

a selection of 319 plates in three parts (1900, 1901, 1905). Britten's total was 331 plants illustrated. Morgan had published his first botanical illustration when just 18 years old but was to die young as a result of complications following an operation for appendicitis.

Britten had intended to include New Zealand and possibly other plants but this project, too, was abandoned after allegedly £837* had been spent over five years. Sixty years later a selection of engraved plates was printed in London and in 1973 appeared the curiously-named *Captain Cook's Florilegium* in an edition of 100 comprising 30 plates, with a deluxe edition of ten with 12 more plates in 1976.

Only with the publication of Banks's *Florilegium* in the 1980s were all of Parkinson's engraved drawings published, albeit in a very exclusive way: loose plates in 100 sets in boxes without commentaries and costing over £100,000*. Only fifteen months ago were any of these drawings or engravings in colour made available to the general public.

By contrast with the first voyage, the botanical results of Cook's second voyage were published rapidly. That these less lavish publications appeared before the findings of the first voyage has meant that many of the plants of the south Pacific, notably New Zealand, were named from the collections made by the Forsters on *Resolution*. As Norfolk Island was the only part of the Australia region they touched on, European knowledge of the botany of New Zealand advanced in front of that of Australia as a result.

Later Solander's manuscripts were used and his unpublished plant-names printed by others, often from the Continent, as Banks now allowed access to

European scientists. It was largely in these ways that the Australasian treasures seeped into the scientific milieu, but this aspect of the influence of the collections of Cook's first voyage has hitherto been inadequately assessed – as there has been an overwhelmingly (understandable in the light of nationalist rivalries) Anglocentric focus.

Can it be that Banks, now deeply involved with matters in Iceland and many other diversions, and having seen Australia and New Zealand as a sideshow of the *Endeavour* voyage – successful in the Transit but unsuccessful in finding the southern continent for Britain, while Australasia had yielded nothing of commercial interest, felt there was now nothing to be lost by such magnanimity? Unlike the Dutch period, when secrecy seems to have been paramount, now the 'commercial in confidence' imperative seems not to have been pressing, so that it was perhaps sufficient then to allow the savants of Europe access to work on the collections.

Indeed, as the years passed, the scientific outcome of the Cook voyages, whatever Banks's thinking and apparent procrastination, was remarkably paradoxical when their initially nationalistic intent is remembered. Work on the collections by Continental scientists, meant that, except for the work of James Edward Smith on Australian First Fleet plants, the initiative had by now been largely lost by Britain – and this was only to be regained with the work of the Scottish botanist, Robert Brown, on the collections from Matthew Flinders's Pacific voyage at the beginning of the nineteenth century. Ironically, yet again, the success of that was to be the result of the intervention of no less than – Sir Joseph Banks. But that is another story!

* For modern equivalents see Editors' Footnote on pg. 124

Plants Of Western Springs Lakeside Park

Ben Goodwin & Mike Wilcox

Western Springs (28.2 ha), the Zoo, and the adjoining MOTAT (Museum of Transport and Technology) together cover a sizeable area in the suburbs of Point Chevalier/Grey Lynn, Auckland (Fig. 1). The Zoo opened in 1923, and was developed on bare wasteland, once the location of Auckland's first flour mill in the 1840s (see Wilcox et al. 2005; Goodwin 2016). A block of Monterey pine (*Pinus radiata*) was planted in 1923 on the slopes between the Zoo and what is now the Western Springs Stadium and is still there today and a prominent landmark (Wilcox 2012), but for safety reasons is destined to be felled in 2020.

In 1874 the springs were purchased for Auckland's water supply. Western Springs Lake is an artificial reservoir constructed by the Auckland City Council in 1875 to contain the water of an aquifer which discharged from beneath a lava flow and which, before this time, formed a small brook flowing into Motions Creek (Russell & Rodgers 1977; Hayward et al. 2011). The springs were an important source of eels for the Maori living on Mt Eden, and the original name for the springs was Waiorea (eel lake). The earliest botanical records are by Thomas Kirk in 1865.

Waiorea is a shallow spring-fed lake with a maximum depth of 2.9 m and covering an area of 5 ha. It discharges from two weirs into Motions Creek and the wetlands have special importance, hosting tremendous biological diversity including abundant water-birds (Gill & West 2016; Gill & West 2018). Human population growth and habitat destruction have seen eel populations around the country decline over time and Waiorea has been redeveloped as a refuge for eels. The Department of Conservation has recently classified the entire park as a special wildlife interest area. Natural wetland vegetation occurs fringing the western end of the springs.

MOTAT (Museum of Transport and Technology) was opened in 1964, and at this time a programme of tree planting commenced around the Western Springs lake. The Lakeside Park was opened to the public in 1977. A wide variety of both native and introduced trees has been planted.

The Fukuoka Japanese Garden in Western Springs Lakeside Park was opened in July 2017. It used to be in the Zoo but was reconstructed and relocated. It features over 1800 native Japanese and New Zealand plants and incorporates items preserved from the original garden including four bonsai trees, paving stones, lanterns, a water basin and the entrance. It has a tea pavilion, waterfall and pond. The design of the new garden was created by Fukuoka's ZEN Environmental Design Ltd with Fukuoka City Greenery Department and Professor Lekatsu Kubota. Auckland Council's landscape architects also worked closely with the Japanese-based designers to ensure that the garden remained true to traditional Japanese design.

Vegetation categories at Western Springs are: planted amenity trees; naturalised trees, shrubs and woody climbers; ornamental shrubs and bedding plants; planted native forest; large ornamental monocots; lawns; rockfields (basalt lava outcrops); aquatic plants of the lake; lake margins, springs area, and other damp areas; Motions Creek; and the old pine forest (see Appendix). Most previous botanical investigations of Western Springs have focussed on the nuisance aquatic plants of the lake (Tanner 1981; Decker 1995; de Winton et al. 2009; Hofstra 2014; Hofstra et al. 2014).

Auckland Botanical Society (ABS) field trip

A group of 39 people explored the area on 20 July 2019, led by Ben Goodwin and Mike Wilcox. The attendees were: Jenny Andrew, Sel Arbuckle, Paul Asquith, Paul Bell-Butler, Zoe Blair, Dan Blanchon, John Braggins, Jan Butcher, Ewen Cameron, Janeen Collings, Steve Cook, Brian Cumber, Peter de Lange, Frances Duff, Marley Ford, Cathy Gabriel, Rhys Gardner, Beth Gibbs, Ben Goodwin, Anna Mairs, Richard Mairs, Mamakan Oustrup Laureijs (and Samuel), Thiagaraj Mahalingam, Andrew Marshall,

Philip Moll, Nathaniel Morgan, Hamish Ogle, Sharon Osman, Juliet Richmond, Anna Rugis, John Rugis, Joshua Salter, Claire Stevens, Thiagaray, Val Tomlinson, Elizabeth Walker, Mike Wilcox, David Wilson, Maureen Young. We concentrated our observations on the rockfields and Motions Creek.

Planted amenity trees

The park features numerous planted trees and is one of Auckland's most diverse dendrological assemblages (Cameron et al. 2008; Wilcox 2012). Australian trees present are Queensland kauri (*Agathis robusta*), white cypress pine (*Callitris glaucophylla*), Western Australian peppermint (*Agonis flexuosa*), river sheoak (*Casuarina cunninghamiana*) and a few swamp sheoak (*Casuarina glauca*), Sydney golden wattle (*Acacia longifolia*), saw-tooth banksia (*Banksia serrata*), Illawarra flame tree (*Brachychiton acerifolius*), kurrajong (*Brachychiton populneus*), tuckeroo (*Cupaniopsis anacardioides*) (Fig. 2), Australian frangipani (*Hymenoporum flavum*), blueberry ash (*Elaeocarpus reticulatus*), silky oak (*Grevillea robusta*), brush box (*Lophostemon confertus*), macadamia nut tree (*Macadamia tetraphylla*), bracelet honey myrtle (*Melaleuca armillaris*), crimson bottlebrush (*Melaleuca citrina*), boobialla (*Myoporum insulare*), hazel pomaderris (*Pomaderris aspera*), magenta lilly pilli (*Syzygium paniculatum*), monkey apple or [white] lilly pilli (*Syzygium smithii*), red cedar (*Toona ciliata*), Moreton Bay fig (*Ficus macrophylla*), water gum or kanooka (*Tristanopsis laurina*), and eucalypts (*Corymbia citriodora*, *Eucalyptus botryoides*, *E. saligna*, *E. tereticornis*, *E. viminalis*). From Norfolk Island there is Norfolk Island hibiscus (*Lagunaria patersonii*) and Norfolk Island pine (*Araucaria heterophylla*). Some of the eucalypts show up as large trees in a 1930 aerial photo and are likely to have been planted pre 1900. The same photo shows what appears to be a well-established grove of willows or river sheoak and/or Western Australian peppermint on the flat land northwest of the lake, and big trees on the present MOTAT site.

From Southern Africa there is a grove of bladdernut (*Diospyros whyteana*), and specimens of yellowwood (*Afrocarpus falcatus*), Henkel's yellowwood (*Podocarpus henkelii*), Natal flame bush (*Alberta magna*), butterspoon tree (*Cunonia capensis*), kaffir plum (*Harpephyllum caffrum*), and from east Africa, *Dombeya torrida* (at the Zoo). An island on the edge of the main lake has a large tree of South African lowveld cabbage tree (*Cussonia spicata*) of the family Araliaceae.

North, Central and South American trees include swamp cypress (*Taxodium distichum*) (Fig. 3), Monterey pine (*Pinus radiata*), Mexican weeping pine (*Pinus patula*), Modoc cypress (*Cupressus bakeri*), pin oak (*Quercus palustris*), scarlet oak (*Quercus coccinea*), sweet gum (*Liquidambar styraciflua*), tulip

tree (*Liriodendron tulipifera*), box elder (*Acer negundo*), cottonwood (*Populus deltoides*) – including a huge tree blown down in a severe storm on 10 April 2018, basswood (*Tilia americana*) (Fig. 4), Mexican alder (*Alnus acuminata* subsp. *glabrata*), monkey's hand tree (*Chiranthodendron pentadactylon*), pepper tree (*Schinus molle*), golden medallion (*Cassia leptophylla*), southern catalpa (*Catalpa bignonioides*), northern catalpa (*Catalpa speciosa*), jacaranda (*Jacaranda mimosifolia*), glory bush (*Tibouchina urvilleana*) and cockspur coral tree (*Erythrina crista-galli*).

European trees here are olive (*Olea europaea*), bay laurel (*Laurus nobilis*), strawberry tree (*Arbutus unedo*), common alder (*Alnus glutinosa*), silver birch (*Betula pendula*), pedunculate oak (*Quercus robur*), flowering ash (*Fraxinus ornus*), narrow-leaved ash (*Fraxinus angustifolia* subsp. *angustifolia*), claret ash (*Fraxinus angustifolia* subsp. *oxycarpa* 'Raywood'), sycamore (*Acer pseudoplatanus*), crack willow (*Salix × fragilis*), columnar white poplar (*Populus alba* 'Pyramidalis', Canary Island pine (*Pinus canariensis*), Atlas cedar (*Cedrus atlantica*), Mediterranean cypress (*Cupressus sempervirens*), horse chestnut (*Aesculus hippocastanum*), golden weeping willow (*Salix × sepulcralis* var. *chrysocoma*) (Fig. 5), London plane (*Platanus × acerifolia*) and narrow-leaved oriental plane (*P. orientalis* 'Digitata').

Asian trees here are ginkgo (*Ginkgo biloba*), Chinese swamp cypress (*Glyptostrobus pensilis*), dawn redwood (*Metasequoia glyptostroboides*), Chinese juniper (*Juniperus chinensis*), sugi (*Cryptomeria japonica*), deodar cedar (*Cedrus deodara*), ban oak (*Quercus lanata*) (Fig. 6), raisin tree (*Hovenia dulcis*), Japanese hop-hornbeam (*Ostrya japonica*), Indian horse chestnut (*Aesculus indica*), persimmon (*Diospyros kaki*), foxglove tree (*Paulownia tomentosa*), crepe myrtle (*Lagerstroemia indica*), Japanese walnut (*Juglans ailantifolia*) (this species also naturalising along the banks of Motions Creek bordering the Zoo), Indian horse chestnut (*Aesculus indica*), Yunnan poplar (*Populus yunnanensis*), trident maple (*Acer buergerianum*), camphor laurel (*Cinnamomum camphora*), Persian lilac (*Melia azedarach*) and gordonia (*Polyspora axillaris*). At the Fukuoka Garden can be seen newly-planted specimens of Japanese maple (*Acer palmatum*), Japanese laurel (*Aucuba japonica*), Japanese dogwood (*Cornus kousa*), Chinese redbud (*Cercis sinensis*), Japanese mahonia (*Mahonia japonica*), lily of the valley shrub (*Pieris japonica*) and Japanese viburnum (*Viburnum japonicum*).

Because of their prominence, good growth, or botanical interest, those exotic trees of most dendrological significance here are:

- Ban oak (*Quercus lanata*): a grove of this evergreen oak from the Himalaya region planted in

the 1990s, and now flowering and bearing crops of acorns.

- Red cedar (*Toona ciliata*): several well-grown trees, and probably the largest concentration in New Zealand of this famous Australian timber tree.
- American basswood (*Tilia americana*): two trees, the largest being one of the finest specimen trees in the park.
- Swamp cypress (*Taxodium distichum*): planted to good effect around a small pond.
- Western Australian peppermint (*Agonis flexuosa*): noteworthy for its abundance, especially on the flat ground bordering Motions Creek.
- Tuckeroo (*Cupaniopsis anacardioides*): a fine specimen of this coastal tree from Australia and rarely seen cultivated in New Zealand.
- Golden weeping willow (*Salix × sepulcralis* var. *chrysocoma*): a feature tree of the lake margins.
- South African lowveld cabbage tree (*Cussonia spicata*): possibly the largest-known specimen in Auckland.

Naturalised trees, shrubs and woody climbers

Some shrubby weeds have become established in various parts of the park, though few have taken over large areas. In the rocky outcrops around the springs can be found gorse (*Ulex europaeus*), blackberry (*Rubus fruticosus*), tree privet (*Ligustrum lucidum*), Chinese privet (*Ligustrum sinense*), brush wattle (*Paraserianthes lophantha*), boneseed (*Chrysanthemoides monolifera*), evergreen buckthorn (*Rhamnus alaternus*), sweet pea shrub (*Polygala myrtifolia*), woolly nightshade (*Solanum mauritianum*), Jerusalem cherry (*Solanum pseudocapsicum*), Sydney golden wattle (*Acacia longifolia*), Japanese honeysuckle (*Lonicera japonica*), castor oil plant (*Ricinus communis*), butterfly bush (*Buddleja davidii*), grey willow (*Salix cinerea*), and mile-a-minute (*Dipogon lignosus*). Himalayan honeysuckle (*Leycesteria formosa*) occurs in the old pines stand (Goldwater 2016), and ivy (*Hedera helix*), Brazilian pepper tree (*Schinus terebinthifolius*), loquat (*Eriobotrya japonica*) and queen of the night (*Cestrum nocturnum*) occur in places along the edge of Motions Creek.

Ornamental shrubs and bedding plants

Several areas near the lake shore have been landscaped with ornamental plants, including some small exotic shrubs: box (*Buxus sempervirens*), *Calliandra brevipes*, *Callistemon viminalis* 'Little John', *Calytrix tetragona*, *Choisya ternata*, *Cistus creticus* subsp. *incanus*, *Coleonema pulchrum*, *Colletia cruciata*, *Cotoneaster dammeri*, *Daphne odora*, *Grevillea rosmarinifolia*, *Lantana montevidensis*, *Lavandula dentata*, *Lonicera nitida*, *Loropetalum chinense*, *Lycianthes cuchiaensis*, *Nandina domestica*, *Rhaphiolepis umbellata*, *Rosmarinus officinalis*, *Santolina chamaecyparissus*, buttercup bush (*Senna pendula* 'John Ball') and



Figs. 1-4: 1. Location map of Western Springs Lakeside Park. 2. *Cupaniopsis anacardioides*, Western Springs, 18 June 2019. All photos except Fig. 26 taken by Mike Wilcox. 3. *Taxodium distichum*, Western Springs, 18 July 2018. 4. *Tilia americana*, Western Springs, 19 Dec 2018.

Westringa fruticosa. Native shrubs grown here as ornamentals are daisy bush (*Brachyglottis greyi*) (Fig. 7), hybrid korokia (*Corokia* × *cheesemania*), native hibiscus (*Hibiscus diversifolius*), shrubby tororaro (*Muehlenbeckia astonii*), Molloy's kowhai (*Sophora molloyi*), *Veronica parviflora* and *V. speciosa*.

Planted native forest

There is an extensive area of native forest revegetation plantings (Wilcox 2012) (Fig. 8), concentrated on the basalt lava flows. Species planted are pohutukawa (*Metrosideros excelsa*), Kermadec pohutukawa (*M. kermadecensis*), karo (*Pittosporum crassifolium*), lemonwood (*Pittosporum*



Figs. 5-13: **5.** Golden weeping willow (*Salix × sepulcralis* var. *chrysocoma*) Western Springs, 1 July 2019. **6.** *Quercus lanata*, Western Springs, 18 July 2018. **7.** *Brachyglottis greyi*, Western Springs, 15 Jan 2019. **8.** Western Springs, native forest revegetation, 21 Oct 2011. **9.** Karaka forest, Western Springs, 23 Jan 2019. **10.** Papyrus, Western Springs, 20 Aug 2018. **11.** *Astelia grandis*, Western Springs, 29 Oct 2018. **12.** Swans, Western Springs, 20 Aug 2018. **13.** *Peperomia urvilleana*, Western Springs, 23 Jan 2019.

eugenioides), kohuhu (*Pittosporum tenuifolium*), ngaio (*Myoporum laetum*), taupata (*Coprosma repens*), karamu (*Coprosma robusta*), titoki (*Alectryon excelsa*), puriri (*Vitex lucens*), kahikatea (*Dacrycarpus dacrydioides*), totara (*Podocarpus totara*), cabbage tree (*Cordyline australis*), nikau (*Rhopalostylis sapida*), kiekie (*Freycinetia banksii*), kanuka (*Kunzea robusta*), thermal kanuka (*K. tenuicaulis*), native broom (*Carmichaelia australis*), karaka (*Corynocarpus laevigatus*), rewarewa (*Knightia excelsa*), broadleaf (*Griselinia littoralis*),

puka (*Griselinia lucida*), tanguru (*Olearia albida*), wharangi (*Melicope ternata*), *Coprosma crassifolia*, *C. virescens* and *Corokia × cheesemanii*. The Australian plants *Leptospermum variable*, *Myoporum insulare* and *Pomaderris aspera* have also been planted in some of the thickets, as has the South African podocarp *Afrocarpus falcatus*. The main native species naturally colonising the forest are kawakawa (*Piper excelsum*), mahoe (*Melicytus ramiflorus*), hangehange (*Geniostoma ligustrifolium*), mapou (*Myrsine australis*), coastal karamu (*Coprosma*

macrocarpa subsp. *minor*), *Coprosma rhamnoides*, nikau, and wharangi, with natural regeneration of karaka often prolific. Kiekie has in places become prevalent – seemingly spreading from original plantings or perhaps by natural colonisation. Poroporo (*Solanum laciniatum*) is an abundant opportunist of forest margins and gaps. One clump of *Cassytha paniculata* has persisted for many years. It was noticed there in 1982 growing on planted manuka from Northland, and later, on kanuka (Cameron 1995).

Much of the planted forest is in lava hollows or on rock slopes, forming a re-created “rock forest”. Here, titoki is one of the commonest and most successful trees, reminiscent of the remnant titoki rock forest at Gribblehirst Park (Esler 1991, Wilcox 2012). Esler (1991) mentions that titoki was well represented at Western Springs until destroyed by landscaping in the 1970s. The forest is a example of successful ecological restoration.

At the “Circle of Friends” is what appears to be a remnant of original karaka forest (Fig. 9). The trees are large (30–40 cm diameter, 15–18 m height), there is a lone taraire (*Beilschmiedia tarairi*), numerous mahoe, mature tree ferns (*Cyathea dealbata* and *Dicksonia squarrosa*), impressive kahikatea and kanuka, and kohekohe (*Dysoxylum spectabile*).

Large ornamental monocots

Ornamental plantings, particularly those close to the lake, feature a diverse range of monocots of both exotic and native plants. Impressive stands of papyrus (*Cyperus papyrus*) (Fig. 10) grow in the lake itself, while spectacular plants on drier ground are fox-tail agave (*Agave attenuata*), candelabra aloe (*Aloe arborescens*), dune aloe (*Aloe thraskii*), climbing aloe (*Aloiampelos ciliaris* syn. *Aloe ciliaris*), the clumping bamboos *Bambusa multiplex* ‘Alphonse Carr’ and *B. oldhamii*, Mexican lily (*Beschorneria yuccoides*), giant spear lily (*Doryanthes palmeri*), gymea lily (*Doryanthes excelsa*), dragon tree (*Dracaena draco*), variegated sword lily (*Furcraea selloa* ‘Marginata’) (Wilcox 2005), elephant’s ear (*Alocasia brisbanensis*), large wild iris (*Dietes grandiflora*), Swiss cheese plant (*Monstera deliciosa*), tree philodendron (*Philodendron bipinnatifidum*), giant white bird of paradise (*Strelitzia nicolai*), Californian fan palm (*Washingtonia robusta*) and windmill palm (*Trachycarpus fortunei*). Bangalow palm (*Archontophoenix cunninghamii*) has been planted along the northern bank of Motions Creek. The European pendulous sedge (*Carex pendula*) has been planted in beds near the bridge across Motions Creek at the MOTAT entrance to Western Springs Park. At the Circle of Friends is a planted bed of Tasman flax-lily (*Dianella tasmanica*).

Native monocots planted as ornamentals are *Arthropodium bifurcatum*, *Ar. cirratum*, *Astelia chathamica*, *As. grandis* (Fig. 11), *Cordyline australis*, *Libertia ixioides*, *Phormium cookianum*, *P. tenax* and *Xeronema callistemon*.

Lawns

The extensive lawns bordering the lake and paths (Fig. 12) comprise a mixture of numerous herbaceous plants and grasses: *Aphanes inexpectata*, *Bellis perennis*, *Cenchrus clandestinus*, *Poa annua*, *Hydrocotyle tripartita*, *H. moschata*, *Lotus angustissimus*, *Mentha pulegium*, *Modiola caroliniana*, *Oxalis exilis*, *Plantago major*, *Prunella vulgaris*, *Ranunculus muricatus*, *R. parviflorus*, *Rumex pulcher*, *Soliva sessilis* and *Veronica serpyllifolia*. The lawns are much grazed by waterbirds, and by rabbits. The native herb, buttonweed (*Cotula australis*), forms mats at the base of some large trees in the main playground/picnic area.

Rockfields

The basalt lava field at the springs provides a volcanic habitat and refuge for several native plants. Ferns are particularly significant, with some rock-dwelling species present, namely *Asplenium flabellifolium*, *Cheilanthes distans*, *C. sieberi*, *Doodia australis*, *Pellaea rotundifolia* and *Arthropteris tenella*. Wharanui (*Peperomia urvilleana*), a native succulent, is numerous in sheltered places (Fig. 13), while kopata (*Pelargonium inodorum*) (Fig. 14) is frequent in more open grassy spots among the rocks, where trailing speedwell (*Veronica plebeia*) is more sparsely present. The grass *Microlaena stipoides* is a considerable feature of the rockfields where it forms green glades.

Plants of lake margins, springs area, and other damp areas

Armiger (1964) mentions some of the freshwater plants of the area. The lake presently does not have a marginal flora of tall, emergent, native monocots, though raupo (*Typha orientalis*), jointed sedge (*Machaerina articulata*) and kuta (*Eleocharis sphacelata*) are known from the park (but not seen by us) and there are plans to plant them (Auckland Council 2018b). Exotic plants of the lake margin include papyrus and yellow flag (*Iris pseudacorus*), the papyrus being recorded as recently naturalising.

A highlight of the flora in the springs area is the expanse of the native fern *Parablechnum minus* (Fig. 15), interspersed with manuka (*Leptospermum scoparium*) and straggly gorse (*Ulex europaeus*) and flax. The native sedges *Carex secta* and *C. virgata* are prominent in the various lakelets of the springs, their bases providing an important habitat for several ferns (Fig. 16), notably *Dicksonia squarrosa*,

Histiopteris incisa, *Hiya distans* (formerly *Hypolepis distans*), *Pteris tremula*, *Tmesipteris elongata* and the clubmoss *Phlegmariurus varius*.

Damp margins and sunken hollows support a varied flora of both native and exotic plants: *Alternanthera nahui*, *Bidens frondosa*, *Callitriche stagnalis*, *Carex secta*, *C. virgata*, *Erechtites hieracifolia*, *Histiopteris incisa*, *Isachne globosa*, *Isolepis prolifera*, *I. reticularis*, *Juncus articulatus*, *J. effusus*, *J. planifolius*, *J. usitatus*, *Ludwigia palustris*, *Lythrum hyssopifolia*, *Myosotis laxa* subsp. *caespitosa*, *M. scorpioides*, *Nasturtium officinale*, *Persicaria* "long spike" (a tag name attributed to Alan Esler for this common water pepper in Auckland with a much more branched inflorescence than *P. decipiens*), *P. hydropiper*, *Plantago australis*, *Sparganium subglobosum* (but not seen by us) and *Veronica serpyllifolia*. *Epilobium pallidiflorum* has been recorded by Alan Esler. *Ludwigia palustris* is generally the dominant plant on drying pond beds. *Glossostigma elatinoides* is a rarity, though appeared locally on peaty surfaces in April 2019.

Aquatic plants recorded here, either floating or anchored on the bottom are: *Azolla rubra*, *Egeria densa*, *Lagarosiphon major*, *Landoltia punctata*, *Lemna disperma*, *Myriophyllum aquaticum*, *M. propinquum*, *M. triphyllum*, *Nymphaea alba*, *N. × marilacea*, *Potamogeton crispus*, *P. ochreatus*, *Salvinia modesta*, *Vallisneria spiralis*, *Wolffia australiana* and the liverwort *Ricciocarpos natans* (Fig. 26) (see Bryophytes section below).

As noted by Hofstra (2014), Tanner (1981) described the presence of the native plant *Potamogeton ochreatus*, the introduced submerged species *Egeria densa*, *Elodea canadensis*, and *Potamogeton crispus*, the marginal weed *Myriophyllum aquaticum*, and the floating fern *Salvinia molesta*. In 1995, aquatic plant growth was described as a major problem in the lake (Decker 1995b). Species identified as being present in the lake were *Egeria densa*, *Potamogeton crispus*, a milfoil species and *Lemna disperma* (Decker 1995). *Salvinia molesta* was once abundant (Hatch 1972) but is now absent. Eradication of the salvinia was recommended using a combination of harvesting and herbicide (paraquat), which including cutting the submerged parts of the plants. Due to the proximity of Western Springs Lake to Auckland Zoo, the salvinia eradication programme was undertaken exclusively using manual/mechanical removal. However, it was also noted that grass carp could provide a solution for the control of submerged plants in this lake (Tanner 1981). Juvenile grass carp were released to control the pest aquatic weed *Egeria densa* there, doing so successfully within 123 days following their release. It is one of the earliest success

stories of grass carp in New Zealand. (New Zealand Waterways Restoration Ltd. website). *Egeria densa* has not been recorded here since 1999 (Hofstra et al. 2014). A study by NIWA (Auckland Regional Council 2009) revealed an almost complete absence of submerged vegetation other than aquatic mosses, such as *Fissidens berteroi* (see Bryophytes section below).

The predominant large fish in the lake are eels (both long-finned and short-finned) and the pest fish, koi carp and catfish. Mosquito fish (*Gambusia affinis*) occur in the springs ponds and have been studied by Mansfield and McArdle (1998) who found that this fish feeds here mainly on a wide variety of aquatic crustaceans (e.g., cladocerans, copepods, amphipods).

Flora of Motions Creek

Motions Creek flows from the lake and along a rock-walled channel (Fig. 17), and then through the Zoo and Jagers Bush to the Waitemata Harbour off Meola Road. The rock walls have an interesting flora, especially ferns. Introduced ferns found here are *Cyrtomium falcatum* (Fig. 18), *Cystopteris fragilis* (Fig. 19), tuber ladder fern (*Nephrolepis cordifolia*) and *Pteris cretica*, together with African club-moss (*Selaginella kraussiana*). Native ferns present are *Asplenium oblongifolium*, *Austroblechnum lanceolatum*, *Diplazium australe*, *Doodia mollis*, *Histiopteris incisa* and *Hypolepis dicksonioides* (Fig. 20). Other plants on the creek banks are mistflower (*Ageratina riparia*), ivy-leaved toadflax (*Cymbalaria muralis*), Mexican daisy (*Erigeron karvinskianus*), galinsoga (*Galinsoga quadriradiata*), tree daisy (*Dahlia excelsa*) – a large clump, *Geranium gardneri*, *G. homeanum*, *G. purpureum*, creeping mallow (*Modiola caroliniana*), grey sedge (*Carex divulsa*), *Juncus usitatus*, Natal lily (*Crinum moorei*), *Setaria palmifolia*, *Ehrharta erecta*, *Cestrum nocturnum*, *Polygonum capitatum*, hemlock (*Conium maculatum*), *Artemisia verlotiorum*, tutsan (*Hypericum androsaemum*) and Japanese walnut.

Aquatic plants recorded from the edge of the stream or submerged are *Glossostigma elatinoides*, *Isolepis inundata*, *Myriophyllum propinquum*, and the moss *Leptodictyon riparium*

Plants of the old pine forest

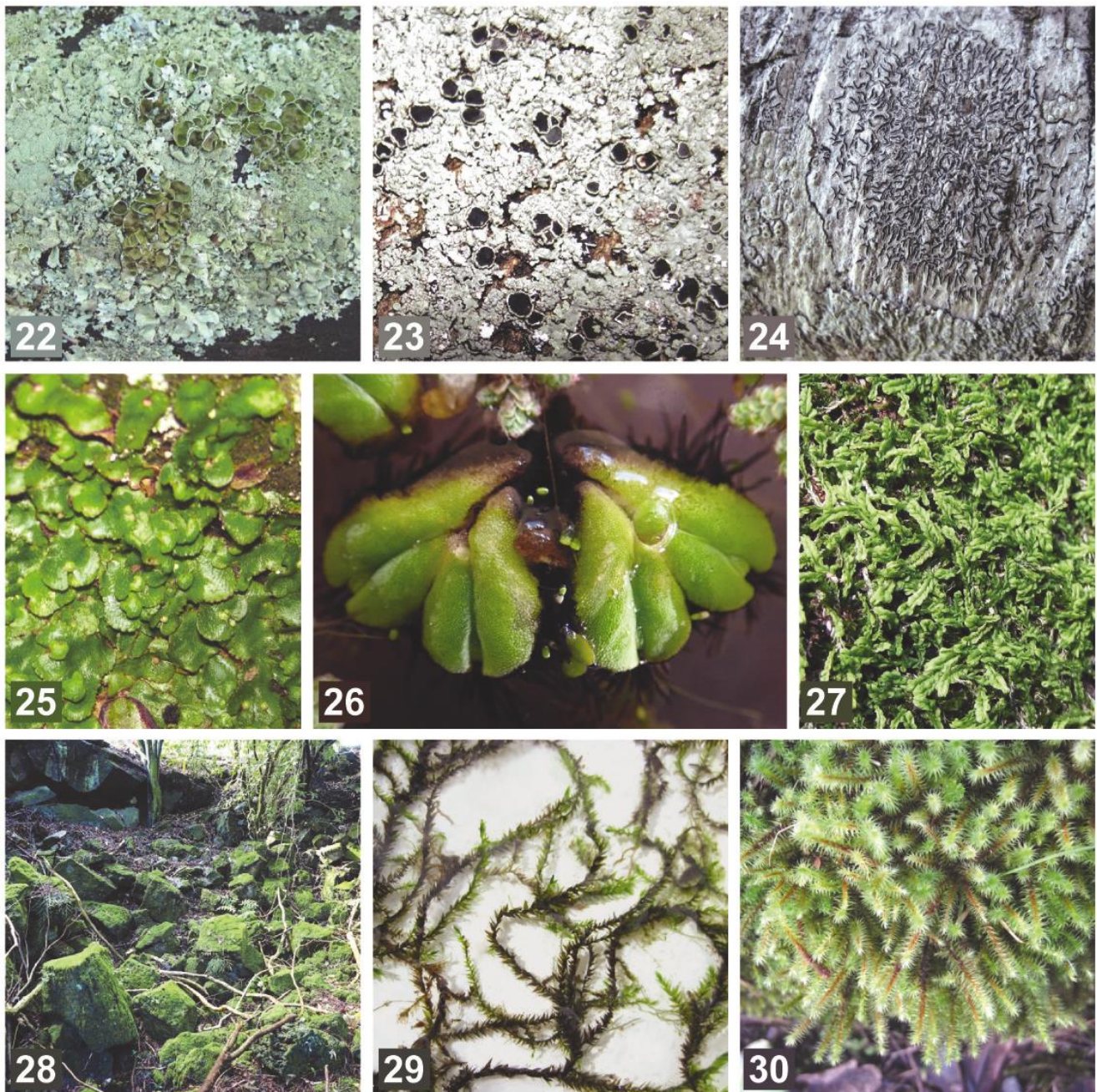
The 3.2 ha block of 95-year-old pines at Western Springs (Fig. 21) is one of the more notable examples in Auckland of exotic woodland (Wilcox 2012). It has been surveyed and reported on by Goldwater (2016) as follows: "The forest is bounded by Motions Creek along its western boundary and residential properties along some of its northeast margin. It is contiguous with mixed indigenous-exotic forest within Auckland Zoo to the north and a small amount of kanuka (*Kunzea robusta*) forest to



Figs. 14-21: 14. *Pelargonium inodorum*, Western Springs, 5 Nov 2018. 15. *Blechnum minus*, Western Springs, 6 Aug 2018. 16. Wetland, Western Springs, 29 Oct 2018. 17. Motions Creek, Western Springs, 20 Aug 2018. 18. *Cyrtomium falcatum*, Motions Creek, Western Springs, 20 Aug 2018. 19. *Cystopteris fragilis*, Motions Creek, Western Springs, 20 Aug 2018. 20. *Hypolepis dicksonioides*, Motions Creek, Western Springs, 3 Sep 2018. 21. Old pines, Western Springs, 21 Oct 2011.

the east (adjacent to Western Springs Stadium). The 35-40 m tall canopy of pine has progressively thinned over recent years, leaving the remaining trees vulnerable to wind-throw. This in turn has allowed the natural development of a sub-canopy and understorey dominated by indigenous plant species. A mixture of ponga (*Cyathea dealbata*), mapou (*Myrsine australis*), mahoe (*Melicytus ramiflorus*) and karo (*Pittosporum crassifolium*) occurs in the sub-canopy, with lesser amounts of cabbage tree (*Cordyline australis*) and mamaku (*Cyathea medullaris*). In the understorey, kawakawa (*Piper excelsum*) occurs frequently with hangehange

(*Geniostoma ligustrifolium*), while on the forest floor grow turutu (*Dianella nigra*), shining spleenwort (*Asplenium oblongifolium*), panic grass (*Oplismenus hirtellus*), hooked sedge (*Carex uncinata*) and meadow rice grass (*Microlaena stipoides*). Much of the forest floor is covered in pine needles". The abundance of particularly mapou, hangehange and silver tree fern in the understorey accords with observations in other old stands of Monterey pine in Auckland (e.g. Zita Maria Park, Massey, Wilcox 2012, p. 194) as well as in Wellington (Moles & Drake 1999).



Figs. 22-30: **22.** *Xanthoparmelia scabrosa* on wooden rail fence, Western Springs, 18 June 2019. **23.** *Dirinaria picta* on *Cupaniopsis anacardioides*, Western Springs, 18 June 2019. **24.** *Pertusaria thiopsida* and *Graphis elegans* on *Cedrus atlantica*, Western Springs, 1 July 2019. **25.** *Reboulia hemisphaerica*, Western Springs, 14 Aug 2018. **26.** *Ricciocarpus natans*, Western Springs. Photo: Peter de Lange, 20 July 2019. **27.** *Chiloscyphus semiteres* on *Syzygium smithii*, Outer Fields bush, Western Springs, 12 Aug 2018. **28.** *Thuidiopsis sparsa* on rock, Western Springs, 17 Aug 2018. **29.** *Leptodictyum riparium*, Western Springs, Motions Ck, 4 March 2019. **30.** *Breutelia pendula*, Outer Fields bush, Western Springs, 12 Aug 2018.

Additional to these observations are coastal karamu (*Coprosma macrocarpa* subsp. *minor*) – abundant in the understorey, pigeonwood (*Hedycarya arborea*) – common and flourishing, houpapa (*Pseudopanax lessonii*), rewarewa (*Knightia excelsa*), and several native trees that have been planted there: pohutukawa (*Metrosideros excelsa*), karaka (*Corynocarpus laevigatus*), kanuka (*Kunzea robusta*), manuka (*Leptospermum*

scoparium), native broom (*Carmichaelia australis*), totara (*Podocarpus totara*), rimu (*Dacrydium cupressinum*), puriri (*Vitex lucens*), lemonwood (*Pittosporum eugenioides*), kohuhu (*P. tenuifolium*) and ngaio (*Myoporum laetum*). Other ferns recorded are bracken (*Pteridium esculentum*), shaking brake (*Pteris tremula*), *Doodia australis*, *Asplenium flaccidum*, *A. polyodon* and *Pyrrosia elaeagnifolia*. The native species assemblage here is similar in

composition to that of the Urban Ark forest at the Zoo (Goodwin 2016).

Environmental pest plants were once prevalent throughout the understorey of the pine forest, the most common of which included tradescantia (*Tradescantia fluminensis*), kahili ginger (*Hedychium gardnerianum*) and mile-a-minute (*Dipogon lignosus*) – the last still abundant. There is also a patch of Himalayan honeysuckle (*Leycesteria formosa*), some moth plant (*Araujia hortorum*), and by Motions Creek, queen of the night (*Cestrum nocturnum*) and crack willow (*Salix × fragilis*). Recent weed control activity, however, has significantly reduced the density and abundance of all pest plant species. Other exotic plants recorded here are Sydney golden wattle (*Acacia longifolia*), brush wattle (*Paraserianthes lophantha*), monkey apple, Taiwan cherry (*Prunus campanulata*), hawthorn (*Crataegus monogyna*), tree privet (*Ligustrum lucidum*), Chinese privet (*Ligustrum sinense*), phoenix palm (*Phoenix canariensis*), coral tree (*Erythrina × sykesii*), boneseed (*Chrysanthemoides monolifera*), woolly nightshade (*Solanum mauritianum*), gorse (*Ulex europaeus*), spindle tree (*Euonymus japonica*), ivy (*Hedera helix*), Japanese honeysuckle (*Lonicera japonica*), nasturtium (*Tropaeolum majus*), blackberry (*Rubus fruticosus*), banana passionfruit (*Passiflora tarminiana*), Cape ivy (*Senecio angulatus*), ragwort (*Jacobaea vulgaris*), montbretia (*Crocsmia × crocosmiiflora*), bindweed (*Calystegia silvatica*), pampas grass (*Cortaderia selloana*), hemlock (*Conium maculatum*), climbing asparagus (*Asparagus scandens*), tuber ladder fern and a seedling of *Diospyros whyteana*.

Plants of Outer Fields bush

This 1.6 ha block, on the steep slopes above the Outer Fields and adjoining the Bullock Track, is a highly modified piece of urban forest comprising some planted exotic trees, naturalised weed trees, planted native trees, and a fragment of what appears to be natural manuka scrub. It has several paths for recreational walking. It is not part of Western Springs Lakeside Park, but is in public ownership under Auckland Tourism, Events and Economic Development (ATEED), an Auckland Council commercial agency, and receives scrutiny from the Waitemata Local Board.

Much of the bush comprises a 12 m-tall canopy of planted ngaio and cabbage tree, together with plantings of lemonwood, kahikatea, kanuka, manuka, karamu, and exotic trees such as lilly pilly and Yunnan poplar. The dominant weed tree is *Acacia longifolia*, and there is also Chinese privet, morning glory (*Ipomoea indica*), *Acanthus mollis* and Japanese honeysuckle. *Pittosporum umbellatum* has been recorded there. Regarding kanuka, as well as *Kunzea robusta* there are trees of *K. linearis*.

There is a significant patch of manuka, around 8 m tall, with *Cyathea dealbata*, *Histiopteris incisa*, *Doodia australis*, *Microsorium pustulatum*, *Microlaena stipoides*, *Schoenus tendo*, *Schoenus maschalinus* and *Machaerina rubiginosa*, indicating that the manuka is a remnant of the former natural scrubland. The native grass *Paspalum orbiculare* was recorded by P.J. de Lange and G.M. Crowcroft from scrub in August 2001 (AK 254709), when, too, *Lepidosperma laterale* was recorded. The sundew *Drosera auriculata* is present, along with the orchids *Microtis unifolia* and *Thelymitra pauciflora*.

Lichens

An assortment of foliose, fruticose, leprose and crustose lichens has been recorded from the park, with most of the first records emanating from a lichen field visit on 2 November 1985 as part of a workshop held at the University of Auckland, organised by Anthony Wright and Bruce Hayward. At that time the lichen-covered basalt lava outcrops were in the open (Ewen Cameron, pers. comm.). A further intensive lichen foray took place on 20 July 2019, with a team from UNITEC (Dan Blanchon Peter de Lange, Marley Ford, Andrew Marshall) leading the way.

A very abundant **foliose** species is *Parmotrema reticulatum* found on the bark of trees, such as old Monterey pine, plane, and pohutukawa, as well as on basalt rock. *Xanthoparmelia scabrosa* occurs on basalt outcrops, asphalt roads and on wood structures (Fig. 22). Other foliose lichens on bark are *Dirinaria appplanata*, *Dirinaria picta* (Fig. 23), *Flavoparmelia haywardiana*, *Heterodermia japonica*, *Heterodermia speciosa*, *Leptogium cyanescens*, and *Punctelia borrieri*. The dark, gelatinous *Collema kauaiense* inhabits the bark of cabbage trees and the yellow *Xanthoria parietina* has been recorded from branches of *Toona ciliata*. Another yellow lichen, *Dufourea ligulata* – best known from coastal rocks – occurs in the park on basalt curbing, basalt emplaced rocks, and more rarely at the base of trees.

Fruticose lichens recorded are *Ramalina celastri* and *Usnea rubicunda*, generally common on dead twigs and branches of trees, *Usnea cornuta* on tree trunks, *Cladia inflata* on clay banks in the Outer Fields bush, *Cladonia darwinii* on rock and at the base of old pine trees, and *Stereocaulon ramulosum* occasionally in the rockfield. **Leprose** (powdery) lichens present are *Chrysothrix xanthina* forming yellow-green splashes on tree trunks, and *Lepraria finkii* on tree trunks and rock – especially common on the vertical shaded walls of the old quarry. **Crustose** lichens are a prominent group here on tree trunks (e.g. the graphids *Graphis elegans* and *Pertusaria thiopsida* (Fig 24) and *Phaeographis mucronata*, and *Lecanora helva*) and on rock, *Amandinea punctata*.

Bryophytes

Western Springs supports a wide variety of bryophytes of urban, forest, rockfield and aquatic habitats. Several **thallose liverworts** are prominent, with *Lunularia cruciata* occurring on soil, *Reboulia hemisphaerica* (Fig. 25) growing in the shade on the rock walls of the old quarry, *Marchantia foliacea* being recorded on rock beside a lakelet, *Fossombronia wondraczeckii* occurring on rock, and *Metzgeria furcata* commonly present on the trunks of trees in shade, the main hosts being karaka and titoki. The floating aquatic liverwort *Ricciocarpos natans* (Fig. 26) occurs in shallow still waters of the lake and a *Riccia* sp. is found on bare soil in the Outer Fields bush. The commonest **leafy liverworts** here are the comparatively hardy species *Chiloscyphus semiteres* (Fig. 27), *Frullania rostellata* and *F. pentapleura*. Epiphytic species on shaded tree trunks and branches include *Porella elegantula*, *Siphonolejeunea nudipes*, and *Spruceanthus olivaceus*. The recently named *Lejeunea hodgsoniana* (Lewington et al. 2013) has been recorded from rock in Motions Creek.

The **moss** flora at Western Springs comprises species of forest, aquatic, and open ground habitats. One of the commonest mosses here is *Thuidiopsis sparsa* (Fig. 28), forming creeping green mats on basalt rocks in shaded forest, on tree trunks, and on the basalt wall alongside Motions Creek. Few other mosses are found on tree trunks and branches in the native thickets and on planted exotic trees, an example being *Amblystegium serpens*. As well as *Thuidiopsis sparsa* numerous mosses occur on basalt rock in the springs area, both in the open and in the shade, common ones being *Barbula convoluta*, *Bryum argenteum*, *Ditrichum difficile*, *Grimmia pulvinata*, *Hypnum cupressiforme*, *Hypopterygium tamarisci*, *Philonotis tenuis*, *Rhynchostegium tenuifolium*, *Rosulabryum campylothecium*, *Syntrichia antarctica*, *Triquetrella papillata* and *Weissia controversa*. *Rosulabryum campylothecium* was the dominant moss on basalt rock outcrops in the open when ABS members explored this habitat on 20 July 2019 – with *Amblystegium serpens* commonly creeping through it.

The principal aquatic mosses in Western Springs and Motions Creek are *Fissidens berteroi*, *F. leptocladius*, *F. rigidulus* and *Leptodictyon riparium* (Fig. 29). Terrestrial mosses found in lawns, beside

paths or in forest are *Brachythecium rutabulum*, *Breutelia pendula*, *Eurhynchium praelongum*, *Fissidens taxifolius*, *Ptychomnion aciculare* and *Rosulabryum subtomentosum*, with *Rhynchostegium tenuifolium* forming mats in the open on the northern edge of the lake. Clay banks in manuka vegetation in the Outer Fields bush have a moss flora comprising *Breutelia pendula* (Fig. 30), *Campylopus clavatus*, *C. introflexus*, *Philonotis tenuis*, *Polytrichadelphus magellanicus*, *Pseudoscleropodium purum* and *Rosulabryum subtomentosum*.

Birds

Paul Asquith took careful note of the birds during the ABS visit. He highlighted the high number (well over 100) of Eurasian coots – the most he has ever seen, anywhere. They were mainly out of the water feeding on the lawns. Self-introduced in the early 1950s, they have spread quite rapidly. Species recorded on the day were: black-backed gull, red-billed gull, Eurasian coot, mallard, mallard/grey duck hybrid, black swan, feral goose (in excessive numbers), pukeko, little shag (pied phase), scaup, blackbird, welcome swallow, house sparrow, fantail, grey warbler, common myna, feral pigeon, silvereye, thrush, starling, domestic hen, Royal spoonbill. Gill & West (2016, 2018) also record Canada goose, little black shag, Paradise shelduck and pied shag, and dabchick, harrier and kingfisher have been seen there. Tui are sometimes seen, attracted in winter to the pink flowers of *Eucalyptus leucoxylon* and in September to the yellow flowers of kowhai.

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We thank Sel Arbuckle and Liz Walker for pointing out the *Psilotum* population, Siân Buley for help with surveying the deepest wetland area and the islands, and ABS members for observations on the 20 July 2019 field trip, including Paul Asquith's list of birds. Marley Ford brought to attention *Asplenium flaccidum* × *A. oblongifolium* and several lichens. Landowner's consent was granted by the Auckland Council for the ABS visit, enabling the group from UNITEC (Dan Blanchon, Peter de Lange, Marley Ford and Andrew Marshall) to make a great contribution to lichen records, and John Braggins to add to the liverwort records. Access to the Western Springs herbarium records held in the Auckland Museum (AK), Te Papa (WELT) and fungi in Landcare Research (PDD).

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Appendix: Species list for Western Springs Lakeside Reserve and Outer Fields Reserve.

Based on 32 visits by the authors between July 2018 and September 2019; an ABS field trip, attended by 39 people (July 2019); earlier visits by Mike Wilcox (in 1998, 2001, 2003) and Ben Goodwin (in 2017); herbarium specimens held in AK, WELT and PDD; and literature records from Armiger (1964), Hatch (1972), Johnstone (1972), Hynes & Turnwald (2002), de Winton et al (2009).

Cult. = cultivated; * = introduced species; # = not seen during surveys between July 2018 and September 2019

Fungi

<i>Agrocybe praecox</i>	On mulch around planted trees
<i>Aleurodiscus zealandicus</i>	On dead branch of a pohutukawa tree, sighted P.J. de Lange & D. Blanchon, 20 Jul 2019
<i>Aseroe rubra</i> #	On mulch, 2017
<i>Auricularia polytricha</i>	On dead tree, 3 Sep 2018; on dead wood, 18 June 2019
<i>Chaetocalanthus cocciformis</i>	On bark of dying <i>Kunzea robusta</i> , P.J. de Lange, 20 Jul 2019, UNITEC 10857
<i>Clavulina</i> sp.	On soil under <i>Kunzea robusta</i> , P.J. de Lange, 20 Jul 2019
<i>Favolaschia calocera</i>	orange poorcap. On dead wood in native thickets.
<i>Fomitopsis nivosa</i>	On <i>Salix</i> × <i>sepulchralis</i> var. <i>chrysocoma</i> (PDD 58336)
<i>Gaeastrum triplex</i>	collared earthstar. Outer Fields Bush, 15 July 2019
<i>Geoglossum glutinosum</i>	earth tongue. On soil, M.D. Wilcox & B.L. Goodwin, 6 Aug 2018
<i>Ileodictyon cibarium</i>	Outer Fields Bush, 15 July 2019
<i>Postia balsamea</i> #	Identified from the old moribund pines on the slopes, C. Inglis, Nov 2018, (ICMP 22373)
<i>Pleurotus</i> sp. cf. <i>ostreatus</i>	On a dead cabbage tree trunk, M.D. Wilcox, 4 Jan 2019
<i>Pycnoporus coccineus</i>	On old pine log
<i>Trametes versicolor</i>	On dead lacebark tree, M.D. Wilcox, 17 Aug 2018; on felled poplar, B.L. Goodwin & M.D. Wilcox, 3 Sep 2018

Note: A large collection (149 specimens) of mainly pathogenic fungi on plants from Western Springs is held at the Landcare Research PDD herbarium, Auckland. There are also 49 culture collections in International Collections of Micro-organism (ICMP).

Algae

<i>Cephaleuros lagerheimii</i>	Abundant on mahoe leaves
<i>Microcoleus lyngbyaceus</i> #	Sarma & Chapman 1975
<i>Microspora pachyderma</i> #	Chapman et al. (1957); Johnstone (1972)
<i>Microspora</i> sp.	Green scum in pool at base of a big poplar tree that blew over in Apr 2018, M.D. Wilcox 6241, 5 Nov 2018, AK 373196
<i>Nitella hookeri</i> #	Johnstone (1972)
<i>Nostoc commune</i>	Rockfield, winter
<i>Oedogonium oelandicum</i> #	Chapman et al. (1957); Johnstone (1972)
<i>Oedogonium subsexangulare</i> #	Chapman et al. (1957); Johnstone (1972)
<i>Rhizoclonium crispum</i> #	Chapman et al. (1957); Johnstone (1972)
<i>Schizomeris leibleinii</i>	Johnstone (1972); Sarma & Chapman (1975)
<i>Spirogyra majuscula</i> #	A large bloom occurred in August 1968 (Johnstone (1972))
<i>Spirogyra maxima</i>	On bottom of a lakelet, M.D. Wilcox 6243, 19 Dec 2018, AK 373199. This may be <i>S. crassoidea</i> (Lewis & Entwistle (2007))
<i>Spirogyra parvula</i> #	Johnstone (1972); Sarma & Chapman (1975)
<i>Spirogyra varians</i> #	Johnstone (1972)
<i>Stigeoclonium elongatum</i> #	Cassie (1984)
<i>Ulothrix zonata</i> #	Johnstone (1972)
<i>Vaucheria</i> sp.	On a rock in Motions Creek, M.D. Wilcox 6239, 3 Sep 2018, AK 373195; on mud surface of dried-out swamp cypress pond, 4 Mar 2019
<i>Vaucheria sessilis</i> #	Sarma & Chapman (1975)

Lichens

<i>Amandinea punctata</i>	On rock, old quarry, <i>J.E. Braggins</i> , 2 Nov 1985, AK 285225; on pine cone, <i>A. Marshall</i> , AM 261
<i>Arthropyrenia minutella</i>	On mahoe, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10957
<i>Bacidia laurocerasi</i>	On ngaio, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10958
<i>Buellia</i> sp.	Basalt rock outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10959
<i>Chrysothrix xanthina</i>	On bark and cones of old pine trees; on pohutukawa bark, <i>E.N. Hayes</i> , 2 Apr 2019, UNITEC 10284; on bark of totara and ngaio, rock forest, <i>D. Blanchon</i> , 20 Jul 2019; on <i>Cyathea dealbata</i> and karo
<i>Cladia inflata</i>	On ground, Outer Fields Bush, M.D. Wilcox, 15 Jul 2019
<i>Cladonia cucullata</i>	Basalt rock outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10960
<i>Cladonia darwinii</i>	On bark at base of old pine trees; rockfield, M.D. Wilcox, 24 Sep 2018
<i>Cladonia ochrochlora</i>	On bark of <i>Agonis flexuosa</i> , M.D. Wilcox, 11 Sep 2019
<i>Cladonia</i> sp.	Basalt rock outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10961
<i>Coenogonium luteum</i>	On pohutukawa, <i>G.N. Benitez</i> , 21 Jun 2017, UNITEC 9354; on totara, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10962; on <i>Pinus radiata</i> , cabbage tree, karo, <i>Cyathea dealbata</i> .
<i>Collema kauaiense</i>	On bark of <i>Griselinia littoralis</i> , M.D. Wilcox, 29 Aug 2018; bark of cabbage tree, B.L. Goodwin & M.D. Wilcox, 3 Sep 2018, 29 Apr 2019
<i>Defourea ligulata</i>	On basalt rocks, edge of lake; base of cabbage tree by lake, M.D. Wilcox, 21 Mar 2019; basalt curbing beside path, M.D. Wilcox, 11 Sep 2019
<i>Dirinaria applanata</i>	Growing over <i>Pyrrosia</i> rhizomes on partially shaded rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171652; on rocks, old quarry, <i>J.E. Braggins</i> , 2 Nov 1985, AK 285223; on bark of <i>Casuarina</i> , <i>E.K. Cameron</i> , 2 Nov 1985, AK 309773; on <i>Sophora chathamica</i> , <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10963; on totara and ngaio, <i>D. Blanchon</i> , 20 Jul 2019
<i>Dirinaria picta</i>	On pohutukawa bark; on bark of <i>Cupaniopsis anacardioides</i>
<i>Fissurina inquinata</i>	On kahikatea, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10964
<i>Flavoparmelia haysomii</i> (as <i>F. euplecta</i>)	On pohutukawa bark, <i>D.J. Galloway</i> , 16 Jan 1996, CHR 611553
<i>Flavoparmelia haywardiana</i>	On bark of <i>Eucalyptus leucoxylon</i> , M.D. Wilcox, 18 June 2019; on totara and karo, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10965
<i>Flavoparmelia soredians</i>	On exposed old wooden seat, <i>E.K. Cameron</i> , 2 Nov 1985, AK 310525; <i>A.E. Wright</i> , 2 Nov 1985, AK 171670; on bark of <i>Acer palmatum</i> , Fukuoka Garden, M.D. Wilcox, 20 Jul 2019
<i>Graphis elegans</i>	On pohutukawa, <i>G.N. Benitez</i> , 28 Jun 2017, UNITEC 9352; on <i>Cedrus atlantica</i> , M.D. Wilcox, 1 July 2019
<i>Heterodermia japonica</i>	On totara, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10966
<i>Heterodermia</i> aff. <i>obscurata</i>	On basalt rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171647; on bare, shaded basalt, <i>E.K. Cameron</i> , 2 Nov 1985, AK 309774; <i>A. Marshall</i> , AM 26F
<i>Heterodermia speciosa</i>	On bark of <i>Casuarina</i> , <i>A.E. Wright</i> , 2 Nov 1985, AK 171648; on <i>Sophora chathamica</i> , <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10967; on totara and ngaio, <i>D. Blanchon</i> , 20 Jul 2019
<i>Lecanora helva</i> #	On bark of <i>Platanus</i> , <i>D.J. Galloway</i> , 15 Jan 1996, CHR 642128
<i>Leioderma sorediatum</i>	On bark of <i>Agonis flexuosa</i> , M. Ford, 20 Jul 2019 https://inaturalist.nz/observations/29198267
<i>Lepraria finkii</i>	On kanuka and totara, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10968
<i>Lepraria incana</i>	On rock, old quarry, <i>L. Fenwick</i> , 2 Nov 1985, AK 285279
<i>Leptogium cyanescens</i>	On mahoe, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10969; on ngaio, rock forest, <i>D. Blanchon</i> , 20 Jul 2019
<i>Leptogium denticulatum</i>	On totara, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10970
<i>Micarea nitschkeana</i>	On cabbage tree, <i>A. Marshall</i> , AM 26R
<i>Normandina pulchella</i> #	On earth by basalt ledge, <i>E.K. Cameron</i> , 2 Nov 1985, AK 310014
<i>Parmotrema perlatum</i>	On kanuka, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10971
<i>Parmotrema reticulatum</i>	On bark of old pine trees, pohutukawa, M.D. Wilcox, 18 Aug 2018, and on plane trees; on basalt rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171658; bark of kahikatea, Circle of Friends, M.D. Wilcox, 21 Mar & 29 Apr 2019; on kanuka, totara, ngaio, kahikatea, rock forest, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10972
<i>Pertusaria thiopsida</i>	On bark of <i>Cedrus atlantica</i> , M.D. Wilcox, 1 July 2019; on kanuka and ngaio, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10973
<i>Pertusaria xanthoplaca</i>	Basalt outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10974

<i>Phaeographis mucronata</i>	On <i>Casuarina</i> bark, <i>E.K. Cameron</i> , 2 Nov 1985, AK 310256; <i>B.W. Hayward</i> , Nov 1985, AK 173486; on kowhai, karo, kahikatea, kanuka, ngaio, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10975
<i>Phaeophyscia orbicularis</i>	On basalt rock fields, locally common. M. Ford, 20 Jul 2019 https://inaturalist.nz/observations/29682015
<i>Physcia adscendens</i>	On fallen twig of kanuka, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10976
<i>Physcia crispa</i>	On karo, <i>A. Marshall</i> , AM 26AP
<i>Physcia erumpens</i>	On <i>Pinus radiata</i> cone, <i>A. Marshall</i> , AM 26I
<i>Physcia jackii</i>	On bark of a tree. M. Ford, 20 Jul 2019
<i>Physcia poncinsii</i>	M. Ford, 20 Jul 2019; on karo, <i>A. Marshall</i> , AM 26J
<i>Physcia tribacoides</i>	On karo, <i>A. Marshall</i> , AM 26AO
<i>Pseudocyphellaria crocata</i> agg.	On basalt outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10977
<i>Punctelia borrieri</i>	On bark of a tree, <i>J.A. Rattenbury</i> , 2 Nov 1985, AK 310526; on bark of ginkgo tree, M.D. Wilcox, 1 July 2019; on karo, <i>A. Marshall</i> , AM 26G
<i>Punctelia subflava</i>	On basalt rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171665; on basalt rock, <i>E.K. Cameron</i> , 2 Nov 1985, AK 310524
<i>Punctelia subrudecta</i>	On basalt outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10978; on kanuka, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10979
<i>Pyxine subcinerea</i>	On karo, <i>A. Marshall</i> , AM26AG
<i>Ramalina celastri</i>	On bark of trees, kowhai, kanuka, ngaio, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 1090
<i>Ramalina peruviana</i>	On totara, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10981
<i>Stereocaulon ramulosum</i>	On rock, springs area, M. D. Wilcox & M. Ford, 20 Jul 2019; basalt outcrop, <i>D. Blanchon</i> , UNITEC 10982
<i>Strigula orbicularis</i>	On titoki leaves, M. Ford, 20 Jul 2019
<i>Teloschistes chrysothalmus</i>	On fallen twigs of kanuka, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10983
<i>Usnea cornuta</i>	Common on trunks of deciduous trees (alder, birch, <i>Melia</i>), M.D. Wilcox, 27 Jul 2019
<i>Usnea rubicunda</i>	On a dead karo tree, by lake margin, M.D. Wilcox, 29 Aug 2018
<i>Usnea</i> sp.	On totara, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10984
<i>Xanthoparmelia mexicana</i> #	On bare basalt, <i>E.K. Cameron</i> , 2 Nov 1985, AK 311107
<i>Xanthoparmelia murina</i> #	On basalt rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171650. On rock (Galloway 2007)
<i>Xanthoparmelia scabrosa</i>	On sealed roads and paths; on low wood fence (treated pine half-rounds), entrance to old quarry off Motions Rd, M.D. Wilcox, 18 June 2019; basalt outcrop, <i>D. Blanchon</i> , 20 Jul 2019, UNITEC 10985
<i>Xanthoparmelia verrucella</i> (<i>Neofuscella verrucella</i>)	On rock, <i>A.E. Wright</i> , 2 Nov 1985, AK 171649; exposed rock on side of old quarry, <i>J.E. Braggins</i> , 2 Nov 1985, AK 285177. Common on exposed basalt rock, <i>E.K. Cameron</i> , 2 Nov 1985, AK 301103; quarry area, <i>J.E. Braggins</i> , 2 Nov 1985, AK 285222
<i>Xanthoria parietina</i>	On <i>Platanus</i> bark, <i>E.K. Cameron</i> , 2 Nov 1985, AK 311106; on <i>Toona ciliata</i> bark, M.D. Wilcox, 1 Jul 2019

Hornworts and Liverworts (includes some records from Meola Creek adjoining Motions Rd)

<i>Anthoceros laminiferus</i> #	Meola Creek, dripping wet cliff, <i>P.J. de Lange</i> & <i>R.O. Gardner</i> , 24 Nov 2007, AK 301248
<i>Chiloscyphus semiteres</i> var. <i>semiteres</i>	Meola Creek, <i>P.J. de Lange</i> & <i>R.O. Gardner</i> , 24 Nov 2007, AK 301260; Outer Fields bush, abundant on tree trunks and on ground (M.D. Wilcox, 12 Aug 2018); on willow tree by Motions Creek; on bark at base of old pines, M.D. Wilcox, 4 Mar 2019; on totara, <i>J. Braggins</i> , 20 Jul 2019, AK 378351
<i>Cololejeunea minutissima</i> #	Meola Creek, on <i>Salix fragilis</i> , <i>P.J. de Lange</i> & <i>R.O. Gardner</i> , 24 Nov 2007, AK 301244
<i>Fossombronina wondraczeckii</i> #	On shaded basalt lava by path, <i>P.J. de Lange</i> , 7 Jul 2009, AK 308205
<i>Frullania rostellata</i>	On bark of <i>Griselinia littoralis</i> , lake edge ; on bark of <i>Coprosma macrocarpa</i> , old pines, M.D. Wilcox, 4 Mar 2019; bark of kanuka.
<i>Frullania pentapleura</i> (syn. <i>F. solanderiana</i>)	On bark of ngaio, M.D. Wilcox, 17 Aug 2018; on <i>Pittosporum eugenioides</i> and <i>Kunzea robusta</i> , <i>J. Braggins</i> , 20 Jul 2019, AK 378356-57.
<i>Lejeunea colensoana</i>	
<i>Lejeunea</i> sp. aff. <i>flava</i>	On <i>Melicope ternata</i> , <i>J. Braggins</i> , 20 Jul 2019, AK 378353.
<i>Lejeunea hodgsoniana</i> #	Motions Creek, Zoo, on basalt, <i>P.J. de Lange</i> , 4 Jan 2008, AK 303709.
<i>Lophojeunea</i> sp.	On bark of <i>Griselinia littoralis</i> , lake edge
<i>Lunularia cruciata</i>	Abundant on bare ground beside paths in open and in bush, <i>J. Braggins</i> , 20 Jul 2019, AK 378354.
<i>Marchantia foliacea</i>	On rock at edge of a pond

<i>Metalejeunea cucullata</i>	On bark of <i>Kunzea robusta</i> , <i>P.J. de Lange</i> , 20 Jul 2019
<i>Metzgeria furcata</i>	Meola Creek, on boulders, <i>P.J. de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301233; on bark of <i>Griselinia littoralis</i> , lake edge; bark of karaka and titoki trees, native forest; bark of karo; bark of kanuka; on several trees, <i>J. Braggins</i> , 20 Jul 2019, AK378350.
<i>Metzgeria leptoneura</i>	On bark of totara, in shaded bush
<i>Microlejeunea latitans</i>	On bark of <i>Kunzea robusta</i> . <i>P.J. de Lange</i> , 20 Jul 2019
<i>Phaeoceros carolinianus</i> #	Base of <i>Carex maorica</i> on lake margin, <i>E.K. Cameron</i> , 8 Nov 1986, AK 318306
<i>Porella elegantula</i>	On bark of <i>Griselinia littoralis</i> , lake edge ; on trunk of <i>Pittosporum eugenioides</i> , Outer Fields Bush, M.D. Wilcox, 15 July 2019
<i>Reboulia hemisphaerica</i>	On shaded rock, rim of old quarry, M.D. Wilcox, 14 Aug 2018)
<i>Riccia</i> sp.	crystalwort. On bare ground, Outer Fields Bush, M.D. Wilcox, 15 July 2019
<i>Ricciocarpos natans</i>	fringed heartwort. Surface aquatic (Johnstone (1972)); in still, shallow water, <i>P.J. de Lange</i> , 20 Jul 2019
<i>Siphonolejeunea nudipes</i>	On trunk and branch of <i>Casuarina cunninghamiana</i>
<i>Spruceanthus olivaceus</i>	On bark of <i>Griselinia littoralis</i> , lake edge
<i>Telaranea herzogii</i> #	Meola Creek, on damp soil, <i>P.J.de Lange</i> , 24 Nov 2007, AK 301253
<i>Thysananthus anguiformis</i>	On <i>Melicope ternata</i> , <i>J. Braggins</i> , 20 Jul 2019, AK 378352.

Mosses (includes some records from Meola Creek adjoining Motions Rd)

<i>Amblystegium serpens</i>	creeping feather moss. Motions Creek. On trunk of <i>Casuarina cunninghamiana</i> ; with other mosses on rock in lava area, M.D. Wilcox, 20 Jul 2019
<i>Barbula convoluta</i>	Motions Creek, above stone embankment, M.D. Wilcox, 20 Aug 2018
<i>Brachythecium rutabulum</i>	Lawn area, on ground under a wooden seat
<i>Breutelia pendula</i>	Outer Fields, banks beside bush tracks, terrestrial, M.D. Wilcox, 12 Aug 2018
<i>Bryum argenteum</i>	On rock, old quarry, M.D. Wilcox, 14 Aug 2018
<i>Bryum blandum</i> #	Meola Creek bed, on rocks in water, <i>P.J de Lange & R.O Gardner</i> , 24 Nov 2007 AK 301325,
<i>Campylopus clavatus</i>	Outer Fields Bush, clay banks in manuka area, M.D. Wilcox & B.L. Goodwin, 15 Jul 2019
<i>Campylopus introflexus</i>	Outer Fields Bush, clay banks in manuka area, M.D. Wilcox & B.L. Goodwin, 15 Jul 2019
<i>Didymodon australasiae</i>	On large placed rocks on edge of lake, M.D. Wilcox, 1 July 2019
<i>Ditrichum difficile</i>	On rock, with <i>Hypopterygium tamarisci</i> , M.D. Wilcox, 29 Oct 2018
<i>Eurhynchium praelongum</i>	In grassy areas, common; on rock, and on bark at base of old pine trees
<i>Fissidens asplenioides</i> #	Meola Creek, <i>P.J.de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301256
<i>Fissidens berteroii</i>	Meola Creek, <i>P.J.de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301231; outlet of main stream from lake into Motions Creek, saxicolous on basalt blocks under bridge, plants trailing in 100-150 mm of fast flowing semi-turbid water, associated with sparse <i>Fissidens rigidulus</i> and <i>Leptodictyum riparium</i> , <i>P.J.de Lange</i> , 2 Jan 2008, AK 301443; common on lake bed, covered in diatoms, <i>P.J.de Lange</i> , 1 Nov 2008, AK 303757; shade of willow tree, submerged, on rock at 1 m depth on lake edge, <i>K. Bodmin</i> , 18 Nov 2008, AK 371206. Motions Creek, <i>Kerry Bodmin</i> , 18 Nov 2008, AK 371202. M.D. Wilcox & B.L. Goodwin, 15 July 2019, common along northern side of main lake.
<i>Fissidens leptocladus</i> #	Meola Creek, on water-washed stones, <i>R.O. Gardner & P.J.de Lange</i> , 24 Nov 2007, AK 301241; Motions Creek, submerged, fast-flowing water, <i>P.J.de Lange</i> , 4 Jan 2008, AK 301440
<i>Fissidens rigidulus</i> #	Lake, <i>E.M. Dickson</i> , 25 Jun 1956, AK 318774; Motions Creek, abundant as submerged plants growing in fast flowing portion of stream. Forming mats in the faster flowing water, but also present admixed with <i>Fissidens berteroii</i> , <i>F. leptocladus</i> and <i>F. waiensis</i> , <i>P.J. de Lange</i> , 4 Jan 2008, AK 303710; on rock submerged in a stream, Motions Creek, AK 318771
<i>Fissidens taxifolius</i>	Meola Creek, abundant on cliff faces, colluvium, rock and rubble above stream, <i>P.J.de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301257; on ground, edge of native planted thickets, M.D. Wilcox, 17 Aug 2018
<i>Fissidens waiensis</i>	Meola Creek, on basalt rock in stream bed, <i>P.J. de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301246
<i>Grimmia pulvinata</i>	Rockfield, M.D. Wilcox, 6 Aug 2018); old quarry, M.D. Wilcox, 14 Aug 2018
<i>Hypnodendron spinnervum</i> #	Meola Creek, <i>P.J. de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301254
<i>Hypnum cupressiforme</i>	Rockfield, M.D. Wilcox, 29 Oct 2018
<i>Hypopterygium didictyon</i> #	Meola Creek, <i>P.J. de Lange & R.O. Gardner</i> , 24 Nov 2007, AK 301255
<i>Hypopterygium tamarisci</i>	Rockfield, M.D. Wilcox, 6 Aug 2018, 29 Oct 2018

<i>Leptodictyum riparium</i> (syn. <i>Amblystegium riparium</i>)	Edge of lake at 1 m depth, with <i>Fissidens berteroi</i> , <i>K. Bodmin</i> , 18 Nov 2008, AK 371201; Motions Creek, M.D. Wilcox & B.L. Goodwin, 4 Mar 2019.
<i>Polytrichadelphus magellanicus</i>	Outer Fields Bush, M.D. Wilcox & B.L. Goodwin, 15 Jul 2019
<i>Pseudoscleropodium purum</i>	With <i>Parablechnum minus</i> in wet area in lava field, M.D. Wilcox, 6 Aug 2018, 15 July 2019; Outer Fields Bush, M.D. Wilcox, 15 Jul 2019
<i>Philonotis pyriformis</i> #	On rock near water, M.D. Wilcox, 1 Sep 1998
<i>Philonotis tenuis</i>	On rock in open at edge of springs pond, <i>M.D. Wilcox</i> , 26 Nov 2018); Outer Field Bush, clay bank, <i>M.D. Wilcox</i> , 15 Jul 2019
<i>Ptychomnion aciculare</i>	Old pines, on ground
<i>Rhyncostegium tenuifolium</i>	On rock in shade, M.D. Wilcox, 14 Aug 2018; on edge of lake, in open, M.D. Wilcox, 11 Sep 2019
<i>Rosulabryum campylothecium</i> (syn. <i>Bryum campylothecium</i>)	Common on bark at base of large old pine trees; abundant on basalt lava outcrops, M.D. Wilcox, 20 Jul 2019
<i>Rosulabryum subtomentosum</i> (syn. <i>Bryum billardierei</i> var. <i>platyloma</i>)	Abundant beside track in Outer Fields bush, M.D. Wilcox, 12 Aug 2018, 20 Jul 2019; Meola Creek, on rotting willow trunk, <i>P.J. de Lange & R.O. Gardner</i> AK 301240
<i>Syntrichia antarctica</i>	Old quarry, Motions Rd, M.D. Wilcox, 14 Aug 2018
<i>Thuidiopsis furfurosum</i>	On concrete bridge over Motions Creek, M.D. Wilcox, 3 Sep 2018
<i>Thuidiopsis sparsa</i>	On rock near old quarry, M.D. Wilcox, 14 Aug 2018; on trunk of <i>Casuarina cunninghamiana</i> ; on stone embankment, Motions Creek, M.D. Wilcox, 4 Mar 2019
<i>Triquetrella papillata</i>	On rocky ground, springs area, M.D. Wilcox, 29 Oct 2018
<i>Weissia controversa</i>	On rocky ground by springs, M.D. Wilcox, 29 Aug 2018.; on concrete bridge over Motions Creek, M.D. Wilcox, 3 Sep 2018

Lycophytes

<i>Phlegmariurus varius</i>	hanging club-moss. Occasional in main wetland, epiphyte on <i>Carex secta</i>
<i>Selaginella kraussiana</i> *	African club-moss. B. Goodwin & M.D. Wilcox, bank of Motions Creek, 3 Sep 2018

Ferns (includes some records from the Zoo portion of Motions Creek)

<i>Adiantum hispidulum</i>	rosy maidenhair. Motions Creek	<i>Doodia australis</i> (syn. <i>Blechnum parriseae</i>)	rasp fern. Plentiful in Outer Fields bush; on walls of old quarry
<i>Adiantum raddianum</i> *			
<i>Arthropteris tenella</i>	jointed fern	<i>Doodia mollis</i> (syn. <i>Blechnum mollis</i>)	Motions Creek
<i>Asplenium flabellifolium</i>	necklace fern		
<i>Asplenium flaccidum</i>	hanging spleenwort	<i>Histiopteris incisa</i>	water fern.
<i>Asplenium flaccidum</i> × <i>A. oblongifolium</i> #	Motions creek. noted by M. Ford in 2019.	<i>Hiya distans</i> (syn. <i>Hypolepis distans</i>)	<i>R.O. Gardner</i> , base of <i>Carex secta</i> , 3 Feb 1982, AK 158796
<i>Asplenium oblongifolium</i>	shining spleenwort	<i>Hypolepis ambigua</i>	<i>R.O. Gardner</i> , base of <i>Carex secta</i> , 27 Dec 1981, AK 158774
<i>Asplenium polyodon</i>	sickle spleenwort	<i>Hypolepis dicksonioides</i>	Motions Creek, also found along Meola Creek
<i>Azolla rubra</i>	floating fern. <i>E. Craig</i> date unrecorded AK 115904	<i>Hypolepis rufobarbata</i> #	<i>T. Kirk</i> , 1865, WELT P007731.
<i>Austroblechnum lanceolatum</i> (syn. <i>Blechnum chambersii</i>)	lance fern. Motions Creek.	<i>Icarus filiformis</i> (syn. <i>Blechnum filiforme</i>)	climbing hard fern. Motions Creek, Zoo
<i>Cheilanthes distans</i>	woolly cloak fern, <i>J.E. Braggins</i> , 2 Nov 1985, CHR 500950	<i>Lastreopsis hispida</i>	hairy legs. Motions Creek, Zoo
<i>Cheilanthes sieberi</i>	smooth cloak fern	<i>Lastreopsis microsora</i>	Motions Creek
<i>Christella dentata</i>	Motions Creek, Zoo	<i>Microsorium pustulatum</i>	hounds tongue fern
<i>Cyathea dealbata</i>	silver tree fern, ponga	<i>Nephrolepis cordifolia</i> *	tuber ladder fern
<i>Cyathea medullaris</i>	black tree fern, Mamaku	<i>Paesia scaberula</i>	scented fern, pig fern. Outer Fields bush
<i>Cyrtomium falcatum</i> *	holly fern. Motions Creek	<i>Parablechnum minus</i> (syn. <i>Blechnum minus</i>)	swamp kiokio
<i>Cystopteris fragilis</i> *	brittle bladder fern, fragile fern	<i>Parablechnum novae-zelandiae</i> (syn. <i>Blechnum novae-zelandiae</i>)	kiokio
<i>Deparia petersenii</i>	Motions Creek, Zoo		
<i>Dicksonia squarrosa</i>	wheki, rough tree fern	<i>Pellaea rotundifolia</i>	button fern. Rock areas
<i>Diplazium australe</i>	Edge of Motions Creek,		

<i>Platycerium bifurcatum</i> *	elkhorn fern. On a <i>Lophostemon confertus</i> tree	<i>Pteris tremula</i>	shaking brake. Commonest fern
<i>Polystichum polyblepharum</i> * (cult.)	Japanese tassel fern. Fukuoka Garden	<i>Pyrrosia elaeagnifolia</i>	leather fern. Epiphyte on old planted trees; on lava walls
<i>Psilotum nudum</i>	First noted by Sel Arbuttle & Liz Walker in 2018	<i>Salvinia molesta</i> *#	Kariba weed. Covering lake surface, <i>L.C. Armiger</i> , May 1964, AK 265617. Hatch (1972); Johnstone (1972). Eradicated in the mid-1980s (de Winton & Edwards (2009))
<i>Pteridium esculentum</i>	bracken	<i>Tmesipteris elongata</i>	Wetland, base of <i>Carex secta</i>
<i>Pteris cretica</i> *	Cretan brake		
<i>Pteris dentata</i> subsp. <i>flabellata</i> *#	Motions Creek, Zoo, <i>P. J. de Lange</i> 29 Dec 2005 AK 294857		

Gymnosperms

<i>Afrocarpus falcatus</i> * (cult.)	yellowwood	<i>Juniperus chinensis</i> Kaizuka' * (cult.)	
<i>Agathis australis</i> (cult.)	kauri	<i>Juniperus communis</i> * (cult.)	common juniper
<i>Agathis robusta</i> * (cult.)	Queensland kauri	<i>Libocedrus plumosa</i> (cult.)	kawaka
<i>Araucaria heterophylla</i> * (cult.)	Norfolk Island pine	<i>Metasequoia glyptostroboides</i> * (cult.)	dawn redwood
<i>Callitris glaucophylla</i> * (cult.)	white cypress pine	<i>Pectinopitys ferruginea</i> syn. <i>Prumnopitys ferruginea</i> (cult.)	miro
<i>Cedrus atlantica</i> * (cult.)	Atlas cedar	<i>Phyllocladus trichomanoides</i> (cult.)	tanekaha
<i>Cedrus deodara</i> * (cult.)	Deodar cedar	<i>Pinus canariensis</i> * (cult.)	Canary Island pine
<i>Cephalotaxus harringtonia</i> 'Fastigiata' * (cult.)	cowtail pine	<i>Pinus elliotii</i> * (cult.)	slash pine
<i>Chamaecyparis lawsoniana</i> dwarf cultivar * (cult.)		<i>Pinus patula</i> * (cult.)	Mexican weeping pine
<i>Cryptomeria japonica</i> * (cult.)	sugi, Japanese cedar	<i>Pinus pinea</i> * (cult.)	stone pine
<i>Cryptomeria japonica</i> 'Elegans' * (cult.)		<i>Pinus radiata</i> * (cult.)	Monterey pine
<i>Cupressus bakeri</i> * (cult.)	Medoc cypress	<i>Pinus thunbergii</i> * (cult.)	Japanese black pine. Bonsai, Fukuoka Garden (died 2018)
<i>Cupressus kashmeriana</i> * (cult.)	Kashmir cypress	<i>Podocarpus henkelii</i> * (cult.)	Henkel's yellowwood
<i>Cupressus lusitanica</i> * (cult.)	Mexican cypress	<i>Podocarpus laetus</i> (cult.)	Hall's totara.
<i>Cupressus sempervirens</i> * (cult.)	Mediterranean cypress	<i>Podocarpus neriifolius</i> * (cult.)	brown pine. Edge of motions creek.
<i>Dacrycarpus dacrydioides</i> (cult.)	kahikatea	<i>Podocarpus totara</i> (cult. and naturalised.)	totara
<i>Dacrydium cupressinum</i> (cult.)	rimu	<i>Prumnopitys taxifolius</i> (cult.)	matai
<i>Ginkgo biloba</i> * (cult.)	ginkgo	<i>Sequoia sempervirens</i> * (cult.)	coast redwood
<i>Glyptostrobus pensilis</i> * (cult.)	Chinese swamp cypress	<i>Taxodium distichum</i> * (cult.)	swamp cypress
<i>Juniperus chinensis</i> * (cult.)	Chinese juniper		

Basal angiosperms & magnoliids

<i>Beilschmiedia tarairi</i> (cult.)	taraire	<i>Magnolia stellata</i> * (cult.)	star magnolia
<i>Cassytha paniculata</i>	tailhoa	<i>Nymphaea alba</i> *	European white water lily, CHR 214626
<i>Cinnamomum camphora</i> * (cult.)	camphor laurel	<i>Nymphaea</i> × <i>marilacea</i> syn. 'Marilacea albida' * (cult.)	water lily (red new leaves in spring)
<i>Hedycarya arborea</i>	pigeonwood	<i>Peperomia urvilleana</i>	wharanui
<i>Laurus nobilis</i> * (cult.)	bay laurel	<i>Piper excelsum</i> subsp. <i>excelsum</i>	kawakawa
<i>Liriodendron tulipifera</i> * (cult.)	tulip tree	<i>Piper excelsum</i> subsp. <i>peltatum</i> (cult.)	kawakawa
<i>Magnolia doltsopa</i> * (cult.)	sweet michelia		
<i>Magnolia grandiflora</i> * (cult.)	evergreen magnolia		
<i>Magnolia</i> × <i>soulangeana</i> * (cult.)	saucer magnolia		

Monocots

<i>Agapanthus orientalis</i> *	agapanthus	<i>Carex inversa</i>	lawn sedge
<i>Agapanthus</i> * (cult.)	a small blue cultivar	<i>Carex lambertiana</i>	Outer Fields bush
<i>Agave attenuata</i> * (cult.)	foxtail agave	<i>Carex maorica</i>	<i>G. Thorby et al.</i> , 1982, AK 262098.
<i>Agave decipiens</i> * (cult.)	false sisal	<i>Carex ochrosaccus</i>	Motions Creek
<i>Agrostis capillaris</i> *	brown top	<i>Carex pendula</i> * (cult.)	pendulous sedge. Outer Fields Bush, wet fringe, <i>P.J. & T. de Lange</i> , 29 Sep 2004, AK 288301 (plant removed). Cultivated in Western Springs Lakeside Park by entrance from MOTAT, July 2019
<i>Agrostis stolonifera</i> *	creeping bent		
<i>Aira caryophyllaea</i> subsp. <i>multiculmis</i> *	silver hair grass		
<i>Allium triquetrum</i> *	onion weed, three-cornered garlic	<i>Carex secta</i>	purei, green swamp tussock
<i>Alocasia brisbanensis</i> *	elephant's ear	<i>Carex uncinata</i>	hook sedge
<i>Aloe arborescens</i> * (cult.)	candelabra aloe	<i>Carex virgata</i>	
<i>Aloe</i> × <i>principis</i> * (cult.)	<i>Aloe ferox</i> × <i>A. arborescens</i>	<i>Cenchrus clandestinus</i> *	kikuyu grass
<i>Aloe thraskii</i> * (cult.)	dune aloe	<i>Chlorophytum comosum</i> *	spider plant
<i>Aloiampelos ciliaris</i> (<i>Aloe ciliaris</i>) * (cult.)	climbing aloe	<i>Cortaderia selloana</i> *	pampas grass
<i>Anthoxanthum odoratum</i> *	sweet vernal	<i>Cordyline australis</i> (cult. and wild)	cabbage tree, ti kouka
<i>Apodasmia similis</i> (cult.)	oioi (including the tall, robust form from Chatham Islands)	<i>Cordyline fruticosa</i> * (cult.)	ti
<i>Archontophoenix cunninghamiana</i> * (cult.)	bangalow palm. Motions Creek.	<i>Cordyline</i> (red leaved sp.)	Outer Fields bush
<i>Aristea ecklonii</i> *	blue-eyed iris	<i>Cordyline rubra</i> * (cult.)	
<i>Arrhenatherum elatius</i> *	tall oat grass	<i>Crinum moorei</i> *	Natal lily, Motions Creek
<i>Arthropodium bifurcatum</i> (cult.)		<i>Crocasmia</i> × <i>crocasmiiiflora</i> *	montbretia
<i>Arthropodium cirratum</i> (cult and naturalised)	rengarenga lily	<i>Cynodon dactylon</i> *	Indian doab, Bermuda grass
<i>Arum italicum</i> * (cult.)	arum lily	<i>Cyperus albostratus</i> 'Nana' * (cult.)	
<i>Asparagus asparagoides</i> *	smilax	<i>Cyperus eragrostis</i> *	umbrella sedge
<i>Asparagus scandens</i> *	climbing asparagus	<i>Cyperus papyrus</i> * (cult.)	papyrus
<i>Astelia banksii</i> (cult?)	coastal astelia	<i>Cyperus ustulatus</i> (incl. f. <i>grandispiculosus</i>)	giant umbrella sedge
<i>Astelia chathamica</i> (cult.)	silver sword	<i>Dactylis glomerata</i> *	cocksfoot
<i>Astelia grandis</i> (cult.)	swamp astelia	<i>Danthonia decumbens</i> *	heath grass. Outer Fields bush
<i>Astelia nervosa</i> (cult.)	bush astelia	<i>Dianella nigra</i>	tūrutu, blueberry
<i>Astelia trinervia</i> (cult.)	kauri grass	<i>Dianella tasmanica</i> * (cult.)	Australian forest flax-lily
<i>Austroderia fulvida</i> (cult.)	toetoe	<i>Dichelachne inaequiglumis</i> #	Mentioned in the 2018 development plan. This may be in mistaken reference to the type specimen collected by D. Petrie in Western Park, Auckland.
<i>Avena fatua</i> * #	wild oat (Hynes & Turnwald (2002))		large wild iris
<i>Axonopus fissifolius</i> *	carpet grass	<i>Dietes grandiflora</i> * (cult.)	summer grass, crab grass
<i>Bambusa multiplex</i> 'Alphonse Carr' * (cult.)	Alphonse Carr bamboo	<i>Digitaria sanguinalis</i> *	gynea lily
<i>Bambusa oldhamii</i> * (cult.)	giant timber bamboo	<i>Doryanthes excelsa</i> * (cult.)	giant spear lily
<i>Beschorneria yuccoides</i> * (cult.)	Mexican lily	<i>Doryanthes palmeri</i> * (cult.)	dragon tree
<i>Briza minor</i> *	shivery grass. Outer Fields bush	<i>Dracaena draco</i> * (cult.)	egeria. Hatch (1972). First recorded from Motions Creek in 1963 (de Winton et al. (2009))
<i>Bromus diandrus</i> *	rip-gut grass	<i>Egeria densa</i> *	veldt grass
<i>Canna indica</i> * (cult.)	Indian shot		sharp spikesedge
<i>Carex breviculmis</i>	Grassland sedge.	<i>Ehrharta erecta</i> *	
<i>Carex comans</i> (cult.)	'Frosted Curls' hair sedge	<i>Eleocharis acuta</i>	
<i>Carex divulsa</i> *	grey sedge	<i>Eleocharis gracilis</i>	
<i>Carex fascicularis</i> #	<i>R.O. Gardner</i> , 1981, AK 214410.	<i>Eleocharis pusilla</i>	

<i>Eleocharis sphacelata</i> #	Hynes & Turnwald (2002)	<i>Narcissus pseudonarcissus</i> *	daffodil
<i>Elodea canadensis</i> * #	Canadian pond weed.	(cult.)	
<i>Eragrostis brownii</i> *	Johnstone (1972)	<i>Nasella neesiana</i> *	nasella tussock grass
<i>Freycinetia banksii</i> (cult. and wild)	common lovegrass	<i>Ophiopogon japonicus</i> *	green mondo grass
	kiekie	(cult.)	
<i>Furcraea selloa</i> 'Marginata' *	variegated sword lily. See	<i>Ophiopogon planiscapus</i> *	black mondo grass
(cult.)	Wilcox 2005	(cult.)	
<i>Glyceria fluitans</i> * #	floating sweet grass. 18 Nov	<i>Panicum dichotomiflorum</i> *	smooth witch grass
	1970, <i>R. Mason</i> , CHR 214630,	<i>Paspalum distichum</i> *	freshwater paspalum, mercer
	<i>P.N. Johnson</i> , 25 Jan 1981,		grass
	CHR 363762		
<i>Hedychium gardnerianum</i> *	kahili ginger. Outer Fields bush	<i>Paspalum dilatatum</i> *	paspalum
<i>Holcus lanatus</i> *	Yorkshire fog	<i>Paspalum orbiculare</i> #	ditch millet, native paspalum.
<i>Hyacinthoides non-scripta</i> *	blue-bell		Outer Fields bush. Recorded by
(cult.)			<i>P.J. de Lange</i> and <i>G.M.</i>
<i>Iris foetidissima</i> *	stinking iris		<i>Crowcroft</i> from scrub in August
<i>Iris japonica</i> * (cult.)	Japanese iris	<i>Paspalum urvillei</i> *	2001 (AK 254709).
<i>Iris pseudacorus</i> * (cult.)	yellow flag		
<i>Isachne globosa</i>	swamp millet	<i>Paspalum urvillei</i> *	Vasey grass. Outer Fields bush.
<i>Isolepis inundata</i>		<i>Poa annua</i> *	annual poa
<i>Isolepis prolifera</i>		<i>Poa trivialis</i> *	meadow grass
<i>Isolepis reticularis</i>		<i>Philodendron bipinnatifidum</i> *	tree philodendron
<i>Juncus articulatus</i> *	jointed rush	<i>Phoenix canariensis</i> *	Canary Island palm, phoenix
<i>Juncus dichotomus</i> *		(cult. and naturalised)	palm
<i>Juncus edgariae</i>		<i>Phormium cookianum</i> (cult.)	mountain flax, wharariki
<i>Juncus effusus</i> var. <i>compactus</i>	Outer Fields bush	<i>Phormium tenax</i>	flax, harakeke
*		(cult. and natural)	
<i>Juncus effusus</i> var. <i>effusus</i> *	soft rush	<i>Piptatherum miliaceum</i> *	Smilo grass. Outer Fields Bush
<i>Juncus planifolius</i>		<i>Potamogeton crispus</i>	curled pondweed. Motions
<i>Juncus prismatocarpus</i> #	Recorded by Gardner (1981)		Creek.
<i>Juncus sarophorus</i>		<i>Potamogeton ochreatus</i> #	blunt pondweed. Johnstone
<i>Juncus tenuis</i> subsp.			(1972)
<i>anthelatus</i> *		<i>Rhopalostylis sapida</i>	nikau
<i>Juncus usitatus</i> (cult. and wild)	<i>R.O. Gardner</i> 1981 AK 151849	(cult. and natural)	
<i>Lagarosiphon major</i> * #	oxygen weed. First recorded	<i>Rytidosperma biannulare</i> *	Outer Fields bush.
	from here in 1953 (de Winton	<i>Rytidosperma racemosum</i> *	wallaby grass
	et al. (2009))	<i>Schoenoplectus</i>	Recorded by Gardner (1981)
<i>Landoltia punctata</i>	duckweed, Hatch (1972)	<i>tabernaemontani</i> #	
	(as <i>Spirodela</i>)	<i>Schoenus maschalinus</i>	
<i>Lemna disperma</i>	duckweed	<i>Schoenus tendo</i>	Outer Fields bush
<i>Lepidosperma laterale</i>	Outer Fields bush (from notes	<i>Setaria palmifolia</i> *	palm grass. Motions Creek
	on AK 254709, <i>P.J. de Lange</i> &	<i>Setaria pumila</i> *	yellow bristle grass. Outer Fields
	<i>G.M. Crowcroft</i> , Aug 2001)		bush
<i>Leucojum aestivum</i> * (cult.)	snowflake	<i>Sparganium subglobosum</i> #	burr reed. <i>R.O. Gardner</i> , 1981,
<i>Libertia peregrinans</i> (cult.)	mikoikoi, orange <i>Libertia</i>		AK 158565.
<i>Libertia ixioides</i> (cult.)	native iris	<i>Sporobolus africanus</i> *	ratstail grass
<i>Lolium perenne</i> *	perennial ryegrass	<i>Strelitzia nicolai</i> * (cult.)	giant white bird of paradise
<i>Machaerina articulata</i> #	jointed sedge. <i>R.O. Gardner</i> ,	<i>Thelymitra pauciflora</i>	Outer Fields bush,
	1982, AK 159480	<i>Trachycarpus fortunei</i> * (cult.)	Chinese windmill palm
<i>Machaerina rubiginosa</i>	orange nut sedge.	<i>Tradescantia fluminensis</i> *	tradescantia
	Outer Fields bush	<i>Tradescantia virginiana</i> *	spiderwort
<i>Microlaena stipoides</i>	patiti	<i>Typha orientalis</i> #	raupo. Johnstone (1972)
<i>Microtis unifolia</i>	onion orchid. Outer Fields Bush	<i>Vallisneria spiralis</i> * #	tape grass. (First recorded in
<i>Monstera deliciosa</i> *	Swiss cheese plant		Meola Creek in 1982: de Winton
		<i>Vulpia myuros</i> *	et al. (2009))
			hair grass

<i>Washingtonia robusta</i> * (cult.)	washingtonia palm, Californian fan palm	<i>Wolffia australiana</i>	watermeal
<i>Watsonia meriana</i> subsp. <i>bulbifera</i> *	watsonia. Outer Fields Bush.	<i>Xeronema callistemon</i> (cult.)	Poor Knights lily
Eudicot herbs			
<i>Acanthus mollis</i> *	bear's breeches	<i>Erigeron sumatrensis</i> *	broad-leaved fleabane
<i>Ageratina riparia</i> *	mist flower	<i>Erodium cicutarium</i> *	common storksbill
<i>Alternanthera nahui</i>	nahui	<i>Euphorbia helioscopia</i> *	sun spurge
<i>Amaranthus lividus</i> *	purple amaranth	<i>Euphorbia lathyris</i> *	caper spurge
<i>Anredera cordifolia</i> *	Madeira vine, mignonette vine,	<i>Euphorbia peplus</i> *	milkweed
<i>Anemone</i> × <i>hybrida</i> * (cult.)	Japanese anemone	<i>Euphorbia platyphyllos</i> *	broad-leaved spurge
<i>Anthemis cotula</i> *	stinking mayweed	<i>Farfugium japonicum</i> * (cult.)	leopard plant
<i>Aphanes inexpectata</i> *	parsley piert	<i>Foeniculum vulgare</i> *	fennel
<i>Artemisia verlotiorum</i> *	Chinese mugwort. Motions Creek	<i>Fumaria capreolata</i> *	white fumitory
<i>Begonia</i> <i>Semperflorens</i> Cultorum hybrid *	wax begonia. Motions Creek	<i>Fumaria muralis</i> *	wall fumitory
<i>Bellis perennis</i> *	lawn daisy	<i>Galinsoga quadriradiata</i> *	Peruvian daisy, shaggy soldier. Motions Creek
<i>Bidens frondosa</i> *	beggar ticks	<i>Galium aparine</i> *	cleavers
<i>Calendula officinalis</i> *	marigold	<i>Galium divaricatum</i> *	slender bedstraw
<i>Callitriche muelleri</i>	starwort. Kirk AK 11365	<i>Galium palustre</i> *	marsh bedstraw
<i>Callitriche stagnalis</i> *	starwort	<i>Gamochaeta coarctata</i> *	purple cudweed
<i>Capsella bursa-pastoris</i> *	shepherd's purse	<i>Geranium dissectum</i> *	cutleaf geranium
<i>Cardamine flexuosa</i> *	wavy bitter cress.	<i>Geranium gardneri</i> *	Gardner's geranium
<i>Cardamine hirsuta</i> *	hairy bitter cress. Abundant in winter	<i>Geranium homeanum</i>	pinakitere
<i>Centella uniflora</i>	pennywort	<i>Geranium molle</i> *	doves's foot geranium
<i>Cerastium glomeratum</i> *	mouse-eared chickweed	<i>Geranium purpureum</i> *	small herb Robert
<i>Chenopodium album</i> *	fat hen	<i>Geranium robertianum</i> *	herb Robert
<i>Ciclospermum leptophyllum</i> *	slender celery	<i>Geranium yeoi</i> (syn. <i>G. rubescens</i>) *	greater herb Robert
<i>Cirsium vulgare</i> *	scotch thistle	<i>Glossostigma elatinoides</i>	
<i>Citrullus lanatus</i> *	watermelon	<i>Haloragis erecta</i>	shrubby haloragis
<i>Conium maculatum</i> *	hemlock	<i>Helleborus orientalis</i> * (cult.)	winter rose
<i>Cotula australis</i>	button weed	<i>Helminthotheca echioides</i> *	oxtongue
<i>Crassula alata</i> *	Old quarry, P.J.de Lange, 2008, AK 303756. See Ogle (2008).	<i>Hibiscus diversifolius</i> (cult.)	native hibiscus
<i>Crassula decumbens</i> *	rufous stonecrop, Cape crassula	<i>Hydrocotyle heteromeria</i>	waxweed
<i>Crassula multicava</i> * (cult.)	fairy crassula, pitted crassula	<i>Hydrocotyle moschata</i>	hairy pennywort
<i>Crepis capillaris</i> *	hawksbeard	<i>Hydrocotyle tripartita</i> *	Australian hydrocotyle
<i>Cymbalaria muralis</i> *	ivy-leaved toadflax	<i>Hypochaeris radicata</i> *	catsear
<i>Dichondra repens</i>	Mercury Bay weed	<i>Impatiens sodenii</i> *	shrub balsam, touch-me-not
<i>Drosera auriculata</i>	sundew. Outer Fields Bush	<i>Impatiens walleriana</i> *	bizzie lizzie
<i>Dysphania pumilio</i> *	clammy goosefoot	<i>Jacobaea vulgaris</i> *	ragwort
<i>Epilobium ciliatum</i> *	American willowherb	<i>Lactuca serriola</i> *	wild lettuce. Outer Fields bush
<i>Epilobium pallidiflorum</i> #	Swamp willowherb. Recorded by Gardner (1981). A.E. Esler, 1982, AK 219346.	<i>Lamium purpureum</i> *	red dead-nettle
<i>Erechtites hieracifolia</i> *	Brazilian fireweed	<i>Lapsana communis</i> *	nipplewort
<i>Erigeron bonariensis</i> *	wavy-leaved fleabane	<i>Leucanthemum vulgare</i> *	oxeye daisy
<i>Erigeron karvinskianus</i> *	Mexican daisy	<i>Linaria purpurea</i> *	purple toadflax
		<i>Lobelia anceps</i>	New Zealand lobelia. Outer Fields bush
		<i>Lotus angustissimus</i> *	slender birdsfoot trefoil

<i>Lotus pedunculatus</i> *	lotus major, big birdsfoot trefoil	<i>Polycarpon tetraphyllum</i> *	allseed
<i>Lotus suaveolens</i> *	hairy birdsfoot trefoil	<i>Polygonum aviculare</i> *	wireweed
<i>Ludwigia palustris</i> *	water purslane	<i>Polygonum capitatum</i> *	pink knotweed
<i>Ludwigia repens</i> *	creeping primrose-willow. Only known site in NZ	<i>Potentilla indica</i> *	Indian strawberry
<i>Lysimachia arvensis</i> subsp. <i>arvensis</i> var. <i>arvensis</i> (syn. <i>Anagallis arvensis</i> subsp. <i>arvensis</i> var. <i>arvensis</i>) *	scarlet pimpernel	<i>Prunella vulgaris</i> *	selfheal
<i>Lysimachia arvensis</i> var. <i>caerulea</i> (syn. <i>Anagallis arvensis</i> var. <i>caerulea</i>) *	blue pimpernel	<i>Pseudognaphalium luteoalbum</i>	jersey cudweed
<i>Lythrum hyssopifolia</i> *	purple loosestrife	<i>Ranunculus amphitrichus</i>	Swamp buttercup.
<i>Malva nicaeensis</i> *	French mallow	<i>Ranunculus muricatus</i> *	spiny-fruit buttercup
<i>Malva pseudolavatera</i> *	Cretan mallow	<i>Ranunculus parviflorus</i> *	small-flowered buttercup
<i>Malva sylvestris</i> *	large-flowered mallow	<i>Ranunculus repens</i> *	creeping buttercup
<i>Matricaria discoidea</i> *	rayless chamomile	<i>Ranunculus sceleratus</i> *	celery-leaved buttercup
<i>Medicago arabica</i> *	spotted medick	<i>Raphanus raphanistrum</i> *	wild radish
<i>Medicago lupulina</i> *	black medick	<i>Raphanus sativus</i> 'Longipinnatus' *	Chinese white radish, daikon
<i>Melilotus indicus</i> *	King Island melilot	<i>Rumex conglomeratus</i> *	clustered dock
<i>Mentha aquatica</i> *	water mint	<i>Rumex obtusifolius</i> *	broadleaved dock
<i>Mentha piperita</i> var. <i>citrata</i> *	Bergamot mint	<i>Rumex pulcher</i> *	fiddle dock
<i>Mentha pulegium</i> *	penny royal	<i>Rumex sagittatus</i> *	climbing dock
<i>Modiola caroliniana</i> *	creeping mallow	<i>Salvia involucrata</i> *	roseleaf sage
<i>Montia fontana</i> subsp. <i>chondrosperma</i> *	dwarf Montia	<i>Salvia officinalis</i> *	sage
<i>Myosotis arvensis</i> *	field forget-me-not	<i>Salvia reflexa</i> *	lanceleaf sage
<i>Myosotis discolor</i> *	yellow and blue forget-me-not	<i>Senecio angulatus</i> *	Cape ivy, climbing groundsel
<i>Myosotis laxa</i> subsp. <i>caespitosa</i> *	water forget-me-not	<i>Senecio bipinnatisectus</i>	fireweed
<i>Myosotis scorpioides</i> *	water forget-me-not	<i>Senecio esleri</i>	hairy legs
<i>Myriophyllum aquatica</i> *	parrot's feather	<i>Senecio glomeratus</i>	fireweed
<i>Myriophyllum propinquum</i>	water milfoil. <i>R.O. Gardner</i> , 1981, AK 153012	<i>Senecio hispidulus</i>	fireweed
<i>Myriophyllum robustum</i> #	stout water milfoil. See Johnstone (1972)	<i>Senecio skirrhodon</i> *	gravel groundsel
<i>Myriophyllum triphyllum</i>	water milfoil. Motions Creek. See Armiger (1964).	<i>Sherardia arvensis</i> *	field madder
<i>Nasturtium officinale</i> *	water cress	<i>Silene gallica</i> *	catchfly
<i>Oenanthe pimpinelloides</i> *	parsley dropwort	<i>Solanum americanum</i>	small-flowered nightshade
<i>Orobancha minor</i> *	broom rape. See Hynes & Turnwald (2002)	<i>Solanum chenopodioides</i> *	velvety nightshade
<i>Oxalis debilis</i> *	pink wood sorrel	<i>Solanum lycopersicon</i> *	tomato
<i>Oxalis exilis</i>	creeping oxalis	<i>Solanum nigrum</i> *	black nightshade
<i>Oxalis incarnata</i> *	lilac oxalis	<i>Solanum opacum</i>	green berry nightshade (Peter de Lange, pers comm., 20 July 2019)
<i>Oxalis pes-caprae</i> *	Bermuda buttercup	<i>Soliva sessilis</i> *	Onehunga weed
<i>Pelargonium inodorum</i>	kopata	<i>Sonchus oleraceus</i> *	sow thistle, puha
<i>Persicaria hydropiper</i> *	water pepper	<i>Sonchus asper</i> *	prickly sow thistle
<i>Persicaria</i> "long spike"	knotweed	<i>Spergula arvensis</i> *	spurrey
<i>Persicaria maculosa</i> *	red shank	<i>Spergularia rubra</i> *	red sand-spurrey
<i>Phytolacca octandra</i> *	inkweed	<i>Stellaria media</i> *	chickweed
<i>Plantago australis</i> *	swamp plantain	<i>Symphytum xuplandicum</i> *	comfrey
<i>Plantago lanceolata</i> *	narrow-leaved plantain	<i>Taraxacum officinale</i> *	dandelion
<i>Plantago major</i> *	broad-leaved plantain	<i>Torilis arvensis</i> *	hedge parsley
		<i>Trifolium pratense</i> *	red clover
		<i>Trifolium repens</i> *	white clover
		<i>Trifolium subterraneum</i> *	subterranean clover
		<i>Tropaeolum majus</i> *	garden nasturtium
		<i>Verbascum virgatum</i> *	moth mullein
		<i>Verbena incompta</i> *	Outer Fields bush

<i>Verbena officinalis</i> *	vervain	<i>Veronica serpyllifolia</i> *	thyme-leaved speedwell
<i>Veronica plebeia</i>	trailing speedwell	<i>Vicia sativa</i> *	common vetch
<i>Veronica persica</i> *	scrambling speedwell	<i>Vinca major</i> *	periwinkle
<i>Veronica filiformis</i> *	slender speedwell		

Eudicot trees, shrubs and climbers

<i>Acacia longifolia</i> *	Sydney golden wattle. Most abundant in Outer Fields bush	<i>Casuarina cunninghamiana</i> * (cult.)	river she oak
<i>Acer buergerianum</i> * (cult.)	trident maple	<i>Casuarina glauca</i> * (cult.)	swamp she oak
<i>Acer negundo</i> * (cult. and naturalised seedlings)	box elder	<i>Catalpa bignonioides</i> * (cult.)	southern catalpa, Indian bean tree
<i>Acer palmatum</i> * (cult.)	Japanese maple. Fukuoka Garden.	<i>Catalpa speciosa</i> * (cult.)	northern catalpa
<i>Acer pseudoplatanus</i> * (cult.)	sycamore	<i>Cedrela odorata</i> (syn. <i>C. glaziovii</i>)	Spanish cedar. MOTAT. P.J. de Lange pers. comm.
<i>Aesculus hippocastanum</i> * (cult.)	horse chestnut	<i>Cercis sinensis</i> * (cult.)	Chinese redbud. Fukuoka Garden
<i>Aesculus indica</i> * (cult.)	Indian horse chestnut	<i>Cestrum nocturnum</i> *	queen of the night
<i>Aesculus</i> × <i>rubra</i> * (cult.)	red buck-eye	<i>Chiranthodendron pentadactylon</i> * (cult.)	monkey's hand tree
<i>Agonis flexuosa</i> * (cult.)	Western Australian peppermint, river myrtle	<i>Choisya ternata</i> * (cult.)	Mexican orange
<i>Alberta magna</i> * (cult.)	Natal flame tree	<i>Chrysanthemoides monolifera</i> *	boneseed
<i>Alectryon excelsum</i> (cult. and wild)	tītoki	<i>Cistus creticus</i> subsp. <i>incanus</i> * (cult.)	rock rose
<i>Alnus acuminata</i> subsp. <i>glabrata</i> * (cult.)	Mexican alder	<i>Coleonema pulchrum</i> * (cult.)	confetti bush
<i>Alnus glutinosa</i> * (cult.)	common alder	<i>Colletia cruciata</i> * (cult.)	anchor plant
<i>Araujia hortorum</i> *	moth plant	<i>Coprosma acerosa</i>	sand coprosma. Motions Creek, naturalised (probably from plantings at the Zoo)
<i>Arbutus unedo</i> * (cult.)	strawberry tree	<i>Coprosma crassifolia</i> (cult.)	
<i>Aucuba japonica</i> * (cult.)	Japanese laurel. Fukuoka Garden	<i>Coprosma crassifolia</i> × <i>Coprosma repens</i> (cult.)	
<i>Banksia serrata</i> * (cult.)	saw-tooth banksia	<i>Coprosma</i> × <i>cunninghamii</i> (cult.)	
<i>Betula pendula</i> * (cult.)	silver birch	<i>Coprosma</i> × <i>kirkii</i> (cult.)	
<i>Brachychiton acerifolius</i> * (cult.)	Illawarra flame tree	<i>Coprosma lucida</i> (cult.)	shining karamū
<i>Brachychiton discolor</i> * (cult.)	bush kurrajong	<i>Coprosma macrocarpa</i>	coastal karamū
<i>Brachychiton populneus</i> * (cult.)	kurrajong	<i>Coprosma propinqua</i> (cult.)	
<i>Brachyglottis greyi</i> (cult.)	daisy bush	<i>Coprosma repens</i> (cult.)	taupata
<i>Buddleja davidii</i> *	butterfly bush	<i>Coprosma rhamnoides</i>	
<i>Buxus sempervirens</i> * (cult.)	box	<i>Coprosma robusta</i>	karamū
<i>Calliandra brevipes</i> * (cult.)	pink powderpuff	<i>Coprosma virescens</i> (cult.)	
<i>Callistemon viminalis</i> 'Little John' * (cult.)	bottlebrush	<i>Coriaria arborea</i> (cult.) #	tutu. Part shade, 1.5m high, on edge of walking path near small lake, <i>C. Johnson</i> , UNITEC 2477
<i>Calystegia sepium</i>	pink bindweed	<i>Cornus kousa</i> * (cult.)	Japanese dogwood. Fukuoka Garden.
<i>Calystegia silvatica</i> *	greater bindweed	<i>Corokia buddleoides</i> (cult.)	korokia
<i>Calytrix tetragona</i> * (cult.)	fringe myrtle	<i>Corokia</i> × <i>cheesemanii</i> (<i>C. virgata</i>) (cult.)	hybrid corokia
<i>Camellia japonica</i> * (cult.)	large, single red flowers	<i>Corokia cotoneaster</i> (cult. and naturalised)	korokia
<i>Camellia japonica</i> * (cult.)	pink flowers	<i>Corymbia calophylla</i> * (cult.)	marri
<i>Camellia sasanqua</i> * (cult.)		<i>Corymbia citriodora</i> * (cult.)	lemon-scented gum
<i>Carmichaelia australis</i> (cult.)	native broom		
<i>Carpodetus serratus</i> (cult.)	putaputaweta		
<i>Cassia leptophylla</i> * (cult.)	golden medallion tree		

<i>Corymbia ficifolia</i> * (cult.)	flowering red gum	<i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' * (cult.)	claret ash
<i>Corynocarpus laevigatus</i> (cult. and wild)	karaka	<i>Fraxinus excelsior</i> * (cult.)	English ash
<i>Cotoneaster coriaceus</i> (syn. <i>C. lacteus</i>) * (cult.)	milk-flower cotoneaster. Top of Bullock Track, entrance to Outer Fields bush	<i>Fraxinus ornus</i> * (cult.)	flowering ash
<i>Cotoneaster dammeri</i> * (cult.)	bearberry cotoneaster. Common, cascading habit	<i>Garrya elliptica</i> * (cult.)	silk tassel bush
<i>Cotoneaster glaucophyllus</i> *	large-leaved cotoneaster. Outer fields bush	<i>Geniostoma ligustrifolium</i>	hangehange
<i>Crataegus monogyna</i> *	hawthorn	<i>Gleditsia triacanthos</i> * (cult.)	honey locust
<i>Cunonia capensis</i> * (cult.)	butterknife tree	<i>Gomphocarpus fruticosus</i> *	swan plant. Outer Fields bush
<i>Cupaniopsis anacardioides</i> * (cult.)	tuckeroo	<i>Grevillea robusta</i> * (cult.)	silky oak
<i>Cussonia spicata</i> * (cult.)	lowveld cabbage tree	<i>Grevillea rosmarinifolia</i> * (cult.)	rosemary grevillea
<i>Dahlia excelsa</i> *	tree dahlia	<i>Griselinia littoralis</i> (cult.)	broadleaf, pāpāuma
<i>Daphne odora</i> * (cult.)	spurge laurel	<i>Griselinia lucida</i> (cult.)	puka
<i>Delairea odorata</i> *	German ivy	<i>Harpephyllum caffrum</i> * (cult.)	kaffir plum tree
<i>Diospyros kaki</i> * (cult.)	persimmon	<i>Hedera canariensis</i> * (cult.)	Canary Island ivy
<i>Diospyros whyteana</i> * (cult.)	bladdernut. Naturalised seedling seen in the old pines	<i>Hedera helix</i> *	ivy
<i>Dipogon lignosus</i> *	mile-a-minute	<i>Helichrysum lanceolatum</i> (cult.)	everlasting daisy, niniao
<i>Dodonaea viscosa</i> (cult. and naturalised)	akeake	<i>Hoheria populnea</i>	lacebark, houhere
<i>Duranta erecta</i> * (cult.)	golden dewdrop	<i>Hovenia dulcis</i> * (cult.)	raisin tree
<i>Dysoxylum spectabile</i> (cult.)	kohekohe	<i>Hymenosporum flavum</i> * (cult.)	Australian frangipani
<i>Elaeocarpus reticulatus</i> * (cult.)	blueberry ash	<i>Hypericum androsaemum</i> *	tutsan
<i>Entelea arborescens</i> (cult.)	whau	<i>Ipomoea indica</i> *	blue morning glory
<i>Eriobotrya japonica</i> *	loquat	<i>Jacaranda mimosifolia</i> * (cult.)	jacaranda
<i>Erythrina crista-galli</i> * (cult.)	cockspur coral tree	<i>Juglans ailantifolia</i> * (cult. and naturalised)	Japanese walnut
<i>Erythrina</i> × <i>sykesii</i> *	coral tree	<i>Knightia excelsa</i> (cult.)	rewarewa
<i>Eucalyptus botryoides</i> * (cult.)	bangalay. A huge tree fell over in the 10 April 2018 storm	<i>Kunzea ericoides</i> (cult.)	kānuka
<i>Eucalyptus cinerea</i> * (cult.)	silver dollar gum	<i>Kunzea linearis</i> * (cult.)	kānuka. Outer Fields
<i>Eucalyptus globoidea</i> * (cult.)	white stringybark	<i>Kunzea robusta</i>	kānuka
<i>Eucalyptus grandis</i> * (cult.)	flooded gun. Felled.	<i>Kunzea tenuicaulis</i> (cult.)	geothermal kānuka
<i>Eucalyptus leucoxylon</i> * (cult.)		<i>Lagerstroemia indica</i> * (cult.)	crepe myrtle
<i>Eucalyptus nicholii</i> * (cult.)		<i>Lagunaria patersonii</i> * (cult.)	Norfolk Island hibiscus
<i>Eucalyptus obliqua</i> * (cult.)	messmate	<i>Lantana montevidensis</i> * (cult.)	trailing lantana
<i>Eucalyptus perriniana</i> * (cult.) #	spinning gum. Present in 1998.	<i>Lavandula dentata</i> * (cult.)	French lavender
<i>Eucalyptus saligna</i> * (cult.)	Sydney blue gum	<i>Leptospermum scoparium</i>	mānuka
<i>Eucalyptus spathulata</i> * (cult.) #	Present in 1998.	<i>Leptospermum variabile</i> *	P.J. de Lange, 18 Jul 2004, AK 287652
<i>Eucalyptus tereticornis</i> * (cult.)	forest red gum	<i>Leycesteria formosa</i> *	Himalayan honeysuckle
<i>Eucalyptus viminalis</i> * (cult.)	manna gum	<i>Ligustrum lucidum</i> *	tree privet
<i>Euonymus japonica</i> *	Japanese spindle tree	<i>Ligustrum sinense</i> *	Chinese privet
<i>Euryops pectinatus</i> * (cult.)	yellow daisy bush	<i>Liquidambar styraciflua</i> * (cult.)	sweet gum
<i>Ficus macrophylla</i> * (cult.; naturalised by Motions Creek)	Moreton Bay fig	<i>Lonicera japonica</i> *	Japanese honeysuckle
<i>Fraxinus angustifolia</i> subsp. <i>angustifolia</i> * (cult.)	narrow-leaved ash	<i>Lonicera nitida</i> * (cult.)	box honeysuckle, hedge honeysuckle
		<i>Lophostemon confertus</i> * (cult.)	brush box
		<i>Loropetalum chinense</i> * (cult.)	Chinese fringe flower
		<i>Lycianthes cuchumatanensis</i> * (cult.)	

<i>Macadamia tetraphylla</i> * (cult.)	macadamia nut tree	<i>Platanus orientalis</i> 'Digitata' * (cult.)	narrow-leaved plane
<i>Mahonia japonica</i> * (cult.)	Japanese mahonia	<i>Polygala myrtifolia</i> *	sweet pea shrub
<i>Melaleuca armillaris</i> * (cult.)	bracelet honey myrtle	<i>Polyspora axillaris</i> * (cult.)	gordonia
<i>Melaleuca citrina</i> (syn. <i>Callistemon citrinus</i>) * (cult.)	crimson bottlebrush	<i>Pomaderris amoena</i>	tauhinu
<i>Melia azedarach</i> * (cult.)	Persian lilac	<i>Pomaderris aspera</i> * (cult.)	hazel pomaderris
<i>Melicope ternata</i> (cult. and wild)	whārangi	<i>Populus alba</i> 'Pyramidalis' * (cult. and spreading by root suckers)	columnar white poplar
<i>Melicytus obovata</i> (cult.)		<i>Populus × canadensis</i> (<i>Populus × euramericana</i>) 'Robusta' * (cult.)	hybrid poplar
<i>Melicytus ramiflorus</i> (cult. and natural)	mahoe, whitey wood	<i>Populus deltoides</i> * (cult.)	cottonwood. A huge tree fell over in the 10 April 2018 storm
<i>Meryta sinclairii</i> (cult.)	puka	<i>Populus nigra</i> 'Italica' * (cult.)	Lombardy poplar
<i>Metrosideros collina</i> 'Tahiti' * (cult.)		<i>Populus yunnanensis</i> * (cult.)	Yunnan poplar
<i>Metrosideros excelsa</i> (cult.)	pōhutukawa	<i>Prunus campanulata</i> *	Taiwan cherry
<i>Metrosideros kermadecensis</i> (cult.)	Kermadec pōhutukawa	<i>Prunus cerasifera</i> 'Nigra' * (cult.)	black cherry plum
<i>Muehlenbeckia astonii</i> (cult.)	wiggy bush	<i>Prunus serrulata</i> *	hill cherry. Outer Fields bush
<i>Muehlenbeckia axillaris</i> (cult.)	creeping pohuehue	<i>Pseudopanax arboreus</i>	five-finger, whauwhaupaku
<i>Muehlenbeckia complexa</i> var. <i>grandifolia</i>	large-leaved pohuehue	<i>Pseudopanax crassifolius</i> (cult.)	lancewood, horoeka
<i>Muehlenbeckia complexa</i>	pohuehue	<i>Pseudopanax discolor</i> (cult.)	
<i>Myoporum insulare</i> * (cult.)	Australian ngaio, boobialla	<i>Pseudopanax lessonii</i>	houpara
<i>Myoporum laetum</i> (cult.)	ngaio	<i>Pseudopanax crassifolius</i> × <i>P. lessonii</i> 'Cyril Watson' (cult.)	
<i>Myrsine australis</i>	māpou	<i>Pyracantha angustifolia</i> * (cult.)	firethorn
<i>Nandina domestica</i> * (cult.)	sacred bamboo	<i>Quercus lanata</i> * (cult.)	ban oak
<i>Olea europaea</i> * (cult.)	olive	<i>Quercus nigra</i> * (cult.)	water oak
<i>Olearia albida</i> (cult.)	tanguru, tree daisy	<i>Quercus palustris</i> * (cult.)	pin oak
<i>Olearia furfuracea</i>	akepiro	<i>Quercus robur</i> * (cult.)	pedunculate oak
<i>Olearia paniculata</i> (cult.)	akiraho, golden akeake	<i>Quercus rubra</i> * (cult.)	red oak
<i>Ostrya japonica</i> * (cult.)	Japanese hop hornbeam	<i>Rhaphiolepis umbellata</i> * (cult.)	yeddo hawthorn, sexton's bride
<i>Paraserianthes lophantha</i> *	brush wattle	<i>Rhamnus alaternus</i> *	evergreen buckthorn
<i>Passiflora edulis</i> *	black passionfruit	<i>Ricinus communis</i> *	castor oil plant
<i>Passiflora tarminiana</i> *	banana passionfruit	<i>Rosa rubiginosa</i> * #	<i>T. Kirk</i> , 1867, WELT SP062517
<i>Paulownia tomentosa</i> * (cult.)	foxglove tree	<i>Rosmarinus officinalis</i> * (cult.)	rosemary
<i>Physalis peruviana</i> * (cult.)	Cape gooseberry	<i>Rubus fruticosus</i> *	blackberry
<i>Pieris japonica</i> * (cult.)	lily of the valley shrub, andromeda	<i>Salix cinerea</i> *	grey willow
<i>Pittosporum cornifolium</i> (cult.)	perching pittosporum	<i>Salix × fragilis</i> * (cult.)	crack willow
<i>Pittosporum crassifolium</i> (cult. and natural)	karo	<i>Salix matsudana</i> 'Tortuosa' * (cult.)	corkscrew willow
<i>Pittosporum eugenioides</i> (cult.)	lemonwood (including a variegated cultivar), tarata	<i>Salix × sepulcralis</i> var. <i>chrysocoma</i> * (cult.)	golden weeping willow
<i>Pittosporum ralphii</i> (cult.)		<i>Sambucus nigra</i> *	elderberry
<i>Pittosporum tenuifolium</i> (cult.)	kōhūhū	<i>Santolina chamaecyparissus</i> * (cult.)	lavender cotton
<i>Pittosporum umbellatum</i>	haekaro. Outer Fields Bush	<i>Schefflera actinophylla</i> * (cult.)	umbrella tree
<i>Plagianthus divaricatus</i> (cult.)	salt marsh ribbonwood, mākaka	<i>Schinus molle</i> * (cult.)	pepper tree
<i>Plagianthus regius</i> (cult.)	lowland ribbonwood, mānātu	<i>Schinus terebinthifolius</i> *	Brazilian pepper tree
<i>Platanus × acerifolia</i> (syn. <i>P. × hispanica</i>) * (cult.)	London plane tree	<i>Senna pendula</i> 'John Ball' * (cult.)	buttercup bush
		<i>Solanum laciniatum</i>	poroporo

<i>Solanum mauritianum</i> *	tobacco weed, woolly nightshade	<i>Tibouchina urvilleana</i> * (cult.)	lasiandra, glory bush
<i>Solanum pseudocapsicum</i> *	Jerusalem cherry	<i>Tilia americana</i> * (cult.)	American basswood
<i>Sophora chathamica</i> (cult.)	kowhai	<i>Toona ciliata</i> * (cult.)	red cedar
<i>Sophora fulvida</i> (cult.)	Anawhata kōwhai	<i>Tristanopsis laurina</i> * (cult.)	water gum, kanooka
<i>Sophora molloyi</i> (cult.)	Molloy's kōwhai, Cook Strait kowhai	<i>Ulex europaeus</i> *	gorse
<i>Sophora tetraptera</i> (cult.)	large-leaved kōwhai	<i>Veronica</i> sp. (cult.)	hebe
<i>Syzygium australe</i> * (cult.)	brush cherry. In Japanese Garden.	<i>Veronica parviflora</i> (cult.)	kōkōmuka-tāranga.
<i>Syzygium paniculatum</i> * (cult.)	magenta lilly pilly	<i>Veronica speciosa</i> (cult.)	tītirangi
<i>Syzygium smithii</i> * (cult. and naturalised)	lilly pilly, monkey apple	<i>Veronica stricta</i> (cult.)	koromiko
<i>Tecomanthe speciosa</i> (cult.)	tecomanthe, Three Kings vine	<i>Viburnum japonicum</i> * (cult.)	Japanese viburnum. Fukuoka Garden
<i>Tetrapanax papyrifera</i> * (cult.)	rice paper plant	<i>Vitex lucens</i> (cult.)	puriri
<i>Teucrium fruticans</i> * (cult.)	silver germander	<i>Westringia fruticosa</i> * (cult.)	coastal rosemary

The vegetation of Repo Ki Pūkorokoro Reserve, Pūkorokoro-Miranda, Waikato

Nick Goldwater

Introduction and ecological context

The Department of Conservation recently purchased 19.6 ha of grazed coastal flats at Pūkorokoro-Miranda with the aim of restoring and increasing wildlife habitat along the coastal margin and adjoining the Ramsar wetland of the Firth Thames. The new reserve – Repo Ki Pūkorokoro – will be managed by a community-led Trust. In April 2019, the company I work for (Wildland Consultants Ltd) was commissioned to prepare a comprehensive ecological restoration plan, which will provide the Trust with guidance on ecological restoration opportunities and priorities, and underpin future applications for restoration activity funding. It is hoped that the implementation of this plan will result in the protection and enhancement of ecological values on the reserve and a significant increase in the extent and quality of indigenous habitats present.

Repo Ki Pūkorokoro Reserve is located on the inland side of East Coast Road in the Hauraki Ecological District, near the boundaries of Hunua and Hapuakohe Ecological Districts (Fig. 1). The coastal wetland to the east of the reserve is a site of international significance and contains extensive habitat for threatened indigenous flora and fauna. Prior to the arrival of European settlers, natural wetlands would have originally covered a much greater area of the flats surrounding the Firth

of Thames; however, these have been progressively modified and reduced in size through the establishment of networks of drains to support pasture-based farming. The remaining wetlands are largely restricted to small estuarine areas around the mouths of the major streams and in shallow depressions between ridges of accreted sand and shells, as well as the intertidal flats along the coastline.

The estuary ecosystems and chenier plain are identified as 'Naturally Uncommon' ecosystems on a national scale (Williams et al. 2007). Only around 12 chenier plain systems have been identified globally, and in New Zealand chenier plains are confined to the Hauraki Gulf and Waitemata Harbour. The coastline at Pūkorokoro-Miranda has the most extensive chenier plain system in New Zealand, and is the only known example, globally, of a chenier plain that is currently aggrading (Clarkson et al. 2014). The most seaward chenier formed around 1969 and has advanced c. 1.5 km southward and parallel to the previous shoreline (Hayward 2013).

A vegetation survey conducted by Merrett and Clarkson (1997) mapped seven major vegetation and habitat types across the area seaward of East Coast Road, being mangrove (*Avicennia marina*) forest, bare shell banks, glasswort (*Salicornia quinqueflora*)