

Vegetation survey of Kahakaharoa Dunes, Hokianga

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Introduction

A vegetation survey of the Kahakaharoa Reserve in North Hokianga was carried out for Te Tapāiru Hirahira o Kahakaharoa Trust on 10-12 February 2020. The site is located to the northwest of Hokianga Harbour (Fig. 1). During the survey, the vascular flora of Kahakaharoa was recorded and vegetation types were mapped (Fig. 2).

Kahakaharoa is an area of great significance to the hapu and iwi of Hokianga, and indeed iwi across Aotearoa. The area of more than 1600 ha (4000 acres) runs from the open coast over to the Hokianga Harbour, forming the north head at Niniwa (Fig. 3). It is part of a network of ancient and significant sites which include maunga which were used for navigational purposes, pa, toka (rocks), unga ki uta (landing places), puna (springs), awa (rivers), roto (lakes), and wahi tapu. These include Niniwa, Tokataa, Pouahi, Pukerangatira, Te Puna ki Hokianga, Maukoro and Kawehitiki (Paul White pers. comm.). Te Tapāiru Hirahira o Kahakaharoa is the historic reserve shown by the black dashed line in Figure 1. It makes up a quarter of Kahakaharoa with the remainder of the land under the Te Puna Topu o Hokianga Trust.

Kahakaharoa Reserve is a 423 ha mix of dune lands containing sandstone, limestone, sand kānuka (*Kunzea amathicola*) and coastal forest ecosystems. It has a cover of Pleistocene consolidated dune sands and Holocene transverse dunes (Brook 1996). Much of this area comprises mobile sand dunes with kōwhangatara (*Spinifex sericeus*), coastal toetoe (*Austroderia splendens*, Fig. 4) and occasional pīngao (*Ficinia spiralis*), as well as foredunes of tree lupin (*Lupinus arboreus*) scrub leading into kānuka forest. The highest point of Kahakaharoa (202 m a.s.l.) is named Pukerangatira (marked as Rangitira in Fig. 1) and is made up of Mahurangi Limestone (Heron 2014).

Kahakaharoa is a special ecosystem within the Hokianga Ecological District because of its unique dune system (Conning *et al.* 2004). Locals say that the name Kahakaharoa comes from the long persistent winds that blow across the dunes. The coastal forest in the north-eastern part of the reserve has a dense understorey of kahakaha (*Astelia banksii*, Fig. 5). Kahakaharoa may have contained larger areas of coastal forest in the past, with kahakaha being more common in the area, another potentially another reason for the area's name. Kahakaharoa Reserve was classified as a historic reserve under the Reserves Act (1977) and was previously managed by the Department of

Conservation but has recently been returned to iwi Te Rarawa ownership.

Vegetation types

Kahakaharoa contains seven broad vegetation types: sand dunes, lupin scrub, native scrubland, sand kānuka forest, mixed coastal forest, and limestone. Sand dunes cover most of the land area (approximately 200 ha) but have little vegetation cover. The most common plant species growing on the sand dune vegetation type is kōwhangatara, along with occasional pīngao (Fig. 4). The lupin scrub is the fastest spreading vegetation type at Kahakaharoa. It is dominated by exotic tree lupins, with pampas (*Cortaderia selloana*), marram grass (*Ammophila arenaria*), and native wīwī (*Ficinia nodosa*) also common throughout. Although most of the vegetation consists of weedy exotic species, it is still facilitating natural succession in the dunes, as sand kānuka or rawiritōa (*Kunzea amathicola*) can be seen coming up through the exotic scrub (Fig. 6). Native scrubland is a mix of coastal toetoe, harakeke (*Phormium tenax*), native wīwī, scrub pōhuehue (*Muehlenbeckia complexa*) and other native shrubs; these communities are usually seen on the steeper slopes (Fig. 7). The limestone is covered in stunted vegetation including pampas, gorse (*Ulex europaeus*), pinātoro (*Pimelea cf. urvilleana*) and tarakupenga (*Coprosma acerosa*) (Fig. 8). Wetlands containing raupō (*Typha orientalis*) and other native sedges are also present (Fig. 9).

Ecology

Sand dunes are classified as critically endangered ecosystems in New Zealand (Holdaway *et al.* 2012); they have declined significantly in the past century, due to coastal development, exotic invasions, and stabilisation using marram grass (Jamieson, 2010). Kahakaharoa forms one of the most extensive expanses of sand dunes in the Far North. Over time it is expected that the foredunes along the west coast of Northland will keep their current form and vegetation cover, while the dunes behind will continue to undergo dynamic vegetation change. These large expanses of rear sand dunes are succumbing to the hold of kānuka or lupins. Without disturbance events such as fire it seems likely that the Kahakaharoa dunes will become covered in vegetation, eventually forming a large area of coastal native forest.

Some of the older kānuka forest remnants show diversification of vegetation, with species that are dispersed by birds becoming more frequent. Over time other species such as tōwai (*Weinmannia sylvicola*) will become more dominant in the canopy,

potentially leading to a canopy dominated by conifers. Conning et al., (2004: p.19) state that "Prior to human settlement, most of Hokianga was forested, apart from the huge dunes on the north side of the harbour entrance and extensive wetlands on the harbour margins". The dunes being referred to here are those of Kahakaharoa Reserve. Fig. 10 shows large logs wedged in the rock of the Whatanui stream running west out to the coast – these could be kauri (*Agathis australis*) or another large conifer species. These logs may have once formed part of a forest at Kahakaharoa or perhaps were confined to the wetter gullies. Whether early Maori or later European settlers were responsible, it is likely that fire or vegetation clearance destroyed the original forest; over time this forest may return with appropriate management.

Indigenous species of interest

In total, 234 vascular plant species were recorded in Kahakaharoa Reserve, comprising 152 indigenous and 82 introduced species (see Appendix). Ten of these species are classified as Threatened or At Risk nationally according to the latest Conservation Status assessment for indigenous vascular plants (de Lange et al. 2018a). For example, a population of the Threatened–Nationally Critical shrub *Pimelea orthia* was seen in the sandstone bluffs growing on the margins of scrubby vegetation (Fig. 11). The more erect growth form and the relatively hairless stems separate it from the common pinātoro. Three At Risk–Declining species were seen during the field survey: tarakupenga was scattered throughout the sandstone, pīngao was occasional in the sand dunes, and *Ranunculus urvillianus* was seen on the edge of the kānuka forest (Fig. 12). Two At Risk–Naturally Uncommon plant species were also recorded: two plants of *Hypolepis dicksonioides* were seen along the Whatanui stream, and *Calystegia marginata* was locally common in the light wells of the kānuka forest (Fig. 13).

Two plants at Kahakaharoa are noted as Regionally Significant plant species within the Hokianga Ecological District (Conning et al. 2004): *Coprosma parviflora*, an occasional shrub in the kānuka forest, and tanguru (*Olearia albida*), which was a locally common shrub in the coastal forest. Historical records of autetaranga (*Pimelea villosa*, At Risk–

Declining) were seen in 1977 (AK 141251 & AK 266506) but have not been seen in recent surveys.

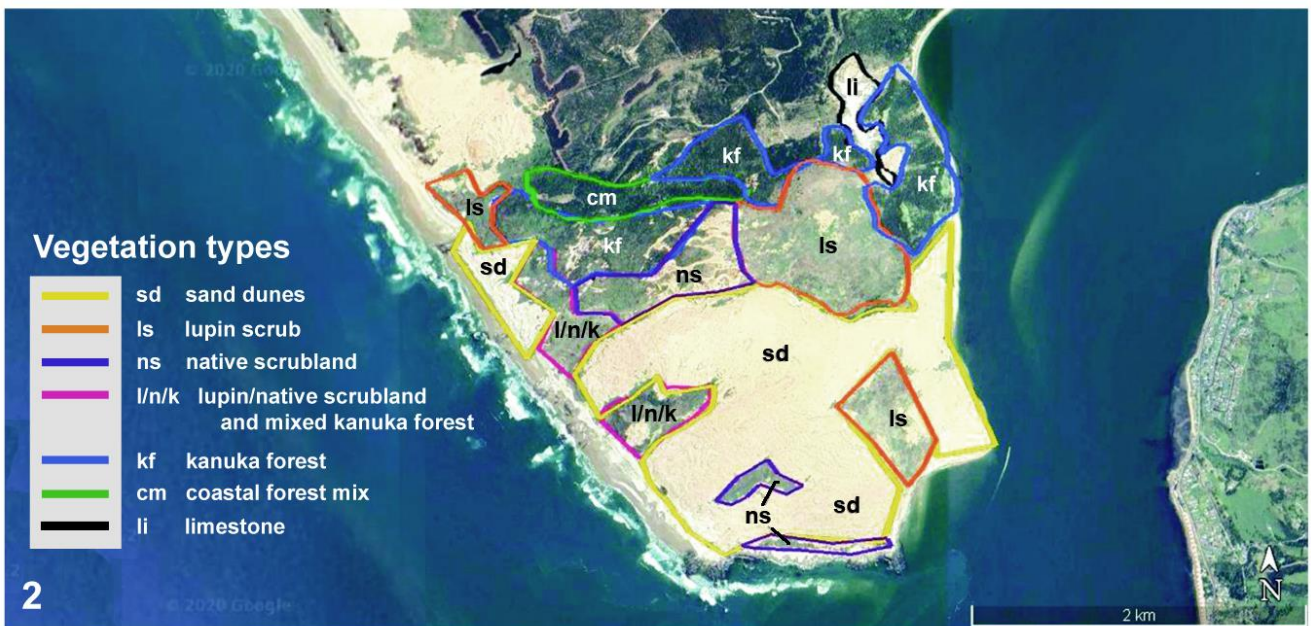
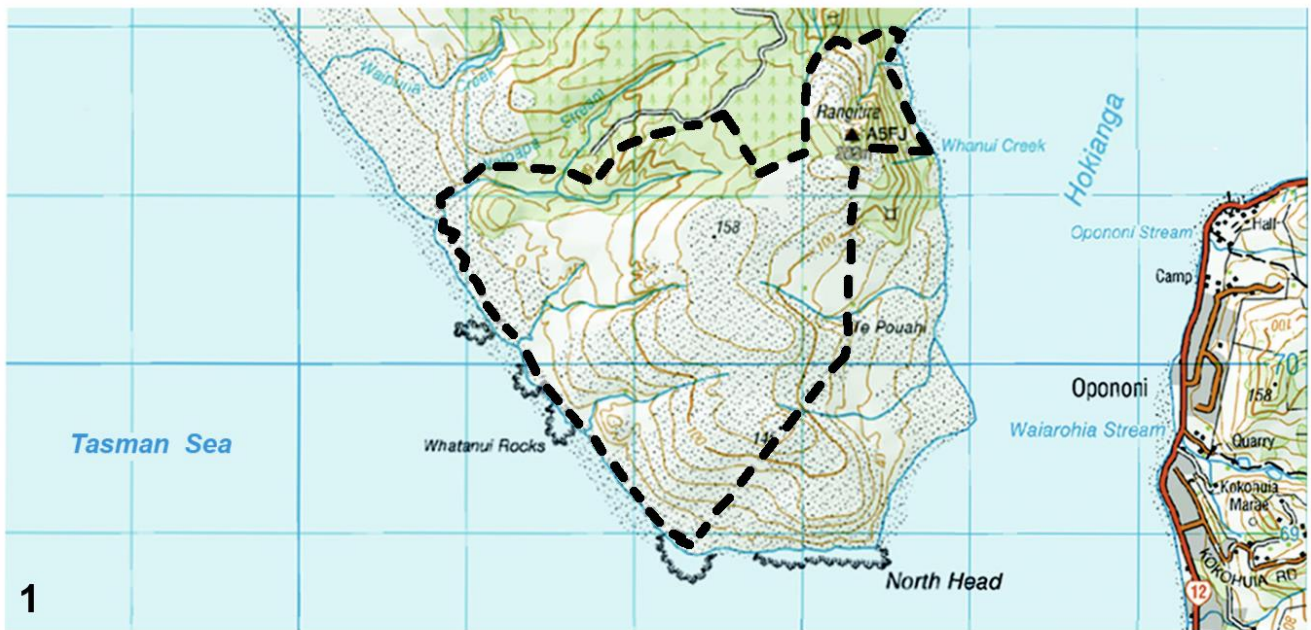
Other species of interest include *Zoysia pauciflora*, which is locally common in the foredunes along the west coast, and *Machaerina sinclairii*, which is common along the south-facing limestone cliffs. *Calystegia sepium* subsp. *roseata*, or a hybrid close to this species, was seen in the coastal scrub above the beach. This plant was not typical of the species, having large fleshy, almost succulent leaves, but still displayed the pink flowers that suggest this species. Another hybrid seen was a *Coprosma* (referred to in the species list as *Coprosma ×cunninghamii*) (<https://inaturalist.nz/observations/38584132>); it is hypothesised that one of the parents is *Coprosma macrocarpa* subsp. *minor*. *Sticherus flabellatus* is a locally common fern at Kahakaharoa, forming large patches with *Parablechnum novae-zelandiae* under kānuka forest in a south-facing gully (Fig. 14). Growing on a stream bank of a deep gully was the filmy fern *Hymenophyllum flexuosum*; an uncommon plant in the lowlands of the Far North.

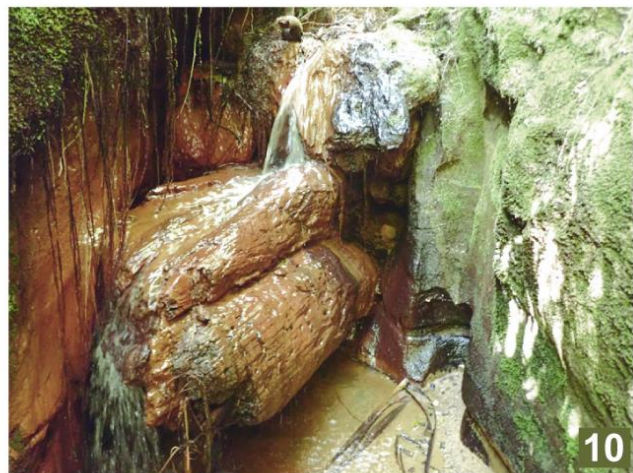
Lichens

Lichens were not investigated in detail during the survey. However, some observations were made, and 18 species are noted here. Generally, lichens were rare in the young sand kānuka forest, but the common species seen included *Pseudocyphellaria wilkinsii* (Fig. 15), *Sticta squamata*, *Heterodermia* species and a range of cyanobacterial lichens including *Pannaria elixii* and *Sticta fuliginosa*. Eight At Risk – Naturally Uncommon lichen species (de Lange et al. 2018b) were recorded at Kahakaharoa Reserve: *Coccocarpia pellita*, *Crocodia poculifera*, *Erioderma leylandii* (Fig. 16), *Pseudocyphellaria bartlettii* (Fig. 17), *Pseudocyphellaria haywardiorum*, *Pseudocyphellaria punctillaris*, *Heterodermia tremulans* (Fig. 18), and *Sticta limbata*. Saxicolous lichens (growing on rock) such as *Dufourea ligulata* were relatively rare but were present, as seen in Fig. 18.

Another interesting lichen was *Pseudocyphellaria punctillaris*; one of the many foliose lichen species growing on the trunks of sand kānuka (<https://inaturalist.nz/observations/58921499>). This At Risk–Naturally Uncommon species has not previously been recorded from mainland New Zealand, but has been recorded from Tuhua (Mayor Island) and the

Figs. 1–8: 1. Map of Te Tapāiru Hirahira o Kahakaharoa Reserve (dashed outline). Topomap modified by Joshua Salter, from information on Department of Conservation map (2018). 2. The seven vegetation types identified at Kahakaharoa Reserve during this survey. Image: T. Hooker, 30 Sep 2020, using Google Earth. 3. View of Kahakaharoa Reserve (the harbour mouth at Niniwa, or North Head, visible at left), from Opononi on the southern side of Hokianga Harbour. All photos by M. Ford, 10–13 Feb 2020. 4. Coastal toetoe (*Austroderia splendens*) on the sand dunes, looking south-east to Opononi on the southern side of Hokianga Harbour. 5. The thick understorey of kahakaha (*Astelia banksii*) in the coastal forest. 6. Extensive weedy scrubland of pampas (*Cortaderia selloana*), with scattered kānuka (*Kunzea amathicola*) seen in the top middle and wilding pines at left; looking south-east. 7. Native scrub dominated by kānuka on sandstone eroding steeply into a small creek; looking east. 8. The limestone peak of Kahakaharoa known to the locals as Pukerangatira.





Figs. 9–19: **9.** Raupō (*Typha orientalis*) and sedge wetland with kānuka forest (*Kunzea amathicola*) at the back and pine (*Pinus radiata*) plantation at the top left. **10.** Large logs, possibly kauri (*Agathis australis*), were wedged in between rocks in this stream. **11.** The erect growth of the shrub *Pimelea orthia* (Threatened-Nationally Critical). **12.** *Ranunculus urvilleanus* (At Risk-Declining) was local on the margins of the kānuka forest. **13.** *Calystegia marginata* (At Risk-Naturally Uncommon) growing up rushes on kānuka forest margins. **14.** *Sticherus flabellatus*, with *Parablechnum novae-zelandiae*, under kānuka forest in a south-facing gully. **15.** *Pseudocyphellaria wilkinsii*, a common corticolous lichen in kānuka forest. **16.** *Erioderma leylandii*, locally common corticolous lichen in the wetland areas. **17.** *Pseudocyphellaria bartlettii*, an extremely soeridiate form of this corticolous lichen was rare, growing with a pale *Heterodermia* species. **18.** The white *Heterodermia tremulans* looking like bird droppings, with the orange *Dufourea ligulata*, both on rock. **19.** Lime tree (*Citrus × latifolia*) two plants? 1m tall, both plants spanning 5m across, growing in dune land.

Kermadec Islands (de Lange & Galloway 2015). It is distinguished by its scabrid areolate upper surface and marginal lobulate phyllidia – becoming markedly lobulate-phyllidiate centrally (de Lange & Galloway 2015).

Exotic plant species of interest

Overall, 82 introduced plant species were recorded in Kahakaharoa Reserve during this survey. Only eight of these species are considered to pose a threat to the local indigenous biodiversity. From field observations, the eastern side of the reserve seems to have older established weed infestations, potentially due to localised human settlement. Weed species are abundant throughout, with the most common species being pampas, gorse, and tree lupin. Emergent pines (*Pinus radiata*) are spreading through the dune ecosystem from the adjacent pine plantations. It is recommended that this species is targeted for weed control across the reserve, because of the potential it has to drastically change the nature of the dunes. *Elaeagnus* (*Elaeagnus × reflexa*) seedlings are scattered across the reserve from seed spread by birds, and control is urgently recommended in order to prevent large infestations arising. A couple of patches of Spanish heath (*Erica lusitanica*) were seen in the scrub communities on the sandstone – these should be targeted for removal before they spread into the wider dune area. There are a few localised infestations of coast pelargonium (*Pelargonium capitatum*) in the dunes to the south-west of the reserve. It is recommended that these are controlled before they spread and create large infestations, as seen in the dunes of South Hokianga (pers. obs.). Other potential weeds include coastal banksia (*Banksia integrifolia*), cotoneaster (*Cotoneaster glaucophyllus*) and prickly hakea (*Hakea sericea*) – currently only one or two plants of each of these species have been seen at Kahakaharoa but there is potential for them to become serious weeds. Marram grass is locally common in the dunes but does not seem to have a large influence in this dune system, even though it is notorious for degrading dune systems (Jamieson 2010). If this species starts to become a dominant part of the dune communities then control

should be considered. Formosan lily (*Lilium formosanum*) is widespread throughout coastal scrub but poses little threat to local biodiversity. A lime tree was seen in the dunes (Fig. 19). Perhaps a relic of settlement, this plant even bore fruit (<https://inaturalist.nz/observations/39715150>).

Fauna

Indigenous species

During the fieldwork six indigenous bird species were seen, including the endemic mātātā or fernbird, which is classified as At Risk–Declining (Robertson et al. 2016). The other species seen were the endemic tōrea pango or variable oystercatcher (*Haematopus unicolor*), tūi or kōkō (*Prosthemadera novaeseelandiae*), piwakawaka or North Island fantail (*Rhipidura fuliginosa* subsp. *placabilis*) and riroriro or grey warbler (*Gerygone igata*). Other native birds seen were kahu or harrier hawk (*Circus approximans*) and karoro or black backed gull (*Larus dominicanus*). The ground beetle *Mecodema antarctica* was seen dead in the sand dunes (<https://inaturalist.nz/observations/38557723>).

Introduced species

Cattle and horse sign was observed throughout the dune and scrub ecosystems, in the form of tracks and faeces. The same sign was observed for rabbit (*Oryctolagus cuniculus*), possum (*Trichosurus vulpecula*) and feral cat (*Felis catus*); the sign for these species was locally common. Control of these pest animals would be of benefit for indigenous fauna and flora, therefore it is recommended that this is investigated in future.

Acknowledgements

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Appendix. List of lichens and vascular plants recorded at Kahakaharoa Reserve, Hokianga, in February 2020. Reference included where supported by herbarium vouchers or published images.

* = exotic	sp. = species
agg. = aggregate	syn = synonym
cf. = comparable to	AK = Auckland Museum herbarium voucher

Lichens (18)

<i>Coccocarpia pellita</i>	Common corticolous lichen on sand kānuka (<i>Kunzea amathicola</i>).
<i>Crocodia poculifera</i>	Frequent corticolous lichen on sand kānuka.
<i>Cladonia confusa</i>	Patch seen under sand forest. https://inaturalist.nz/observations/39642722
<i>Dufourea ligulata</i>	Occasional saxicolous lichen.
<i>Erioderma leylandii</i>	Occasional, corticolous on mānuka in wetland. https://inaturalist.nz/observations/38788862
<i>Heterodermia</i> sp.	Common corticolous lichen on sand kānuka.
<i>Heterodermia tremulans</i>	Saxicolous with <i>Dufourea ligulata</i> (Identification help from Dan Blanchon) https://inaturalist.nz/observations/57604178
<i>Leptogium denticulatum</i>	Common in sand kānuka forest. https://inaturalist.nz/observations/39642728
<i>Notoparmelia erumpens</i>	Corticolous on sand kānuka. https://inaturalist.nz/observations/39715149
<i>Pannaria elixii</i>	Very common corticolous lichen on sand kānuka.
<i>Physcia poncinsii</i>	One patch seen on sand kānuka. https://inaturalist.nz/observations/54581473
<i>Pseudocyphellaria bartlettii</i>	Rare on sand kānuka. (Identification help from Peter de Lange) https://inaturalist.nz/observations/38563384
<i>Pseudocyphellaria haywardiorum</i>	Locally common on sand kānuka.
<i>Pseudocyphellaria punctillaris</i>	Rare, corticolous lichen on sand kānuka. (Identification help from Peter de Lange) https://inaturalist.nz/observations/58921499
<i>Ramalina peruviana</i>	Stunted growing on abandoned bus in sand kānuka forest. https://inaturalist.nz/observations/39642720
<i>Sticta fuliginosa</i>	Common corticolous lichen on sand kānuka.
<i>Sticta limbata</i>	Rare corticolous lichen on sand kānuka. https://inaturalist.nz/observations/57296550
<i>Sticta squamata</i>	Occasional in sand kānuka forest. https://inaturalist.nz/observations/39642726

Ferns & fern allies 33 (32+ 1) (= Native + Exotic)

<i>Abrodictyum elongatum</i>	<i>Dicksonia squarrosa</i>	
<i>Adiantum cunninghamii</i>	<i>Doodia australis</i>	
<i>Adiantum hispidulum</i>	<i>Gleichenia microphylla</i>	
<i>Asplenium flaccidum</i>	<i>Histiopteris incisa</i>	
<i>Asplenium oblongifolium</i>	<i>Hymenophyllum flexuosum</i>	AK 380160
<i>Austroblechnum membranaceum</i>	https://inaturalist.nz/observations/54581472	
<i>Azolla pinnata</i> *	<i>Hymenophyllum demissum</i>	
<i>Cyathea dealbata</i>	<i>Hymenophyllum dilatatum</i>	
<i>Cyathea medullaris</i>	<i>Hymenophyllum flabellatum</i>	
	<i>Hymenophyllum nephrophyllum</i>	

Hymenophyllum revolutum
Hypolepis dicksonioides (AK 380164)
Icarus filiformis
Lycopodiella cernua
Lycopodium volubile
Paesia scaberula
Parablechnum novae-zelandiae
Pneumatopteris pennigera

Pteridium esculentum
Pteris macilenta
Pteris tremula
Pyrrosia eleagnifolia
Sticherus flabellatus
<https://inaturalist.nz/observations/54502988>
Tmesipteris lanceolata
Zealandia pustulata subsp. *pustulata*

AK 380150

Conifers 4 (2+2)

Dacrydium cupressinum
Phyllocladus trichomanoides

Pinus pinaster *
Pinus radiata *

Dicots 117 (67 +50)

Ageratina adenophora *
Alternanthera nahui
Anaphalioides trinervis
Apium prostratum subsp. *prostratum*
Atriplex prostrata *
Avicennia marina subsp. *australasica*
Banksia integrifolia * coastal banksia
Cakile edentula *
Callitriche muelleri
Calystegia marginata
Calystegia sepium subsp. *roseata*
Calystegia soldanella
Calystegia tuguriorum
Carmichaelia australis
Centaurium erythraea *
Centella uniflora
Citrus × latifolia * lime
Cirsium vulgare *
Cotoneaster glaucophyllus * cotoneaster
Coprosma acerosa tarakupenga
Coprosma lucida
Coprosma parviflora
Coprosma rhamnoides
Coprosma robusta
Coprosma × cunninghamii
<https://inaturalist.nz/observations/41018191>
Coriaria arborea var. *arborea*
Crepis capillaris *
Daucus carota *
Disphyma austral
Dodonaea viscosa
Dysphania ambrosioides *
Elaeagnus × reflexus * elaeagnus

Entelea arborescens
Epilobium ciliatum *
Epilobium rotundifolium
Erechtites hieraciifolia *
Erica lusitanica * Spanish heath
Erigeron canadensis *
Erigeron sumatrensis *
Euchiton audax
Euchiton involucratus
Foeniculum vulgare *
Gamochaeta coarctata *
Gamochaeta simplicicaulis *
Gaultheria antipoda
Geranium homeanum
Goodenia radicans (syn. *Selliera radicans*)
Hakea sericea * prickly hakea
Haloragis erecta subsp. *erecta*
Hydrocotyle novae-zeelandiae
<https://inaturalist.nz/observations/54581471>
Hypericum pusillum
Hypochaeris radicata *
Jacobaea vulgaris *
Knightia excelsa
Kunzea amathicola kānuka or rawiritoa
Lantana camara var. *aculeata*
Leptospermum scoparium agg.
Leptostigma setulosum
Leucopogon fasciculatus
Leucopogon fraseri
Ligustrum sinense *
Linum trigynum
Lobelia anceps
Lotus pedunculatus *

AK 380159

Dicots cont...

<i>Lotus suaveolens</i> *			<i>Polygala myrtifolia</i> *	
<i>Lupinus arboreus</i> *	tree lupin		<i>Pomaderris amoena</i>	
<i>Lysimachia arvensis</i> *			<i>Pseudognaphalium luteoalbum</i>	
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>			<i>Ranunculus acaulis</i>	
<i>Metrosideros excelsa</i>			<i>Ranunculus reflexus</i>	
<i>Metrosideros perforata</i>			<i>Ranunculus urvilleanus</i>	AK 380156
<i>Muehlenbeckia complexa</i>			<i>Rubus cissoides</i>	
<i>Myrsine australis</i>			<i>Rumex acetosella</i> *	
<i>Nasturtium officinale</i> *			<i>Sagina procumbens</i> *	
<i>Netera depressa</i>			<i>Samolus repens</i> var. <i>repens</i>	
<i>Oenothera stricta</i>		AK 380155	<i>Senecio bipinnatisectus</i>	
* https://inaturalist.nz/observations/39642710			<i>Senecio diaschides</i>	AK 380157
<i>Olearia alba</i>	tanguru	AK380152	https://inaturalist.nz/observations/39642721	
<i>Oplismenus hirtellus</i> subsp. <i>imbecillis</i>			<i>Senecio esleri</i>	
<i>Ornithopus pinnatus</i> *			<i>Senecio lautus</i>	
<i>Ozothamnus leptophyllus</i>			<i>Senecio skirrhodon</i> *	
<i>Parentucellia viscosa</i> *			<i>Silene gallica</i> *	
<i>Pelargonium capitatum</i> * coast pelargonium			<i>Solanum americanum</i>	
https://inaturalist.nz/observations/39715141			<i>Solanum linnaeanum</i> *	
<i>Persicaria decipiens</i>			<i>Solanum mauritianum</i> *	
<i>Persicaria hydropiper</i> *			<i>Sonchus oleraceus</i> *	
<i>Phytolacca octandra</i> *			<i>Sophora chathamica</i>	
<i>Pimelea orthia</i>			<i>Symphotrichum subulatum</i> *	
<i>Pimelea</i> cf. <i>urvilleana</i>	pinātōro		<i>Trifolium repens</i> *	
<i>Piper excelsum</i> subsp. <i>excelsum</i>			<i>Ulex europaeus</i> *	gorse
<i>Plantago australis</i> *			<i>Vellereophyton dealbatum</i> *	
<i>Plantago lanceolata</i> *			<i>Vitex lucens</i>	
<i>Polycarpon tetraphyllum</i> *			<i>Weinmannia sylvicola</i>	tōwai

Monocots 80 (50+30)

<i>Agrostis stolonifera</i> *		<i>Carex lessoniana</i>	
<i>Ammophila arenaria</i> *	marram grass	<i>Carex longibrachiata</i> *	
<i>Anthoxanthum odoratum</i> *		<i>Carex ochrosaccus</i>	
<i>Apodasmia similis</i>		<i>Carex pumila</i>	
<i>Aristea ecklonii</i> *		<i>Carex</i> "raotest"	
<i>Astelia banksia</i>	kahakaha	https://inaturalist.nz/observations/38584131	
<i>Austroderia splendens</i>	coastal toetoe	<i>Carex uncinata</i>	
<i>Axonopus fissifolius</i> *		<i>Carex virgate</i>	
<i>Briza minor</i> *		<i>Catapodium rigidum</i> *	
<i>Bromus diandrus</i> *		<i>Cenchrus clandestinus</i> *	
<i>Bromus catharticus</i> *		<i>Cordyline australis</i>	
(identified by Rhys Gardner)		<i>Cortaderia selloana</i> *	pampas
https://inaturalist.nz/observations/58915091		<i>Cyperus brevifolius</i> *	
<i>Carex flagellifera</i>		<i>Cyperus eragrostis</i> *	
<i>Carex inversa</i>		<i>Cyperus polystachyos</i> *	
<i>Carex lambertiana</i>			

Cyperus sanguinolentus *
<https://inaturalist.nz/observations/41018183>

Cyperus ustulatus

Dactylis glomerata *

Dianella nigra

Dichelachne crinite

Eleocharis acuta

Eleocharis gracilis
<https://inaturalist.nz/observations/39715140>

AK 380158

Ficinia nodosa wīwī

Ficinia spiralis pīngao

Gahnia lacera

Holcus lanatus *

Isachne globosa

Isolepis cernua

Isolepis inundata
<https://inaturalist.nz/observations/39642711>

AK 380161

Isolepis prolifera

Isolepis sepulchralis *
<https://inaturalist.nz/observations/39642713>

Juncus acuminatus *

Juncus articulatus *

Juncus bufonius *

Juncus dichotomus *

Juncus edgariae

Juncus effusus *

Juncus pallidus

Juncus prismatocarpus

Lachnagrostis billardierei

Lagurus ovatus *

Lepidosperma laterale

Lilaeopsis novae-zelandiae

Lilium formosanum * Formosan lily

Luzula picta var. *picta*

Machaerina articulata

Machaerina juncea

Machaerina rubiginosa

Machaerina sinclairii

Microtis unifolia

Morelotia affinis

Paspalum dilatatum *

Paspalum distichum *

Phormium tenax harakeke

Poa anceps

Pterostylis banksia

Rhopalostylis sapida

Rytidosperma biannulare
<https://inaturalist.nz/observations/39715138>

Schoenoplectus tabernaemontani

Schoenus apogon

Schoenus maschalinus

Spinifex sericeus kōwhangatara

Sporobolus africanus *

Triglochin striata

Typha orientalis raupō

Vulpia sp. *

Zoysia pauciflora
<https://inaturalist.nz/observations/38563386>

Purewa Revisited: 33 years of change in an urban Auckland cemetery

Timothy J. Martin

Inspired by enforced lockdown in eastern Auckland suburbia, and a 1987 article by a botanical forefather (Gardner 1987), I explored an overlooked place almost on my doorstep. Purewa Cemetery, one of the oldest cemeteries in Auckland, sweeps down a broad slope from St Johns Road to the south-eastern railway line and the edge of Purewa Creek. A full account of its early history, and its vegetation in the mid 1980s, is provided by Rhys Gardner's article "Purewa and its Cemetery", published in 1987. The

intent of this article is to provide an account of key changes over the past 33 years, particularly changes in tree species and cover, and any new additions to its naturalised flora. The article covers the same area described by Gardner (1987), and includes the entrance drive between St Johns Road and Parsons Road known as Fancourt Reserve. This article excludes an account of mown lawns, and the well-kept gardens associated with the cemetery buildings. A notated species list is provided in Appendix 1.