there is one outlet at the seaward end. The outlet from the lagoon has a sectioned weir which is used to control water levels. A significant amount of water is lost through evaporation, and in dry years the lagoon has been known to dry out completely. The average depth of the lagoon is about two metres. The area of open water has decreased since the lagoon was first surveyed in 1872. The catchment area is about 3,000 ha.

The climate is one of warm summers and mild winters. The mean annual rainfall is 940 mm, falling mostly in the winter. Summer droughts are common.

**Ecological features:** Pukepuke Lagoon is probably the largest area of open water in the Manawatu. The natural vegetation of the wetland can be described as a hydrosere, *i.e.* a sequence of zones from aquatic communities to the drier terrestrial communities. The aquatic vegetation includes pondweeds *Potamogeton* spp., Water Milfoil *Myriophyllum triphyllum*, algae, duckweed (Lemnaceae) and *Azolla rubra*. Shallow water levels and nutrient run-off from surrounding farmland favour the growth of Raupo *Typha orientalis* around the lagoon margins. Also found here is the endemic sedge *Carex secta*. Further from the water's edge, New Zealand Flax *Phormium tenax* and Cabbage Tree *Cordyline australis* appear, as well as

scattered shrubs of Karamu *Coprosma robusta*, *Coprosma propinqua*, *Olearia solandri*, Toetoe *Cortaderia toetoe* and *Muehlenbeckia complexa*.

**Land tenure:** The wetland is Crown land held as Conservation area. Surrounding areas are a mixture of private land, land held by Land Corporation (a state-owned enterprise) for farming purposes, and Crown land held by the Defence Department for defence purposes.

**Conservation measures taken:** Pukepuke Lagoon is Crown land held as Conservation area, managed and administered by the Department of Conservation. Management includes the management of game-bird hunting and seasonal grazing of adventive grasses.

**Conservation measures proposed:** It has been recommended that the lagoon be gazetted as a Wildlife Management Reserve under the Reserves Act 1977. There is a need to control the spread of Raupo *Typha orientalis* and manipulate water levels for the maximum benefit of all wildlife. Raupo is causing infilling of the wetland at an accelerated rate, and this conversion of the wetland area to dry land could be slowed by controlling the plant. Development proposals for an educational facility should be initiated.

**Land use:** Conservation of plants and animals, particularly native species. Some seasonal grazing of the wetland is encouraged to minimise the impacts of exotic vegetation. The outlet from the lagoon has a sectioned weir to help maintain water levels in the summer and to alleviate flood waters in the winter. A small rural population lives in the immediate surrounding area, while the city of Palmerston North (50,000) is approximately 40 minutes drive from the wetland.

**Possible changes in land use:** None known.

**Disturbances and threats:** Mustelids and cats are a problem for the avifauna. Nutrient enrichment from surrounding farmland has encouraged the growth of Raupo *Typha orientalis* which is reducing the amount of open water.

**Hydrological and biophysical values:** The wetland plays a general role in sediment trapping and the maintenance of water quality, and is important in supporting aquatic and terrestrial food chains. The lagoon has been identified as an area of national importance to fisheries by the Ministry of Agriculture and Fisheries because of its scientifically and biologically important population of Short-finned Eel *Anguilla australis*.

**Social and cultural values:** The area is an important game-bird hunting area, and is culturally significant for its eel fishery. Pukepuke was once the site of a fortified "pa", occupied by the Ngati apa. The lagoon provided a range of resources to the Ngati apa, including plant, animal and fish products.

**Noteworthy fauna:** The lagoon supports a wide variety of waterbirds including a number of scarce and/or declining species such as the New Zealand Dabchick *Poliiocephalus rufopectus*, Australasian Bittern *Botaurus poiciloptilus*, New Zealand Shoveler *Anas rhynchotis variegata*, New Zealand Scaup *Aythya novaeseelandiae*, Spotless Crake *Porzana tabuensis plumbea*, Marsh Crake *Porzana pusilla affinis* and North Island Fernbird *Bowdleria punctata vealeae*. The Royal Spoonbill *Platalea regia* has been recorded as an occasional visitor.

The lagoon is an important wetland for the Short-finned Eel *Anguilla australis*.

**Noteworthy flora:** Two plant species with localised distributions occur at Pukepuke Lagoon, *Hydrocotyle pterocarpa* and *Zannichellia palustris*.

**Scientific research and facilities:** The wetland has been heavily utilised for scientific research, predominantly into waterfowl biology by the former New Zealand Wildlife Service. Research facilities are available, with accommodation for about 12 people, and are used by Massey University and the Ornithological Society of New Zealand.

**Conservation education:** The area is currently used for educational and interpretive programmes.

**Recreation and tourism:** Game-bird hunting is the main recreational pursuit, although the area is used for more passive recreation such as bird-watching.

**Management authority:** The Department of Conservation (Wanganui Conservancy) has responsibility for management of Crown land and wildlife. The Manawatu/Wanganui Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans. The Manawatu District Council has statutory responsibilities under the Resource Management Act 1991 for water resources.

**Jurisdiction:** Functional: Department of Conservation. Territorial: Manawatu/Wanganui Regional Council and the Manawatu District Council.

**References:** Department of Conservation (in prep.); Fechny *et al.* (1990).

**Reasons for inclusion:**

- 1a Pukepuke Lagoon is a good representative example of a coastal dune lake, a wetland type characteristic of New Zealand.
- 2a The lagoon supports appreciable numbers of two globally threatened species of birds, *Poliocephalus rufpectus* and *Botaurus poiciloptilus*.
- 2b The lagoon supports two plant species with localised regional distributions and a diverse avifauna, including several rare and declining species, and is thus of special value for maintaining the genetic and ecological diversity of the region.
- 2c The estuary is of special value for the Short-finned Eel *Anguilla australis*.

**Source:** W. Hutchinson.

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### Lake Kaikokopu and Lake Koputara (35)

**Location:** Kaikokopu: 40°22'45"S, 175°16'15"E; Koputara: 40°24'15"S, 175°16'E. On the west coast of the North Island, 10 km and 7 km north of Foxton, respectively.

**Area:** Lake Kaikokopu, c.20 ha; Lake Koputara, c.40 ha.

**Altitude:** 10 m.

**Overview:** Two small dune lakes, one of which is managed for game-birds and used for recreational hunting. Both lakes are important breeding and feeding areas for two threatened species of waterfowl, New Zealand Dabchick *Poliocephalus rufpectus* and Australasian Bittern *Botaurus poiciloptilus*, and are important for a number of other species of birds.

**Physical features:** Lake Koputara is a dune lake with swampy ground around the edges; Lake Kaikokopu is a dune lake with artificial stop-banks. Both are basin-type dune lakes formed at the boundary of two dune forming phases. They are shallow and have sandy bottoms. Lake Koputara is fed by groundwater and local rainfall, while Lake Kaikokopu has an inlet stream and an outflow through the dunes to the nearby ocean. The climate is temperate, but often buffeted by the prevailing westerly winds.

**Ecological features:** Lake Koputara has a high component of indigenous vegetation, including Raupo *Typha orientalis*, New Zealand Flax *Phormium tenax*, *Carex secta* and Toetoe *Cortaderia toetoe*, all of which are common. About 75% of Lake Kaikokopu is open water; 20% is Raupo *T. orientalis* and *Carex secta*, and the remaining 5% is Crack Willow *Salix fragilis*.

**Land tenure:** Private land.

**Conservation measures taken:** The wetlands are privately owned, with Lake Koputara having a Queen Elizabeth II Open Space Covenant over it. The Covenant was established in 1984. Lake Kaikokopu is managed privately for game-bird hunting.

**Conservation measures proposed:** The District Council has, in the past, investigated the possibility of sand stabilisation at Lake Koputara.

**Land use:** Land use at the wetland is not known. The surrounding area sustains a small rural population. Some afforestation has been undertaken in the area, primarily for revenue purposes but also to stabilise the land.

**Possible changes in land use:** None known.

**Disturbances and threats:** Lake Koputara is threatened by sand encroachment from the west, which has completely displaced the lake in the last 100 years. Sambar Deer *Cervus unicolor* damage Cabbage Trees *Cordyline australis*, while Gorse *Ulex europaeus* and exotic weed species are spreading throughout the area. There life Service (1987a); Ravine (1991).

**Reasons for inclusion:**

- 1b Manawatu Estuary is a particularly good representative example of a common wetland type, a coastal estuary.
- 2a The estuary supports appreciable numbers of two globally threatened species of birds, *Botaurus poiciloptilus* and *Anarhynchus frontalis*.
- 2c The estuary is an important wintering area for *Platalea regia* and a number of international migratory shorebirds.
- 2d The estuary supports populations of several endemic species, notably the Brown Mudfish *Neochanna apoda*.
- 3c The estuary regularly supports 1% of the world population of *Anarhynchus frontalis*.

**Source:** W. Hutchinson.

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### Manawatu River Mouth and Estuary (36)

**Location:** 40°29'S, 175°14'E. 5 km west of Foxton township, Manawatu, North Island.

**Area:** c.200 ha.

**Altitude:** Sea level.

**Overview:** A moderately sized estuary retaining a high degree of naturalness and diversity. The area is of high ornithological value but is threatened by invasion of weeds and domestic livestock. The area also has important fisheries values.

**Physical features:** The site comprises a small estuarine system with muds, silts and clays. The main freshwater inflow is the Manawatu River, which drains a large catchment area. The average annual rainfall is about 850 mm, and the prevailing winds are westerly.

**Ecological features:** Large areas of the mudflats are covered with Bachelor's Button *Cotula coronopifolia*. In areas where sand has covered the mudflats and there is less tidal influence, there are tens of hectares of herb fields with Half Star *Selliera radicans*, Shore Primrose *Samolus repens* and Glasswort *Sarcocornia quinqueflora*. Several introduced plant species have some impact on the natural values of the wetland, notably *Juncus acutus*, Tall Fescue *Festuca arundinacea*, Creeping Bent *Agrostis stolonifera* and the aquatic weed *Spartina anglica*.

**Land tenure:** The wetland is largely unallocated Crown land with some reserve for harbour improvements (now vested in the Horowhenua District Council), some private land and a small area of Crown land held as Conservation area (25 ha). The surrounding area is in mixed ownership, including private land, Horowhenua District Council (Recreation Reserve) and Timberlands (Waitarere Forest).

**Conservation measures taken:** Some 25 ha of Crown land are held as Conservation area, managed and administered by the Department of Conservation. Control of the aquatic weed *Spartina anglica* is undertaken, and there is public education on the values of the wetland.

**Conservation measures proposed:** Eradication of *Spartina anglica*. A student was preparing a report on the values and requirements for protection of the estuary in late 1991.

**Land use:** Conservation of plants and animals on the Conservation area; boating, swimming and off-road vehicles in other areas. Land use in surrounding areas includes pine afforestation (south side), urban development (roads, housing, camp grounds, rubbish dump and boating clubs) and farming.

**Possible changes in land use:** None known.

**Disturbances and threats:** Cordgrass *Spartina anglica* covers 80 ha of the estuary, reducing the amount of habitat available to native fauna and flora, while *Juncus acutus* and *Festuca arundinacea* are invading at an alarming rate. Domestic livestock are reducing natural areas and allowing the invasion of *Agrostis stolonifera* and *Festuca arundinacea*.

**Hydrological and biophysical values:** The wetland has a general role in flood control and sediment trapping, and is of great importance in supporting aquatic and terrestrial food chains.

**Noteworthy fauna:** The Manawatu Estuary is of national importance for migratory shorebirds, and was assigned a high ranking by the New Zealand Wildlife Service. The extensive areas of exposed mudflat provide feeding habitat for large numbers of international migratory shorebirds, notably Pacific Golden Plover *Pluvialis fulva* (5% of the national population), Far Eastern Curlew *Numenius madagascariensis* (4-10% of the national population), Bar-tailed Godwit *Limosa lapponica* (300-450), Ruddy Turnstone *Arenaria interpres* and Red Knot *Calidris canutus* (40-260). Less common species of migratory shorebirds have included Asiatic Whimbrel *Numenius phaeopus variegatus*, Wandering Tattler *Tringa incana*, Terek Sandpiper *T. cinerea* and Great Knot *Calidris tenuirostris* (first recorded in New Zealand at this estuary in 1967). The estuary is particularly important for wintering Royal Spoonbills *Platalea regia* regularly holding up to half of the national population of this species. Other species regularly using the estuary include Australasian Bittern *Botaurus poiciloptilus*, Banded Dotterel *Charadrius bicinctus* (up to 100) and Wrybill *Anarhynchus frontalis* (up to 40). The southernmost population of the North Island Fernbird *Bowdleria punctata vealeae* occurs in this area. The Brown Mudfish *Neochanna apoda* is found in the estuary.

**Noteworthy flora:** None known.

**Scientific research and facilities:** The Ornithological Society of New Zealand carries out annual counts of waterfowl. No other long-term scientific studies are under way.

**Conservation education:** There are no permanent educational programmes or facilities, although the area is utilised for educational purposes by school groups and conservation organisations.

**Recreation and tourism:** Tourism in this area is only on a domestic basis. The area provides recreational opportunities for whitebait fishermen, net and line fishermen, jet-boating, water-skiing and yachting.

**Management authority:** The Department of Conservation (Wanganui Conservancy) is responsible for the management of reserves under its control, unallocated Crown land and wildlife. Horowhenua District Council has jurisdiction for land under its control. The Manawatu/Wanganui Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans. The Wellington Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting.

**Jurisdiction:** Functional: Department of Conservation, Wellington Fish and Game Council and Horowhenua District Council. Territorial: Horowhenua District Council and Manawatu/Wanganui Regional Council.

**References:** Davies (1988); Fechny *et al.* (1990), New Zealand Wildlife Service (1987a); Ravine (1991).

**Reasons for inclusion:**

- 1b Manawatu Estuary is a particularly good representative example of a common wetland type, a coastal estuary.
- 2a The estuary supports appreciable numbers of two globally threatened species of birds, *Botaurus poiciloptilus* and *Anarhynchus frontalis*.
- 2c The estuary is an important wintering area for *Platalea regia* and a number of international migratory shorebirds.
- 2d The estuary supports populations of several endemic species, notably the Brown Mudfish *Neochanna apoda*.
- 3c The estuary regularly supports 1% of the world population of *Anarhynchus frontalis*.

**Source:** W. Hutchinson.

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