

Acknowledgements

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References

Locker, R.H. 2001: *Jade River: a History of the Mahurangi*. Friends of the Mahurangi. 400 p.
Taylor, G.A. 1989: A register of northern offshore islands and a management strategy for island resources. Department of Conservation, Northern Region Technical Report Series no. 13. 126p.

Ferns

Microsorium pustulatum
Pteridium esculentum
Pyrrosia eleagnifolia

Gymnosperms

Pinus radiata *

Dicotyledons

Anagallis arvensis
ssp. *arvensis* var. *arvensis* ?*
Atriplex prostrata *
Avicennia marina
Centaurium erythraea *
Cirsium vulgare *
Conyza sumatrensis *

Coprosma robusta
Geranium gardneri *
Hebe stricta
Hypochaeris radicata *
Leontodon saxatilis *
Ligustrum lucidum *
Linum bienne *
Lotus suaveolens *
Metrosideros excelsa
Myrsine australis
Olearia furfuracea
Orobanche minor *
Petroselinum crispum *
Pittosporum crassifolium
Plantago lanceolata *

Prunus persica cv. *
Pseudopanax lessonii
Sonchus oleraceus *
Trifolium dubium *
Trifolium repens *

Monocotyledons

Cortaderia sp.*
Dactylis glomerata *
Ficinia nodosa
Lolium multiflorum *
Paspalum dilatatum *
Poa anceps
Sporobolus africanus *
Trisetum arduanum

Native vegetation of the Auckland Zoo's 'Urban Ark'

Ben Goodwin



Fig. 1. Urban Ark area outlined. Google maps. Retrieved 25/01/2016.

In January 2016, I surveyed the Urban Ark area of Auckland Zoo to catalogue its native species and to provide a clear botanical record, should changes occur in the future. The Urban Ark project was initially established in 2012, with the mission, "To work with the local community to establish a network of green spaces, centred on the zoo, where exotic plant and animal pests are controlled and which serve as working examples of urban ecological restoration that inspire others". Subsequently, a significant area of the zoo was set aside for the core of the project.

The site is approximately 1.3 ha, consisting of historic, predominantly native plantings on a sloping, south-facing site (Figs. 1 and 2). Native vegetation has regenerated below and around these initial plantings and since then, further species have been added. In this report, I have attempted to explain



Fig. 2. South-eastern area of the Urban Ark site. All photos by Ben Goodwin, 2016.



Fig. 3. Original plantings with regeneration of naturally occurring species below.



Fig. 4. *Metrosideros perforata*, most likely a result of indirect establishment.

the history of the vegetation, drawing attention to those species which appear to be naturally-occurring, significant and/or interesting. I have highlighted those species which appear to have become locally extinct over the last ~5 years. This report also includes some recommendations for the on-going management of the site.

Origin of Vegetation

Plants in the Urban Ark area have varied origins. I have tentatively classified the recorded species into groups, though some certainly belong to more than one category. Little is known about the historic vegetation of the Western Springs area. Small rock-forest fragments are present at the edge of Meola Creek, at the mouth of Oakley Creek and at the southern end of Chamberlains Park Golf Course. Although degraded, these still retain some of their original species, which provide clues to the area's vegetation prior to its clearance (see Gardner 2007; Gardner & de Lange 2008).

Original plantings (PL)

Initial plantings throughout the site began as early as 1922, when it was reported that 1150 native trees had been secured for planting at the Zoo (Wood 1992). Original plantings appear to include *Beilschmiedia tarairi*, *Knightia excelsa*, *Metrosideros excelsa*, *Sophora microphylla*, *Vitex lucens* and all seven species of conifers recorded (Fig. 3). In addition, *Pittosporum eugenioides* may also have been planted during this period but original plants have since expired, leaving their progeny of various ages behind. The exact origin of this species is unclear as it is also present with dubious origins, in rock forest at the mouth of Oakley Creek (Gardner & de Lange 2008). With the exception of *Phyllocladus trichomanoides*, *Prumnopitys ferruginea* and *Libocedrus plumosa*, all of the above species have naturalised at the site and plants of various sizes can be observed throughout (see Appendix).

Additional plants (PL)

It is clear that various enrichment plantings have occurred at the site over time, most recently in 2011 as part of the Zoo's Te Wao Nui development. These include mainly single plantings of *Blechnum discolor*, *Coprosma areolata*, *Earina autumnalis*, *Libocedrus plumosa*, *Kunzea robusta*, *Metrosideros fulgens*, *Pseudopanax crassifolius* and *Ripogonum scandens*. All of these species appear to be struggling in the current environment.

During this time, I also planted several species at the bush margin behind the Te Wao Nui offices: *Sonchus kirkii*, *Picris burbridgeae*, *Leptospermum scoparium*, and an *Astelia hastata*. The former two species have naturalised. *Phormium tenax*, *Rhopalostylis sapida*, *Dicksonia fibrosa*, *D. squarrosa* and three *Astelia hastata* have been planted some time ago (Hugo Baynes, pers. comm., 2016).

Indirect establishment (IN)

It is possible that some species in this group are naturally occurring. However, as they are also known to be planted within the zoo grounds it is likely that some, if not all of the population, stem from these planted specimens. Species are typically non-locals, hybrids, or local species found in small populations

and disturbed areas at the site. They include *Blechnum novae-zelandiae*, *Alternanthera nahui*, *Coprosma propinqua* × *C. robusta*, *Melicope ternata*, *Piper excelsum* subsp. *peltatum*, *Pseudopanax crassifolius* × *P. lessonii*, *Pittosporum tenuifolium*, *Coprosma robusta*, *Entelea arborescens*, *Cordyline australis*, *Cyperus ustulatus*, *Carex flagellifera* and *Juncus planifolius*. As well as the above, there are some species that are well established and widespread, possibly indicating natural occurrence. They include *Coprosma rhamnoides*, *Hebe stricta* and *Hoheria populnea*.

Hedycarya arborea and *Dysoxylum spectabile* probably also belong in this group, though, to date, I have been unable to find any mature trees. An interesting occurrence is a single specimen of *Metrosideros perforata* (Fig. 4). Its history is unknown but seems likely to be a result of indirect establishment. It has grown little since I first discovered it around 2011.

Natural occurrence (NO)

There are several species growing in the Urban Ark site that I believe to be naturally occurring. These are typically local species that are known to grow naturally in similar habitats, persist in urban areas and/or are uncommon in cultivation. Most of the fern and fern allies, including *Tmesipteris sigmatifolia* (Figs. 5 and 6), fit into this category with the exception of *Blechnum novae-zelandiae* and *B. discolor* (mentioned previously).

The tree ferns *Cyathea dealbata* and *C. medullaris* belong in this group; a photograph of the zoo, taken by Henry Winklemann in 1925 clearly shows them regenerating at the site, though the current population may also stem, in part, from cultivated specimens throughout the zoo grounds.

Coprosma macrocarpa subsp. *minor*, *Geniostoma ligustrifolium*, *Leucopogon fasciculatus*, *Myrsine australis*, *Pittosporum crassifolium*, *Pseudopanax lessonii*, *Piper excelsum* subsp. *excelum*, *Corynocarpus laevigatus*, *Alectryon excelsus* and *Melicytus ramiflorus* certainly appear to be naturally occurring, along with the following native herbs: *Haloragis erecta* subsp. *erecta*, *Dichondra repens*, *Centella uniflora*, *Hydrocotyle moschata*, *Veronica plebeia* and the following monocots: *Carex banksiana*, *Carex lambertiana*, *Carex uncinata*, *Dianella nigra*, *Microlaena stipoides*, *Oplismenus hirtellus* and an unidentified *Juncus* species.

Perhaps most interesting in this category is the pot-bellied orchid (*Gastrodia sesamoides*), recorded over two growing seasons approximately 5 years prior to this survey (Doug Lockyer, pers. comm., 2015), but now absent from the site. The species is growing currently at one other site in the zoo grounds.



Fig. 5. *Tmesipteris sigmatifolia* on a ponga trunk.



Fig. 6. *Tmesipteris sigmatifolia*, close-up showing the paired sporangia.

Recommendations

As with any suburban bush area, invasive plants are an ongoing issue and these should be removed to allow normal regeneration of the local species. Non-local natives should be treated as exotic species in this respect. Though the Urban Ark has an excellent

animal pest control programme, rabbits are causing significant damage throughout the site and their control, at this stage, appears unsatisfactory. Extensive native plantings have occurred at one edge of the site as part of the Zoo's Te Wao Nui development and it is inevitable that some species will naturalise in the future. These should be carefully documented and potentially, actively controlled. If new species are to be planted in the site, they should be carefully selected and appropriately locally sourced.

Currently, there appears to be no requirement for any new species to be added to the Urban Ark site. However, there would be some benefit to revegetative planting of a successional species in the open area south of the Native Fauna building. Locally-sourced *Kunzea linearis* would be suitable for this. In addition the Nationally Vulnerable *Geranium retrorsum* has a distinct race that is known only from a single population at nearby Oakley Creek (Hall *et al.* 2009). This taxon may benefit from restoration within the Urban Ark area, if suitable habitat is present.

References

- Gardner, R. 2007: Two rock-forest remnants at Meola Creek, Auckland City. *Auckland Botanical Society Journal* 62: 75-76.
 Gardner, R.; de Lange, P. 2008: Rock-forest at the mouth of Oakley Creek, Auckland. *Auckland Botanical Society Journal* Volume 63: 48-49.
 Hall, K.; Wilcox, M.; John, W. 2009: Field Trip Report: Oakley Creek Te Auaunga, Waterview Saturday, 16 May 2009. *Auckland Botanical Society Journal* 64: 123-133.
 Wood, D. 1992: *A Tiger By The Tail: A history of Auckland Zoo 1922 – 1992*. Auckland, New Zealand: Auckland City.

Local Extinctions

Though this survey was undertaken in 2016, I have visited the site frequently since 2011. Until recently, the epiphytic fern *Asplenium polyodon* was relatively common, typically growing with *A. oblongifolium* on old tree stumps. It now appears to be locally extinct, aside from one specimen growing in the remnants of a long dead *Astelia hastata*. It is likely that this particular specimen is not natural; rather, it was planted with the wild-collected *Astelia* (H. Baynes. pers comm. 2016). The saprophytic orchid *Gastrodia sesamoides* was present over two growing seasons in the bush margin of the far western area of the site approximately 5 years earlier (Doug Lockyer pers. comm. 2015). It was not observed in this survey, though one plant exists in the wider zoo grounds.

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Thanks to Hugo Baynes for sharing his knowledge on the plantings in and around the Urban Ark site and Ewen Cameron for his editing and identification of *Tmesipteris sigmatifolia*, *Carex lambertiana* and *Carex flagellifera* from photographs.

Appendix. Vascular plants in the 'Urban ark' at Aucklan Zoo, recorded in 2016. For the key to 'origin' categories see headings above.

Species	Common name	Origin	Abundance
Ferns and fern allies			
<i>Asplenium flaccidum</i>	drooping spleenwort	NO	Widespread
<i>Asplenium oblongifolium</i>	shining spleenwort	NO	Widespread
<i>Asplenium polyodon</i>	sickle spleenwort	NO & PL	Single specimen
<i>Blechnum discolor</i>	crown fern	PL	Localised
<i>Blechnum filiforme</i>	climbing hard fern	NO	Two Locations
<i>Blechnum novae-zelandiae</i>	kiokio	IN	Localised
<i>Blechnum parrisiae</i>	rasp fern	NO	Widespread
<i>Cyathea dealbata</i>	silver fern	NO, IN?	Widespread
<i>Cyathea medullaris</i>	mamuku	NO, IN?	Widespread
<i>Dicksonia fibrosa</i>	wheki ponga	PL	Localised
<i>Dicksonia squarrosa</i>	wheki	PL	Localised
<i>Lastreopsis glabella</i>	smooth shield fern	NO	Localised
<i>Microsorium pustulatum</i>	hounds tongue fern	NO	Widespread
<i>Paesia scaberula</i>	ring fern	NO	Localised
<i>Pilotum nudum</i>	whisk fern	NO	Single location
<i>Pteridium esculentum</i>	bracken	NO	Localised
<i>Pteris comans</i>	netted brake	NO	Localised
<i>Pteris macilenta</i>	sweet fern	NO	Single specimen

<i>Pteris tremula</i>	tender brake	NO	Widespread
<i>Pyrrhosia eleagnifolia</i>	leather leaf fern	NO	Widespread
<i>Tmesipteris sigmatifolia</i>	fork fern	NO	Two locations

Gymnosperms

<i>Agathis australis</i>	kauri	PL	Localised
<i>Dacrycarpus dacrydioides</i>	kahikatea	PL	Widespread
<i>Dacrydium cupressinum</i>	rimu	PL	Widespread
<i>Libocedrus plumosa</i>	kawaka	PL	Four specimens
<i>Phyllocladus trichomanoides</i>	tanekaha	PL	Single specimen
<i>Podocarpus totara</i>	totara	PL	Widespread
<i>Prumnopitys ferruginea</i>	miro	PL	Single specimen

Dicotyledons

<i>Alectryon excelsus</i>	titoki	PL? NO? IN?	Widespread
<i>Alternanthera nahui</i>	nahui	IN, NO?	Single location
<i>Beilschmiedia tarairi</i>	taraire	PL	Localised
<i>Centella uniflora</i>	centella	NO	Single location
<i>Coprosma areolata</i>	netted Coprosma	PL	Single specimen
<i>Coprosma macrocarpa</i> subsp. <i>minor</i>	coastal Coprosma	NO	Widespread
<i>Coprosma propinqua</i> x <i>C. robusta</i>	hybrid Coprosma	IN	Localised
<i>Coprosma rhamnoides</i>	twiggy Coprosma	IN, NO?	Localised
<i>Coprosma robusta</i>	karamu	IN, NO?	Localised
<i>Corynocarpus laevigatus</i>	karaka	NO, IN?	Widespread
<i>Dichondra repens</i>	Mercury Bay weed	NO	Localised
<i>Dysoxylum spectabile</i>	kohekohe	IN	Localised
<i>Geniostoma ligustrifolium</i>	hangehange	NO	Widespread
<i>Haloragis erecta</i> subsp. <i>erecta</i>	fireweed	NO	Localised
<i>Hebe stricta</i>	koromiko	PL, NO?	Localised
<i>Hedycarya arborea</i>	pigeonwood	IN?	Widespread
<i>Hoheria populnea</i>	lacebark	PL, IN?	Widespread
<i>Hydrocotyle moschata</i>	hairy pennywort	NO	Widespread
<i>Knightia excelsa</i>	rewarewa	PL	Widespread
<i>Kunzea robusta</i>	manuka	PL	Single specimen
<i>Leptospermum scoparium</i>	kahikatoa	PL	Localised
<i>Leucopogon fasciculatus</i>	mingimingi	NO	~7 specimens
<i>Melicope ternata</i>	wharangi	IN	Single specimen
<i>Melicytus ramiflorus</i>	mahoe	NO	Widespread
<i>Metrosideros excelsa</i>	pohutukawa	PL	Widespread
<i>Metrosideros fulgens</i>	rata	PL	Single specimen
<i>Metrosideros perforata</i>	white rata	IN?	Single specimen
<i>Myrsine australis</i>	red mapou	NO	Widespread
<i>Picris burbridgeae</i>	native oxtongue	PL	Localised
<i>Piper excelsum</i> subsp. <i>excelsum</i>	kawakawa	NO	Widespread
<i>Piper excelsum</i> subsp. <i>peltatum</i>	Hauraki kawakawa	IN	Widespread
<i>Pisonia brunoniana</i>	pparapara	IN	Single location
<i>Pittosporum crassifolium</i>	karo	NO, IN?	Widespread
<i>Pittosporum eugenioides</i>	tarata	PL? IN? NO?	Widespread
<i>Pittosporum tenuifolium</i>	kohukohu	IN	Single specimen
<i>Pittosporum umbellatum</i>	haekaro	?	~ 3 specimens
<i>Pseudopanax crassifolius</i>	lancewood	PL	Single specimen

<i>Pseudopanax lessonii</i>	houpara	NO, IN?	Widespread
<i>Pseudopanax crassifolius</i> x <i>P. lessonii</i>	hybrid pseudopanax	IN	~3 specimens
<i>Sonchus kirkii</i>	puha	PL	Localised
<i>Sophora microphylla</i>	kowhai	PL	Localised
<i>Veronica plebeia</i>	speedwell	NO	Localised
<i>Vitex lucens</i>	puriri	PL	Widespread

Monocotyledons

<i>Astelia hastata</i>	collosperrum	PL	Localised
<i>Carex banksiana</i>	fine-leaved bastard grass	NO	Widespread
<i>Carex lambertiana</i>	forest sedge	NO	Widespread
<i>Carex uncinata</i>	bastard grass	NO	Widespread
<i>Carex flagellifera</i>	trip-me-up	IN, NO?	Single location
<i>Cordyline australis</i>	cabbage tree	IN	Widespread
<i>Cyperus ustulatus</i>	coastal cutty grass	IN	Localised
<i>Dianella nigra</i>	inkberry	NO	Widespread
<i>Earina autumnalis</i>	Easter orchid	PL	Single specimen
<i>Gastrodia sesamoides</i>	pot-bellied orchid	NO	Extinct
<i>Juncus planifolius</i>	grass-leaved rush	IN	Localised
<i>Juncus</i> sp. (<i>australis</i> ?)	wiwi	NO	Localised
<i>Microlaena stipoides</i>	rice grass	NO	Widespread
<i>Oplismenus hirtellus</i>	panic grass	NO	Widespread
<i>Phormium tenax</i>	flax	PL	Single location
<i>Rhopalostylis sapida</i>	nikau	PL	Widespread
<i>Ripogonum scandens</i>	supplejack	PL	Single specimen

***Pittosporum crassifolium* (Pittosporaceae) on the dunes at Piha, Waitakere Ranges**

Rhys Gardner

Introduction

More than a decade ago I contributed to a report on a proposed effluent disposal scheme at North Piha's Les Waygood Park (LWP), in the dunes on the northern side of the Marawhara Stream (Fig. 1). The field would receive filtered sewage and grey-water from a new toilet block to be constructed near the pre-school and Barnett Hall buildings. This fluid would be spread in dripper lines on the surface of a rectangular area c. 1600 sq m. in extent, some 150 m or so southwards of the toilet block (Fig. 1).

These developments were carried out, and the disposal field seems to be working satisfactorily. To a non-engineer though, the chief interest here is the unique vegetation the field is located in: a several metres tall scrub nearly entirely formed by karo (*Pittosporum crassifolium*).

Previous description of LWP vegetation

The changes to the plant cover in this part of the Piha dunes, between 1940 and the mid-70s, were described and mapped by Alan Esler (1975). His historical information came from aerial photographs and P. A. Lush's 1948 M.Sc. thesis at the University of Auckland (partly published, Williamson [née Lush] 1953). I have not had access to the photographs or the thesis.

Esler termed the southern half or so of LWP the "Marawhara Accretion", a dune landform that had rapidly built up, post-1940, through extension of the foredune some 250 m southwards. The fundamental cause of the accretion would have been the arrival, from the south, of a large pulse of sand in the longshore drift. Additionally, the man-made diversion of the Marawhara Stream in the early