

Changes in the wild vascular flora of Tiritiri Matangi Island, 1978–2010

Ewen K. Cameron^{1*} and Neil C. Davies²

¹Auckland War Memorial Museum, Private Bag 92018, Auckland, New Zealand

²Glenfield College, PO Box 40176, Glenfield 0747, Auckland, New Zealand

*Author for correspondence (Email: ecameron@aucklandmuseum.com)

Published online: 18 November 2013

Abstract: Tiritiri Matangi Island ('Tiri') in the Hauraki Gulf of the northern North Island of New Zealand was deforested, pastorally farmed, and then farming was abandoned in 1972. This history is typical of many northern New Zealand islands. The island's modern history is less typical; since 1984 it has been the focus of a major restoration project involving thousands of volunteers. No original forest remains, but grazed secondary forest in a few valley bottoms covered about 20% of the island when farming was abandoned. Tiri's wild vascular flora was recorded in the 1900s and again in the 1970s. From 2006–2010 we collated all past records, herbarium vouchers, and surveyed the island to produce an updated wild flora. Our results increase the known pre-1978 flora by 31% (adding 121 species, varieties and hybrids). A further six species are listed as known only from the seed rain; 32 species as planted only; and one previous wild record is rejected. These last three decades have seen major changes on the island: the eradication of the exotic seed predator Pacific rat, *Rattus exulans*, in 1993; the planting of about 280,000 native trees and shrubs during 1984–94 as part of a major restoration project along with a massive increase in human visitation; and the successful translocation of 11 native bird species and three native reptile species. More than two-thirds of the additions to the flora are exotic species, and over half of these are being controlled because of their weedy nature. The 32,000 humans who visit Tiri each year are suspected to be the main vectors of the new exotic plant species added to the flora. The recent planted forest, which covers 64% of the island, has transformed most of the former pasture and bracken fern cover; many of the exotic herbs of open areas are surviving in anthropogenic habitats (mown tracks and lawns); however, 75 species recorded during 1905–1977 appear to have become extinct. We recommend adoption of tighter quarantine requirements, control of more weed species, removal of hybrid ngaio and certain native species, more regular plant surveys, specific rare herb management, and promotion of the Hauraki Gulf threatened flora. We conclude by predicting that over the next 20 years there will be an increase in bird-dispersed seed, increase in seabird guano habitat, few new native tree species, and a continued increase in the proportion of shade-tolerant trees.

Keywords: ecological restoration; biological invasions; extinctions; weeds; threatened plants; seabirds; dispersal; human vectors

Introduction

Changing land use of islands directly alters their vegetation and flora (Hannus & von Numers 2010). Compared with most other islands worldwide, human modifications to New Zealand islands are very recent (< 800 years; Wilmhurst et al. 2008). Furthermore, compared with many islands worldwide, many New Zealand islands have had repeated visits by botanists within the post-colonial period (c. 1800 to present) so we are in a good position to identify trends in how New Zealand island floras alter with changes in land use. Most northern New Zealand islands have been considerably altered by Māori and European settlement, and successional pathways following deforestation and agriculture to secondary forest cover and loss of seabirds have been documented (Esler 1967, 1978a,b, 1980, 2004; Atkinson 2004; Bellingham et al. 2010a). Northern New Zealand islands that supported warm temperate coastal forest were deforested by Māori, who usually also introduced the Pacific rat (kiore; *Rattus exulans*), a seed and fauna predator. Then in European colonial times, many islands were converted to pastoral farming, with introduced pasture plants and exotic mammals. When pastoral farming became uneconomic, agriculture was abandoned and secondary succession from a mixture of native and exotic species usually occurred. In

general, successions back to woody cover usually cause a reduction in the herbaceous species (Bellingham et al. 2010b; Hannus & von Numers 2010).

Tiritiri Matangi Island (hereafter referred to by the local name 'Tiri') in many ways is quite a typical northern New Zealand island: deforested, farmed, and then abandoned. However, atypical features include assisted restoration, with widespread planting of native shrubs and trees by volunteers (a novelty in New Zealand when it began in 1984), fairly early eradication of the seed predator (Pacific rat) in 1993, and an explicit aim of getting a dispersal and pollinator community (at least of birds) re-established on the island (Rimmer 2004; Craig & Vesely 2007; Galbraith 2009).

By New Zealand standards Tiri has had a long period of Māori then European occupation and over 100 years of pastoral farming which ended in 1972. By that time most of the vegetation was reduced to grassland and bracken fern (Esler 1978b; Rimmer 2004: incl. photos p.18 & 79). Because of the slow natural regeneration in the dense grassland and bracken (West 1980a,b, pers. comm.; Cashmore 1995) and the desire for forest habitat for selected fauna, planting a native forest was planned in the late 1970s and promoted in the early 1980s (Drey 1982; Hawley 1997). Most of the seed was sourced, germinated and propagated on the island. The resulting

seedlings were planted out by thousands of volunteers of all ages – marking the beginning, in 1984, of New Zealand’s most successful revegetation project involving the public (Mitchell 1985; Rimmer 2004). During 1984–1994 about 280,000 tree and shrub species were planted out as part of a revegetation programme, covering 64% of the island (Fig. 1). Red-crowned parakeets had been released earlier, in 1973. Pacific rats were eradicated in 1993 and between 1984 and 2009 eleven terrestrial native bird species and three reptile species were introduced (Galbraith 2009). The island’s restoration programme has been greatly assisted by the Supporters of Tiritiri Matangi; a large volunteer group founded in 1988 to further the aims of Tiri habitat restoration and species translocation projects (<http://www.tiritirimatangi.org.nz/>).

Esler (1978b: p.214) predicted some of the consequences of agricultural abandonment and secondary succession for the future flora of Tiri. These included:

1. “Exotic plants will decline very markedly because nearly all are plants of open country.”
2. “Brush wattle [*Paraserianthes lophantha*] is a prominent feature of Wattle Creek [Valley]... native trees and shrubs will curb its spread and eventually replace it.”
3. “Palatable species will play an increasing role in successions as some of the unpalatables decline.”

In 1980, Tiri was declared an open sanctuary, meaning access by the public was permitted via commercial ferry or their own boats. Tiri receives 32,000 visitors annually. This popularity



Figure 1. Place names, vegetation zones (adapted from Rimmer, 2004: p.14) and location of Tiritiri Matangi Island, Hauraki Gulf.

has helped to raise the profile of the conservation programme and brought some funding, but it also presents a range of management challenges. One likely outcome of these high visitation rates is the influx of propagules of exotic plants on the footwear and equipment of visitors. Biosecurity protocols for the island includes notices at the two ferry departure points regarding checking packs, clothing and boots to minimise risk of unwanted introductions (pests, seeds, soil, etc), and there is usually a volunteer assigned to politely remind people before they embark. There are brushes for cleaning footwear on the wharf prior to departure and also on the ferries, and public notices via the public address system on the ferry. Footwear brushes are also situated at the end of the Tiri wharf and the ranger reinforces the message again when welcoming visitors to the island. There are also notices at the back of the main beach and on the wharf for visitors arriving by private boats or kayaks but these are focused on animal stowaways, not plant propagules. Despite these measures, propagules still reach Tiri, resulting in an increase in the richness and abundance of non-native plants, as has occurred on coral cays in Great Barrier Reef with high visitation rates (Chaloupka & Domm 1986).

The first aim of this paper is to present a comprehensive current checklist of the flora of Tiri and then to examine changes in the flora over time by analysing the species richness (native and exotic) and estimates of abundance. Secondly, we assess whether exotic plant species richness and abundance has increased over time, as could be expected with high visitation rates. Thirdly, we discuss whether the lack of seabird management and subsequent low seabird numbers may have resulted in a scarcity of expected guano-loving plants on Tiri. Finally we make recommendations and predictions regarding the future flora of Tiri.

Study site

Tiri is 197 ha (Taylor 1989) and lies 3.5 km off the Whangaparaoa Peninsula on the north-eastern coast of the Auckland region, in the Hauraki Gulf of northern New Zealand (Fig. 1). The island's centre is at 36° 36' 6" S and 174° 53' 23" E. The island is a long-oval shape and measures about 2.7 km × 0.7 km. The geology comprises eroded ancient greywacke rocks (Jurassic–Triassic) with a thin cap of younger Waitemata Sandstone (Miocene) overlying it (Sporli & McAlister 1995). Its highest point is roughly midway along the central ridge at c. 90 m asl and the island reaches 72 m asl at its southern end (where the historical lighthouse is situated). The main backbone of Tiri runs NW–SE, c. 60–70 m asl. Valleys run off each side, with creeks flowing gently down to the coast. In summer these creeks usually dry up and in places leave a series of pools in shaded forest. Most of these valleys containing bush have been unofficially referred to with different numbers, e.g. Bush 1, 2, 3, etc, and others are named after other attributes, e.g. Wattle Valley, Lighthouse Valley, etc (see Fig. 1; for aerial photographs see Rimmer 2004: p. 8, 18). The island is a Scientific Reserve, administered by the Department of Conservation, and managed as an open sanctuary (Hawley 1997). Wooded Island (0.95 ha) lies 200 m off Tiri's northern coast (Fig. 1), reaches 35 m asl, and is included here as part of Tiri.

Vegetation

By 1975 pastoral farming had reduced the vegetation to 52% grassland, 27% bracken fernland, 10% mānuka (*Leptospermum scoparium*) and kānuka (*Kunzea* aff. *ericoides*) shrubland,

6% isolated trees of pōhutukawa (*Metrosideros excelsa*), 3% kohekohe (*Dysoxylum spectabile*) regrowth forest, and 1% māpou (*Myrsine australis*) regrowth forest (Esler 1978b). No original forest remained (see aerial photo in Rimmer 2004: p.18). Esler (1978b) provided full descriptions of the different components of the vegetation in the 1970s and also mapped them. Secondary succession post-Esler has been documented by West (1980a,b) and Cashmore (1995).

Brief descriptions follow for the main present-day vegetation types:

(a) Natural regrowth forest and isolated pōhutukawa trees (19% of the island's area; all percentages are from Fig. 1, adapted from Rimmer 2004: p.14)

The largest areas of tall natural forest are in the valleys of Bush 1, 2, 21 and 22 where broadleaf canopy trees of kohekohe are commonly present, with occasional trees of māhoe (*Melicytus ramiflorus*), taraire (*Beilschmiedia tarairi*), karaka (*Corynocarpus laevigatus*) and tāwāpou (*Planchonella costata*). Most of the surrounding upper valley slopes are dominated by kānuka and in a few places mānuka. Smaller and lower stature forest patches also exist in Bush 3, 4, 23, and Wattle, Little Wattle and Lighthouse Valleys. Scattered large pōhutukawa trees are a feature of the Tiri coast, and often stand alone on the cliff tops (Fig. 2).

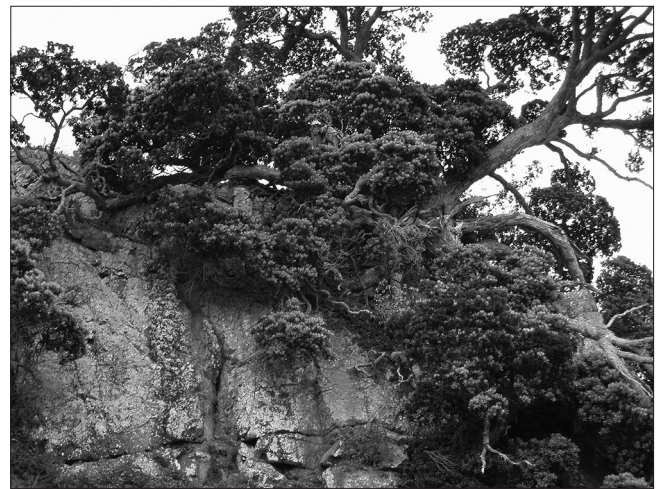


Figure 2. Large solitary pōhutukawa trees are a common feature of the Tiri coast. Photo: Pohutukawa Cove, EKC, 3 Dec 2006.

(b) Planted forest (64%)

This vegetation-type has undergone the most rapid change; in the 1970s much of the island was either rank pasture or fernland (Fig. 3). The earliest plantings were mainly of salt-tolerant pōhutukawa and taupata (*Coprosma repens*), but it was soon realised that faster growing shrubs, e.g. coastal karamū (*Coprosma macrocarpa*), houpara (*Pseudopanax lessonii*), ngaio (*Myoporum laetum*) and karo (*Pittosporum crassifolium*), shaded out the pasture and fruited much more quickly than pōhutukawa and the planting emphasis was changed to these species (Ray Walter pers. comm.). The early planted stands of pure pōhutukawa have formed dry litter with little to no regeneration underneath. In places their understorey is limited to grassland dominated by microlaena (*Microlaena stipoides*). Atkinson (2004) found pōhutukawa retards the rate at which



Figure 3. Twenty years of change – looking north from Coronary Hill: in pasture in 1989 (a); and the same place in planted forest in 2009 (b). Photos: NCD, 20 Aug 1989 & 6 Feb 2009.

a diverse forest community can develop, and recently some trial felling in the pure pōhutukawa stands has occurred to encourage more diverse regeneration. The mixed plantings have been much more successful; many are now c. 8m tall and there has been regeneration of shade-tolerant shrubs and canopy species, especially māhoe and kohekohe.

(c) Open pasture (10%; including the lighthouse complex)

This includes mown pasture (tracks, Coronary Hill, lighthouse complex and associated paddocks) and rank grassland left to regenerate (mainly along the main ridge and lower western slopes, but also some steep coastal slopes). The mown pasture is dominated by exotic grasses and herbs, and the rank grassland by microlaena, bracken (*Pteridium esculentum*), pōhuehue (*Muehlenbeckia complexa*) and exotic grasses especially sweet vernal (*Anthoxanthum odoratum*) and cocksfoot (*Dactylis glomerata*). A steep coastal slope by Lighthouse Bay is dominated by the native grass, *Anthosachne multiflora*. Approximately half the area shown by Rimmer (2004) as 'open pasture' near the southern end has actually been planted (see Fig. 1).

(d) Natural regenerating area (7%)

The main area is at the northern end of the island, but it is actually only about half the size of the area shown by Rimmer (2004: p.14); the rest has been planted. The steep coastal slopes that have also been left to regenerate are not included in this 7% total. The northern regenerating area is a mix of rank grassland, bracken, pōhuehue, flax (*Phormium tenax*), and shrubs of coastal karamū, hangehange (*Geniostoma ligustrifolium*), māhoe and pōhutukawa.

(e) Wetlands (not mapped)

Wetlands in Tiri are mainly narrow strips in valley bottoms being actively shaded out by the successful natural regeneration and plantings of these wetter and more-sheltered sites, e.g. Little Wattle, Bush 21 & 22. There is also a series of small earth dams (c. 10) put in to encourage waterfowl; several of these dry up completely after winter rains have ceased. The largest and most open surviving wetland is in Lighthouse Valley, where three creeks feed into Pumphouse Creek. Scattered along the open margins of this slow-moving creek are tree ferns (mamaku [*Cyathea medullaris*], whekī [*Dicksonia squarrosa*]), cabbage trees (*Cordyline australis*), shrubs (mānuka, coastal karamū),

sedges (*Carex geminata*, *C. secta*, *C. virgata*, *Machaerina rubiginosa*), rushes (*Juncus* spp.), ferns (*Blechnum novae-zelandiae*, *Deparia petersenii*, *Paesia scaberula*), swamp millet (*Isachne globosa*), and herbs (*Epilobium pallidiflorum*, *Ranunculus reflexus*, *R. urvilleanus*).

(f) Planted exotic trees (not mapped)

Planted exotic trees are restricted to the lighthouse complex. All were planted during 1902–1978 and many have been removed in recent times. In 2006 the tall exotics were still a landscape feature by the lighthouse. They included: a shelterbelt of exotic pines (*Pinus radiata*, *P. ?pinaster*), gum trees (*Eucalyptus saligna*), four macrocarpas (*Cupressus macrocarpa*), two flame trees (*Erythrina × sykesii*) and a Norfolk pine (*Araucaria heterophylla*). All the pines and a few of the gum trees were cut down during 2006/07 and the Norfolk pine and one of the macrocarpas were topped at the same time. There is also a remnant Australian ngaio (*Myoporum insulare*) hedge near the visitors centre.

Previous botanical investigations

The first recording of the vascular flora of Tiri appears to have been by Leonard Cockayne, who visited the island at least twice. He recorded brief ecological notes in his notebook on 17 February 1905. He listed 17 native plant species along with some general plant names, i.e. rushes, grasses and thistle (Cockayne 1905). No herbarium specimens collected by Cockayne from Tiri were located.

Thomas Cheeseman compiled a vascular plant list for the island based on specimens sent to him for identification by Anders Hansen, the Tiri lighthouse keeper for 1906–1909 (Cheeseman 1908; Rimmer 2004). Of the 234 entries, about 193 native and naturalised vascular plant species were recorded (many names were repeated). Four of these records are represented by specimens in the Auckland Museum herbarium (AK) (herbarium acronyms follow Thiers 2010).

Alan Esler (1978b) published a full vascular flora of wild plants (native and naturalised, but excluding anything that was planted) for the island along with a description of the vegetation based on field work in December 1970 (5 days), October 1975 (4 days) and November 1977 (1 day). He was aware of Cockayne's (1905) observations, but not Cheeseman's (1908) list. Esler's valuable baseline record of 339 (actually 347 if all his entries are included) species and varieties (55%

native) was before abandonment of sheep and cattle grazing in 1972 and subsequent revegetation planting. Importantly, he provided comments on changes in the vegetation over the next few years. In the mid-1970s there were only a few hectares of regrowth forest (stock-browsed) in several gullies, otherwise it was mainly grassland and bracken fern. Forty-eight Tiri specimens collected by Esler were located in AK herbarium and also a few in CHR.

Cameron & West (1986) added 20 (but only 16 based on present knowledge) new wild flora records and commented on several others based on many visits from 1978–1986. The vascular flora of the adjacent Wooded Island was recorded for the first time by Taylor & Tennyson (1999) based on day visits in August 1987 and February 1989, making 3 (only 2 based on present knowledge) additions to the flora of Tiri. Cameron (2013) updated and added to the Wooded Island flora, but no new records were added to the Tiri flora. Other interesting Tiri records were submitted to AK and AKU herbaria from rangers, contract staff and volunteers doing weeding, and university research students. In all, 168 Tiri vascular plant specimens exist in AK from this 1978–2005 period, including many specimens collected by one of us (EKC).

Methods

During 2006–2010 our objective was to record all wild vascular plants, determine their year of establishment and rank current abundance, and provide voucher specimens for most records for Tiri. The thousands of plantings were generally ignored because our object was to record the wild flora. One of us (NCD) spent much of 2006 surveying the island and collecting voucher specimens, EKC had five trips of 1–4 days specifically searching for new records. An attempt was also made to locate all previous herbarium collections, relevant publications and reports, and talk to knowledgeable people about the island's flora, e.g. weed management staff, and current and former rangers. Plants observed as only seed rain on Tiri, with no live plants seen, are recorded separately in Appendix 1.

As far as possible all previous plant names were updated to current taxonomy, with indigenous species following de Lange & Rolfe (2010), and the naturalised species following the Landcare Research database (<http://nzflora.landcareresearch.co.nz/>, accessed Dec 2012). It was beneficial that the names on the Cheeseman (1908) list directly related to the names he used in the Manual of the New Zealand Flora (Cheeseman 1906). Cheeseman herbarium specimens in AK were also specifically referred to for clarification of names being used by him at that time. Where different, all original recorded names are included in the updated annotated checklist (Appendix 1).

Recording the wild flora is sometimes complicated on Tiri by the difficulties recognising wild from planted individuals. In this respect, our survey was timely as the plantings were usually recent enough to be able to make this distinction. Also, the abundance of many naturalised species was influenced by the management of targeted weed species funded by the Supporters of Tiritiri Matangi. There has been a weeding programme carried out on the island virtually since the planting began in 1984; this was more formalised in the 1990s (Dunning 1996) and during the last decade there has been a list of about 40 targeted weed species recorded in the Annual Weed Reports (Anon. 2003; Lindsay 2004, 2006, 2007, 2008, 2009, 2010; Lindsay & Price 2005). About 20 additional species have been killed when seen. These weeds are all marked “†” (targeted

species) or “n” (additional) in column 5 of Appendix 1. The Annual Weed Reports (2002–2010) have been invaluable to document the managed weed species.

Results

Four hundred and thirteen herbarium vouchers were collected during our 2006–10 survey on Tiri. A further 241, pre-2006, vascular plant vouchers from Tiri were located in AK, CHR and WELT herbaria, the earliest collected in 1906. This brings the total Tiri vascular plant herbarium collections to 654 (representing 71% of the total wild flora): 417 in AK (which also includes former AKU collections), 223 UNITEC, 13 CHR, and 1 WELT. The label information of CHR and WELT herbarium specimens is not yet fully electronically available and those herbaria may contain further records.

An annotated checklist is presented for all vascular plant records since 1905 in five categories (Appendix 1): (a) wild, (b) seed rain only, (c) cultivated only (no wildlings), (d) rejected wild records, (e) additional records recorded in 2013. The total of all the wild vascular species, varieties and hybrids recorded is 512 taxa with just over half being indigenous (Table 1). Six species (1 native, 5 exotic) are recorded only as seed rain. A further 32 species are categorised as cultivated only (excluding the ranger's garden): four exotic; eight indigenous (but outside their geographical range); and 20 indigenous (part of the revegetation project). A single record is rejected as wild. The additional five records added in proof are not included in the flora totals. The indigenous status of the species follows de Lange & Rolfe (2010).

The wild vascular flora

Ten Nationally (de Lange et al. 2013) and 22 Regionally (Stanley et al. 2005) Threatened and Uncommon species have been recorded on Tiri (Table 2). Thirteen of these species are now presumed extinct on the island. However, Tiri appears to be a regional stronghold for some of these species: *Anthosachne multiflora*, *Einadia triandra*, *Ipomoea cairica* (Fig. 4), *Plantago raoulii* (Fig. 5) and *Ranunculus urvilleanus*. Based on the numerous seedlings observed in the forested valleys there is also an expanding population of tawāpou, a regionally uncommon tree. Esler (1978b) recorded fewer than 12 tawāpou, including one sapling and no seedlings. Tiri is also the likely natural geographical southern limit for *Ipomoea cairica* (Cheeseman 1925; Cameron 2005) and the population includes an unusual white-flowering form (Fig. 4).

Based on present abundance, an attempt was made to ascertain whether the pre-1978 taxa have increased, decreased or remained the same since Esler's (1978b) survey. The overall totals indicate that 46% decreased, 38% showed no change, 16% increased (Fig. 6) and 121 new additions arrived. Seventy-five of the pre-1978 records (19% of the pre-1978 flora) have not been confirmed by this update (Table 1, Appendix 1). This is not surprising because the habitat was being constantly degraded during most of this period by grazing animals. After the stock were removed in 1972 the grazed areas reverted to rank pasture. Then, the massive replanting project began (in 1984) transforming 64% of the island, but causing many of the small herbaceous plants to be shaded out. These unconfirmed records include one Cockayne and 32 Cheeseman records which Esler also did not see. Of these 75 records, 64% were native and 13 were threatened and uncommon species (Table 2).



Fig. 4 This exposed, grassy slope at Fishermans Bay is home to the regionally threatened coastal morning glory (*Ipomoea cairica*) (a), both the usual mauve-flowering form and an unusual white-flowering form (b) occur here – at the likely natural New Zealand geographical southern limit for the species. Photos: NCD, Jan 2009; and 20 Oct 2006.

Table 1. Totals of historical (up to 1977) and recent (post-1977) wild vascular plant species and hybrids in broad plant groups separated into native and exotics for Tiritiri Matangi.

xx = combined total of all records

(xx) = combined Cockayne, Cheeseman & Esler records (1905–1977)

[xx] = post Esler additions (1978–2010)

Vascular plant group	Native	Exotic	Totals	Unconfirmed pre-1978 records: Native + exotic
Lycopods & Ferns	44 (32)[12]	1 (0)[1]	45 (32)[13]	1 + 0
% increase	38%	-	41%	3% loss
Conifers	2 (1)[1]	4 (1)[3]	6 (2)[4]	-
% increase	100%	300%	200%	
Trees & Shrubs				
1. Dicots	54 (45) [9]	25 (8) [17]	79 (53) [26]	3 + 0
2. Monocots	4 (3) [1]	1 (0) [1]	5 (3) [2]	1 + 0
% comb. increase	21%	225%	49%	7% loss
Climbers & Allies				
1. Dicots	13 (13) [0]	10 (4) [6]	23 (17) [6]	4 + 1
2. Monocots	1 (1) [0]	1 (0) [1]	2 (1) [1]	-
% comb. increase	0%	175%	39%	28% loss
Dicot Herbs				
1. Daisies	17 (12) [5]	36 (25) [11]	53 (37) [16]	3 + 5
2. excl. Daisies	55 (49) [6]	110 (87) [23]	165 (136) [29]	14 + 15
Monocot Herbs				
1. Orchids	9 (7) [2]	-	9 (7) [2]	5 + 0
2. Non-orchids	7 (6) [1]	15 (4) [11]	22 (10) [12]	0 + 1
% comb. increase	19%	39%	31%	23% loss
Other Monocots				
1. Rushes & Allies	9 (9) [0]	6 (4) [2]	15 (13) [2]	3 + 0
2. Sedges	32 (30) [2]	3 (2) [1]	35 (32) [3]	9 + 0
3. Grasses	14 (14) [0]	39 (34) [5]	53 (48) [5]	5 + 5
% comb. increase	4%	20%	12%	24% loss
Totals	261 (222) [39]	251 (169) [82]	512 (391) [121]	48 + 27
	51% (native)	49% (exotic)		64% (native)
% incr.	15%	49%	31%	19% loss

Table 2. Nationally and Regionally Threatened & Uncommon species recorded on Tiritiri Matangi.

Nationally Threatened (de Lange et al. 2013)	Conservation status	Present status on Tiritiri
<i>Hibiscus richardsonii</i>	Nationally Critical	scarce
<i>Senecio scaberulus</i>	Nationally Critical	presumed extinct
<i>Daucus glochidiatus</i>	Nationally Vulnerable	presumed extinct
<i>Geranium retrorsum</i>	Nationally Vulnerable	presumed extinct
<i>Juncus pauciflorus</i>	Nationally Vulnerable	presumed extinct
<i>Geranium solanderi</i> s.str.	Declining	occasional
<i>Solanum aviculare</i>	Declining	presumed extinct
<i>Planchonella costata</i>	Relict	locally common
<i>Sicyos mawhai</i>	Relict	presumed extinct
<i>Blechnum norfolkianum</i>	Naturally Uncommon	local
Regionally Threatened (Stanley et al. 2005)		
<i>Plantago raoulii</i>	Regionally Critical	local
<i>Ranunculus acaulis</i>	Regionally Critical	scarce
<i>Schoenus concinnus</i>	Regionally Critical	presumed extinct
<i>Epilobium pedunculare</i>	Regionally Endangered	presumed extinct
<i>Scleranthus biflorus</i>	Regionally Endangered	presumed extinct
<i>Ranunculus urvilleanus</i>	Serious Decline	locally common
<i>Anthosachne multiflora</i>	Gradual Decline	locally abundant
<i>Myoporum laetum</i>	Gradual Decline	occasional
<i>Einadia triandra</i>	Sparse	locally common
<i>Linum monogynum</i>	Sparse	local
<i>Pelargonium inodorum</i>	Sparse	local
<i>Psilotum nudum</i>	Sparse	scarce
<i>Pteris comans</i>	Sparse	occasional
<i>Senecio quadridentatus</i>	Sparse	local
<i>Tmesipteris sigmatifolia</i>	Sparse	scarce
<i>Wahlenbergia vernicosa</i>	Sparse	local
<i>Dichondra</i> aff. <i>brevifolia</i>	Range Restricted	local
<i>Ipomoea cairica</i>	Range Restricted	locally common
<i>Centipeda aotearoana</i>	Data Deficient	presumed extinct
<i>Epilobium billardioreanum</i>	Data Deficient	presumed extinct
<i>Epilobium chionanthum</i>	Data Deficient	presumed extinct
<i>Urtica incisa</i>	Data Deficient	presumed extinct



Figure 5. This bank under an open pōhutukawa canopy near Paa Point contains one of the best Auckland regional populations of *Plantago raoulii*. Other species of this native herbfield include *Lagenophora pumila*, *Oxalis exilis*, *Senecio lautus*, *Carex flagellifera* and *Apium prostratum*. Sites like this containing a threatened herb will require weed management for the herb to survive. Photos: EKC 15 Sep 2007; and *P. raoulii*. NCD, 3 Feb 2007.

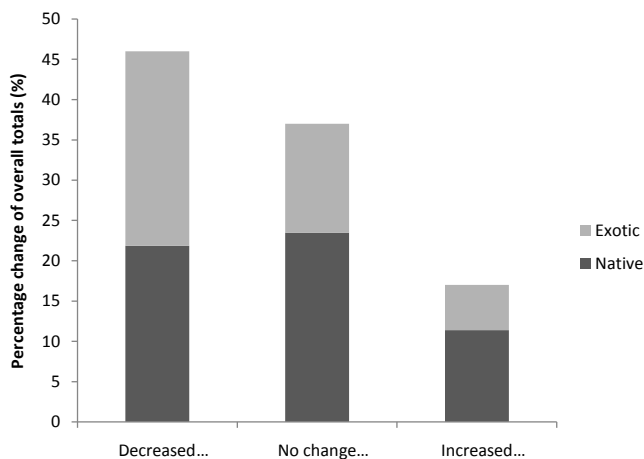


Figure 6. Changes in pre-1978 species populations compared with present day, lumped into three categories, with native and exotic components separated (data from Appendix 1, column 6).

On the other hand, ten Cheeseman records not confirmed by Esler have now been re-recorded (6 native, 4 naturalised, see Appendix 1) and most were at low numbers. These could have been suppressed by the livestock, existed only in the seed bank, been small populations just missed by Esler, or they became locally extinct and have since returned to the island. They include the previously misidentified but now confirmed *Einadia triandra*. It is assumed there has been an increased sampling effort during 1978–2010, compared with the early field surveys.

Swampy valley bottoms are actively being shaded out as regeneration progresses to forest. Consequently, some wetland species and plants associated with open wetlands are decreasing. For example, Esler (1978b) recorded raupō (*Typha orientalis*) as “Locally plentiful in many of the creeks... [and] almost pure colonies...” in two of the creeks. Raupō is now reduced to two creek margins and is sparsely distributed in those habitats. Native wetland species that Esler saw and now appear to have gone include *Centipeda aotearoana* (species uncertain), *Eleocharis acuta*, *Lilaeopsis novae-zelandiae* and *Schoenoplectus tabernaemontani*. In 1985 one of us (EKC) counted 75 *Ranunculus urvilleanus* plants scattered along two open southern Tiri creek margins; 21 years later they had decreased to a single plant, most likely because the open habitat had been overgrown. The Cheeseman-only records of

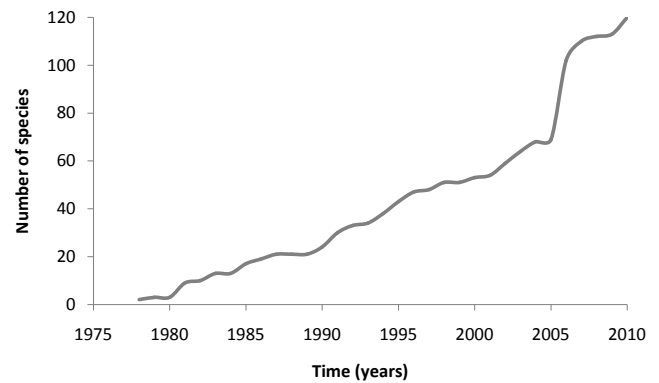


Figure 7. The accumulative addition of vascular plant species records against time for Tiritiri Matangi Island (1978–2010). The steepest gradient coincides with the only comprehensive survey for new additions since Esler’s survey in 1970–77. When the first-record date is uncertain, the median of the suspected range is taken.

Epilobium spp. and *Juncus* spp. may have been eliminated by grazing livestock and rabbits while the wetlands were still open.

The accumulative 121 wild plant additions graphed against time (Fig. 7) show that intensive searching during 2006–10 resulted in more new records compared with the passive collection of new records for the period 1978–2005. Sixty-eight percent of the increase is of exotic species and 29% of these are listed as pest plants in the Auckland Regional Pest Management Strategy (Anon. 2008). These and over 20 other weedy species are currently being controlled on the island (marked ‘†’ or ‘n’ in Appendix 1). Also, three of the six ‘seed rain only’ records are also regional plant pests (Anon. 2008).

Common vegetables and fruit eaten by humans were present in low numbers wild on Tiri, presumably discarded by visitors, e.g. apple (*Malus × domestica*), avocado (*Persea americana*), plum (*Prunus × domestica*), pumpkin (*Cucurbita maxima*), tomato (*Solanum lycopersicum*), passionfruit (*Passiflora edulis* and probably *P. tarminiana*), and tree tomato (*Solanum betaceum*).

We have speculated how the 121 additions since 1977 might have arrived on the island (Table 3, Appendix 1). Floras of other inner Hauraki Gulf Islands of different histories give clues as to how the recent propagules may have reached Tiri. Plant species were excluded from the human-assisted category if they were (1) present from the more unmodified inner Hauraki

Table 3. Possible mode of arrival to Tiritiri Matangi for all new vascular plant records¹ (exotic and combined) during 1978–2010.

Possible mode of arrival	Exotic totals (%)	Combined native & exotic totals (%)
Human (H) ²	36 (42)	38 (30.5)
Wind (W)	10 (12)	28 (22.5)
Bird (internal) (Bi) / (external) (Be)	13/5 (21)	20/6 (21)
From adjacent planted source (PI)	7 (8)	10 (8)
Overlooked (not new) (O)	2 (2)	9 (7)
Floated (F)	6 (7)	7 (6)
Garden escape (G)	5 (6)	5 (4)
Sheep (S)	1 (1)	1 (1)
Totals	85 (100)	124 (100)

¹ = note three records are entered arriving by two different means

² = symbols used in column 7 of Appendix 1

Gulf Islands that are dominated by native vegetation and have relatively low rates of human visitation, e.g. Motuoruhi of 64 ha (Wilcox et al. 2005), the two main islands of The Noises of 8 and 15 ha (Cameron 1998) and Tarahiki Island of 6 ha (Cameron et al. 2007; Cameron 2010a), or (2) present on either of the two farmed islands, Rotoroa of 90 ha and Pakihi of 114 ha (Cameron et al. 2007; Cameron 2010a, b) of the inner Hauraki Gulf that also contained some native bush and have low rates of human visitation. Exceptions included 14 plant species suspected to have been human-assisted because they were either a popular fruit of humans, or they were only located in human-maintained habitats on Tiri. Using the above criteria nearly one third of all the recent introductions may have been assisted by humans (directly attached, accidentally or intentionally brought, or attached to vehicles, machinery, etc.), making this the largest single arrival method (Table 3). This is unsurprising because there are around 32,000 human visitors to the island per year. It is consistent with the conclusions of Chaloupka & Domm (1986) for ten coral islands on the Great Barrier Reef of Australia where they found the percentage of the alien flora increased with an increase in visitor numbers.

The next most common method of arrival appears to be by wind (22.5%); the 13 additional ferns and lycopods make up nearly half of this group. Alternatively, these could have been accidentally brought in by humans on boots or vehicles. However, all these taxa are widespread on other islands in the inner Hauraki Gulf; including several virtually uninhabited islands (from herbarium specimens; and EKC pers. obs.), and therefore we believe they have more likely to have arrived by wind.

Seven species (6% additions since 1977) appeared to have floated to the island; these include the weedy century plant (*Agave americana*), *Oxalis pes-caprae* and smilax (*Asparagus asparagoides*). At least three species appeared to have arrived by two different methods: smilax by birds (under a known starling roost) and sea (a tuberous root-clump at back of a beach amongst driftwood and flotsam); nahui (*Alternanthera nahui*) by humans (old nursery site) and waterfowl (in a remote dam at the northern end of the island); and naked ladies (*Amaryllis belladonna*) remnant plantings in the lighthouse paddock which have expanded vegetatively (pink-flowered form), and a recent illegal planting by Hobbs Beach (white-flowered form).

An odd absentee from the island's flora is *Samolus repens*; despite plenty of suitable coastline. It was perhaps eliminated by the farm stock and/or by rabbits when they were abundant about 110 years ago (see Rimmer 2004). However, it is also absent from Wooded Island which appears to have never had exotic mammals.

Discussion

How accurate were the earlier predictions?

Esler (1978b) predicted that as woody cover increased during succession, the number of exotic species would decline. This has not happened; instead there has been a net gain of 24 exotic herbs: 21 pre-1978 exotic herbs were lost but 45 were gained (Table 1). Many of the exotic herbs on the island now grow in human-related habitats, such as mown lawns, roads, tracks and their margins. These habitats have been developed post-Esler. The growth of native trees and shrubs has suppressed the cover of brush wattle in Wattle Valley over the last three decades (EKC pers. obs.) as Esler (1978b) predicted would occur. However, brush wattle is still present

and newly germinated seedlings are still removed from the boundary of Wattle Valley, most commonly along the open road margin. Maintenance of the brush wattle is likely to have been assisted by severe storm events like the one on 10 July 2007 when the associated plants of māhoe, karaka and coastal karamū were stripped of their foliage and small branches in the upper southern flank of Wattle Valley (EKC pers. obs.) temporarily opening up the canopy to the advantage of the light-loving brush wattle. It is likely that brush wattle is a persistent component of the soil seed bank, as is the case for related species (e.g. Auld 1986). As predicted by Esler (1978b), the abundance of palatable species has increased (e.g. hangehange, māhoe, kawakawa (*Piper excelsum*), kohekohe, pigeonwood (*Hedycarya arborea*), taraire, tawāpou have all appeared to have increased) and some unpalatable species appeared to have declined (e.g. māpou) or stayed the same (e.g. *Coprosma rhamnoides*).

Lack of seabird management

Comparing Tiri's vascular flora with nearby seabird islands showed that very few species were absent due to the lack of management of native seabirds on Tiri. However, the abundance and vigour of some species may be affected. For example, a suite of plants that benefit from seabird guano enrichment are either more common or much more lush on the major seabird island off Tiri's NE coast, Wooded Island (Taylor & Tennyson 1999; Cameron 2013). These include *Disphyma australe*, taupata, shore groundsel (*Senecio lautus*), *Einadia trigonos*, and glasswort (*Sarcocornia quinqueflora*). However, the only plant recorded here that is not on Tiri is māwhai (*Sicyos mawhai*), which is now extinct on the island. Existing breeding seabirds on Tiri are blue penguin, diving petrel, grey-faced petrel, red-billed gull, black-backed gull, white-fronted tern and probably fluttering shearwater; and there is evidence that the diving petrel and grey-faced petrel colonies are expanding (Mel Galbraith pers. comm.). Expansion of the seabird colonies should benefit the guano-loving plants. Other guano-loving plants listed by Gillham (1960a, b, c) and Norton et al. (1997) present in the Hauraki Gulf but absent from Wooded Island include Cook's scurvy grass (*Lepidium oleraceum*), poroporo (*Solanum aviculare*) (present on Tiri in the past) and sea celery (*Apium prostratum*) (present on Tiri). The widespread demise of māwhai and Cook's scurvy grass is more complex than just a lack of guano and appears to be disease-related in māwhai (Delmiglio & Pearson 2006) and probably partially disease-related in Cook's scurvy grass (Norton et al. 1997; Hasenbank et al. 2011).

Recommendations

The future composition of the flora of Tiri is likely to be influenced by ongoing human impacts. To ensure dominance of appropriate native plant species in the future flora of Tiri, we recommend:

1. Tighter quarantine requirements for plant propagules. This recommendation is based on the fact that 42% of the exotic additions are suspected of being human introductions; some of the present biosecurity measures are only fauna-focused.
2. The results indicate that the present quarantine message needs to specifically warn visitors about the disposal of fruit and vegetable waste. Surprisingly no kiwifruit (*Actinidia deliciosa*) have been recorded wild yet because the fruit is commonly eaten and wild vigorous

vines have established in many Auckland school grounds (EKC pers. obs.).

3. That managers consider controlling more weedy species on the island, i.e. currently localised species that are expected to spread and suppress native herbaceous species of open habitats, such as *Carex divulsa*, *Cynodon dactylon*, *Daucus carota*, *Oxalis pes-caprae*, *Parentucellia viscosa*, *Polygonum arenastrum*, *Stenotaphrum secundatum* and *Torilis arvensis*.
4. Removal of ten indigenous species planted in small numbers outside their natural geographical range (listed in Appendix 1, a & c) because some may hybridise with related natural species on the island and others may naturalise. Note that seedlings of *Pittosporum umbellatum* and *Meryta sinclairii* have already been observed, the latter about 200 m from the two planted adults.
5. That managers highlight threatened species of the inner Hauraki Gulf near the island's visitors' centre, rather than the current species displayed that are outside their natural geographic range, perhaps beginning with the 13 which are suspected to have been lost already (see Table 2).
6. Removal of the Australian ngaio (*Myoporum insulare*) hedge and hybrid ngaio (*M. insulare* × *M. laetum*) plantings because they will pollute the native ngaio (*M. laetum*) gene pool.
7. Removal of two, planted, yellow-flowering pōhutukawa c. 5 m tall near the top of Bush 22 because they are not of local origin and they may impact on the local pōhutukawa gene pool.
8. Although feral exotic mammals are now absent from Tiri, exotic bird and invertebrate species are present and may have a negative impact on the native flora. One such exotic species worthy of study is the common garden snail (*Cantareus aspersus*) which is present on Tiri (Chris Green, pers. comm.).
9. Conduct regular and more frequent surveys for new plant species arrivals and local extinctions, ideally every five years. Good management relies on knowing what is present (e.g. Lindenmayer et al. 2012).
10. The maintenance of populations of rare herbs (Table 2) that require open sites is unlikely, unless management is changed to ensure persistence of their preferred habitats. Apart from the steep coastal slopes, most of their current habitats are rapidly being shaded and competition from naturalised herbs is increasing throughout. For the non-coastal species there is potential for them to grow along track margins. This is occurring naturally for *Ranunculus urvilleanus*; however, weed management will be important for maintaining such populations.
11. If management of open wetland habitats is not maintained, their current flora is likely to keep declining, e.g. *Carex lessoniana*, *C. secta*, *Epilobium pallidiflorum*, *Juncus primatocarpus*, and *Ranunculus amphitrichus*. The existing small dams offer minor areas of semi-permanent still water, but the swampy stream habitats (e.g. Lighthouse Valley) may require a weir or vegetation management for them to be maintained as open wetland habitat.

Predictions

Over the next twenty years, we predict that:

1. Movement of land birds over the sea between Tiri and the

Whangaparaoa Peninsula (3.5 km distant) will increase with the recently completed predator-proof fence and mainland island at the tip of the Whangaparaoa Peninsula which includes Shakespear Regional Park. This will result in an increase of bird-dispersed seed (native and exotic species).

2. The current nesting seabirds (blue penguins, diving petrels, grey-faced petrels and possibly fluttering shearwaters) will keep expanding their present colonies, potentially benefitting a suite of guano-loving plant species.
3. Natural dispersal to Tiri of native trees that are not currently present should slowly continue to occur, but will be low in number because most of the expected tree species for an island of this size and location are already present. Island size is a limiting factor because larger islands have more diverse habitats and more areas protected from salt-laden winds. Bird-dispersed tree species such as *Litsea calicaris*, *Pittosporum tenuifolium* and *Pseudopanax crassifolius* are likely species that may colonise the island during the next twenty years.
4. A rise in the proportion of shade-tolerant tree species will continue to occur (e.g. karaka, kohekohe, māhoe, taraire, and tawāpou) as increasingly shaded habitat continues to become available for these species as regeneration progresses.

Acknowledgements

We thank the Supporters of Tiritiri Matangi for encouraging this survey; Barbara and Ray Walter (Tiri rangers from 1983 and 1986 respectively until June 2006), Helen Lindsay (Tiri weed contractor since 2002), Shelley Heiss-Dunlop (involved in weeding Tiri since Dec 2004), Ian Price (Tiri ranger 2002–2005 & 2006–2008), Toby Shanley for plant information and plant collections; Shelley Heiss-Dunlop and Helen Lindsay for field assistance and checking the planting diaries held on Tiri; Rhys Gardner and Peter de Lange for assistance with identifications; Jane Cruickshank and Pat Brownsey for herbarium label data from CHR and WELT respectively; Layla Tweedie-Cullen and Robert Cameron for producing Figures 1 and 6 respectively; Discovery Cruises for discounted travel costs; Peter Bellingham, Hannah Buckley, Tim Curran, Jo Monks, Carol West and an anonymous referee for critically reviewing the draft manuscript; others whom we've acknowledged in the text for information; and Neil Davies thanks the Royal Society of New Zealand for his 2006 Science Teacher Fellowship.

References

- Anon. 2003. Weed control programme report Tiritiri Matangi Island, 2002–03. Unpublished Report, Auckland, Department of Conservation. 8 p.
- Anon. 2008. Auckland Regional Pest Management Strategy 2007–2012. Auckland, Auckland Regional Council.
- Atkinson IAE 2004. Successional processes induced by fires on the northern offshore islands of New Zealand. *New Zealand Journal of Ecology* 28: 181–193.
- Auld TJ 1986. Population dynamics of the shrub *Acacia suaveolens* (Sm.) Willd.: Dispersal and the dynamics of the soil seed-bank. *Australian Journal of Ecology* 11: 235–254.

- Bellingham PJ, Towns DR, Cameron EK, Davis JJ, Wardle DA 2010a. New Zealand island restoration: seabirds, predators, and the importance of history. *New Zealand Journal of Ecology* 34: 115–136.
- Bellingham PJ, Wiser SK, Wright AE, Cameron EK, Forester LJ 2010b. Disperser communities and legacies of goat grazing determine forest succession on the remote Three Kings Islands, New Zealand. *Biological Conservation* 143: 926–938.
- Cameron EK 1998. Bot Soc trips to The Noises (Hauraki Gulf) and an updated species list. *Auckland Botanical Society Journal* 53: 25–35.
- Cameron EK 2005. New Zealand geographical limits of native vascular plant species in the Auckland region: past & present. *Auckland Botanical Society Journal* 60: 123–129.
- Cameron EK 2010a. Updated vascular flora for the seven-island chain east and southeast of Waiheke Island. *Auckland Botanical Society Journal* 65: 37–38.
- Cameron EK 2010b. Updated vascular flora of Pakihi Island, with notes on fauna, geology and some history, Hauraki Gulf, Auckland. *Auckland Botanical Society Journal* 64: 154–169.
- Cameron EK 2013. Updated vascular flora of Wooded Island, off Tiritiri Matangi Island. *Auckland Botanical Society Journal* 68: 69–74.
- Cameron EK, West CJ 1986. Notes on the flora of Tiritiri Matangi Island, Hauraki Gulf. *Tane* 31: 121–123.
- Cameron EK, de Lange PJ, McCallum J, Taylor GA, Bellingham PJ 2007. Vascular flora and some fauna for a chain of six Hauraki Gulf islands east and southeast of Waiheke Island. *Auckland Botanical Society Journal* 62: 136–156.
- Cashmore P 1995. Revegetation ecology in Tiritiri Matangi Island and its application to Motutapu Island. Unpublished MSc thesis, University of Auckland.
- Chaloupka MY, Domm SB 1986. The role of anthropochory in the invasion of coral cays by alien flora. *Ecology* 67: 1536–1547.
- Cheeseman TF 1906. *Manual of the New Zealand Flora*. Wellington NZ, Government Printer.
- Cheeseman TF 1908. Numbered plant list from Tiritiri based on specimens sent by A. Hansen. Unpublished, Auckland War Memorial Museum library (C52), Auckland.
- Cheeseman TF 1925. *Manual of the New Zealand Flora*. 2nd ed. Wellington NZ, Government Printer.
- Cockayne L 1905. Notebook 21. Unpublished, Leonard Cockayne manuscript collection, Auckland War Memorial Museum library (MS 74), Auckland.
- Cousens RD, Cousens JM 2011. Invasion of the New Zealand coastline by European sea-rocket (*Cakile maritima*) and American sea-rocket (*Cakile edentula*). *Invasive Plant Science and Management* 4: 260–263.
- Craig J, Vesely ÉT 2007. Restoring natural capital reconnects people to their natural heritage: Tiritiri Matangi Island, New Zealand, Chapter 12, In: Aronson J, Milton SJ, Blignaut JN eds. *Restoring natural capital: science, business, and practise*. Society for Ecological Restoration International, Washington USA, Island Press.
- de Lange PJ 2008. *Hibiscus richardsonii* – the discovery of a native hibiscus in New Zealand. *New Zealand Botanical Society Newsletter* 93: 13–15.
- de Lange PJ, Rolfe JR 2010. New Zealand indigenous vascular plant checklist 2010. Wellington, New Zealand Plant Conservation Network.
- de Lange PJ, Rolfe JR, Champion PD, Courtney SP, Heenan PB, Barkla JW, Cameron EK, Norton DA, Hitchmough RA 2013. Conservation status of New Zealand vascular plants, 2012. *New Zealand threat classification series 3*. Wellington, Department of Conservation. 70p.
- Delmiglio C, Pearson MN 2006. Effects and incidence of cucumber mosaic virus, watermelon mosaic virus and zucchini yellow mosaic virus in New Zealand's only native cucurbit, *Sicyos australis*. *Australasian Plant Pathology* 35: 1–7.
- Drey R, Connel PJ, Craig JL, Mitchell ND, Spring-Rice W 1982. Tiritiri Matangi Island Working Plan. Auckland NZ, Department of Lands and Survey for the Hauraki Gulf Maritime Park Board.
- Dunning S 1996. Weed management strategy for Tiritiri Matangi Island (draft). Auckland NZ, Department of Conservation, Auckland Conservancy.
- Esler AE 1967. The vegetation of Kapiti Island. *New Zealand Journal of Botany* 5: 353–393.
- Esler AE 1978a. Botanical features of islands near the west coast of the Coromandel Peninsula, New Zealand. *New Zealand Journal of Botany* 16: 25–44.
- Esler AE 1978b. Botanical features of Tiritiri Island, Hauraki Gulf, New Zealand. *New Zealand Journal of Botany* 16: 207–226.
- Esler AE 1980. Botanical features of Motutapu, Motuihe, and Motukorea, Hauraki Gulf, New Zealand. *New Zealand Journal of Botany* 18: 15–36.
- Esler AE 2004. *Wild plants in Auckland*. Auckland NZ, Auckland University Press.
- Flohr J 2004. Weed dispersal by starlings (*Sturnus vulgaris*) – A case study on Tiritiri Matangi Island, Hauraki Gulf, New Zealand. Unpublished MSc thesis, University of Auckland.
- Galbraith M 2009. Tiritiri Matangi Open Sanctuary, New Zealand. *Ecological Restoration and Management* 10: 162.
- Gardner RO 1997. *Macropiper* (Piperaceae) in the south-west Pacific. *New Zealand Journal of Botany* 35: 293–307.
- Gillham, ME 1960a. Plant communities of the Mokohinau Islands, northern NZ. *Transactions of the Royal Society of New Zealand* 88: 79–98.
- Gillham, ME 1960b. Vegetation of tern and gannet colonies in northern New Zealand with a comparative note on colonies in the Bass Strait, Tasmania. *Transactions of the Royal Society of New Zealand* 88: 211–234.
- Gillham, ME 1960c. Vegetation of New Zealand shag colonies. *Transactions of the Royal Society of New Zealand* 88: 363–380.
- Hambly G 1998. A botanist's exciting discovery. In: *Supporters of Tiritiri Matangi Island*, Bulletin 34.
- Hannus J-J, von Numers M 2010. Temporal changes in the island flora at different scales in the archipelago of SW Finland. *Applied Vegetation Science* 13: 531–545.
- Hasenbank M, Brandon M, Hartley S, 2011. White butterfly (*Pieris rapae*) and the white rust *Albugo candida* on Cook's scurvy grass (*Lepidium oleraceum*). *New Zealand Journal of Ecology* 35: 69–75.
- Hawley J 1997. Tiritiri Matangi Working Plan, Department of Conservation, Auckland Conservancy. 72p.
- Lindenmayer DB, Gibbons P, Bourke, M et al. 2012. Improving biodiversity monitoring. *Austral Ecology* 37: 285–294.
- Lindsay H 2004. Weed control programme report Tiritiri Matangi Island, 2003–04. Unpublished Report, Department of Conservation, Auckland. 7 p.
- Lindsay H 2006. Weed control programme report Tiritiri

- Matangi Island, 2005–06. Unpublished Report, Department of Conservation, Auckland. 27 p.
- Lindsay H 2007. Weed control programme report Tiritiri Matangi Island, 2006–07. Unpublished Report, Department of Conservation, Auckland. 26 p.
- Lindsay H 2008. Weed control programme report Tiritiri Matangi Island, 2007–08. Unpublished Report, Department of Conservation, Auckland. 20 p.
- Lindsay H 2009. Weed control programme report Tiritiri Matangi Island, 2008–09. Unpublished Report, Department of Conservation, Auckland. 7 p.
- Lindsay H 2010. Weed control programme report Tiritiri Matangi Island, 2009–10. Unpublished Report, Department of Conservation, Auckland. 20 p.
- Lindsay L, Price I 2005. Weed control programme report Tiritiri Matangi Island, 2004–05. Unpublished Report, Department of Conservation, Auckland. 17 p.
- Mitchell ND 1985. The revegetation of Tiritiri Matangi Island: the creation of an open sanctuary. Royal New Zealand Horticultural Society Annual Journal 13: 36–41.
- Murray BG, Craven LA, de Lange PJ 2008. New observations on chromosome number variation in *Hibiscus trionum* s.l. (Malvaceae) and their implications for systematics and conservation. New Zealand Journal of Botany 46: 315–319.
- Norton DA, de Lange PJ, Garnock-Jones PJ, Given DR 1997. The role of seabirds and seals in the survival of coastal plants: lessons from New Zealand *Lepidium* (Brassicaceae). Biodiversity and Conservation 6: 765–785.
- Rimmer A 2004. Tiritiri Matangi – a model of conservation. Auckland NZ, Tandem Press.
- Sporli KB, McAlister LM 1995. Structural geology of the greywackes of Tiritiri Matangi Island. Tane 35: 95–111.
- Stanley R, de Lange PJ, Cameron EK 2005. Auckland regional threatened & uncommon vascular plant list. Auckland Botanical Society Journal 60: 152–157.
- Taylor GA 1989. A register of northern offshore islands and a management strategy for island resources. Northern Regional Technical Report Series 13. Auckland, Department of Conservation.
- Taylor GA, Tennyson AJD 1999. Flora and fauna of Wooded Island, inner Hauraki Gulf. Tane 37: 91–98.
- Thiers B 2010. Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. <http://sweetgum.nybg.org/ih/> (continuously updated).
- Walter R 1995. Flora notes. In: Supporters of Tiritiri Matangi Island, Bulletin 21.
- Walter R 1996. Flora notes. In: Supporters of Tiritiri Matangi Island, Bulletin 24.
- West CJ 1980a. Regeneration studies on Tiritiri Matangi Island. New Zealand Journal of Ecology 3: 158.
- West CJ 1980b. Aspects of regeneration on Tiritiri Matangi Island. Unpublished MSc thesis, University of Auckland.
- West CJ 1981. The significance of small plastic boats as seed dispersal agents. Tane 27: 175.
- Wilcox M, Donaghy G, Haines L, Jane G, McSweeney C, Young M 2005. Coromandel Peninsula, Auckland Anniversary Weekend 28/01/05 to 1/02/05. Auckland Botanical Society Journal 60: 1–12.
- Wilmshurst JM, Anderson AJ, Higham TFG, Worthy TH 2008. Dating the late prehistoric dispersal of Polynesians to New Zealand using the commensal Pacific rat. Proceedings of the National Academy of Sciences of the USA 105: 7676–7680.

- Wright AE 1984. *Beilschmiedia* Nees (Lauraceae) in New Zealand. New Zealand Journal of Botany 22: 109–125.

Appendix 1. Wild vascular Flora of Tiritiri Matangi from 1905–2010.

Key

Column 1

- * = a naturalised or adventive exotic species
 ** = solely spreading from planted parent(s)
 **~ = exotic cultivated species which has not naturalised
 *** = cultivated native species outside their geographic range
 P = also a limited number planted (< 1000)
 PP = also a major planted species (> 1000)

Column 2

- C = Cockayne record (Cockayne 1905)
 Ch = Cheeseman's list (Cheeseman 1908) compiled by Cheeseman from plants sent by Hansen for identification
 [Ch] = on Cheeseman's list (1908) under a related name (not a synonym)

Column 3

- E = listed by Esler (1978b)
 [E] = based on a redetermination of an Esler specimen (not listed by him)

Column 5 (current abundance, based on observations 2006–10)

- a = abundant
 c = common
 ex = has been seen post-1977, but possibly now extinct on the island
 Ex = not seen since 1977, presumed extinct on the island
 l = local
 o = occasional
 s = scarce (< 5 populations seen)
 † = a weed species being actively managed
ⁿ = a weed species being partially managed (removed when seen, but not searched for)

Column 6 (estimated abundance change post-Esler)

- A = additions since 1977
 D = decreased
 I = increased
 NC = no change

Column 7 (possible mode of arrival to Tiri for additions post-1977)

See Table 3 for key to symbols

Column 8 (Current population notes)

- C&W = record from Cameron & West (1986)
 Herbarium acronyms follow Thiers (2010)

(a) Wild taxa grouped by plant group & life form	Cheeseman (1908), Cockayne (1905)	Esler (1978)	1st record	Current abundance	Abundance change	Dispersal	Comments on current populations (unless otherwise stated); voucher specimens cited at end of entry
LYCOPODS (3 + 0) (= native + naturalised)							
<i>Lycopodiella cernua</i>			2004	s	A	W	2 patches Pōhutukawa Cove, largest 6 x 2m ² ; open coastal slope. AK288939, UNITEC2216
<i>Lycopodium volubile</i>			2006?	s	A	W	2 patches: by Ngati Paoa Track (8 x 8m ²); and on steep coastal clay slope, Lighthouse Bay (1 x 1m ²). UNITEC2398-99
<i>Phlegmariurus varius</i>			1995	s	A	W	Epiphyte on pōhutukawa in Bush 22. AK222571, UNITEC2073
FERNS (41 + 1)							
<i>Adiantum aethiopicum</i>	Ch	E	1906-09	s	NC		2 patches at S end of Fisherman's Bay. AK345438
<i>Adiantum cunninghamii</i>	Ch	E	1906-10	o-lc	I		Patch-forming mainly in forest (= <i>A. affine</i> of Cheeseman's list). UNITEC2047
<i>Adiantum hispidulum</i>	Ch	E	1906-09	o	I		Bush margins and open coastal slopes. UNITEC2048
<i>Asplenium flaccidum</i>	Ch	E	1906-09	o	NC		Usually epiphytic in forest. UNITEC2042-43
<i>Asplenium gracillimum</i>	[Ch]	[E]	1906-09	l	NC		Best forested areas, e.g. kohekohe forest in Bush 1 & 22 (presumed = <i>A. bulbiferum</i> of Cheeseman's list & of Esler). AK300536
<i>Asplenium haurakiense</i>		E	1970-77	o-lc	I		Rupestrial coastal slopes throughout, in open or under pōhutukawa, including Wooded I. (= <i>A. flaccidum</i> coastal form of Esler)
<i>Asplenium lamprophyllum</i>			2006	s	A	W	Single clump (<1m across) & 2 adjacent young plants, in forest, top of Bush 1 - a new arrival? AK300557, UNITEC2360
<i>Asplenium oblongifolium</i>	Ch	E	1906-09	o	NC		Forest and shrubby coastal slopes; occasionally epiphytic (= <i>A. lucidum</i> of Cheeseman's list & of Esler). UNITEC2041
<i>Asplenium polyodon</i>		E	1970-77	o	NC		Mainly epiphytic in forest (= <i>A. falcatum</i> of Esler). AK314029, UNITEC2040
<i>Blechnum chambersii</i>		E	1970-77	o-lc	I		Creek margins in best forested valleys (= <i>B. lanceolatum</i> of Esler). AK271009, UNITEC2029
<i>Blechnum filiforme</i>	Ch	E	1906-09	o-a	NC		Mainly terrestrial in forest and as a low climber, largest continuous patch to 40m across in upper Bush 21 (= <i>Lomaria filiformis</i> of Cheeseman's list). AK314028, UNITEC2028
<i>Blechnum membranaceum</i>		E	1970-77	o	NC		Creek margins under good forest. AK271023, UNITEC2074
<i>Blechnum notfolkianum</i>			1981	l	A	W	Near creek under forest in Bush 1. AK271010
<i>Blechnum novae-zelandiae</i>	Ch	E	1906-09	o-lc	NC		kiokio. Especially in damp areas and by creek mouths (= <i>Lomaria capense</i> of Cheeseman's list, & <i>B. capense</i> of Esler). UNITEC2027

<i>Cheilanthes distans</i>	Ch	E	1906-09	o	NC	Scattered over rocky outcrops along the east coast in the open (= <i>Notholaena distans</i> of Cheeseman's list). UNITEC2031	
<i>Cheilanthes sieberi</i>			2006	l	A	W	Occuring with <i>C. distans</i> , but only observed around the general Emergency Landing area. UNITEC2032
<i>Cyathea dealbata</i>	Ch	E	1906-09	o-la	I		ponga. Bush margins, under tall kāmuka and in forest. UNITEC2023, 2049
<i>Cyathea medullaris</i>		E	1970-77	o	NC		mamaku. Wetter more sheltered areas than <i>C. dealbata</i> . UNITEC2022
<i>Deparia petersenii</i>			2006	l	A	W	Lighthouse Valley, semi-open swampy creek margin (only locality). AK300502, UNITEC2397
<i>Dicksonia squarrosa</i>	Ch	E	1970-77	o	NC		whēki. Best population (>20 plants) in Lighthouse Valley, swampy creek margin. UNITEC2361
<i>Doodia australis</i>	Ch	E	1906-09	c-la	NC		Most open areas and under forest (= <i>D. media</i> of Cheeseman's list & of Esler). UNITEC2050
<i>Histiopteris incisa</i>	Ch	E	1906-09	l	NC		Disturbed swampy areas, e.g. Lighthouse Valley and lower Bush 22 (= <i>Pteris incisa</i> of Cheeseman's list)
<i>Hypolepis ambigua</i>	Ch	E	1906-09	o-lc	I		Spreading patches in open often with bracken and/or rank microlaena pasture (= <i>H. tenuifolia</i> of Cheeseman's list & of Esler). AK271030 & 300572, CHR 505848, UNITEC2035
<i>Lastreopsis glabella</i>			2006	l	A	W	Only observed in Bush 1 forest. UNITEC2026
<i>Lastreopsis microsora</i>		E	1970-77	o	NC		In forest, including a patch 4 x 4m in Bush 2 (= <i>Ctenitis decomposita</i> of Esler). UNITEC2036, 2053
<i>Lygodium articulatum</i>		E	1970-77	s	D		Single plant and 2 young plants in forest in Bush 1 up until 2006; appeared to have died in 2010
<i>Microsorium pustulatum</i>	Ch	E	1906-09	c	I		hound's tongue. Mainly terrestrial in forest and shrubby areas (= <i>Polypodium billardieri</i> of Cheeseman's list & <i>Phymatodes diversifolium</i> of Esler). UNITEC2025
<i>Microsorium scandens</i>		E	1970-77	l	D		Terrestrial, observed in forest in Bush 1 (= <i>Phymatodes scandens</i> of Esler). UNITEC2024
<i>Nephrolepis cordifolia</i> *			2004	s†	A	W	tuber ladder fern. Two sites - in light gaps surrounded by bush, just N of Paa Point and by Bush 2; original patch c.5m ² - virtually eradicated. AK289398
<i>Paesia scaberula</i>		E	1970-77	s	D		scented fern. Patch 15 x 15m ² in wetland, Lighthouse Valley. UNITEC2396
<i>Pellaea rotundifolia</i>			2006	s	A	W	3 small populations in open: by Lighthouse Dam, track S end Hobbs Beh and above the Stamper (SE cliffs). AK300501, UNITEC2030
<i>Pneumatopteris pennigera</i>		E	1970-77	l	NC		Forested gullies, near creeks (= <i>Thelypteris pennigera</i> of Esler). UNITEC2045
<i>Polystichum wawranum</i>	Ch	[E]	1906-09?	o-lc	NC		Semi-open coastal slopes and in forest (presumed = <i>Aspidium richardii</i> of Cheeseman's list & <i>P. richardii</i> of Esler). AK299842, CHR 223509, UNITEC2034, 2058
<i>Psilotum nudum</i>			1981	s	A	W	First record: several plants in Bush 1 in 1981 (C&W); x2 present there in 2006. AK271012
<i>Pteridium esculentum</i>	Ch	E	1906-09	c	D		bracken. Most open areas, pure swards in places often with rank pasture and <i>Muehlenbeckia complexa</i> (= <i>P. aquilinum</i> var. <i>esculentum</i> of Cheeseman's list & of Esler). UNITEC2046
<i>Pteris comans</i>	Ch	E	1906-09	o	D		Forested valleys, and shaded coastal slopes. AK299061, UNITEC2037, 2072
<i>Pteris macilentia</i>		E	1970-77	Ex	D		Recorded by Esler, not seen by us
<i>Pteris tremula</i>	Ch	E	1906-09	o	NC		Widespread, open areas, forest and under plantings. UNITEC3036
<i>Pyrossia eleagnifolia</i>	Ch	E	1906-09	c	NC		leather fern. Widespread, epiphytic usually on pōhutukawa (local on taupapa on Wooded 1), and rupestral by the coast (= <i>Polypodium serpens</i> of Cheeseman's list & <i>Pyrossia serpens</i> of Esler). AK318481, UNITEC2033
<i>Tmesipteris elongata</i>		E	1970-77	o	I		Epiphytic in forest, mainly on trunks of <i>Cyathea dealbata</i> . AK271027
<i>Tmesipteris lanceolata</i>			1981	o	A	W	Epiphytic in forest, mainly on trunks of <i>Cyathea dealbata</i> , e.g. Bush 1, 21 & 22. First record C&W. AK271026, UNITEC2359
<i>Tmesipterisigmatifolia</i>			1981	s	A	W	Epiphytic, on trunks of <i>Cyathea dealbata</i> in Bush 1. First record C&W. AK271025

CONIFERS (2 + 4)

<i>Araucaria heterophylla</i> ** P					2007	s	A	PI	Norfolk pine. Single seedling near the only cultivated adult Norfolk pine (topped in 2006); N side Visitors Centre. AK299057
<i>Cupressus macrocarpa</i> ** P	E				1970-77	I	NC		macrocarpa. >12 seedlings to 40cm tall in 2010, open grassy bank, by cultivated adults, N side Visitors Centre. AK314033
<i>Dacrycarpus dacrydioides</i> P					1996	s	A	Bi	kahikatea. First wild seedlings observed in 1996 (Bush 1); and since then more widespread. Species also planted. AK225613, UNITEC2087
<i>Pinus ?pinaster</i> ** P(?)					2004-05	ext	A	PI	maritime pine. Single suspected juvenile by Lighthouse paddock (2004-05) and several S of the Fog Horn shed (2009) (H Lindsay pers. comm.); cultivated or wild maritime pines not seen by us
<i>Pinus radiata</i> ** P					c.2003	ext	A	PI	radiata pine. From c.2003-06 <10 seedlings removed on the SE side of the island, and more recently (2010) a few seedlings in the shelterbelt site (H Lindsay & I Price pers. comm.); the seed source was from a planted shelterbelt of pines between lighthouse and bunkhouse which were cut down 2006-07; seedlings not seen by us
<i>Podocarpus totara</i> P	E				1970-77	o-lc	I		iōtara. Seedlings and saplings in forest and under plantings; the largest tree c.10m tall, basal diameter c.80cm in Bush 1 associated with another tree c.30cm DBH and several saplings 4-6m tall. UNITEC2158

DICOT TREES & SHRUBS (54 + 25)

<i>Avicennia marina</i>					2006	s	A	F	mangrove. 4 plants seen, 0.2-1m tall, upper rocky intertidal shelf from just S of NW Point to N Point. AK300577, UNITEC2414
<i>Beilschmiedia tarairi</i> P	E				1970-77	o-lc	NC		taraira. A few adult trees in best forest areas, especially in Bush 2, and occ. seedlings. AK216031
<i>Beilschmiedia tawa</i> (incl. <i>B. tawarua</i>) P	Ch				1906-08	s	NC		tawarua. Single tall tree in Bush 1 with >40cm dbh, the leaves are up to 45mm wide and would match <i>B. tawarua</i> of Wright (1984) which is now thought to intergrade with <i>B. tawa</i> ; evidently 2 smaller trees have been recorded in Bush 2 in the past; progeny from Bush 1 seed planted out (c.24 plants), currently only 2 weak survivors (Bush 4 & Wattle Valley) (= <i>B. tawa</i> broad-leaved var. of Cheesem's list, and <i>B. sp.</i> of Esler). AK165449, 272524 & 283817, UNITEC2078
<i>Berberis glaucocarpa</i> *					1995	ext†	A	Bi	barberry. First record 20+ seedlings behind Hobbs Beach, also occurred in Lighthouse Valley; last record by the weed team 2005-06; not seen by us. AK222141
<i>Brachyglottis repanda</i>	Ch				1906-09	lc	I		rangiora. Coastal bush slopes, especially from Paa Point to NW Point, and around Pōhutukawa Cove. UNITEC2086
<i>Carpodetus serratus</i>					1991	s	A	Bi	putaputawētā. Single seedling c.46cm tall in Bush 1 – this species has never been planted on the island. AK278766
<i>Chamaecytisus palmensis</i> * P					1990s?	I†	A	PI	tree lucerne. Originally c.50 planted out by Wharf Road (below Graham's Rd) in 1984 as food source for native pigeons - site still being actively weeded
<i>Chrysanthemoides monnifera</i> *					1981	I†	A	Bi	bone-seed. Population virtually confined to the coastal slopes from Saddleback Bay to Emergency Landing, with the main population on the cliffs at Fishermans Bay; seedlings and adults still being found. First record on Hobbs Beach (C&W). AK299053
<i>Coprosma arborea</i>	E				1970-77	s	I		tree coprosma. x5 plants observed in forest: c.0.5 & 10m tall in upper Bush 21; c.1 & 3m in lower Bush 1; 0.5m in upper Bush 22 where Esler recorded a few plants. AK328121, UNITEC2400
<i>Coprosma areolata</i>	E				1970-77	o-lc	I		In 3 main forested valleys (Bush 1, 21, 22), most frequent in Bush 21. UNITEC2056
<i>Coprosma grandifolia</i>					1986	s	A	Bi	3 small shrubs first recorded in Bush 1, and a female flowering plant 11 years latter. First record C&W. AK234265
<i>Coprosma lucida</i>	E				1970-77	Ex	D		shiny karamū. Recorded by Esler as "occasional plants along the creeks"; not seen by us
<i>Coprosma macrocarpa</i> subsp. <i>minor</i> P	E				1970-77	c	I		coastal karamū. Most frequent coprosma on the island occurring throughout in shrublands, forest coastal slopes and establishing in planted areas. AK275690 & 277608, UNITEC2404, 2409
<i>Coprosma macrocarpa</i> x <i>C. propinqua</i>	[E]				[1970-77]	s	NC		A few wild shrubs appeared to be this hybrid (= <i>C. propinqua</i> × <i>C. robusta</i> of Esler?). AK284531, UNITEC2161

<i>Coprosma macrocarpa</i> x <i>C. robusta</i>	2006	o	A	Bi	Some wild shrubs appeared to be this hybrid
<i>Coprosma repens</i> PP	E 1970-77	o-la	I		taupata. Most tolerant woody plant of salt-spray, widespread along all coasts, rocky stacks and Wooded 1, exposed plants prostrate. AK254869, UNITEC2132
<i>Coprosma repens</i> x <i>C. rhamnoides</i> P	E 1970-77	o	NC		Shrubs to 1.5m tall, mainly open coastal slopes. AK217268-69, 234262, 234264 & 234497
<i>Coprosma rhamnoides</i>	E 1970-77	o-lc	NC		Mainly as understory shrub in the main forested valleys (Bush 1, 21, 22) and occasionally shrublands on coastal slopes. UNITEC2055
<i>Coprosma robusta</i>	Ch E 1906-09?	o	NC		karamū. Bush and open creek margins, several forms intergrade with <i>C. macrocarpa</i> (<i>C. macrocarpa</i> ssp. <i>minor</i> was not distinguished from <i>C. robusta</i> by Cheeseman (1906)). AK300573, UNITEC2130
<i>Cortaria arborea</i>	Ch E 1906-09	s	NC		tutu. 2 plants to 6m tall (1 dying) in steep gully, Bush 23, NE coast (presumed same site as Esler's record) (= <i>C. ruscifolia</i> of Cheeseman's list). UNITEC2407-08
<i>Corynocarpus laevigatus</i> P	C,Ch E 1905	o	I		karaka. A few trees along NW coast, Bush 1, 21 & 22, wild saplings and seedlings local
<i>Dysoxylum spectabile</i> P	C E 1905	c	I		kohekohe. Main broadleaf forest canopy species in parts of Bush 1 (dominant canopy species), 2, 21 & 22, being most dominant in Bush 1 forming a canopy 12-15m tall; scattered large trees in some of the valleys even taller; widely regenerating where sheltered, including under planted pōhutukawa. UNITEC2084
<i>Elaeocarpus dentatus</i>	Ch E 1906-09	s	D		hinau. Single tree 8m tall c.40cm dbh, head blown out, in Bush 1 forest; no seedlings seen
<i>Entelea arborescens</i> P	Ch E 1906-09	o	NC		whau. Bush margins, but often difficult to tell whether natural or planted
<i>Ficus carica</i> *	E 1970-77	ex ⁿ	D		fig. Colony in Wattle Valley eradicated 2004-05; 2 cultivated bushes still present by the Visitors Centre
<i>Geniostoma ligustrifolium</i> P	E 1970-77	c	I		hangehange. In all main forest areas and shrubland slopes. UNITEC2156
<i>Hakea salicifolia</i> *	1987	ex†	A	W	willow-leaved hakea. Single plant c.1.5 m tall x 2 m wide appeared amongst teatree/ferm/mingimingi, upper Lighthouse Valley. AK276686
<i>Hebe stricta</i> var. <i>stricta</i> P	Ch E 1906-09	o	NC		koromiko. Shrubby coastal slopes, nowhere common (presumed = <i>Veronica salicifolia</i> of Cheeseman's list). AK317171, UNITEC2163
<i>Hedyocarya arborea</i> P	E 1970-77	c	I		pigeonwood. In all main forest areas, seedlings and saplings locally common. AK272526, UNITEC2155
<i>Hypericum androsaemum</i> *	1998	ex†	A	Bi	Single plant, Fishermans Bay near track under a pōhutukawa. AK234637
<i>Knightia excelsa</i> P	E 1970-77	s	D		rewarewa. Single emergent tree above canopy in Bush 1 (with a kaka nest box attached) and c.3 smaller ones above the bandstand in Bush 1; no wild seedlings observed. AK272525
<i>Kunzea</i> aff. <i>ericoides</i> P	Ch E 1906-09	lc	NC		kānuka. Main canopy tree (to 80cm dbh) in the upper forested valleys of Bush 1, 21 & 22, along the flanks of broadleaf forest in the lower valley; widely planted, but little regeneration (= <i>Leptospermum ericoides</i> of Cheeseman's list & of Esler). AK300558, UNITEC2402
<i>Leptospermum scoparium</i> P	C,Ch E 1905	o	D		mānuka. Persisting on the steep, coastal slopes and some upper bush areas (e.g. Bush 21); Cheeseman noted "pink flowered var." for one of the mānuka specimens sent by Hansen; white and pink-flowering forms have been planted from island stock; all the pink-flowering plants we saw were planted, e.g. AK 313748. AK271017 & 313748
<i>Leucopogon fasciculatus</i>	Ch E 1906-09	o-lc	D		mingimingi. Most frequent on steep, coastal slopes, often low and spreading when exposed; scattered inland plants on margin of rank pasture (= <i>Cyathodes fasciculata</i> of Esler). UNITEC2083
<i>Ligustrum lucidum</i> *	E 1970-77	ex†	D		tree privet. As a hedge around the lighthouse keepers house and bunkhouse, former hedge removed in 1995 and the latter in 2007, last juveniles recorded by Weed Team in 2006-07
<i>Ligustrum sinense</i> *	1992	ex†	A	Bi	Chinese privet. It has only been recorded in low numbers, the first were 3 juvenile trees at the top of Bush 2; seedlings occur under bird roosts, last recorded seedlings by Weed Team were in 2005-06
<i>Litsea calicaris</i> P	Ch E 1906-09	ex	D		mangeo. Single wild tree in Bush 1 died in 1999, cuttings were taken but were unsuccessful

<i>Lycium ferocissimum</i> *	E	1970-77	I†	D	boxthorn. Used to be common on coastal slopes around NE Bay and on Wooded I., and scattered generally along the northern coasts; since 1995 managed on main island where it has been systematically cut and poisoned at all sites, and managed on Wooded I. since 2005; presently small populations and regrowth shoots are being managed from Paa Point northwards around to Fishermans Bay and also on Wooded I. AK254870
<i>Malus ×domestica</i> *		2006	s ⁿ	A	H apple. A large wild flowering tree near Papakura Pa was cut down c.2002; smaller plants by Bush 1, L&S block, and rough pasture near the workshop in 2006
<i>Melia azedarach</i> *		2001	s	A	Bi bead tree. Single seedling in Bush 1. AK255398
<i>Melicope ternata</i> P	Ch	1906-09	I	NC	wharangi. A few in forested valleys; also planted
<i>Melicytus novae-zelandiae</i>	Ch	1906-09	o-lc	I	coastal māhoe. Main population around NE Bay coast, with scattered plants occurring down to Pōhutukawa Cove on E coast and NW Point on the W, also on Wooded I.; shrubs low-lying in exposed sites and up to 3m tall where sheltered; leaves pale green (= <i>Hymenanthera latifolia</i> of Cheeseman's list, & <i>H. novae-zelandiae</i> of Esler). AK304885, UNITEC2417
<i>Melicytus ramiflorus</i> P	Ch	1906-09	o-lc	I	māhoe. Present in the canopy of all forested valleys and shrublands, seedlings usually also present. AK272520
<i>Meryta sinclairii</i> **		2006	I	A	PI puka. Three wild seedlings near the 2 planted adults by toilet block, and 2 seedlings (to 1.3 m tall) Chinaman's Bay c.200m distant from planted adults. AK321601
<i>Metrosideros excelsa</i> PP	C	1905	c	I	pōhutukawa. Splendid large trees dominant the coastal cliffs (often standing alone) and their emergent heads protrude from the forested valley canopies; also on Wooded I. The large tree with a canopy spread of 55m mentioned by Esler lost one of its major limbs in 1988 during cyclone Bola, however, there are nearly comparable-sized trees still present. AK254847
<i>Myoporum insulare</i> * × <i>M. laetum</i> **		2010	o	A	PI Australian ngaio (<i>M. insulare</i>) has been present as a remnant hedge by the lighthouse complex since at least the 1970s; much of the planted ngaio for revegetation appears to be of hybrid origin (including 4 shrubs on Wooded I.), some of the wild seedlings along the coast appear to also be of hybrid origin. AK314025, 318479
<i>Myoporum laetum</i> P	E	1970-77	o	I	ngaio. Coastal plants at Hobbs Beach, and along the E coast from Lighthouse Bay to E Lighthouse Bay appeared to be the NZ species (obvious leaf glands, dark leaf buds and large flowers), other plants (mainly young plants) along the NE coast matched this species but the leaf buds were green; otherwise the plants seen were hybrids; including 4 planted on Wooded I. AK272519, UNITEC2162, 2413
<i>Myrsine australis</i>	C	1905	o-lc	D	māpou. Most common as a canopy cover on margins of forested valleys, open creek margins, and in coastal shrublands. AK232853, UNITEC2160
<i>Nestegis lanceolata</i>		1991	s	A	Bi white maire. Only 1 tree known, c.2m tall in 1991, now c.8m tall, in bush near Paa Point. AK278795, UNITEC2403
<i>Olea europaea</i> subsp. <i>europaea</i> *	E	1970-77	s†	D	olive. Shrub c.1.5m tall cut out of Pōhutukawa Cove in 1993, a large tree cut out of NE Bay in pre-2004, and low spreading plant spotted on steep slope S of No Name Bay in 2010 (to be felled later) (wrongly referred to as African olive in some weed reports). AK215100
<i>Olearia furfuracea</i>	Ch	1906-09	o	D	akepiro. Widespread in steep coastal shrublands but nowhere common
<i>Ozothamnus leptophyllus</i>	C,Ch	1905	o	NC	tauhinu. Exposed coastal slopes and cliff tops (= <i>Cassinia retorta</i> of Cheeseman's list & of Esler)
<i>Paraserianthes lophantha</i> *	E	1970-77	lc ⁿ	NC	brush wattle. Originated from a planting of 6 trees in the lighthouse shelterbelt in the 1940s; spread and contained by active management to Wattle Valley where it is still common (= <i>Albizia lophantha</i> of Esler). AK300062, UNITEC2075-77
<i>Persea americana</i> *		2008	s ⁿ	A	H avocado. Single reord c.1.2m tall, behind Fishermans Bay (Jan Butcher pers. comm.) removed?
<i>Pimelea urvilleana</i>	Ch	1906-09	s	I	Single record at Fishermans Bay by G. Hambly in 1995 (Walter 1995: p.6); not seen by us (= <i>P. laevigata</i> var. of Cheeseman's list); also x1 cultivated at Visitors Centre
<i>Piper excelsum</i> subsp. <i>excelsum</i> P	Ch	1906-09	o-lc	I	kawakawa. Present in all forested valleys as an understory shrub, also in windswept coastal shrublands, frequently with flax; two forms present, one with dull leaves, the other with shiny leaves and over-lapping leaf bases match the "Hauraki Gulf" form of Gardner (1997) and the earlier records of Cheeseman's list & of Esler (= <i>Piper excelsum</i> var. <i>major</i> of Cheeseman's list, & <i>M. excelsum</i> var. <i>majus</i> of Esler). AK300582, UNITEC2079

<i>Pittosporum crassifolium</i> PP	E	1970-77	o-c	I	karo. Widespread coastal shrub in all size classes, including rock stacks on E side and Wooded I; often associated with taupata. UNITEC2122
<i>Pittosporum tenuifolium</i>	E	1970	Ex	D	kōhūhū. Noted by Esler at the head of Bush 22 in 1970, but he didn't see it subsequently; not seen by us
<i>Pittosporum umbellatum</i> ** P		2010	s	A	PI Two wild seedlings (Barbara Walter pers. comm.) near planted adults (seed ex Little Barrier I, >100 planted; x3 seen 5-7m tall in 2006), Wattle Valley. UNITEC2219
<i>Planchonella costata</i> P	E	1970-77	o-lc	I	tawāpou. Few adult trees present on coast and forested valleys; in lower Bush 22 >100 seedlings near several adult trees; seedlings also frequent in Bush 21. AK272523, UNITEC2124
<i>Polygala myrtifolia</i> *		1996	lc†	A	W sweet pea shrub. Confined to northern part of island from about a line north of NW Point; many localities in open shrublands, pasture and coastal slopes; all localities monitored and seedlings, saplings and adults still being removed. AK229593 & 299060, UNITEC2406
<i>Pomaderris amoena</i>	Ch	1906-09	I	NC	tauhinu. Open coastal slopes and artificial dam margins on bare clay in northern part of the island (= <i>P. phyllicifolia</i> of Cheeseman's list & of Esler). AK314015, UNITEC2131
<i>Pomaderris kumeraho</i> P	Ch	1906-09	o	I	kūmerahou. The first record after Cheeseman's list was a single shrub by Paa Point in 1986; there are now scattered plants present, but difficult to be sure if planted or wild (= <i>P. elliptica</i> of Cheeseman's list). UNITEC2057
<i>Prunus × domestica</i> *	E	1970-77	ex†	D	plum. Unhealthy old tree near the head of Bush 21 in early 2000s (H. Lindsay pers. comm.) (= single wild tree recorded by Esler as <i>Prunus</i> sp.?)
<i>Prunus persica</i> *		2003	s†	A	H peach. Two plants: on the bank above the wharf; and head of true left valley above Emergency Landing - both removed
<i>Pseudopanax arboreus</i> P	E	1970-77	lc	I	whauwhaupaku. Present in all size classes in most bush areas. UNITEC2418
<i>Pseudopanax crassifolius</i> × <i>P. lessonii</i>		1981	s	A	Bi Single 1.5m tall plant under kohekohe in Bush 1. First record C&W. AK271024
<i>Pseudopanax lessonii</i>	E	1970-77	lc	I	houpara. Scattered along the coast, abundant at Pōhutukawa Cove. WELT85995, UNITEC2123
<i>Quercus robur</i> *		1996	s ^o	A	H oak. Single seedling c.20cm tall, entrance to Wattle Valley, removed (Walter 1996; p.6)
<i>Rosa rubiginosa</i> *	E	1970-77	ex†	D	sweet briar. Never common, the few scattered sites are monitored; last record was a juvenile behind the bunkhouse (2007-08)
<i>Solanum aviculare</i> P	Ch	1906-09	Ex	D	poroporo. On Cheeseman's list; not seen by Esler or us; a trial planting in 1987 failed
<i>Solanum betaceum</i> *		2000s	ex†	A	H tamarillo. Seedlings close to cultivated plants by the bunkhouse - adults and seedlings removed
<i>Solanum mauritianum</i> *		2003-04	ex†	A	Bi woolly nightshade. Single record - 1 large seedling adult on margin of bracken below Bush 2
<i>Sophora chathamica</i> **		2006	lc	A	PI kōwhai. Regenerating under planted pōhutukawa, seed source from widely planted kōwhai (ex Hen I., Rangitoto I., & Whangaparaoa Penin.). Although kōwhai seed used to naturally be present along the drift line before it was ever planted on Tiri, it did not manage to self establish (Carol West pers. comm.). AK300605, UNITEC2411
<i>Streblus heterophyllus</i>	E	1970-77	I	NC	tūrepo/milk tree. A few plants in Bush 1, tallest >5m with galled branchlets, local regeneration (= <i>Paratrophis microphylla</i> of Esler). AK271008, UNITEC2054
<i>Syzygium smithii</i> *		2002-03	ex	A	Bi monkey apple. A single seedling in Wattle Valley (uprooted) - no adults on the island; not seen by us
<i>Toxicodendron succedaneum</i> *		2000	ex†	A	Bi Japanese wax tree. First record two 1.5m plants and 2 seedlings in Bush 2; followed mainly by seedlings under starling roosts and a 3m plant in Bush 3, Wattle Valley and Pumphouse Creek, the last record was in 2005-06; not seen by us (= <i>Rhus</i> sp. of the weed reports). AK251140, 280991 & 282614
<i>Ulex europaeus</i> *	E	1970-77	o-lc	I	gorse. Widespread, but most common at the northern end where it forms pure patches, otherwise more as scattered individuals/small patches on steep coastal slopes; most will ultimately be shaded out by regeneration in most places, however, on exposed coastal slopes, rank pasture and around artificial ponds it is expanding; currently only controlled on track margins
<i>Vitex lucens</i> P	E	1970-77	s	NC	PI ōpūriri. Only 2 original trees present; emergent canopy tree in upper Bush 1 with a divided trunk c.1m diameter; another canopy tree in upper Bush 21 with associated seedlings; widely planted on the island and many of these are now fruiting (seed local trees & Puriri Drive street trees in Epsom)

DICOT CLIMBERS & RELATED TRAILERS (13 + 10)

<i>Araujia hortorum</i> *		1983	I†	A	W	moth plant. Currently being managed at sites throughout the island, but very few adults now being found. First record C&W as <i>A. sericeifera</i>
<i>Calystegia sepium</i> subsp. <i>roseata</i>	E	1970-77	lc	NC		pink bindweed. Mainly swampy creek and artificial pond margins in the open. AK217694 & 254858
<i>Calystegia soldanella</i>	Ch	1906-09	lc	NC		shore bindweed. Widespread - back of all sandy beaches - the inland extensions mentioned by Esler is more likely to be the hybrid taxon (EKC pers. obs.). AK217698
<i>Calystegia soldanella</i> × <i>C. tuguriorum</i>	[E]	1970	l	NC		hybrid bindweed. An intermediate form in open or through rank pasture, from coast to cliff tops, e.g. Wattle Valley, NW Point, Pōhutukawa Cove, Fishermans Bay to Lighthouse Bay (collected and included by Esler under <i>C. soldanella</i> , AK 217699). AK217699, 300507, 300599 & 314262
<i>Calystegia tuguriorum</i>	Ch	1906-09	Ex	D		On Cheeseman's list; not seen by Esler or us, however, a presumed hybrid with this species was recorded
<i>Clematis ?cunninghamii</i>	Ch	1906-09	Ex	D		On Cheeseman's list as "perhaps <i>C. parviflora</i> "; not seen by Esler or us
<i>Clematis paniculata</i>	Ch	1906-09	o	NC		clematis. Only observed in the main forested valleys (= <i>C. indivisa</i> of Cheeseman's list). UNITEC2153-54
<i>Cucurbita maxima</i> *	[E]	[1970-77]	s	NC		pumpkin. Single small plant in disturbed area by bunkhouse - from compost waste? (= <i>C. pepo</i> of Esler?). AK300581
<i>Dipogon lignosus</i> *	E	1970-77	I†	I		mile-a-minute. Spread from the lighthouse shelterbelt down to Lighthouse Valley and Lighthouse Bay; now being managed there and at one outlier No Name Bay (= <i>Dolichos lignosus</i> of Esler). AK222063
<i>Elaeagnus ×reflexa</i> *		1994	ex†	A	G	elaegagnus. Originally a hedge in lighthouse complex; it was a large spreading tangle there 1994 (behind the bach), chain sawed down shortly later, monitored since then; occasional seedlings/regrowth found in that vicinity, AK222344
<i>Hedera helix</i> *		2006	ex†	A	Bi	ivy. Single seedling in Wattle Valley
<i>Ipomoea cairica</i>	Ch	1906-09	lc	I		coastal morning glory. Large spreading mats in the open through rank pasture at Fishermans Bay from the back of the beach to the cliff tops (Fig. 4); most the usual mauve-flowering form, however, the colony along the cliff tops is white-flowering with mauve restricted to inside the corolla throat (= <i>Ipomoea palmata</i> of Cheeseman's list & Esler). AK7382-83, 254850 & 271021, UNITEC2214
<i>Lonicera japonica</i> *	E	1970-77	ex†	D		Japanese honeysuckle. Garden escape from the lighthouse complex; well established in the southern part of the island, especially Wattle & Little Wattle Valleys in the early 1980s (1 occurrence in Bush 22), actively managed since 1984, including herbicide spraying; occ. new populations are found, but now mainly reduced to a few juveniles occurring at known southern sites. AK230330
<i>Metrosideros fulgens</i>	Ch	1906-09	Ex	D		On Cheeseman's list as <i>M. scandens</i> ; not seen by Esler or us
<i>Muehlenbeckia australis</i>	Ch	1906-09	l	NC		pōhuehue. A few vines on bush/track margins. UNITEC2071
<i>Muehlenbeckia complexa</i>	C,Ch	1905	o-la	I		pōhuehue. Tangles in open along coastal slopes including Wooded I., large patches in microaena meadows, and high-climbing (4-5m) and smothering many of the plantings along trackside margins - many of these latter plants appear to be hybrids with <i>M. australis</i> . AK275753-54 & 313747, UNITEC2164; AK300556 (hybrid?)
<i>Parsonia heterophylla</i>	Ch	1906-09	l	NC		Present as a liane in the main forested valleys on ground and high-climbing. AK272528-29, UNITEC2410
<i>Passiflora edulis</i> *		1993	ex†	A	H	passionfruit. At least 3 vines found - Wattle Valley in 1993 & 1998 and another in Bunkhouse Valley in 2006-07; not seen by us. AK236681
<i>Passiflora ?tarriminiana</i> *		1995	ex†	A	H	banana passionfruit. First vine was on margin of Wharf Road; also at least 2 vines and several seedlings removed between 2002-06, 1 was fruiting, all records from Wattle Valley; not seen by us (recorded as <i>P. mollissima</i> in the weed reports)
<i>Rosa multiflora</i> *		1991	l†	A	G	Scrambling through rank pasture NE of lighthouse, almost eradicated. AK207277

<i>Sicyos mawhai</i>	Ch	1906-09	Ex	D		māwhai. Known only from a collection from Goat Rock [Wooded I.] by Hansen (Cameron 2013), Cheeseman's list and a letter by Hansen to Cheeseman saying that the vines on Goat Rock attain great length, nearly 9m; not seen by Esler, us, or Taylor & Tennyson (1999) who surveyed Wooded I. (= <i>S. angulata</i> of Hansen). AK 9198	
<i>Tetragonia implexicoma</i>	E	1970-77	lc	I		native spinach. Widespread around the coast in open and partial shade on rocky slopes (incl. on rock stacks and Wooded I.), back of sandy beaches, and well in from the coast under pōhutukawa canopy (= <i>T. trigyna</i> of Esler). AK269646	
<i>Tropaeolum majus</i> *	E	1970-77	Ex	D		nasturtium. Recorded by Esler at the lighthouse station; not seen by us	
DICOT HERBS - DAISIES (17 + 36)							
<i>Ageratina adenophora</i> *		1983	l†	A	W	Mexican devil. By the early 2000s it was widespread in the southern part of the island with the main population in Wattle Valley, and 2 occurrences to the north (Bush 2 & 22); a few adults and juveniles are still being removed at known sites. First record C&W as <i>Eupatorium adenoporum</i>	
<i>Ageratina riparia</i> *		1994	ex†	A	W	mist flower. Single patch first found in Wattle Valley, last seen on the island in 2003-04 at same locality. AK220773	
<i>Arctotheca calendula</i> *	E	1970-77	o	NC		Cape weed. Grassy and open bare areas, especially cliff tops, from N Point and down the E coast to Pumphouse Creek (= <i>Cryptostemma calendula</i> of Esler). AK317880, UNITEC2377	
<i>Aster subulatus</i> *	E	1970-77	o-lc	I		sea aster. Mainly track and artificial pond margins. AK313746	
<i>Bellis perennis</i> *		2006	l	A	H	lawn daisy. In mown lawn by lighthouse complex and a few in Coronary Hill lawn	
<i>Cirsium arvense</i> *		2007	s	A	H	California thistle. Single patch in pasture by Kawerau Track just below Bush 1 forest	
<i>Cirsium vulgare</i> *	E	1970-77	o ⁿ	D		Scotch thistle. Widespread, mainly as individuals on track margins, coastal slopes and rank pasture	
<i>Carduus tenuiflorus</i> *	Ch	1906-09	l†	D		winged thistle. Was more common in pasture in the 1980s (C&W), now mainly reduced to edge of pasture in Lighthouse paddock (presumed = <i>C. pycnocephalus</i> of Cheeseman's list & <i>C. nutans</i> of annual weeding reports). AK254856	
<i>Carthamus lanatus</i> *		2006	ex ⁿ	A	S	saffron thistle. A couple of apparent grubbed up adults and an adjacent seedling in a disturbed site in Lighthouse paddock – no others seen. AK298019	
<i>Centaurea solstitialis</i> *	Ch	1906-09	Ex	D		yellow star thistle. On Cheeseman's list; not seen by Esler or us	
<i>Centaureum erythraea</i> *	Ch	1906-09	l	NC		centaury. Scattered individual plants on open coastal slopes (= <i>Erythraea centaureum</i> var. <i>pulchella</i> of Cheeseman's list). AK275577, UNITEC2376	
<i>Centipeda ?aotearoana</i>	E	1970-77	Ex	D		Recorded as <i>C. orbicularis</i> by Esler; but not seen by us	
<i>Conyza bonariensis</i> *		2006	l	A	H	wavy-leaved fleabane. A few patches along mown Ridge Road and Lighthouse lawn. AK300555	
<i>Conyza sumatrensis</i> *	Ch	1906-09	o-lc	NC		fleabane. Throughout in most disturbed and open areas, some plants in sheltered places were up to 2.36m tall (= <i>Erigeron linifolius</i> of Cheeseman's list & <i>E. floribundus</i> of Esler). AK276476	
<i>Cotula australis</i>	Ch	1906-09	o-lc	NC		soldier's button. Seasonally obvious along open track margins, coastal slopes mown areas and Wooded I. AK300597, UNITEC2223	
<i>Cotula coronopifolia</i>	Ch	1906-09	l	D		bachelor's button. By seeps over coastal rocks, e.g. N Fishermans Bay. UNITEC2125	
<i>Crepis capillaris</i> *	E	1970-77	o	NC		hawksbeard. Track margins and mown pasture	
<i>Erechtites valerianifolia</i> *		1991	l ⁿ	A	W	Brazilian fireweed. A few by open creeks (Little Wattle & Lighthouse) and 1 present in bracken fernland; more common in 1991. AK207276	
<i>Erigeron karvinskianus</i> *		2003-04	ex†	A	H	Mexican daisy. 2 seedlings on Wattle Valley Track, then a flowering plant in 2004-05 in upper Bush 21; not seen by us	
<i>Euchiton audax</i>	[E]	1970	Ex	D		creeping cudweed. Collected by Esler on 'dry sunny coastal slopes' but included by him within <i>E. collinus</i> (= <i>Gnaphalium gymnocephalum</i>) at that time; not seen by us, but coastal habitat still present. AK217344, CHR 219963	

<i>Euchiton involucreatus</i>	E	1970-77	I	NC	creeping cudweed. Grassy margins of tracks and by Wharf pond (= <i>Gnaphalium involucreatum</i> of Esler). AK300504 & 300583, CHR 219964
<i>Euchiton japonicus</i>	Ch	1906-09	o	D	creeping cudweed. Grassy track margins, sunny banks and open areas between plantings (presumed = <i>Gnaphalium collinum</i> of Cheeseman's list, & <i>Gnaphalium gymnocephalum</i> of Esler). AK217343, CHR 219966, UNITEC2387
<i>Euchiton sphaericus</i>	Ch	1906-09?	I	I	Japanese cudweed. Track margins and open areas between plantings (= <i>Gnaphalium japonicum</i> of Cheeseman's list, & <i>G. sphaericum</i> of Esler). UNITEC2349
<i>Gamochaeta calviceps</i> *	E	1970-77	I	NC	silky cudweed. Mown track (Wharf Road) and around disturbed areas by workshop (= <i>Gnaphalium calviceps</i> of Esler). AK300565, UNITEC2348
<i>Gamochaeta coarctata</i> *	E	1970-77	o	NC	purple cudweed. Widespread herb of mown tracks and lawns, track margins and open areas between plantings (= <i>Gnaphalium spicatum</i> of Esler). AK300567
<i>Gamochaeta simplicicaulis</i> *	E	1970-77	o-lc	NC	Open coastal slopes, track margins and open areas between plantings (= <i>Gnaphalium simplicicaule</i> of Esler). AK276474 & 230331
<i>Gamochaeta subfalcata</i> *		1985	I	A	silky cudweed. Only site is lower Wharf Road margin near artificial pond in 1985 & 2006. First record C&W as <i>Gnaphalium subfalcatum</i> . AK176668 & 275453
<i>Helminthotheca echinoides</i> *	Ch	1906-09	o-lc	NC	ox-tongue. Disturbed areas, especially around the lighthouse complex, also mown track margins and back of beaches (= <i>Helminthia echinoides</i> of Cheeseman's list & <i>Picris echinoides</i> of Esler)
<i>Hypochaeris glabra</i> *	E	1970-77	o	NC	smooth catsear. Open sites, track and creek margins, and microlaena meadows. AK300505
<i>Hypochaeris radicata</i> *	Ch	1906-09	lc	NC	catsear. Open sites, track and creek margins, mown areas, and microlaena meadows. Some individuals appeared intermediate of the two species, i.e. AK 300506 & 300587. AK254862 & 275758
<i>Lagenophora pumila</i>	Ch	1906-09	s	D	Single, shady locality amongst other native herbs under pohutukawa near Paa Point (= <i>L. forsteri</i> of Cheeseman's list). AK217651, UNITEC2357
<i>Lapsana communis</i> *	E	1970-77	Ex	D	nipplewort. Recorded by Esler; not seen by us
<i>Leontodon taraxacoides</i> *	E	1972	Ex	D	hawkbit. Esler recorded it as "occasional in pastures in 1972, but not seen ... recently"; surprisingly not seen by us because suitable coastal habitat is still present
<i>Matricaria discoidea</i> *	E	1970-77	lc	I	rayless chamomile. On several of the mown tracks in the open (= <i>Matricaria matricarioides</i> of Esler). AK299048, UNITEC2384
<i>Pseudognaphalium luteoalbum</i>	Ch	1906-09	I	NC	Jersey cudweed. Coastal rocks, and margin of one of the artificial ponds in the N (= <i>Gnaphalium luteo-album</i> of Cheeseman's list, & Esler)
<i>Senecio angulatus</i> *	E	1970-77	st†	I	Cape ivy. Esler recorded it spreading from a planted hedge at the lighthouse station; around the mid-1990s it reached its peak dominating >30 x 100m of pasture on the main ridge on the N side of the lighthouse complex before eradication was initiated in 1996; very occasional plants still occurring in this area. AK207275, 212287, 271020
<i>Senecio bipinnatisectus</i> *	E	1970-77	o	NC	Australian fireweed. Disturbed areas, usually along mown track margins and around the lighthouse complex; it was more common in 1985 as a weed in cleared areas for planting. AK314027
<i>Senecio bipinnatisectus</i> * × <i>S. diaschides</i>		2007	I	I	fireweed hybrid. Present along with both suspected hybrid parents, grassy track margin (Ridge Track)
<i>Senecio diaschides</i>		2006	o-lc	A	fireweed. Widespread in rank pasture, track margins and coastal slopes, including back of Hobbs Beach; often growing with other fireweed species. AK300534, UNITEC2346
<i>Senecio esleri</i>		1994	o	A	Esler's fireweed. Disturbed areas of pasture, roadsides, cliffsides and rocky coast on S third of island. AK222345
<i>Senecio glomeratus</i> × <i>S. hispidulus</i>		2006	I	A	fireweed hybrid. Present along with both suspected hybrid parents, grassy track margins. AK300528
<i>Senecio glomeratus</i>		1985	I	A	fireweed. By wetland in Lighthouse Valley, an artificial pond near N end, and track margins; it was more common in 1985 as a weed in cleared areas for planting. First record C&W. AK275450
<i>Senecio hispidulus</i>	Ch	1906-09	lc	NC	fireweed. Main habitat is now mown track margins, road margins and less commonly coastal slopes; it was more common in 1985 as a weed in cleared areas for planting; also on Wooded I. (= <i>Erechtites hispidula</i> of Cheeseman's list). AK314034

<i>Senecio lautus</i>	Ch	E	1906-09	lc	NC	shore groundsel. Widespread on coastal rocks in the open or light shade under pōhutukawa within reach of salispray, including Wooded I. AK219199, 269644 & 275568, UNITEC2358
<i>Senecio quadridentatus</i>			2000	I	A	W cotton fireweed. A single record by Cameron Kilgour on track margin amongst grass under an open pōhutukawa tree; 8 plants present; NE end of island. AK251139
<i>Senecio scaberulus</i>	Ch	[E]	1906-09	Ex	D	fireweed. On Cheeseman's list as <i>Erichites scaberula</i> ; collected by Esler in 1970 as <i>Erechites</i> ; not seen by us which is consistent with the overall decline of this NZ endemic threatened species (= <i>Erechites scaberula</i> of Cheeseman's list). CHR219967
<i>Senecio skirrhodon</i> *			1985	s	A	W gravel groundsel. First record was a single plant in Pumphouse Creek (C&W), and then a single plant at the N end of the island in 2010. AK176671 & 318740
<i>Senecio syhaticus</i> *		E	1970-77	Ex	D	wood groundsel. Recorded by Esler from a single locality in the north-west; not seen by us
<i>Sigesbeckia orientalis</i> *	Ch		1906-09	Ex	D	On Cheeseman's list; not seen by Esler or us
<i>Soliva sessilis</i> *			2006	lc	A	H Onehunga weed. Mown tracks and lighthouse complex lawns, all achenes seen were the unwinged form. AK300553
<i>Sonchus asper</i> *		E	1970-77	s	NC	prickly sow thistle. A few plants in a disturbed area in the lighthouse complex in 2007. AK300575
<i>Sonchus oleraceus</i> *	Ch	E	1906-09	o	D	sow thistle. Widespread but no where common, open coastal slopes and disturbed areas in lighthouse complex, also on Wooded I. AK254865
<i>Taraxacum officinale</i> *	Ch	E	1906-09	I	D	dandelion. Only c.5 plants seen: Lighthouse complex lawn, main Ridge Track and mouth of Pōhutukawa Creek. UNITEC2082

DICOT HERBS - excl. Daisies (55 + 110)

<i>Acaena agnipila</i> var. <i>aequispina</i> *	E		1970-77	ex	D	Present in rank pasture at least until 2000; not seen by us since then. AK251558, 272527 & 275451, UNITEC2394
<i>Acaena anserinifolia</i>	Ch	E	1906-09	I	NC	bidibid. Patches in rank microlaena pasture throughout (= <i>A. sanguisorbae</i> of Cheeseman's list). AK315065
<i>Acaena novae-zelandiae</i>	E		1970-77	lc	NC	bidibid. Patches in rank microlaena pasture and mown areas throughout. AK230332, UNITEC2096
<i>Alternanthera nahui</i>			2008	I	A	H,Be nahui. In lawn by Visitors Centre (near old nursery site); and free-floating in upper Silvester artificial pond near NE Point. AK301529 & 314020
<i>Anagallis arvensis</i> var. <i>arvensis</i> *	Ch	E	1906-09?	o-lc	I	scarlet pimpernel. Widespread from open coastal slopes to track and rank pasture margins (presumed = <i>A. arvensis</i> of Cheeseman's list). UNITEC2217
<i>Anagallis arvensis</i> var. <i>coerulea</i> *		E	1970-77	o	D	blue pimpernel. Mainly E coastal sites, but also in disturbed lawn site near bunkhouse (= <i>A. foemina</i> of Esler). AK300508, UNITEC2218
<i>Aphanes inexpectata</i> *	E		1970-78	I	D	parsley piert. Scattered tiny annual plants on bare clay on cliff-top track above Lighthouse Bay, also on rocks at Emergency Landing. AK301021
<i>Apium nodiflorum</i> *			2006	s	A	H water celery. 3 small populations: by Visitors Centre; depression margin of Ridge Track; and free floating in upper artificial pond Silvester wetland by NE Point. AK299047 & 314020, UNITEC2366
<i>Apium prostratum</i> var. <i>prostratum</i>	Ch	E	1906-09	o-lc	I	NZ celery. Scattered along the coast within reach of salt spray (= <i>A. australe</i> of Cheeseman's list). AK272403, UNITEC2090
<i>Atriplex prostrata</i> *	E		1970-77	o-lc	NC	orache. Widespread coastal high tide fringe on sandy and gravel beaches (= <i>A. hastata</i>). AK271022
<i>Beta vulgaris</i> *	E		1970-77	Ex†	D	beet. Recorded by Esler; but not seen by us
<i>Brassica rapa</i> subsp. <i>syhensis</i> *	E		1970-77	lc	NC	wild turnip. >50 plants, cliff-top and down adjacent steep coastal slope, E coast, in front of cottage near Visitors Centre (= <i>B. campestris</i> of Esler). AK299044-45, UNITEC2355
<i>Cakile edentula</i> *	E		1970-78	Ex	D	sea rocket. Recorded by Esler; not seen by us. <i>Cakile maritima</i> has now replaced this species throughout much of its New Zealand range (Cousens & Cousens 2011)

<i>Cakile maritima</i> *	E	1970-78	lc	I	sea rocket. Back of beaches at Hobbs, NE, No Name, and Fishermans Bays. AK218232, UNITEC2091-92
<i>Callitriche muelleri</i>	Ch	1906-09	l	D	starwort. Small patches in damp muddy hollows on tracks or creek margins in Wattle & Lighthouse Valleys and Bush 22
<i>Callitriche stagnalis</i> *	E	1970-77	l	I	starwort. Coastal seep (N Fishermans Bay rocky headland), artificial ponds (Wharf Pond) and damp muddy hollows by creeks (Bush 22)
<i>Capsella bursa-pastoris</i> *	E	1970-77	o	I	shepherd's purse. Mown tracks and mown Lighthouse pasture. AK300595, UNITEC 2369
<i>Cardamine debilis</i> agg.	Ch	1906-09	Ex	D	On Cheeseman's list as <i>C. hirsuta</i> ; not seen by Esler or us
<i>Centella uniflora</i>	E	1970-77	l	NC	Lawns, mown pasture, open creek margins and open shrubland in southern part of island. UNITEC2229
<i>Cerastium fontanum</i> *	E	2006	l	A	mouse ear-chickweed. Single population margin of Grahams Road on bank amongst rank grasses. AK300552, UNITEC2374
<i>Cerastium glomeratum</i> *	Ch	1906-09	o	NC	annual mouse ear-chickweed. Mown lawns, track margins and open coastal slopes
<i>Chenopodium album</i> *	E	1970-77	Ex	D	fathen. Recorded by Esler; but not seen by us
<i>Chenopodium murale</i> *	E	1970-77	Ex	D	nettle-leaved fathen. Recorded by Esler; but not seen by us
<i>Chenopodium pumilio</i> *	E	1970-77	s	D	clammy goosefoot. Several plants in full sun, track margin by Hobbs Beach. AK301527
<i>Conium maculatum</i> *	E	1970-77	l†	D	hemlock. Margins of mown tracks and around the lighthouse complex; managed since 1991; only seen by us around the lighthouse complex. AK299069
<i>Convolvulus arvensis</i> *	E	1970-77	Ex	D	field bindweed. One small population recorded by Esler; not seen by us. AK220973, UNITEC2350
<i>Crassula decumbens</i> *	E	2007	l	A	Scattered tiny annual plants on bare clay on cliff-top track above Lighthouse Bay, also on rocky outcrops at Emergency Landing, N Fishermans Bay, and Wooded I. AK300594, 300596, 318470
<i>Crassula sieberiana</i>	Ch	1906-09	lc	NC	Mainly on sunny coastal slopes and rocky outcrops on E and NW coast, also on Wooded I. (= <i>Tillaea sieberiana</i> of Cheeseman's list & of Esler). AK300498, 318467, 318477
<i>Daucus carota</i> *	E	1970-77	l ^a	NC	wild carrot. Two small populations on open mown track margins
<i>Daucus glochidiatius</i>	Ch	1906-09	Ex	D	On Cheeseman's list as <i>D. brachiatus</i> , and recorded by Esler; not seen by us
<i>Dichondra</i> aff. <i>brevifolia</i>	Ch	2007	l	A	N end of Fishermans Bay, small patches, on top exposed rock just above splash zone. AK300599
<i>Dichondra repens</i>	C,Ch	1905	o-a	NC	Mercury Bay weed. Most abundant under pōhutukawa canopy (wild & planted), also in shrublands, mown pasture, track margins, coastal slopes, back of beaches, rocky headlands and Wooded I. AK269645, UNITEC2391
<i>Disphyma australe</i>	C,Ch	1905	c	NC	NZ ice-plant. Widespread mats on coastal rocks and stacks, incl. Wooded I.; most luxuriant in seabird guano sites (= <i>Mesembryanthemum australe</i> of Cockayne & of Cheeseman's list)
<i>Drosera auriculata</i>	Ch	1906-09	l	D	sundew. Steep coastal slopes on clay, E side of island (H Lindsay pers. comm.)
<i>Duchesnea indica</i> *	E	1970-77	o-lc	I	Indian strawberry. Widespread in a variety of habitats, often in damp areas of shaded forest, and shaded or sunny margins of artificial ponds, mown areas and track margins. UNITEC2390
<i>Einadia triandra</i>	Ch	1906-07	o-lc	I	Widespread around the rocky coast, in sunny and semi-shaded sites, also on Wooded I. (= <i>Rhagodia nutans</i> of Cheeseman's list; Esler's collection of <i>Rhagodia triandra</i> was <i>E. trigonos</i>). AK300510, UNITEC2127
<i>Einadia trigonos</i> subsp. <i>trigonos</i>	[E]	1970	o-lc	I	Widespread around the rocky coast, in sunny and semi-shaded sites, frequently occurring with <i>E. triandra</i> but was more frequent, also on Wooded I. (Esler's collection of <i>Rhagodia triandra</i> was this species). AK219279, UNITEC2370
<i>Epilobium billardiereanum</i>	Ch	1906-09	Ex	D	On Cheeseman's list but not seen by Esler or us
<i>Epilobium chionanthum</i>	Ch	1906-10	Ex	D	On Cheeseman's list; but not seen by Esler or us

<i>Epilobium ciliatum</i> *	E	1970-77	I	D	tall willowherb. By Visitors Centre near old nursery area	
<i>Epilobium cinereum</i>	Ch	1906-09	Ex	D	On Cheeseman's list as <i>E. junceum</i> ; but not seen by Esler or us	
<i>Epilobium pallidiflorum</i>	Ch	1906-09	I	NC	swamp willowherb. Lighthouse Valley swampy creek margin	
<i>Epilobium pedunculare</i>	Ch	1906-09	Ex	D	On Cheeseman's list as <i>E. nummulariifolium</i> var. <i>pedunculare</i> ; but not seen by Esler or us	
<i>Epilobium rotundifolium</i>	Ch	1906-09	Ex	D	On Cheeseman's list; but not seen by Esler or us	
<i>Erodium cicutarium</i> *	Ch	1906-09	Ex	D	storksbill. On Cheeseman's list; not seen by Esler or us	
<i>Erodium moschatum</i> *	E	1970-77	Ex	D	musky storksbill. Recorded by Esler; not seen by us	
<i>Euphorbia pepus</i> *	E	1970-77	I	D	spurge. Coastal slopes on both coasts in partial shade and a few disturbed pasture areas especially by Lighthouse complex. AK300560, UNITEC2088	
<i>Fumaria capreolata</i> *		2006	s	A	H	rampant fumitory. Patch (c. 4 x 4 m) at back of Hobbs Beach. AK300058, UNITEC2093
<i>Fumaria muralis</i> *		2006	s	A	H	scrambling fumatory. Patch on margin of Wharf Rd 300 m up from wharf. AK345444
<i>Galium aparine</i> *	E	1970-77	o ⁿ	D	cleavers. Mainly on track margins and open areas between plantings; weeded out when seen because the burs catch in the bird's feathers	
<i>Galium divaricatum</i> *	Ch	1906-09	s	NC	slender bedstraw. Mown tracks and disturbed sites (= <i>G. parviflorum</i> of Cheeseman's list & of Esler). AK300585	
<i>Galium propinquum</i>	Ch	1906-09	Ex	D	On Cheeseman's list as <i>G. umbrosum</i> ; not seen by Esler or us	
<i>Geranium dissectum</i> *	Ch	1906-09	o-lc	D	cut-leaved cranesbill. Track margins in the open, mown areas and rank pasture (= <i>G. dissectum</i> & <i>G. dissectum</i> var. of Cheeseman's list). AK230329, 254852 & 275562, UNITEC2212	
<i>Geranium gardneri</i> *	[E]	1970-77	lc	I	The most common geranium present, open track margins, pasture/fermland areas, between plantings and rocky coastal outcrops; flowers usually pale pink, but a deep pink form also present (incl. within <i>Geranium solanderi</i> by Esler). AK216605, 271007 & 298379-80	
<i>Geranium homeanum</i>	E	1970-77	Ex	D	Although recorded in the note line as present in 3 AK herbarium collections (Oct 1981), without a herbarium voucher the record remains doubtful; recorded by Esler; not seen by us	
<i>Geranium molle</i> *	E	1970-77	ex	D	dove's foot. Last definite record appears to have been in 1978. AK254851	
<i>Geranium retrorsum</i>	[E]	1977	Ex	D	Collected by Esler as <i>Geranium</i> aff. <i>dissectum</i> with petals 6-7mm and mentioned by him under <i>G. dissectum</i> ; not seen by us. AK216602	
<i>Geranium solanderi</i> s.str.		1985	o	A	O	Widespread in rank microlaena pasture, its root tuber possibly gives it enough resources to compete with the pasture (Esler's <i>G. solanderi</i> now treated as <i>G. gardneri</i>). First record by C&W as <i>G. solanderi</i> "large petals". AK275567 & 301044, UNITEC2230
<i>Gonocarpus incanus</i>	E	1970-77	Ex	D	Recorded by Esler as <i>Haloragis procumbens</i> "of very limited distribution"; not seen by us	
<i>Haloragis erecta</i>	Ch	1906-09	o-lc	I	toatoa. Widespread in open sites: margin of mown tracks, creek margins, coastal slopes and back of beaches (= <i>H. alata</i> of Cheeseman's list)	
<i>Hibiscus richardsonii</i>		1986?	s	A	H	Single plant with pale-centred flower, on bank above artificial pond, NE Bay in 2006. First record C&W (may have been dark-centred form <i>Hibiscus trionum</i> agg.?)
<i>Hydrocotyle moschata</i>	Ch	1906-09	Ex	D	hydrocotyle. On Cheeseman's list; not seen by Esler or us	
<i>Hydrocotyle tripartita</i> *		2006	I	A	H	Australian hydrocotyle. In lawn near bunkhouse
<i>Hypericum humifusum</i> *	Ch	1906-09	Ex	D	On Cheeseman's list; not seen by Esler or us	
<i>Hypericum pusillum</i>	E	1970-77	I	D	Single locality: open swampy creek margin in Lighthouse Valley wetland (= <i>H. japonicum</i> of Esler). AK216639	
<i>Lepidium coronopus</i> *	E	1970-77	I	NC	wort cross. Disturbed sites in the open, in Lighthouse complex and mown track margins (= <i>Coronopus squamatus</i> of Esler). AK299043, UNITEC2367	

<i>Lepidium dichymum</i> *	Ch	E	1906-09	o	NC	twin cross. Disturbed sites in the open, mainly by Lighthouse complex, mown track margins and coastal rocks, and Wooded I. (= <i>Senebiera dichyma</i> of Cheeseman's list, & <i>Coronopus dichymus</i> of Esler). AK300576
<i>Lilaeopsis novae-zelandiae</i>	E	E	1970-77	Ex	D	Recorded by Esler as <i>L. lacustris</i> at a creek-mouth site by the jetty; not seen by us. AK217256
<i>Linum bienne</i> *	Ch	E	1906-09	o	NC	pale flax. Pasture and mown track margins (= <i>L. marginale</i> of Cheeseman's list & of Esler). AK315751, UNITEC2388
<i>Linum monogynum</i>	E	E	1970-77	l	NC	NZ true flax. Coastal cliffs, Fishermans Bay & below the Fog Horn. AK 328511
<i>Linum trigynum</i> *	E	E	1970-77	lc	NC	yellow flax. Open coastal slopes. UNITEC2352
<i>Lobelia anceps</i>	C,Ch	E	1905	o	NC	Widespread around the coast, especially in damp areas (creek mouths and seeps), also along some creek margins, e.g. Little Wattle Valley. AK254859, UNITEC2095
<i>Lotus angustissimus</i> *	E	E	1970	lc	NC	slender birdsfoot trefoil. Widespread on sunny coastal slopes and mown tracks (incl. " <i>Lotus</i> sp." of Esler, CHR 326645). AK219556, CHR 326645 & 326648
<i>Lotus pedunculatus</i> *	Ch	E	1906-09	l	D	lotus. Only a few patches seen on the coast by NW Point and grassy track margins in the open (= <i>L. corniculatus</i> of Cheeseman's list). UNITEC2365
<i>Lotus suaveolens</i> *	E	E	1970-77	lc	NC	hairy birdsfoot trefoil. The most frequent lotus species: open coastal slopes, track margins and back of beaches (= <i>L. subbiflorus</i> of Esler). UNITEC2380
<i>Ludwigia palustris</i> *			2006	l	A	water purslane. Margin of artificial pond (Wharf Pond). AK299052
<i>Ludwigia peploides</i> subsp. <i>montevidensis</i> *			1990	l	A	primrose willow. Submerged in artificial pond in 1990, observed there again in 2008. AK278778
<i>Maha neglecta</i> *	E	E	1970-77	Ex	D	dwarf mallow. Recorded by Esler; but not seen by us
<i>Maha nicaeensis</i> *	E	E	1970-77	lc	I	French mallow. Disturbed areas on southern part of island, open track margins, edges of pasture. AK299050
<i>Maha parviflora</i> *	E	E	1970-77	lc	I	small-flowered mallow. Disturbed areas on southern part of island, open track margins, edges of pasture, cliff tops on E coast, and on Wooded I. AK299055, 314032, 317881 & 318445-47
<i>Marrubium vulgare</i> *	E	E	1970-77	l	NC	horehound. Esler's small colony by the lighthouse paddock is still present. AK235540 & 299059
<i>Medicago arabica</i> *	Ch	E	1906-09	o-lc	NC	spotted bur medick. Disturbed areas, especially along the margins of mown tracks and lawns in the open, and around the lighthouse area (= <i>M. maculata</i> of Cheeseman's list). UNITEC2220
<i>Medicago nigra</i> *	Ch	E	1906-09	l	NC	bur medick. Disturbed areas, including track margins and coastal slopes (= <i>M. denticulata</i> of Cheeseman's list, & <i>M. polymorpha</i> of Esler). UNITEC2362
<i>Melilotus indicus</i> *			1978	lc	A	King Island melilot. Open coastal sites, especially at the back of Hobbs and Fishermans Beaches. First record C&W
<i>Mentha × piperrita</i> var. <i>citrata</i> *			1991	ex ⁿ	A	bergamot mint. Garden escape - spreading through rank pasture c.30m below the bunkhouse. AK297507
<i>Mentha pulegium</i> *	Ch		1906-09	l	I	pennyroyal. In lawn near bunkhouse and on Ridge Track. UNITEC2363
<i>Mentha spicata</i> subsp. <i>tomentosa</i> *	E	E	1970-77	s ⁿ	D	spearmint. Spreading through rank pasture just south of bunkhouse; and still present where Esler saw it near wharf toilets (H. Lindsay pers. comm.) (presumed = <i>M. spicata</i> of Esler). AK297969
<i>Modiola caroliniana</i> *	Ch	E	1906-09	o	D	creeping mallow. In open along mown tracksides and coastal slopes and disturbed pasture areas (= <i>M. multifida</i> of Cheeseman's list). UNITEC2221
<i>Nasturtium officinale</i> *	E	E	1970-77	l	D	watercress. Only observed by Pōhutukawa Creek mouth. AK254864, UNITEC2385
<i>Ornithopus pinnatus</i> *	E	E	1970-77	l	NC	yellow serradella. Rocky open coast, e.g. Lighthouse Bay. AK219408, UNITEC2379
<i>Orobanche minor</i> *	E	E	1970-77	l	NC	broomrape. Back of Fishermans Bay, especially at back of beach, and margin of Wharf Road. UNITEC2215
<i>Osteospermum jucundum</i> *			1992	ext ^l	A	Single occurrence at back of rocky beach by Wattle Valley. AK209191
<i>Oxalis corniculata</i> var. <i>corniculata</i> *	E	E	1970-77	l	D	A few plants observed in open areas, mainly in lighthouse complex. AK219478 & 299892

<i>Oxalis exilis</i>	C,Ch	E	1905	o	D	Widespread on open and semi-shaded coastal slopes (presumed = <i>O. corniculata</i> record of Cockayne & of Cheeseman's list - <i>O. exilis</i> not recognised by Cheeseman at that time). AK275570, CHR 219244
<i>Oxalis incarnata</i> *			1992	ex†	A	H lilac oxalis. Two patches, between wharf and toilets. AK210012 & 279013
<i>Oxalis pes-caprae</i> *			2010	lc	A	F Bermuda buttercup. Patches from NE Bay along the open E coast to at least Lighthouse Bay, including 2 of the rock stacks N of Lighthouse Bay, and track margin between wharf and Hobbs Beach. AK343852
<i>Oxalis rubens</i>	E		1970-77	l	NC	Open coastal slopes (= <i>O. corniculata</i> var. <i>crassifolia</i> of Esler). AK219486-87 & 271018
<i>Oxalis thompsoniae</i>			2006	s	A	O Single collection, rocky coast, S end Fishermans Bay. AK300019
<i>Papaver somniferum</i> subsp. <i>segitrum</i> *			2010	s ⁿ	A	H small flowered opium poppy. Single flowering plant in disturbed ground behind bunkhouse; uprooted. AK318212
<i>Parentucellia viscosa</i> *			1979	l	A	W tarweed. Margin of mown tracks and pasture, e.g. Grahams Road; and on dry headland, N end of Fishermans Bay. First record C&W. AK275578, UNITEC2373
<i>Parietaria debilis</i>	Ch	E	1906-09	l	NC	Only observed on a steep coastal bank at Pōhutukawa Cove, and Wooded I. AK318474
<i>Pelargonium inodorum</i>	Ch		1906-09	l	NC	In dry shrublands/clay banks on E coast (= <i>P. australe</i> of Cheeseman's list). AK300533, UNITEC2372
<i>Peperomia urvilleana</i>	Ch	E	1906-09	o-lc	NC	Widespread on shady coastal rocks and Wooded I. (= <i>P. endlicheri</i> of Cheeseman's list)
<i>Persicaria capitata</i> *			2002	ex†	A	H Single occurrence by the generator shed. AK283496
<i>Persicaria decipiens</i>	E		1970-77	lc	NC	Several of the swampy creek margins and some of the artificial ponds (= <i>Polygonum</i> sp. of Esler). AK219117-18, UNITEC2231
<i>Physalis peruviana</i> *	E		1970-77	ex†	D	cape gooseberry. Never common, controlled at least since 2002 and last seen by Weed Team 2005-06; not seen by us
<i>Phytolacca octandra</i> *	Ch	E	1906-09	o-lc ⁿ	NC	inkweed. Widespread, most common in disturbed sites: coastal slopes, forest gaps the lighthouse complex, and Wooded I. AK313690
<i>Plantago lanceolata</i> *	Ch	E	1906-09	o-lc	NC	narrow-leaved plantain. Mown tracks and lawns, open track margins, pasture, back of beaches, sunny coastal slopes, including rock stacks on E side. AK254849, UNITEC2383
<i>Plantago major</i> *	Ch	E	1906-09	o	NC	broad-leaved plantain. Mown tracks and lawn and open creek margins. AK271034 & 300578, UNITEC2382
<i>Plantago raoulii</i>	Ch	E	1906-09	l	NC	Single locality (most likely the same as recorded by Esler) under pōhutukawa canopy with other native herbs over c.3 x 2m, near Paa Point (Fig. 5). AK219079, UNITEC2356
<i>Polycarpon tetraphyllum</i> *	Ch	E	1906-09	o-lc	NC	allseed. Widespread on coastal slopes and coastal rocks, including rock stacks on E coast and Wooded I. AK301530 & 304753, UNITEC2381
<i>Polygonum arenastrum</i> *			2006	lc	A	H Prostrate mats in open to 1m diameter; widely and well established when first observed along most mown tracks, gravel tracks and lawns. AK299056
<i>Portulaca oleracea</i> *	Ch	E	1906-09	l	NC	purslane. Only seen on rocky outcrop at the N end of Fishermans Bay. AK300601
<i>Prunella vulgaris</i> *	E		1970-77	o	NC	selfheal. Mainly mown lawns and tracks, track margins; and locally in pasture. AK314024, UNITEC2393
<i>Ranunculus acaulis</i>	E		1970-77	s	D	Single colony on wet coastal cliff by mouth of the Little Wattle Valley. AK219036 & 275564
<i>Ranunculus amphirichus</i>	Ch	E	1906-09	l	NC	Shallow wetlands, stream margin of lower Bush 22 only location seen post 2005 (= <i>R. rivularis</i> of Cheeseman's list & of Esler). AK4324, 219042 & 276015
<i>Ranunculus parviflorus</i> *	Ch	E	1906-09	o	D	small-flowered buttercup. Along open track margins, especially Ridge Track. AK275452, UNITEC2389
<i>Ranunculus reflexus</i>	Ch	E	1906-09	l	D	Present by Lighthouse Valley wetland on raised tree bases (= <i>R. hirtus</i> of Cheeseman's list & Esler). UNITEC2375
<i>Ranunculus repens</i> *	E		1970-77	Ex	D	creeping buttercup. Recorded by Esler, not seen by us
<i>Ranunculus sessiliflorus</i> *	Ch		1906	l	I	Mown lawn by bunkhouse (= <i>R. parviflorus</i> var. <i>sessiliflorus</i> of Cheeseman's list). AK4349

<i>Ranunculus urvilleanus</i>	E	1970-77	lc	I	Open creek and mown track margins; the 75 plants reported in the two southern catchments [creek margins] in Nov 1985 (C&W) are now reduced to a single plant because of regeneration, however, the Lighthouse Creek would support nearly 100 plants, and the track margins are now an important habitat for this species. AK219051, 275449 & 276028	
<i>Raphanus raphanistrum</i> subsp. <i>raphanistrum</i> *	E	1975	lc ⁿ	I	wild raddish. Back of Hobbs and Fishermans Beaches; also weed by disturbed area in Lighthouse complex (suspected = <i>R. maritimus</i> of Esler). AK269647 & 271029, UNITEC2097-99	
<i>Rumex acetosella</i> *	Ch	1906-09	lc	NC	sheep's sorrel. Mown trackside weed, in thin pasture, open cliff tops and margin of some artificial ponds. AK254868, UNITEC2126	
<i>Rumex brownii</i> *	[Ch]	1906-09	l	D	hooked dock. Coastal slopes in pasture along the E side of the island (presumed = <i>R. flexuosus</i> of Cheeseman's list). AK218263	
<i>Rumex conglomeratus</i> *	Ch	1906-09	o	D	clustered dock. Trackside weed, pasture, back of gravel beaches and margin of some artificial ponds - nowhere common (presumed = <i>R. viridis</i> of Cheeseman's list)	
<i>Rumex crispus</i> *		1978	o	A	O	curled dock. First collected on coastal rocks at the N end of Fishermans Bay, also present in steep pastoral slopes (e.g. Chinamans Bay), and at the back of Hobbs Beach. AK275576 & 300579
<i>Rumex obtusifolius</i> *	E	1970-77	Ex	D	broad-leaved dock. Recorded by Esler; not seen by us	
<i>Rumex pulcher</i> *	E	1970-77	l	D	fiddle dock. On mown tracks	
<i>Rumex sagittatus</i> *		1990	ext†	A	H	climbing dock. Single occurrence in upper Wattle Valley, spread to a few patches, now eradicated. AK222346
<i>Sagina apetala</i> *	Ch	1906-09	Ex	D	annual pearlwort. On Cheeseman's list; not seen by Esler or us despite ideal habitat being present	
<i>Sagina procumbens</i> *	E	1970-77	l	D	procumbent pearlwort. Coastal rocks, south coast	
<i>Salsola kali</i> *	Ch	1906-09	Ex	D	saltwort. On Cheeseman's list; only seen by Esler on Hobbs Beach; not seen by us	
<i>Sarcocornia quinqueflora</i>	Ch	1906-09	lc	NC	glasswort. Widespread on coastal rocks, rock stacks within reach of saltspray, including Wooded I. (= <i>Salicornia australis</i> of Cheeseman's list & of Esler)	
<i>Scleranthus biflorus</i>	Ch	1906-09	Ex	D	On Cheeseman's list; not seen by Esler or by us	
<i>Selliera radicans</i>		1983	l	A	O	remuremu. Several patches, largest 2 x 4m ² with <i>Triglochin striata</i> at back of shell/sand beach at ±springtide level, S of Fishermans Bay. First record C&W
<i>Sherardia arvensis</i> *	E	1970	ex	D	field madder. Esler recorded it as occasional in pasture in 1970 but not seen there since; the last record appears to be by C&W that is was locally frequent in grassy areas in Nov 1978; not seen by us during the recent survey. AK275575	
<i>Sitene gallica</i> *	Ch	1906-09	o	NC	catchfly. Coastal slopes on rocks, thin soils and open grasslands. AK269643, UNITEC2210-11	
<i>Sisymbrium officinale</i> *	Ch	1906-09	l	D	hedge-mustard. In disturbed ground by bunkhouse. AK318213	
<i>Solanum linnaeanum</i> *	E	1970-77	l†	D	apple of Sodom. Just persisting in a few coastal sites, particularly Fishermans Bay where a collapsed 4 x 6m ² patch was present in the winter 2010; all known localities monitored (= <i>S. sodomeum</i> of Esler). AK313707	
<i>Solanum lycopersicum</i> *		2007	l	A	H	tomato. 2 fruiting plants at Hobbs Beach in the sand, occasional plants around lighthouse complex, especially by the bunkhouse and workshop. AK300580
<i>Solanum nigrum</i> *	E	1970-77	l	D	black nightshade. Mainly in disturbed areas in and around by the lighthouse complex and paddock; also on Wooded I. AK237516 & 298992, UNITEC2089	
<i>Solanum nodiflorum</i>	[Ch]	1906-09?	o-lc	NC	small-flowered nightshade. Widespread in semi-sheltered and open areas, particularly where recent disturbance has occurred, and on Wooded I. (presumed = <i>S. nigrum</i> of Cheeseman's list). AK271033 & 298020	
<i>Spergularia tasmanica</i>	Ch	1906-09	lc	I	native sea spurrey. Widespread on bare coastal rocks within reach of saltspray, including Wooded I.; surprisingly not recorded by Esler (= <i>Spergularia media</i> of Cheeseman's list). AK298004, UNITEC2371	
<i>Stachys arvensis</i> *	Ch	1906-09	Ex	D	staggerweed. On Cheeseman's list; not seen by Esler or us	

<i>Stellaria media</i> *	Ch	E	1906-09	I	D	chickweed. Coastal slopes under light shade, only a few populations seen including at Pōhutukawa Cove; also reported from Wooded I.
<i>Stellaria parviflora</i>	Ch	E	1906-09	s	D	Single locality at Pōhutukawa Cove (same locality as Hambly 1998: p.7). AK217707
<i>Torilis arvensis</i> *			2006	lc	A	H spreading hedge parsley. In 2006 it was well established bordering the lawn from the toilets to the bunkhouse (>50m) and also some on the N side of lawn & E side of shelterbelt; x1 on lower Kawerau Track in Jan 2008; and now also locally on Hobbs Beach; seeds with curved spines easily dispersed by attachment to animals. AK299063, 299067 & 301528, UNITEC2351
<i>Trifolium campestre</i> *	Ch		1906-09	Ex	D	hop trefoil. On Cheeseman's list as <i>T. procumbens</i> ; not seen by Esler or us
<i>Trifolium dubium</i> *		E	1970-77	o	NC	suckling clover. Widespread in mown tracks and lawns, and coastal slopes (sunny and shaded) including on the inshore E islets. AK300554, UNITEC2364
<i>Trifolium glomeratum</i> *	Ch	E	1906-09	s	D	clustered clover. Coastal rocks, including on an inshore E islet, only seen in 2 places on E coast. AK300531
<i>Trifolium micranthum</i> *	Ch	E	1906-09	Ex	D	lesser suckling clover. Listed by Cheeseman as <i>T. filiforme</i> , and recorded by Esler from Fishermans Bay; not seen by us
<i>Trifolium repens</i> *		E	1970-77	o	D	white clover. Only observed in lawns, mown tracks and track margins
<i>Trifolium subterraneum</i> *	Ch	E	1906-09	I	D	subterranean clover. Only observed in lighthouse complex lawn. UNITEC2368
<i>Urtica incisa</i>	Ch		1906-09	Ex	D	native nettle. On Cheeseman's list; not seen by Esler or us
<i>Verbena bonariensis</i> *			1987	I†	A	H purple-top. Scattered localities, many in pasture throughout the lighthouse complex, margins of mown tracks and in planted shrublands, 1 plant 3m tall in the canopy by Wharf Pond; adult plants still occurring in 2010; first recorded collection on Wooded I. (Taylor & Tennyson 1999). AK299051, UNITEC2401
<i>Veronica arvensis</i> *		E	1970-77	o	NC	field speedwell. Mown tracks and lawns. AK216074 & 299049
<i>Veronica persica</i> *		E	1970-77	s	D	scrambling speedwell. Only recent record in disturbed part of lighthouse paddock. AK300496, UNITEC2354
<i>Veronica plebeia</i>	Ch	E	1906-09	o	NC	Australasian speedwell. Mainly steep, coastal grassy slopes, also in coastal shrublands. AK238334, 254848 & 276473
<i>Veronica serpyllifolia</i> *	Ch		1906-09	I	NC	turf speedwell. In lawn near bunkhouse
<i>Vicia disperma</i> *			2006	s	A	H two-seeded vetch. Single record, thin pasture on steep coastal slope, upper Lighthouse Bay
<i>Vicia sativa</i> *	Ch	E	1906-09	lc	I	vetch. Most common vetch, on track margins, coastal slopes, pasture and back of beaches (including <i>V. angustifolia</i> & <i>V. sativa</i> of Esler). AK254855, UNITEC2100
<i>Vicia tetrasperma</i> *	Ch	E	1906-09	o	D	four-seeded vetch. Widespread open coastal slopes, mown track margins and artificial pond margins; often occurring with <i>V. sativa</i> (= <i>V. gemella</i> of Cheeseman's list). AK300543, UNITEC2222
<i>Vinca major</i> *		E	1970-77	I†	D	periwinkle. Spread from lighthouse garden; managed at 4 sites: below bunkhouse, cliff top by bach, by workshop and margin of Wharf Road. AK222347 & 300593, UNITEC2209
<i>Wahlenbergia vernicosa</i>		E?	1970-77	I	NC	NZ harebell. Coastal rocks in salt-spray zone, including Wooded I., flowers pale blue (? = in part <i>W. gacilis</i> of Esler). AK300499
<i>Wahlenbergia violacea</i>		E?	1970-77	s	NC	NZ harebell. Only seen on open grassy bank above Wārtle Valley, and on Wooded I., flowers blue (? = in part <i>W. gacilis</i> of Esler). UNITEC2347
MONOCOT TREES & SHRUBS (4 + 1)						
<i>Cordyline australis</i> PP	C	E	1905	lc	NC	ti/cabbage tree. Still dominates parts of some valleys, e.g. Wārtle, Lighthouse Valleys & Bush 21; some large plants in forest areas & scattered in shrublands; also widely planted
<i>Cordyline australis</i> × <i>C. banksii</i>		E	1970-77	s	NC	A few plants appeared to be this hybrid

<i>Cordylone pumilio</i>	E	1970-77	s	NC		dwarf cabbage tree. Forest areas, including upper Wattle Valley
<i>Phoenix canariensis</i> *		2003-04	ex†	A	Bi	Canary Island palm. First record as 5 seedlings under a starling roost by Wharf Road, upper Wattle Valley; and a further 8 seedlings later, also found behind Saddleback Bay and Lighthouse Valley; last recorded by the weed team 2005-06; not seen by us
<i>Rhopalostylis sapida</i> P		c.1994	l	A	PI	nīkau. Neil Mitchell reported at least 2 wild seedlings (Walter 1996); seedlings present in Bush 21; planted in low numbers in many of the forested valleys (seed ex Little Barrier I. & Warkworth). AK338120
MONOCOT CLIMBERS (1 + 1)						
<i>Asparagus asparagoides</i> *		2002	st	A	Bi,F	smilax. First record under pines by lighthouse; also occurred behind Hobbs Beach and No Name Bay (coastal slope), and then 3 years later a sprouting clump in 2010 at the back of No Name Bay beach appeared to be washed in. AK256253 & 314026
<i>Ripogonum scandens</i>	E	1970-77	lc	NC		supplejack. Forested gullies of Bush 1, 21 & 22. UNITEC2081
ORCHIDS (9 + 0)						
<i>Acianthus sinclairii</i>	Ch	E	1906-09	Ex	D	Esler recorded a few groups of plants in mapou stands; not seen by us (= <i>Acianthus fornicatus</i> var. <i>sinclairii</i> of Esler)
<i>Diplodium 'alobulum</i>	Ch		1906-09	Ex	D	On Cheeseman's list as <i>Pterostylis trullifolia</i> , but small Hauraki Gulf island populations are more likely to be <i>D. alobium</i> (EKC, pers. obs.) which wasn't distinguished from <i>D. trullifolium</i> until 1949; unrecorded since Hansen
<i>Microtis parviflora</i>	Ch	E	1906-09	Ex	D	onion orchid. On Cheeseman's list and recorded by Esler; but not seen by us
<i>Microtis unifolia</i>	E	1970-77	o	D		onion orchid. Open inland sites, e.g. track margins & thin pasture areas. AK246030 & 278647, UNITEC2213
<i>Nematoceras trilobum</i>	E	1970-77	Ex	D		Recorded by Esler as occasional in mapou stands; not seen by us (= <i>Corybas trilobus</i> of Esler)
<i>Orthoceras novae-zeelandiae</i>	E	1970-77	Ex	D		Recorded by Esler as <i>O. strictum</i> ; but not seen by us. AK245814
<i>Pterostylis banksii</i>		1990	l	A	O	Small colonies observed in forest in Bush 1 & 22. AK278646, UNITEC2392
<i>Thelymitra longifolia</i>	Ch	E	1906-09	lc	NC	sun orchid. Scattered plants mainly along the open E coast; best population headland at N end of Fishermans Bay; open white flowers some with a flush of pink. AK300603, UNITEC2395
<i>Thelymitra pauciflora</i>		2002	s	A	W	sun orchid. Single plant on sunny bank up Wharf Road. AK280972
RUSHES & ALLIES (9 + 6)						
<i>Apodasmia similis</i>	E	1970-77	s	NC		oioi. Single 3 x 4m ² patch on coastal ledge at creek mouth of Little Wattle Valley (= <i>Leptocarpus similis</i> of Esler)
<i>Juncus acuminatus</i> *		2006	l	A	Be	Single occurrence by Wharf Dam. AK300568
<i>Juncus articulatus</i> *	E	1970-77	l	D		jointed rush. Observed in a few artificial dams, e.g. Wharf & near N Point
<i>Juncus australis</i>	E	1970-77	o-lc	D		Mainly an occasional component of microlaena meadows & track margins. AK275565-66 & 275750
<i>Juncus bufonius</i> var. <i>bufonius</i> *	E	1970-77	l	D		toad rush. Bare patches in mown lawn near bunkhouse. AK300509, UNITEC2333
<i>Juncus edgariae</i>	E	1970-77	l	D		In pasture and by creeks and artificial dams (= <i>Juncus gregifforus</i> of Esler)
<i>Juncus effusus</i> *	E	1970-77	l	D		soft rush. Open creek margins, especially in Lighthouse Valley. AK215521
<i>Juncus flavidus</i> *		2006	o-lc	A	Be	In rank pasture, roadsides & artificial dams. AK300561 & 300586

<i>Juncus pallidus</i>	Ch	1906-09	Ex	D		giant rush. On Cheeseman's list; not seen by Esler or us
<i>Juncus pauciflorus</i>	Ch	1906-09	Ex	D		On Cheeseman's list; not seen by Esler or us
<i>Juncus planifolius</i>	Ch	1906-09	I	D		flat-leaved rush. Open creek margins (e.g. Lighthouse & Little Wattle Valleys). AK217055, UNITEC2314
<i>Juncus prismatocarpus</i>	E	1970-77	I	D		Open creek margins & artificial dams (i.e. Wharf dam, Lighthouse V. & lower dam near N Point). AK314023
<i>Juncus sarophorus</i>	E	1970-77	Ex	D		Recorded by Esler; but not seen by us
<i>Juncus tenuis</i> var. <i>tenuis</i> *	Ch	1906-09	o	NC		track rush. Track margins and mown lawns (= <i>J. tenuis</i> of Cheeseman's list & of Esler). UNITEC2319
<i>Juncus usitatus</i>	E	1970-77	I	D		Only observed by the Wharf Dam. AK300549
SEDGES (32 + 3)						
<i>Bolboschoenus fluviatilis</i>	E	1970-77	I	I		Bunkhouse Dam (flowers); & sterile patch c. 1 x 4m ² at Pōhutukawa Creek mouth (= <i>Scirpus ?fluviatilis</i> of Esler)
<i>Carex breviculmis</i>		2006	o	A	O	Mainly grassy, sunny areas along E coast. AK300598
<i>Carex dissita</i>	[E]	1970-77	I	D		Shaded forest areas (= <i>C. dipsacea</i> of Esler - a mixup of names by him?). AK300529, UNITEC2224
<i>Carex divulsa</i> *	E	1970-77	o	I		Small tussocks, mainly in rank pasture, roadsides & partially open bush areas in S part of island; top of Bush 22 was the most N seen. AK254867, UNITEC2227
<i>Carex flagellifera</i>	Ch	1906-09	o	NC		Widespread, mainly coastal in open & semi-open areas; also along track & bush margins (= <i>C. lucida</i> of Cheeseman's list). AK271011, UNITEC2324
<i>Carex geminata</i>	E	1970-77	lc	NC		Swampy creek margins; this taxon has female spikes 9-12cm long. AK216195, 271014 & 300545, UNITEC2225
<i>Carex inversa</i>	Ch	1906-09	o	D		Mainly small colonies, sunny open areas, including mown lawn, rank pasture, track & bush margins. AK275757 & 300646, UNITEC2323
<i>Carex lambergiana</i>	E	1970-77	o-lc	I		Forest areas, especially Bush 1, 22 & Lighthouse Valley. AK271028 & 300530, UNITEC2325
<i>Carex lessoniana</i>	Ch	1906-09	I	D		One of Esler's specimens matches this species with female spikes only 2-2.5cm long; seen by us at NE Bay dam (= <i>C. ternaria</i> of Cheeseman's list). AK216196, UNITEC2317
<i>Carex ochrosaccus</i>	E	1970-77	Ex	D		Recorded by Esler as occasional in woody vegetation; not seen by us. AK217961
<i>Carex pumila</i>	C	1905	I	D		In sand, back of Fishermans Bay. UNITEC2313
<i>Carex secta</i> P	E	1970-77	I	NC		Swampy valley bottoms of Lighthouse Valley & Bush 22, some plants with trunks to 1m tall; also planted from local stock at 2 artificial dams. AK271013, UNITEC2226
<i>Carex solandri</i>	E	1970-77	o	D		Forest areas, especially Bush 1 & 22. AK217991 & 300562
<i>Carex spinirostris</i>	Ch	1906-09	Ex	D		On Cheeseman's list as <i>C. vacillans</i> [vacillans]; not seen by Esler or us
<i>Carex testacea</i>	E	1970-77	Ex	D		Recorded by Esler as occasional in mapou stands; not seen by us
<i>Carex virgata</i>	Ch	1906-09	o-lc	NC		Creek margins and less commonly semi-open bush areas; best colonies lower Bush 21 & Little Wattle Valley creek margins
<i>Cyperus eragrostis</i> *		1998	I†	A	H	umbrella sedge. First record was as a contaminant in the nursery. Since 2006: margin of Graham's Road; and by artificial dam near NE Point. AK235023
<i>Cyperus ustulatus</i>	C,Ch	1905	o-lc	D		giant umbrella sedge. Mainly open coastal sites and along open swampy creek margins; also occ. in rank pasture; one collection is the form <i>grandispiculatus</i> (AK275756); (= <i>Mariscus ustulatus</i> of Cheeseman's list). AK275756
<i>Eleocharis acuta</i>	Ch	1906-09	Ex	D		On Cheeseman's list and recorded by Esler as occasional in some swampy creeks; surprisingly not seen by us

<i>Ficinia nodosa</i>	C,Ch	E	1905	o-lc	NC	knobby sedge. Mainly open coastal slopes throughout including Wooded I., on soil, rock and in sand, occasionally inland in pasture & track margins (= <i>Scirpus nodosus</i> of Cheeseeman's list, & of Esler). AK275752	
<i>Gahnia lacera</i>	Ch	E	1906-09	o-lc	I	bamboo sedge. Occasional in forests, most frequent in coastal shrublands and coastal forest margins	
<i>Isolepis cernua</i> var. <i>cernua</i>	Ch	E	1906-09	o-lc	NC	Salt spray zone of coastal rocks and on sand where there is a freshwater seep; best colony at outfall of Little Wattle creek (= <i>Scirpus cernuus</i> of Cheeseeman's list, & of Esler). UNITEC2334	
<i>Isolepis inundata</i>	Ch	E	1906-09	I	NC	Margin of 2 artificial ponds (near wharf & top of Bush 22) (= <i>Scirpus inundatus</i> of Cheeseeman's list & of Esler). AK300180-81	
<i>Isolepis reticularis</i>			2006	I	A	O	Patch in small =shaded wetland, lower Bush 22 near creek. AK300177
<i>Isolepis sepulcralis</i> *	E		1970-77	I	D	Small patches mainly along the open creek margins of Lighthouse & Little Wattle Valleys, & Bush 22 (= <i>Scirpus chlorostachyus</i> of Esler). AK300178-79	
<i>Lepidosperma australe</i>	E		1970-77	Ex	D	square-stemmed sedge. Recorded by Esler; but not seen by us	
<i>Machaerina juncea</i>	Ch	E	1906-09	s	NC	Single patch c. 10 x 10m ² in coastal gut under large pōhutukawa, outflow of Bush 22 (= <i>Cladium junceum</i> of Cheeseeman's list & <i>Baumea juncea</i> of Esler). UNITEC2321	
<i>Machaerina rubiginosa</i>	Ch	E	1906-09	I	NC	Lighthouse Valley wetland by creek; and 2-4m wide sward along Little Wattle Valley creek (= <i>Cladium glomeratum</i> of Cheeseeman's list & <i>Baumea rubiginosa</i> of Esler). AK300571	
<i>Morelotia affinis</i>	Ch		1906-09	Ex	D	On Cheeseeman's list as <i>Gahnia arenaria</i> ; not seen by Esler or us	
<i>Schoenoplectus tabernaemontani</i>	E		1970-77	Ex	D	Recorded by Esler as <i>Isolepis lacustris</i> ; not seen by us	
<i>Schoenus brevifolius</i>	Ch		1906-09	Ex	D	On Cheeseeman's list; not seen by Esler or us	
<i>Schoenus concinnus</i>	C		1905	Ex	D	Recorded by Cockayne (1905) on moist ground; not seen since	
<i>Schoenus maschalinus</i>	Ch	E	1906-09	I	NC	In a few damp shaded hollows e.g. Lighthouse Valley & Bush 22 (= <i>Schoenus axillaris</i> of Cheeseeman's list). UNITEC2322	
<i>Uncinia banksii</i>	E		1970-77	o-lc	NC	hook grass. Main bush areas	
<i>Uncinia uncinata</i>	Ch	E	1906-09	o-lc	NC	hook grass. Main bush areas and mapou stands (= <i>U. australis</i> of Cheeseeman's list). UNITEC2228	
GRASSES (14 + 39)							
<i>Agrostis capillaris</i> *	Ch	E	1906-09	o-lc	I	browntop. Patches in rank grassland & mown lawns (= <i>A. vulgaris</i> of Cheeseeman's list & <i>A. tenuis</i> of Esler). AK300512, UNITEC2330	
<i>Aira caryophyllaea</i> subsp. <i>caryophyllaea</i> *	Ch	E	1906-09	lc	NC	Annual on thin soils, open coastal rock & slopes (= <i>A. caryophyllaea</i> of Cheeseeman's list). UNITEC2341	
<i>Alopecurus pratensis</i> *	Ch	E	1906-09	ex	D	meadow foxtail. Probably died out - no record since 1978 (presumed = <i>A. agrestis</i> of Cheeseeman's list). AK254861	
<i>Anthosachne multiflora</i>	Ch	E	1906-09	o-la	NC	blue wheatgrass. Mainly steep, sunny coastal slopes on the E coast - a regional stronghold for the species (= <i>Agropyron multiflorus</i> of Cheeseeman's list & <i>A. kiriki</i> of Esler). AK218042, UNITEC2328	
<i>Anthosachne scabra</i> *	E		1970-77	o-lc	I	Rank pasture at S end of island (= <i>Agropyron scabrum</i> of Esler). AK218038 & 300532	
<i>Anthoxanthum odoratum</i> *	Ch	E	1906-09	o-la	NC	sweet vernal. Pasture component & open coastal slopes. AK254857, UNITEC2339-40	
<i>Austrodieria splendens</i>	E		1970-77	s	D	toetoe. Shrubby coastal slopes, only 3 young plants were now known in 2007: E coast & near NW Point (H Lindsay pers. comm.); not seen by us (= <i>Cortaderia splendens</i> of Esler). AK216961	
<i>Austrostipa stipoides</i>	Ch	E	1906-09	o-lc	I	needle tussock. Close to the sea, usually on rock, most common on the N end of island (both E & W coast) (= <i>Stipa teretifolia</i> of Cheeseeman's list, & of Esler). AK254860	
<i>Bothriochloa macra</i> *	E		1970-77	lc	D	redleg grass. Mainly sunny (hot) open grassy coastal slopes. AK271019, UNITEC2332	

<i>Briza minor</i> *	Ch	1906-09	I	I	shivery grass. Coastal rocks on E coast, e.g. Pōhutukawa Cove. UNITEC2329	
<i>Bromus diandrus</i> *	E	1970-77	o-la	NC	ripgut brome. Scattered along coastal slopes; biggest population in sand at back of beach at Fishermans Bay; also on Wooded I. AK254863 & 317493, UNITEC2208	
<i>Bromus hordeaceus</i> *	Ch	1906-09	o	D	soft brome. Open grassy areas, including mown lawns, and on rocky ledges on Wooded I. (= <i>Bromus mollis</i> of Cheeseman's list, & of Esler). AK318484, UNITEC2337	
<i>Bromus lithobius</i> *	E	1970-77	I	D	Chilean brome. Only observed along Wharf Road & near Paa Point (= <i>Bromus breviaristatus</i> of Esler). AK276475	
<i>Bromus willdenowii</i> *	Ch	1906-09	o-lc	D	prairie grass. Widespread in open areas, including Wooded I. (= <i>Bromus unioloides</i> of Cheeseman's list & of Esler). AK318850, UNITEC2338	
<i>Cenchrus clandestinus</i> *		1996	ext†	A	H	kikuyu grass. First seen by us in 2008 as a single 3 x 5 m patch in lighthouse paddock by vehicle track, and still there in 2010; but recorded previously on the island by Dunning (1996) as <i>Pennisetum clandestinum</i> . AK303603
<i>Cortaderia jubata</i> *		2010	st	A	W	purple pampas grass. Single fertile clump on steep coastal slope of Lighthouse Bay in 2010 is the only confirmed record of this species; some earlier pampas records may also have been this species. AK313455
<i>Cortaderia selloana</i> *	E	1970-77	I†	D	pampas grass. Mainly along steep E coastal slopes; used to also occur near NW Point, and in Little Wattle and Lighthouse Creek Valleys; all known sites being actively managed and very few plants now reach maturity. AK313459	
<i>Critexon murinum</i> subsp. <i>murinum</i> *	E	1970-77	ex	D	barley grass. Last recorded at Hobbs Beach in 1978. AK254853	
<i>Cynodon dactylon</i> *		2006	I	A	H	Indian doab. Patches to 10 m across in the open, especially in and by the Lighthouse paddock; also present by artificial dam near NW Point. UNITEC2344
<i>Dactylis glomerata</i> *	Ch	1906-09	o-a	NC	cocksfoot. Throughout in most grassy communities, including the microlaena meadows. AK275754	
<i>Dichelachne crinita</i>	Ch	1906-09	Ex	D	plume grass. On Cheeseman's list & recorded by Esler; surprisingly not seen by us	
<i>Echinopogon ovatus</i>	Ch	1906-09	Ex	D	hedgehog grass. On Cheeseman's list; not seen by Esler or us	
<i>Ehrharta erecta</i> *		2007	st	A	H	veldt grass. Single plant record by Peter de Lange on margin of upper Wattle Valley track. Eradicated. AK301045 [second patch c. 50 m from original found Oct 2013 (S Heiss-Dunlop pers. comm.)]
<i>Festuca rubra</i> subsp. <i>commutata</i> *	E	1970-77	Ex	D	chewings fescue. Recorded by Esler as a few plants in grassland (as <i>F. rubra</i>); not seen by us	
<i>Holcus lanatus</i> *	Ch	1906-09	o	D	Yorkshire fog. Local patches in pasture and track margins, also on Wooded I.	
<i>Isachne globosa</i>	Ch	1906-09	lc	NC	swamp millet. Swampy areas of Lighthouse Valley and below Pumphouse dam (= <i>I. australis</i> of Cheeseman's list & of Esler)	
<i>Lachnagrostis billardierei</i>	E	1970-77	Ex	D	wind grass. Recorded by Esler; but surprisingly not seen by us	
<i>Lachnagrostis filiformis</i>	Ch	1906-09	Ex	D	On Cheeseman's list as <i>Deyeuxia forsteri</i> ; Esler's voucher is <i>L. littoralis</i> ; not seen by us	
<i>Lachnagrostis littoralis</i> subsp. <i>littoralis</i>	E	1970	o-lc	NC	coastal wind grass. Coastal rocks within reach of salt spray, widespread, including Wooded I., but lacking from some parts of the coast (= <i>L. filiformis</i> of Esler). AK216372, 300503, 318463, UNITEC2326	
<i>Lolium perenne</i> *	Ch	1906-09	o-lc	D	ryegrass. Mainly as patches in Lighthouse paddock, mown lawns, and track margins. UNITEC2345	
<i>Lolium rigidum</i> *		2007	o-lc	A	F	annual ryegrass. Several patches in Lighthouse paddock; also in sand at back of beach, NE Bay. AK300574
<i>Microlaena stipoides</i>	Ch	1906-09	la	D	microlaena. The dominant grass on the island forming nearly pure meadows in most open & light-shaded situations; common associates are bracken fern, <i>Muehlenbeckia complexa</i> & other perennial grasses. AK254866, UNITEC2331	
<i>Oplismenus hirtellus</i> subsp. <i>imbecillis</i>	Ch	1906-09	lc	NC	Under forest, usually as small-sized mats (= <i>O. aemulus</i> & <i>O. undulatifolius</i> of Cheeseman's list & <i>O. imbecillis</i> of Esler). UNITEC2128	
<i>Parapholis incurva</i> *	E	1970-77	lc	NC	sickle grass. Widespread on open coastal rocks and occasional beach within the salt-spray zone. AK218022 & 275563, UNITEC2335-36	

<i>Parapholis strigosa</i> *	E	1970-77	Ex	D	Recorded by Esler; but not seen by us
<i>Paspalum dilatatum</i> *	E	1970-77	o	D	paspalum. Scattered plants throughout pasture, open coastal slopes, and track margins. AK275755, UNITEC2327
<i>Paspalum distichum</i> *	E	1970-77	l	NC	Mercer grass. Single mat c. 12m x 1m at back of Hobbs Beh by a seep (= <i>Paspalum paspalodes</i> of Esler), AK299068
<i>Paspalum orbiculare</i> *	Ch	1906-09	ex	D	scobic. Last record appears to be in rank pasture behind Hobbs Beh in 1981 (= <i>P. scobiculatum</i> of Cheeseman's list, & of Esler). AK216862 & 271015
<i>Phalaris minor</i> *	E	1970-77	Ex	D	lesser canary grass. Recorded by Esler at the lighthouse station; not seen by us. AK216492
<i>Poa anceps</i>	Ch	1906-09	o	NC	Mainly on steep coastal slopes, occasionally on open inland banks. AK218083-84
<i>Poa annua</i> *	E	1970-77	o-lc	D	annual poa. Open track margins, mown lawns and coastal slopes, including Wooded I.
<i>Poa pratensis</i> *	Ch	1906-09	l	D	smooth meadow grass. Open track margins
<i>Poa trivialis</i> *	E	1970-77	l	D	rough meadow grass. Rough pasture near bunkhouse and margin of Ridge Track. UNITEC2343
<i>Rytidosperma biannulare</i>	[Ch]	1906-09	lc	NC	Open coastal slopes and track margins, also on Wooded I. (<i>Danthonia semiannularis</i> of Cheeseman's list could include both <i>R. biannulare</i> & <i>R. unarede</i>). AK318482
<i>Rytidosperma penicillatum</i> *	E	1970	o	NC	Open grassy areas (= <i>Notodanthonia penicillata</i> of Esler). CHR318060
<i>Rytidosperma racemosum</i> *	[Ch]	1906-09	la	NC	Steep coastal slopes, ridgetops, open banks, and track margins (presumed = <i>Danthonia pilosa</i> on Cheeseman's list, Cheeseman lumped most exotic danthonias under this name; & = <i>Notodanthonia racemosa</i> of Esler). AK271016, CHR318059
<i>Rytidosperma tenuius</i> *	E	1970-78	Ex	D	Recorded by Esler as <i>Notodanthonia purpurascens</i> ; but not seen by us
<i>Rytidosperma unarede</i>	[Ch]	1906-09	l	D	Coastal slopes and grassland margins (<i>Danthonia semiannularis</i> of Cheeseman's list could include both <i>R. biannulare</i> & <i>R. unarede</i> ; = <i>Notodanthonia unarede</i> of Esler). AK216982
× <i>Schedololium holmbergii</i> *	Ch	1906-09	Ex	D	tall fescue-rye grass hybrid (= <i>Festuca elatior</i> of Cheeseman's list); not seen by Esler or us
<i>Sporobolus africanus</i> *	Ch	1906-09	lc	D	ratstail. Mainly on open coastal rocks; less commonly on edge of pasture, track margin or mown lawns (= <i>S. indicus</i> of Cheeseman's list). AK275644, UNITEC2129
<i>Stenotaphrum secundatum</i> *	E	1970-77	l†	D	buffalo grass. Observed as a sward in the Lighthouse paddock and west of Northeast Bay. UNITEC2355
<i>Vulpia bromoides</i> *	Ch	1906-09	o-lc	NC	vulpia hair grass. Mainly on bare coastal slopes (including Wooded I.), banks & pond margins (= <i>Festuca bromoides</i> of Cheeseman's list). AK300548, 318465, UNITEC2342
<i>Vulpia myurus</i> *	Ch	1906-09	Ex	D	vulpia hair grass. On Cheeseman's list as <i>Festuca myurus</i> ; not seen by Esler or us
OTHER MONOCOT HERBS (7 + 15)					
<i>Agave americana</i> *		1998	st	A	F century plant. Single medium-sized plant washed up in Pōhutukawa Cove - removed. AK236680
<i>Allium triquetrum</i> *		2006	o†	A	H onion weed. Patches in lawn by bunkhouse, by Little Wattle Valley creek, in shade by Bunkhouse Dam, and back of Hobbs Beach. AK299165, 343850 [Little Wattle Valley population increased markedly by Oct 2013 (S Heiss-Dunlop pers. comm.)]
<i>Allium vineale</i> *	E	1970-77	o	NC	wild onion. Mainly scattered small patches in rank pasture or bracken; largest patch ~opposite top of Bush 22, scapes to > 1m tall. AK299607, UNITEC2312
<i>Amaryllis belladonna</i> *		1982	l	A	H,PI naked ladies. A few patches up to c.20 plants in or near Lighthouse paddock, their pink flowers obvious in Feb-Mar. A pure white flowering clump of 4 bulbs at north end Hobbs Beh just appeared, illegal planting(?), eradicated. First record C&W. AK236175, 236605, 321826
<i>Arthropodium cirratum</i>	E	1970-77	o-lc	I	rengarenga. Coastal cliffs, especially on the E coast; also on Wooded I. AK300511

<i>Arum italicum</i> *	E	1970-77	Ex	D		Italian arum. Esler recorded some wild on the lighthouse station; not seen by us
<i>Astelia banksii</i>	E	1906-09	o-lc	I		coastal astelia. Mainly terrestrial on coastal cliffs, but also absent from many; rarely epiphytic; also on SW stack of Wooded I.
<i>Clivia miniata</i> *		2009	s†	A	Bi	clivia. Single clump c.1.5m in from the edge of Hobbs Beach under shrubs. Removed. AK304817 & 307224
<i>Collospermum hastatum</i>		2010	s	A	Bi	Single epiphyte (leaves to 30cm long) on ponga trunk, in Bush 21. AK314031
<i>Crocossmia × crocosmiiflora</i> *		2002-03	ext†	A	H	montbretia. 3 open sites below Bush 2, and a garden escape below the bunkhouse - last seen by the weed team 2005-06; not seen by us
<i>Dianella latissima</i>	[E]	1970-77	o	NC		tussock blueberry. Tussocks on margins of shrubland and forest matched <i>D. latissima</i> (vouchered) – the recently separated species from <i>D. nigra</i> s.lat. However, smaller plants in the forest and coastal slopes may be this species or <i>D. nigra</i> s.str. AK299066 & 314022
<i>Gladiolus dalenii</i> *	E	1970-77	ext†	D		Present in rank pasture (= <i>G. natalensis</i> of Esler)
<i>Gladiolus tristis</i> var. <i>tristis</i> *		1991	ext†	A	G	In pasture, Lighthouse Bay in 1991; not seen in 2000s. AK205796, 279012 & 279015
<i>Gladiolus undulatus</i> *		2004	lc†	A	F	wild gladiolus. Salt spray zone of coast, in sand and shallow soil over rocks, particularly by Paa Point, Fishermans & NE Bays. AK300604 & 300606
<i>Hebechium gardnerianum</i> *		1997	ext†	A	Bi	kahili ginger. Only record is two 1m plants in lower Wattle Valley. Eradicated. AK235620 [single seedling in Bunkhouse Valley found Oct 2013 (S Heiss-Dunlop pers. comm.)]
<i>Landolphia punctata</i> *		1995	ex	A	Be	purple-backed duckweed. Covering artificial dam behind Hobbs Beach - single occurrence. AK222139
<i>Narcissus</i> cv.*		2010	s	A	H	jonquil. Margin of artificial dam near NE Point, brought in with soil from lighthouse area, flowers not seen, however, suspected to be similar to jonquils in and near the ranger's garden
<i>Nothoscordum gracile</i> *		2007	s†	A	G	Several plants in rank pasture E side of Visitors Centre - garden relic? AK300592
<i>Phormium tenax</i> +P	E	1905	o-lc	NC		NZ flax. Pure stands still exist in some gullies; scattered clumps throughout including open coastal slopes
<i>Triglochin striata</i>	Ch	1906-09	l	NC		4 patches, largest a 2 x 4m ² clump with <i>Selliera radicans</i> on shell & sand, at ±springtide level; N Fishermans Bay, S of Fishermans Bay & Little Hobbs Beach (= <i>T. triandra</i> of Cheeseman's list). AK300500
<i>Typha orientalis</i>	E	1970-77	lc	D		raupō. Scattered along two swampy creek margins on SW side (Bunkhouse & Little Wattle Valleys), no longer "almost pure colonies", as reported by Esler
<i>Zantedeschia aethiopica</i> *	E	1970-77	l†	D		arum lily. Widespread, coastal sites, creek margins and pasture from Pōhutukawa Cove southwards; all known sites monitored, seedlings, adults and regrowth still occurring. UNITEC2101
(b) Additions recorded only as seed rain						
(1 + 5)						
<i>Amaranthus</i> sp.*		1979	s	A	F	Washed ashore in a toy boat (West 1981)
<i>Ficus macrophylla</i> *		2004	l	A	Bi	Morton Bay fig. Seed rain from starling roost (Flohr 2004)
<i>Leycesteria formosa</i> *		2004	l	A	Bi	Himalaya honeysuckle. Seed rain from starling roost (Flohr 2004)
<i>Pyracantha ?angustifolia</i> *		2004	l	A	Bi	firethorn. Seed rain from starling roost (Flohr 2004)
<i>Rubus fruticosus</i> agg.*		2004	l	A	Bi	blackberry. Seed rain from starling roost (Flohr 2004) [also see under (e) below]
<i>Spinifex sericeus</i>		2007	l	A	F	spinifex. Seedheads only on Hobbs Beach and near North Point

(c) Additional planted natives and exotics (excluding gardens) (28 + 4)

<i>Alectryon excelsus</i> subsp. <i>excelsus</i>	1984-94	o	tītiki. Widely planted no wildings seen. UNITEC2157
<i>Agathis australis</i>	1984-94	s	kauri. Two plants between main ridge and Fishermans Bay; Esler (1978b: p.208) found no soil evidence of kauri ever growing on Tiri
<i>Alseuosmia macrophylla</i>	1984-94	s	Seed ex Little Barrier I. Only a few survived - x1 Wattle Valley in 2007
<i>Alseuosmia quercifolia</i>	1984-94	Ex?	Evidently planted (Mitchell 1985, as <i>Alseuosmia</i> spp.), but not seen by us
<i>Carmichaelia australis</i>	1984-94	o	Widely planted out in small numbers. UNITEC2152
<i>Carmichaelia williamsonii</i>	1984-95	Ex?	Seed ex Little Barrier I. Planted out - appears to have failed
<i>Clianthus puniceus</i>	1984-94	s	kākā beak. Several off Ridge Rd which died in the drought in autumn 2010; and x1 in Visitors Centre (provenance Moturemu Island)
<i>Dacrydium taylorii</i>	1998	Ex?	Seed ex Little Barrier I. Sown in 3 places by the Kawerau Track (Bec Stanley pers. comm.) nothing appeared so far
<i>Dodonaea viscosa</i>	1984-94	s	akeake. Planted out, x1 on Ridge Rd
<i>Elingamita johnsonii</i> ***	1984-94	s	Planted out, x1 on Wattle Track 3-4m high. UNITEC2085
<i>Erythrina xyskiesii</i> **~	pre-1980	s	flame tree. Two large trees by Visitors Centre
<i>Eucalyptus saligna</i> **~	pre-1981	l	Planted shelterbelt of c.10 trees in a row, >15m tall - a few felled in late 2000s. AK298016
<i>Euphorbia glauca</i>	1984-94	Ex	Ex Little Barrier I. Trial planting, died out (Ray Walter pers. comm.)
<i>Fuchsia excorticata</i>	1984-95	s	Ex Little Barrier I. Trial planting, evidently one survived, but may now have died
<i>Fuchsia procumbens</i> ***	1984-94	s	Planted out, x1 by Visitors Centre
<i>Hebe macrocarpa</i>	1984-94	s	x1 Visitors Centre in 2010
<i>Hebe pubescens</i> subsp. <i>sejuncta</i> ***	1984-94	s	x2 healthy plants, Lighthouse paddock behind shelterbelt in 2006 and x1 by Visitors Centre. AK223414, UNITEC2405
<i>Hibiscus diversifolius</i> ***	1984-94	s	x1 Visitors Centre in 2010
<i>Hibiscus trionum</i> agg.**~	2006	l	x6 unofficially planted at Fishermans Bay in 2006 (with dark-centred flowers), presumably in mistake for <i>H. richardsonii</i> ? Taxonomy follows Murray et al. (2008). AK299054
<i>Hoheria populnea</i>	1984-94	l	Top of Bush 22, 4m tall (2006). UNITEC2318
<i>Ileostylus micranthus</i>	c.2003	s	green mistletoe. Single plant on karo at margin of Graham's Rd, first seen in Sep 2013 and estimated to be c. 10 years old. AK343668
<i>Myoporum insulare</i> **~	pre-1977	l	Australian ngaio. Remnant hedge by workshop. AK219506, UNITEC2412
<i>Olearia rani</i>	1984-85	Ex?	heketara. Evidently planted (Mitchell (1985) not seen by us
<i>Piper excelsum</i> subsp. <i>peltatum</i> ***	1984-94	s	x1 plant in Visitor Centre. AK315064
<i>Pittosporum cornifolium</i>	1984-94	s	Seed ex Little Barrier I. At least 1 plant in Wattle Valley in 2006. UNITEC2316
<i>Prumnoptys ferruginea</i>	1984	s	miro. Planted out; observed in Wattle Valley and by Bunkhouse dam, all <1m tall in 2010. UNITEC2159
<i>Rhabdolanthus solandri</i>	1984-85	o	Seed ex Little Barrier I. Observed in Wattle Valley (x2), Bush 22, and Bush 21 (x4 all c.1.6m tall). AK314030, UNITEC2080

<i>Schefflera digitata</i>	1984-94	l				patē. Seed ex Little Barrier I. A few adult trees along western margin of Ridge Rd. UNITEC2315
<i>Sophora tetraptera</i> ***	1984-94	s				Only seen by bunkhouse dam in 2010; presumably a mistake planting instead of <i>S. chathamica</i>
<i>Streblus smithii</i> ***	1984-94	s				x1 (male) Wattle Track, c.1m high
<i>Tecomanthe spectiosa</i> ***	1984-94	s				x1 by Visitors Centre (fl. Jun 2010), x2 by Bunkhouse Dam (very rarely flowers), another below Bush 21. UNITEC2416
<i>Xeronema callistemon</i> ***	1984-94	s				Poor Knights lily. Visitors Centre in 2006
(d) Rejected wild records (1 + 0)						
<i>Dodonaea viscosa</i> +P	1986	s				akeake. Only record by C&W based on a single plant in Bush 1 by Paa Point- this species has never been confirmed in the wild but has been planted
(e) Additions to the flora added in proof (based on specimens collected by Shelley Heiss-Dunlop and Toby Shanley in Oct 2013) (1 + 4)						
<i>Adiantum raddianum</i> *	2013	s	A	W		Single plant, valley just N of Paa Point, Oct 2013. AK345437
<i>Aristea ecklonii</i> *	2013	s†	A	?		aristea. Single patch of a few sterile adult plants and many seedlings on steep slope, S of Emergency Landing, Oct 2013. AK345442
<i>Asplenium hookerianum</i>	2013	s	A	W		Single plant on shaded stream bank, valley just N of Paa Point, Oct 2013. AK345436
<i>Cardamine hirsuta</i> *	2013	l	A	H		bitter cress. Roadside weed near workshop along Wharf Rd, Oct 2013. AK345443
<i>Rubus fruticosus</i> agg.*	2013	s†	A	Bi		blackberry. Single seedling, between bunkhouse and gum trees, Oct 2013. AK345444