Vegetation and flora inventory of Resolution Island

Fiordland National Park, New Zealand

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Cover image - Brain Rance looking north-east from near Mt. Roa, Resolution Island, March 2008 (George Ledgard)

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Contents

Executive summary

Resolution Island is situated in the southwest corner of Fiordland National Park between the entrances to Breaksea and Dusky sounds. At 20,860ha Resolution Island is the seventh largest island in the New Zealand archipelago and the largest island in New Zealand to undergo a pest eradication attempt. Detailed vegetation surveys on Resolution Island and within the wider Preservation Ecological District have been limited. With increased access to this remote part of New Zealand, the opportunity was taken by the Department of Conservation to conduct a comprehensive vegetation survey of the island while also assessing the suitability of vegetation monitoring options to measure the outcomes of deer eradication. The island was divided into four study areas and in March 2008 four staff covered a study area individually over 10 days completing an inventory of the vegetation using the unbounded Recce method and a condensed form of this method.

Diverse plant communities extending from the coastal environment, through forest habitat up into the alpine environment were surveyed and comprehensively described. These communities included localised and unusual communities as well as extensive communities.

In total, 414 species have been recorded on the island making it more species rich than Secretary Island, the second largest island in Fiordland. Threatened plants were inventoried and a number of threatened species were found including *Carex littorosa* and all three beech mistletoe species. In addition several plants of the umbrella fern *Sticherus tener* were found at two locations and collected specimens identified were able to confirm this species as present in New Zealand. Several new records to the Preservation Ecological District have also been added, along with the identification of a number of new weed species for the island.

The survey highlighted significant red deer (*Cervus elephus scoticus*) browse in lower altitude, fertile, mesic sites and some alpine areas, where a distinct lack of palatable plant species was observed within the browse tier. It is recommended that outcome monitoring for deer control occurs, with Seedling Ratio Index (SRI) lines being established as a minimum for forest habitats. For alpine sites, either Wraight 20x20m plots or Scott height-frequency transects are recommended to assess the response of alpine vegetation to the removal of deer.

Keywords: Resolution Island, Fiordland National Park, flora, vegetation inventory, *Sticherus tener*, red deer, plant communities.

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1. Introduction

Introduced mammalian herbivores such as deer have had a major modifying effect on the vegetation of New Zealand. Indeed, there are few places within the New Zealand archipelago that are free from these introduced herbivores. There has been much progress and many successes in removing introduced animals from islands. As a result of these successes larger islands and additional species have been targeted in eradication programmes. In 2003 a proposal was put to Treasury for the eradication of both stoats and deer from Secretary and Resolution Islands. This funding bid was approved in 2004.

Resolution Island is a significant island, at 20,860ha it is not only the largest Fiordland island but also the seventh largest island in the New Zealand archipelago. The island extends from sea level up to the summit of 1069m on Mt Clerke and contains much ecological diversity with extensive forest areas, several alpine areas, wetlands and a variety of coastal habitat. The island is also important due to the fact that there are currently only three introduced mammals on the island; stoats, red deer and mice. The island has never been colonised by possums and rats reportedly disappeared off the island after the arrival of stoats.

Secretary Island has received considerable botanical attention (e.g. Mark, Wardle & Baylis 1963; Mark & Baylis 1975; Mark, Baylis & Dickinson 1991; Monks et al. 2005) and consequently its vegetation and flora are well documented. However Resolution Island is relatively poorly described compared with many other Fiordland islands (especially Secretary, Breaksea and Anchor Islands) and comprehensive flora surveys within this region have been limited to the West Cape district (Wardle et al. 1963). The major survey information available for the island is for the Disappointment Cove area (conducted by Peter Johnson, 1992) and other localised surveys by DOC Southland Conservancy botanist, Brian Rance.

In order to fully determine the ecological benefits of the removal of introduced animal pests it is important to have an accurate assessment of the ecological resources present on Resolution Island. The flora and vegetation represent major ecological resources that required further investigation. This examination was the major function of the expedition.

The objectives of the expedition were:

- To describe the major vegetation types present on Resolution Island.
- To find and assess populations of threatened flora species.
- To compile a comprehensive flora list for the island.
- To consider the effect of deer upon the vegetation.
- To assess the suitability of different parts of the island for vegetation outcome monitoring of the forthcoming deer eradication attempt.
- To record fauna sightings of interest including invertebrates.

2. Background

Formal vegetation surveys on Resolution Island have been limited with only localised shore-based surveys being conducted at Five Fingers Peninsula and Disappointment Cove by Brian Rance and Peter Johnston respectively. In the wider area (within the Preservation Ecological District) surveys have been conducted on the Dusky Sound Islands (Rance 2002), Breaksea Island (Allen et al. 1990), and at West Cape (Wardle et al. 1973). These surveys have provided some data on the flora of the area but are still inadequate in comparison to the other intensively managed islands on the western Fiordland Coast e.g. Secretary and Anchor Islands. The larger size of Resolution Island and the presence of Five Fingers Peninsula have resulted in the occurrence of a variety of habitats and ecosystems not found on these other islands and the likelihood of a greater diversity of plant species.

Major areas of potentially different vegetation on the island were identified as key areas for botanical investigation. These priority sites were:

- Alpine areas (especially Mt Roa – the most extensive alpine area and Mt Clerke – the highest alpine area).
- Coastal sites, especially beaches (e.g. Disappointment Cove); estuaries (e.g. Goose/Woodhen Coves and the head of Duck Cove); and other open coastal sites.
- North facing forest areas (these are expected to be more fertile and hence favoured deer habitat).
- South facing forest areas.
- Five Fingers Peninsula (past work has indicated some differences in forest and other vegetation).
- Other habitats that may be identified, in particular rock faces/outcrops, wetlands and valley floors.
- Areas of different geology (the island is dominated by granite, therefore other geological substrates may contain additional species).

On the basis of these prioritised sites and values the island was divided into four study areas for the survey which was carried out between 2-11 March 2008.. The survey team consisting of four people was split with each team member being responsible for undertaking the survey in one of these study areas. This split was as follows:

South-west - Brian Rance

East - Sue Lake

North - George Ledgard

Five Fingers Peninsula - Richard Ewans

3. Geology and Soils

3.1 Geology

Plutonic rocks, of which c. 95% are granitoids, comprise c. 60% of the basement rocks in southwest Fiordland and include the Resolution and Anchor Island groups. These episodes of plutonism have occurred in response to terrane amalgamation, continental thickening, and subduction along the alpine fault offshore of Resolution Island, resulting in the development of the Southwest Fiordland upthrust landscape of which the island is a part of (Allibone et al. 2007).

The island is dominated by paragneiss and granulite of the Paleozoic period with some extrusions of biotite-schist and paragneiss, marble and quartzite around the Disappointment Cove area (DSIR 1958). Exposed domes and outcrops of these granitoids and gneiss occur along the central ranges of the island from Mt Roa through to Mt Wales and at the northern end of Five Fingers Peninsula. The western and eastern sides of the mainland of the island are dominated by diorite and gabbro while the remainder of Five Fingers Peninsula consists of variably foliated biotite hornblende tonalite, quartz diorite and diorite (Allibone et al. 2007). There is also an unusual occurrence of fossiliferous mudstone on the southeastern shore of Five Fingers Peninsula with thin coal seams present (Turnbull & Lindqvist 1981). The distinct shape and topography of the peninsula results from relatively young (Pliocene to Pleistocene; 1.5-3Ma) marine upthrust benches being forced up between the Alpine Fault offshore and a major fault system running up the inshore of the peninsula.

Although looking similar to the landscape around it, Resolution Island is unique in its geological composition and its combination of plutonics is not replicated in any other landscape in southwest Fiordland. In saying this, the chemo-geological effect on fertility is negligible within this landscape and this has resulted in infertile soils in many places. Of geological interest is the discovery of an area of marble outcrop and associated sinkholes near Mt Wales. Its influence on soil fertility and plant composition warrants further exploration at the site.

3.2 Soils

Soils on Resolution Island vary with topography and elevation with distinct variations on Five Fingers Peninsula, Wood Hen Cove and lower elevation sites on the northern coast and at Duck Cove. Soils are described under the NZ genetic soil classification (Hewitt 1998). The dominant soils are acid brown soils and podzols , which cover much of the higher elevations and lower graded topography on the island (DSIR 1962; DSIR 1964). Recent soils occur in exposed areas or areas of high soil disturbance and impeded development. Glaciation has removed soils from some areas with extensive areas of scratched rock and skeletal soils around areas such as Mt Roa. Five Fingers Peninsula is characterised by its topographical nature which is similar to that of the West Cape, with uplifted mudstone and conglomerate marine benches overlain with acid brown brown soils and podzols interspersed by blanket peats/organic soils (DSIR 1964; Wardle et al. 1963). Sandy recent

soils characterised by dunes and alluvial outwashes are present at the head of Woodhen Cove, while the lower elevated areas of the north coast and Duck Cove contain more fertile brown soils. Gley recent soils are present adjacent to some of the larger rivers near the coast (DSIR 1962; DSIR 1964). Gravel beach associations are sparse with the only significant site being the gravel beach and bar in Disappointment Cove. One other minor gravel beach was observed at the mouth of the largest river on the north coast (remains unnamed).

Salt marsh and estuarine systems consisting of marine sands and outwash silts and clays are minimal but present at the head of Woodhen/Goose Cove and Duck Cove.

In general, nutrient availability from plutonic rocks is low however where sufficient soil formation has occurred and soil temperature is adequate (such as north facing alluvial gullies) fertility is high (McLaren & Cameron 1990), supporting a diverse range of forest species.

4. Methods

Each team member completed vegetation assessments of distinct vegetation communities that they encountered. These vegetation assessments were conducted in two forms. The unbounded Recce method (see Hurst & Allen 2007a) was used as a more formal description of sites of interest while a condensed Recce method (hereafter known as the mini Recce method) was used where there were time constraints or limited vegetation significance and/or diversity.

Recce method (unbounded): All data was recorded on the 2007 version of the National Vegetation Survey Databank (NVS) Recce sheet (See Hurst and Allen 2007a) to standard NVS protocol. The exceptions to this method were:

Plot layout was not recorded due to the Recce's being unbounded;

Mesoscale topographic index not completed due to the lack of hypsometers being available;

Cover scores were given a percentage not a cover class in some instances (note: a '+' denoted <1% cover).

Mini Recce method: This method was a reduced form of the Recce. Essentially it incorporated the back page of the Recce (i.e. plant species present) with basic cover scores and a few location descriptors. These forms were recorded within field notebooks. For an example see Appendix 2.

Flora recording: An inventory of plants observed during the study was made. In some cases several lists within a study site were completed. Additional notes were made on locations of threatened plants, other notable plant records and palatable plant species abundances or distributions.

All plant specimens unidentifiable in the field were collected, pressed and formally identified back in the office. The remaining specimens whose identification could not be confirmed were sent through to the Plant Identification Service at Landcare Research. In addition some voucher collection specimens have been lodged at the Allen Herbarium and additional specimens (ferns and *Hebe* spp. samples only) were identified and lodged at Te Papa/National Museum of New Zealand.

Other records: Notes were made on locations of indigenous fauna, deer sightings, deer impacts (including browsing, tracking and other deer sign) and other notable observations.

5. Vegetation

A total of 36 Recce Plots and 78 mini Recces were completed. Although the whole island was not covered, the survey captured most key vegetation communities resulting in a comprehensive flora list for the island. Alpine tops and forests in the central, southern and eastern parts of the island were inventoried by Brian, Sue and George. Richard spent ten days intensively exploring Five Fingers Peninsula and Goose Cove. Coastal forest, rocky shorelines and coves along the north coast were visited by George. Swamps, valley floor forests, salt marshes and bogs were also inventoried.

Overall the survey was comprehensive and most flora species expected to be on the island were encountered along with some new recordings for the area. Notably *Sticherus tener*, only recorded once previously in New Zealand, on Five Fingers Peninsula, was confirmed at several locations on the island.

There were still some deficiencies however, and naturally rare ecosystems such as marble outcrops and flushes need further investigation along with other communities which were underrepresented in the surveys. The steep eastern side of the island (above Acheron Passage) would also benefit from additional work.

5.2 Vegetation communities

A number of vegetation communities are present on the island, their distribution being largely driven by aspect, altitude and soil development. Outlined in the below table are the vegetation classes that occurred on the Island, their composition and distribution, and structure. The New Zealand Vegetation Cover Map (NZVCM) classes (Newsome 1987) were used as a descriptor of forest type. A summary of all the descriptor classes is in Appendix 2.

Table 1 below shows a summary of the vegetation communities sampled and a brief description of those communities.

Table 1: Summary of vegetation communities on Resolution Island.

Bio Climatic Zone	Vegetation Community	NZVCM Class	Composition	Distribution	Canopy Ht (M)	Altitude	Plots R=Recce r= mini Recce
ALPINE	*Chionochloa acicularis* tussockland	G4	*Chinochloa acicularis*, *Celmisia* spp., *Carpha alpina* and other associated species	Alpine tops	0.5	>700m	2R, 1r
	Chionochloa pallens and *C. rigida* subsp. *amara* tussockland	GS4	*Chinochloa pallens*, *Hebe odora* and *Dracophyllum* spp. dominated tussock-shrubland	Alpine tops	<1.5	>800m	1R, 1r
	Fell field, exposed rock turf communities	M1	Set amongst rocky crags, scree and exposed granite domes. Low vegetation cover with prostrate shrub and plant communities	Mt Lort	<0.5	>550m	1R, 6r

Bio Climatic Zone	Vegetation Community	NZVCM Class	Composition	Distribution	Canopy Ht (M)	Altitude	Plots R=Recce r= mini Recce
	Exposed cliff community	GS4	Steep, moist cliff face characterised by a mosaic of shrub species such as moss *Epilobium*, *Gaultheria*, and *Bulbinella* spp., etc	Western range	<0.5	>600m	1r
	Tussock dominated shrub community	GS4	*Chionochloa acicularis* interspersed with *Dracophyllum* spp., flax, and *Hebe* spp.	Alpine tops	0.5	700-900m	3R, 3r
SHRUBLAND	Mixed indigenous scrub – subalpine	S3 – FS7	*Dracophyllum* spp., pink pine, *Olearia* spp., *Hebe* spp., flax grading to subalpine forest	Adjacent to or amongst alpine grassland	1.5	500-700m	2R, 5r
	Infertile podocarp-broadleaved scrub	FS2	Manuka, pink pine and yellow silver pine dominated scrub/stunted forest	Infertile sites around the island	4	200-600m	6r
	Leptospermum scrub dominated shrubland	S2	Manuka dominated shrubland	Exposed bedrock ridges and swamps	2	200-700m	2R, 5r
	Mixed indigenous scrub – coastal	S1	Coastal scrub belt and rocky shore – *Olearia* spp., *Dracophyllum longifolium*, *Hebe* spp., flax, three finger	Steep coastal fringes, exposed sites	2	5-40m	2R,1r
FOREST	Highland podocarp-broadleaved-beech forest	F5	Silver/mountain beech, pink pine canopy over a broadleaved shrub under story	Sub alpine stunted forests throughout	6	500-600m	2R, 3r
	Lowland podocarp-broadleaved-beech forest, infertile	F4 – FS3	Rata/silver pine/kamahi/beech/rimu over a mingimingi, yellow silver pine, *Coprosma* spp. understorey	Mid - low altitude infertile	25	100-300m	2R, 7r
	Lowland podocarp-broadleaved-beech forest, fertile	F4	Silver beech, kamahi, miro, rimu over palatable broadleaved understorey, fern forest floor	Mid - low altitude fertile	30+	5-200m	R, 1r
	Broadleaved forest	F8	A variety of broadleaved shrub-tree species with the noticeable absence of beech and podocarps	Woodhen Cove isthmus	4	11m	2r
	Beech forest	F6	Beech dominated subalpine forest - >85% silver or mountain beech over a sparse understorey	Eastern faces above Acheron Passage	12	500-800m	4r
	Beech broadleaved forest	F7	Beech/kamahi/rata dominated forest with broadleaf understorey over fern	Mid slope – mid altitude	20	20-600m	5R, 7r
COASTAL	Dune land with tidal fan	M3	Combination of salt marsh, turf and dune species	Head of Goose Cove	<0.5	<5m	2R, 2r
	Rocky shoreline vegetation	N/A	Characterised by matt species amongst rocks such as *Isolepis praetextata* and other short coastal species such as *Blechnum banksii* and *Poa breviglumis* and *P. astonii*.	North coast and Five Fingers Peninsula Shoreline	<0.5	<5m	2r
	Beach/Rivermouth	N/A	*Carex* spp., *Poa* spp. and *Coprosma* spp. shrubs – weedy. Variable in composition and rare in occurrence.	Uncommon – North coast and Goose Cove	<2	1m	2R, 1r

Bio Climatic Zone	Vegetation Community	NZVCM Class	Composition	Distribution	Canopy Ht (M)	Altitude	Plots R=Recce r= mini Recce
WETLAND	Lake margin/wetland	M2	Dominated by rushes and sedges and freshwater aquatics such as *Potamogeton* spp.	Uncommon	<1.5	600m	1r
	Cushion bog	N/A	Characterised by *Donatia novae-zelandiae, Drosera* spp., *Oreobolus* spp., and other cushion bog species	Mt Roa, Five Fingers Peninsula	<0.5	600-850m	3R, 3r
	Manuka wetland	S2	Ecotone between bog areas and forest – manuka interspersed with stunted infertile forest spp. such as pink pine and mountain beech.	On the margins of valley floor bogs	<4	100-650m	3R
	Lowland-montaine wetland	M2	Mixture of *Chionochloa acicularis* with moss interspersed with other wetland monocots	Poorly drained inter-montane basins and valley floors, Five Fingers Peninsula	<1	50-700m	3R, 8r
OTHER	River banks	N/A	Varied depending on substrate and species rich – very diverse	Island wide	0.5-30	20-200m	1R
	Slip/regenerating bush	FS3	Regenerating broadleaf species and herbs amongst crown fern, heavily browsed	Exposed steep faces and windswept ridges	3	400-100m	1r
	Marble outcrop	N/A	Localised outcrop of marble with species that prefer higher fertility situations than the surrounding landscape exhibited: Fuchsia, pate and ribbonwood.	East of Mt Wales	8	498	1R

5.2 Community descriptions

5.2.1 Alpine and Upland Vegetation

There are several alpine areas the most extensive being Mt Roa - Mt Lort, North Phillips, Mt Phillips, and Mt Clerke. Other smaller alpine areas include Mt Wales, Mt Lyall, Mt Forbes, and other un-named peaks and ridges. In addition, there are other areas of open vegetation below treeline in exposed areas and on shallow soils.

5.2.2 Tussocklands

There were five species of snow tussock encountered; *Chionochloa acicularis* and *C. crassiuscula* are both widespread and common, while *C. pallens*, *C. rigida* and *C. ovata* are both localised and uncommon.

Chionochloa acicularis tussockland

Recce: Roa 5 & Roa 6, SW 5 & SW 7

Altitude: c. 700 -1069m

This community is the most extensive alpine community. The community has minor variability dependent upon site conditions. Typically the community is dominated by *C. acicularis* with a cover of 40-75% (average 55%) cover and a canopy height of 30-80cm

(average 50cm). Other major associated species include *Chionochloa crassiuscula* (1-10%, average 5%), *Celmisia petrieii* (1-8%, average 3%), *Carpha alpina* (1-8%, average 2%), *Dracophyllum pearsonii* (0-5%, average 1%), *D. menziesii* (0-5%, average 1%), *Astelia linearis* (0-5%, average 1%), *Uncinia viridis* (1%), *Pimelea gnidia* (0-4%, average <1%), *D. longifolium* (0-2%, average 1%), *Celmisia verbascifolia* (0-2%, average 1%). Other widespread but minor associates include *Gentiana montana, Aciphylla lyallii, Celmisia du-reitzii, Anisotome haastii, Schoenus pauciflorus* and *Oreobolus impar*.

On damp sites the community contains more *Chionochloa crassiuscula* (10-20%), *Carpha alpina* (c. 15%), *Astelia linearis* (c. 10%), *Schoenus pauciflorus* (c. 2%) *Celmisia du-rietzii* (c.2%) and locally *Donatia novae-zelandiae*, *Oreobolus strictus, Bulbinella gibbsii* and *Coprosma elatirioides*. Within the *C. acicularis* tussockland are localised areas where pineapple shrub (*Dracophyllum menziesii*), pink pine (*Halocarpus biformis*) or leatherwood (*Olearia colensoi*) may dominate.

The community grades into cushionbog/wetland on sites with impeded drainage; shrub-tussockland generally at lower altitudes and on less exposed sites; and into sparsely vegetated communities on eroded granite surfaces. In addition *C. acicularis* can dominate on valley floor wetlands. These communities are described elsewhere in this report.

Chionochloa crassiuscula tussockland: Although widespread and locally common, especially on damp sites, it is seldom dominant. Therefore this vegetation is best considered a variant of *C. acicularis* tussockland.

Chionochloa pallens and *C. rigida* subsp. *amara* tussockland

Recce: Clerke 1

Mini Recce: G8

Altitude: c.900m

This community is very localised on the Mt Roa range whereas extensive areas occur on the Mt Clerke range. The site on Mt Roa occupied a gully (c. 100x10m). The community was dominated by *Chionochloa pallens* (c. 50% cover), with *Dracophyllum menziesii* (18%), *Hebe odora* (15%), *Celmisia verbascifolia* (2%), *Anisotome haastii* (1%). A notable feature of this community is *Dracophyllum fiordense* (1%).

On Mt Clerke the area surveyed had extensive deer damage with species such as *Chionochloa rigida* subsp. *amara* and *Anisotome haastii* exhibiting heavy browse including numerous dead *C. rigida* stumps. The community here was far more diverse with almost double the species recorded. Dominant species included *Chionochloa rigida* subsp. *amara* (5%), *C. pallens* (5%), *Poa colensoi* (c. 60%) and *Oxalis lactea* (c.20%). A similar community was found near the summit of Mt Wales.

Fellfield, exposed rocky turf communities

Mini Recce: G1

Altitude: c.916m

This community is distinctive though localised and of limited extent. It occupies exposed sites on ridges (e.g. saddles) at higher altitudes. At the study site the community consisted of *Dracophyllum politum* (22%), *Raoulia buchananii* (10%), *Chionochloa crassiuscula* (2%), *Oreobolus impar* (2%), *Celmisia sessiliflora* (1%) and other species in smaller amounts. The

total vegetation cover is variable but up to c. 60% with the remainder of the cover consisting of mainly rock and gravel.

Shrub-tussockland

Recce: Roa 4

Altitude: c.500-650m

This community is widespread but fragmented. Though the community is transitional between shrubland and tussockland it is sufficiently widespread to be included in its own right. It is found on relatively exposed sites and generally on shallow soils. The canopy is generally less than 1m tall, with the average height being c. 50cm. The community is generally dominated by *Chionochloa acicularis* (c.30%) and manuka (25%). Other components include pink pine (*Halocarpus biformis*) (4-10%), *Carpha alpina* (4-8%), *Astelia linearis* (2-6%), inaka (*Dracophyllum longifolium,* 3%), mountain beech (*Nothofagus solandri* var. *cliffortioides*, 3%), *Gahnia procera* (2%), *Oreobolus impar* (2%), *O. strictus* (1%), prickly mingimingi (*Leptecophylla juniperina*), *Gentiana montana*, and other species.

5.2.3 Shrublands

Subalpine shrubland

Recce: Roa 8,

Mini Recce: Roa 3, Roa a1 & Roa a4

Altitude: c.780m

This community is found bordering the alpine to sub alpine tussocklands around the higher elevation sites on the island. With decreasing altitude there is a graded transition into higher stature vegetation which is described in the forest classifications. Prominent species within this community consist of *Halocarpus biformis* (c.30%), *Olearia colensoi* (c.15%), *Dracophyllum* spp. (c.15%), *Nothofagus* spp. (c.10%), *Astelia* spp. (c.5%), *Phormium tenax* (c.2%). Other uncommon but distinguishing species are *Pseudopanax colensoi* var. *fiordense* within the browse tier, *Gahnia procera* and *Myrsine nummularia*.

Podocarp - broadleaved shrubland - infertile

Recce: RR5

Mini Recce: Roa a4, R1 & G14

Altitude: c.400 – 700m

This is probably the most widespread shrubland community on the island. Its species composition appears to be highly influenced by low soil fertility brought about in most instances by impeded drainage. At higher altitude this shrub class has been differentiated into a Subalpine Shrubland class (see previous paragraph), which is more mixed in species composition and probably occurs on more fertile sites. Its typical composition is dominated by *Halocarpus biformis* (c 40% canopy cover) (and *Lepidothamnus intermedius* on five fingers) with *Metrosiderous umbellata, Nothofagus menziesii* and *Leptospermum scoparium* comprising the remainder of the canopy. The sub canopy, if there is one, is sparse with

Dracophyllum menziesii (3%), *Leptecophylla juniperina* (2%) and *Astelia* spp. Ground covers are usually dominated by bryophytes (c.50%) and litter (c.30%).

Manuka dominated shrublands

Recce: Roa 3

Mini Recce: Plateau Biv, Roa a6, SWa10 & SWa6

Altitude: c.550

These shrublands are highly variable with manuka varying in cover and stature. However, there are some similarities and associations that allow this category to be used to document a significant component of the island's shrublands. This shrub type could be broadly classified into two categories, high stature (2-5m) and low stature (<1.5m). The high stature shrubland comprises *Leptospermum scoparium* (c.40%) and stunted forest species such as *Nothofagus solandri* var. *cliffortioides, Metrosiderus umbellata, Dracophyllum* spp. and *Halocarpus biformis* (totalling c.40%). The understorey was often sparse and the community was often found at higher altitudes. Communities with almost 100% Leptospermum canopy cover were found on infertile well drained ridges at mid altitude sites, however these were the least common sub community. The low stature sites were much more diverse and Leptospermum was less dominant and patchy in its overall presence. These sites were often infertile or had impeded drainage. Associated species within this community were *Carpha alpina, Chionochloa acicularis, Astelia linearis* var. *linearis, Gentianella montana* var. *montana, Donatia novaezelandiae* and *Drosera* spp. These sites are closely linked to the manuka wetland margin descriptions further on in the text.

Coastal shrub

Recce: NW4

Mini Recce: G14, R10 & R14

Altitude: c.10m

This community was most commonly found on exposed coastal slopes, particularly on the western and northern sides of the island. The dominant shrub in this zone is *Olearia oporina* (c.50%) with *Dracophyllum longifolium* (c.20%) sometimes dominating in localised patches. Other common species are *Phormium tenax* (c.5%), *Hebe elliptica,* (c.5%) *Brachyglottis rotundifolia* and *Austroderia richardii*.

5.2.4 Forest

Highland podocarp-broadleaved-beech forest

Recce: Roa 2, BR2, G1, RR5 & G14

Mini Recce: Roa a8, SWa7, SL8 & SL11

Altitude: c.600m

These forests are characterised by the presence of pink pine (*Halocarpus biformis*) (20%), co-dominant with rata (20%), kamahi (30%) and mountain/silver beech (40%). The understorey also contains species associated with this infertile habitat such as *Dracophyllum longifolium* (5%), *Olearia colensoi* (10%), *Archeria traversii* (5%) and *Myrsine*

divaricata (5%). The forest floor is often open with a distinct lack of groundcover from species such as ferns etc.

These forests are often found on poorly drained, infertile ridgelines, often with bedrock close to the surface.

Lowland podocarp-broadleaved beech-forest - infertile

Recce: SW11, SW4, SW12, RR6, RR2 & RR1

Mini recce: R3, R9, R13, R17 & G17

Altitude: c.60m

Similar to the above description however distinguished by the presence of some of the taller podocarps in less exposed sites. Rimu, miro, pink pine and totara dominate along with pokaka, beech and kamahi to make up a taller statured forest overlying a relatively sparse understorey of prickly mingimingi, coprosma spp. and other small leaved shrubs. Sites where this forest type was present were flat, infertile boggy areas, often with standing water.

Lowland podocarp broadleaved beech forest - fertile

Recce: SW1

Altitude: c.10m

This fertile valley floor forest was characterised by the diversity of the forest and the presence of a variety of palatable tree species such as mahoe, pigeon wood, pate and fuchsia. The canopy was dominated by podocarps and beech with numerous epiphytes, notably kiekie, which was not found anywhere else on the island. High levels of deer in the area have impeded regeneration and the forest floor is dominated by crown fern (*Blechnum discolor*). The largest tract of this forest was in the Disappointment Cove valley while some small pockets were observed at the mouths of some of the larger rivers.

Broadleaved forest

Mini Recce: R15 & G16

Altitude: c.8m

The two locations of this forest type were on the isthmus of Woodhen Cove and on a steep dynamic river bank, 400m inland on the north coast. The canopy height was low with nothing present over four meters. A number of highly palatable forest species were present with species such as pigeonwood, fuchsia, rata, broadleaf and karamu occurring (although not within the browse tier at Goose Cove). Understorey species consisted of mainly non-palatable grasses and ferns such as *Blechnum discolor*, *Microlaena avenacea* and *Uncinia unciniata*. However, when access to deer was restricted a number of deer-preferred species were observed such as *Asplenium bulbiferum* and fuchsia and marble leaf seedlings.

Beech forest

Recce: SW9 & RR3

Mini Recce: SL18, SL19, G11, Ba3, Ba5, G5, G7 & G15

Altitude: c.600m

This forest type was predominant on the high elevated slopes above Acheron Passage on the eastern edge of the island with localised patches elsewhere. Areas with over 60% beech dominating the canopy were assigned to this community. Other species present in the canopy were most often kamahi and rata. The understorey commonly consisted of ferns such as *Cyathea colensoi* and *Blechnum* spp. along with a variety of *Coprosma* spp. and other small-leaved shrubs such as *Pittosporum divaricatum* sparsely scattered throughout. Ground covers were dominated by bryophytes (c.70%) and the hook grass *Uncinia filiformis* was usually present. Two lowland fertile sites dominated by silver beech were recorded along the southwest coast. The understorey was more diverse than higher altitude sites and this forest type may be more common along this coast.

Beech - broadleaved forest

Recce: WALES3, SW6, SW8, NW3 & NW2

Mini recce: SWa1, SWa2, R4, R5, R8, R11, R12, R16, G10, G11, SL9, SL12 & SL13

Altitude: c.500m – sea level.

Beech broadleaf is probably the most singularly dominant forest type on the island. This forest type typically occurs on mid-to-low altitude, medium fertility, sloped sites. The two primary dominant species are kamahi and beech. Beech broadleaved forests consist of a combination of mountain and silver, with silver preferring the more productive sites and usually the dominant of the two. Other minority species found in the canopy are rata, broadleaf, marble leaf and *Pseudopanax colensoi* var. *fiordense* (epiphytic). In the mid tier dominants consist of *Coprosma foetidissima, C. cuneata, C. ciliata, Cyathea colensoi, Dicksonia squarosa* and others, while the understorey is dominated by *Blechnum* fern species. Bush lawyer and supplejack are both common, while some podocarps (miro and rimu) appear sporadically along the ridges. The lack of palatable plants observed within the browse tier suggests that these forests hold high deer numbers.

5.2.5 Coastal

Dune land with tidal flats

Recce: RR7, RR8 & RR9

Altitude: 6m

The only extensive community comprised of salt marshes and dunes is located at the head of Goose Cove. Other isolated patches occur at the head of coves along the south west coast. The jointed rush, *Leptocarpus similis* is common around the intertidal zone (c.30%) along with *Samolus repens* (c.10%), *Isolepis cernuus* and *Crassula moschata* (<5%). Further inland the community is far more diverse with a number of turf species, rushes, sedges and grasses present. Common species included *Coprosma propinqua, Carex appressa, Hydrocotyle novae-zealandiae, Centella uniflora* and *Leptinella squalida*. Some stunted podocarp species such as rimu and totara were also present further inshore.

Beach/Rivermouth

Recce: DISS 2

Mini recce: G13

Altitude: 1m

This habitat was very rare and only two sites were found: Disappointment Cove and an unnamed cove on the North Coast. These sites consisted of a gravel/sand bar with a slight back beach. Exposure, salt spray, and tidal fluctuations are the dominant environmental variables which influence these plant communities. *Carex*, rushes, and sedges were common at both sites while some locally and nationally rare and threatened species such as pingao (*Ficinia spiralis*), kowhai (*Sophora microphylla*), *Coprosma rugosa*, mingimingi (*C. propinqua*) and saltmarsh ribbonwood (*Plagianthus divaricatus*) were present at Disappointment Cove. The pingao appeared to be healthy. The major threat to these sites are weed invasions (gorse and scotch thistle were noticeable along the coast in some locations) and intensive deer browsing preventing regeneration.

Rocky shoreline vegetation

Recce: RR10

Mini Recce: G13

Altitude: 1m

This vegetation type is found on the exposed rocky shorelines, typically along the western and northern exposed coasts. Vegetation is low in stature and consists of plants tolerant to sea spray. Total cover is dominated by exposed rock while *Poa* spp. (10%) and *Carex pleiostachys* (10%) are dominants. Other common coastal species were *Anisotome lyalii, Lobelia anceps, Sagina procumbens* and *Blechnum banksii*.

5.2.6 Wetlands

Cushion bog

Recce: Roa 9 & RR5

Mini Recce: Roa a5, R2 & R6

Altitude: 680-860m

This community is widespread and relatively common, although generally on a small scale. The community grades into *Chionochloa acicularis* tussockland on better drained sites. The major components of this community include *Donatia novae-zelandiae* (25-45%, average 35%), *Carpha alpina* (5-20%, average 12%), *Oreobolus pectinatus* (8-15%, average 10%), *Chionochloa crassiuscula* (5-8%, average 6%), *Oreobolus impar* (2-10%, average 5%), bryophytes (5%). Other characteristic species include *Dracophyllum prostratum* (1-6%, average 4%), *C. acicularis* (2-4%, average 3%), *Astelia subulata* (1-4%, average 2%), *Zotovia thomsonii* (2%), *Rostokovia magellanica* (2%), manuka (+-6%, average 1%), *Astelia linearis* (+-5%, average 1%), *Gaimardia setacea* (1-3%, average1%), *Lipparophyllum gunnii* (+-3%, average 1%), *Actinotus novae-zelandiae* (1%), *Rytidosperma nigricans, Mitrasacme novae-zelandiae, Drosera arcturii, Pentachondra pumila,* and other species.

Within the cushionbog are pools and areas that are temporarily flooded. These wet areas tend to be dominated by *Lipparophyllum gunnii* with *Centrolepis ciliata, C. pallida, Gaimardia setacea, Zotovia thomsonii, Juncus antarcticus, Astelia subulata* and bryophytes.

Around the margins of the cushionbog the community merges into other adjacent communities, generally tussockland. A distinctive though discontinuous community that was sampled contains *Chionochloa crassiuscula* (15-30%, average 22%), *C. acicularis* (10-20%, average 15%), *Carpha alpina* (10-20%, average 15%), *Donatia novae-zelandiae* (5-15%, average 10%), *Astelia linearis* (5-20%, average 10%), bryophytes (5-12, average 8%), and *Oreobolus pectinatus* (1-12%, average 5%). Also present are *Dracophyllum politum* (3%), *Schoenus pauciflorus* (2%), *Bulbinella gibbsii, Forstera sedifolia, Drosera arcturii, Zotovia thomsonii, Hebe odora,* and manuka.

Valley floor bogs

Reece: Roa1, SW10 & RR11

Mini Recce: Roa a7, SWa3 & SWa4

Altitude: 120-600m

This community is found on scattered sites on valley floors and depressions. It is generally small-scale (the largest being > 2ha), though they are generally much smaller (often < 0.1ha). The community is dominated by *Chionochloa acicularis* (10-75%, average 30%), with a canopy height of 30-75cm (average 50cm). Major associated species include much bryophyte (2-60%, average 20%) and *Carpha alpina* (15%). *Astelia linearis* (0-15%, average 2%), wirerush (*Empodisma minus*) (0-35%) and manuka (0-10%) are not always present, however at some sites are common. Other associated species include *Donatia novae-zelandiae, Oreobolus pectinatus, O. strictus, Drosera spathulata, D. arcturii, Lycopodium ramulosum, Gaimardia setacea, Zotovia thomsonii, Actinotus novae-zelandiae, Liparophyllum gunnii Pentachondra pumila, Deyeuxia aucklandica*, and other species. Litter is generally common (c. 20% cover). *Sprengelia incarnata* and *Lepidospermea australe* may be characteristic species at some lower altitude sites.

Manuka wetland

Recce: RR4, Diss 1 & SW 3

Altitude: 100-650m

This community is on wet, peaty soils, often around the margin of valley floor bogs. The vegetation is a semi-open shrubland, the woody component is dominated by manuka (up to 4m tall) generally with some pink pine, yellow silver pine, inaka and mountain beech. The understorey often includes *Gahnia procera*. The ground cover generally contains much bryophyte along with *Donatia-novae-zelandiae, Carpha alpina, Oreobolus strictus, O. impar, Lycopodium ramulosum, Actinotus novae-zelandiae, Centrolepis ciliat*a, and other species.

Lake margins

Mini Recce: Roa 06

Altitude: 670m

Around the margin of a lake north of Mt Lort is a wetland community. This community is distinctive though localised. The major vegetation is *Isolepis aucklandicus* (30%) and bryophyte (25%), with *Carpha alpina* (15%), *Juncus antarcticus* (10%), *Chionochloa acicularis* (5%), *Schoenus pauciflorus* (5%), *Juncus bulbosus* (5%), *Hebe odora* (2%), *Chionochloa crassiuscula* (1%), and several other species in minor amounts.

5.2.7 Other

River Banks

Recce: NW3

Altitude: 20m

Only one Recce was conducted on a river bank however the diversity of vegetation was very high with several communities present within this area e.g. dynamic gravel river bed, low light, wet stable channel, sheltered, steep mossy bank and terrace edge/forest floor. The fertile terrace edge forest was a mix of beech-podocarp-broadleaf species, while the moist mossy bank and stream held a variety of *Hymenophyllum* species and palatable species such as *Asplenium bulbiferum* in areas inaccessible to deer. The river bank which was exposed to flooding was the residence of many small herb species and creepers such as *Hydrocotyle moschata, Oxalis exilis* and *Lobelia angulata*.

Regenerating forest

Mini Recce: G12

Altitude: 400m

These sites tended to occur on the steep coastal country where slips had occurred or along ridges where wind throw had occurred. Mountain beech was the main canopy species that was seen to be regenerating, however the regeneration of other canopy species has been impeded by heavy deer browse. These sites are often diverse with a number of herbs and small perennials present. Dominant species include; *Coprosma cuneata* (20%), *C. pseudocuneata* (20%), *Blechnum procerum* (20%), *B. discolor* (15%), and *Nertera depressa* (2%).

Marble area to the east of Mt Wales

Recce: SL17

Altitude: 498m

This site was a damp forested area with large marble boulders and a sink hole approximately 20m deep and 15m wide. The species encountered here are indicative of a fertile site with pate, fuchsia, and ribbonwood all present. The floor of the sink hole was a damp area with no trees present. Two plants found that are of particular interest were *Myosotis spathulata* and a small *Asplenium bulbiferum* which is possibly the marble specific *A. cimmeriorum* (due to small size and lack of bulbils). This is an unusual habitat and definitely warrants further investigation.

6. Flora

This survey confirmed that Resolution Island has a very rich flora, with 411 indigenous species recorded (see Appendix 5). The flora is highly representative of the Preservation and southern Doubtful Ecological Districts. Notably this survey adds several new records to our knowledge of the flora of the Preservation Ecological District (south-western Fiordland).

Future additional survey work is expected to further increase the known flora of Resolution Island. It is noted that there are several species that have been recorded from adjacent Dusky/Breaksea Sound Islands that were not recorded in this survey. In addition, there are some species recorded from the Secretary Island and West Cape area that also were not recorded. It is likely that the total flora could be in the vicinity of 450 indigenous species.

The richness of the flora recorded is largely a consequence of the size of the island, the diversity of habitat available, and the intactness of the habitat. While it was not possible to survey the island in its entirety, all major habitats and major portions of the island received some attention. The south-western portion of the island contained the richest flora (291 species) which is largely a consequence of the diversity of habitat covered. Five Fingers Peninsula was the least diverse area, which is probably a reflection of the relative lack of diversity of habitat.

The diversity of the major different life forms is presented in Table 2. The greatest diversity within the flora was that of herbaceous species (114 species), trees and shrubs (85 species), and ferns (77 species). These groups represent 67% of the flora.

Table 2: Plant diversity of the major different plant life forms found on Resolution Island (SW=South-west, SE=South-east, N=North, FF=Five Fingers Peninsula, T=total for Resolution Island), Dusky Sound Islands (DI), West Cape (WC), Secretary Island (SI).

Plant groups	SW	SE	N	FF	T	DI	WC	SI
FERN	57	51	58	41	77	61	36	69
PODOCARP	6	4	5	5	6	6	5	8
TREES & SHRUBS	69	61	57	55	85	61	60	78
CLIMBERS & VINES	3	3	5	3	6	5	4	5
HERBACEOUS	67	72	52	43	116	36	26	94
GRASSES	25	19	12	10	32	6	9	26
SEDGES	28	20	26	24	41	27	14	32
ORCHIDS	14	11	13	14	22	13	12	17
RUSHES	10	7	7	9	16	7	3	10
OTHER MONOCOTS	12	10	7	7	13	8	8	13
Total	291	258	242	211	414	235	172	332

The flora is considered diverse compared to other areas of western Fiordland that have been studied. Of particular note is the richer flora recorded from Resolution Island compared to Secretary Island (414 c.f. 332 species) despite much more intensive studies on Secretary Island. Likewise the greater diversity of Resolution Island compared to the flora of other adjacent, smaller and lower altitude islands in Dusky/Breaksea Sound is highlighted (414 c.f. 230 species). The diversity of Resolution Island compares favourably to the limited

diversity of the West Cape area (Wardle et al. 1973) which is a different environment, especially in landform, soils and climate, from most of Resolution Island. The environment of the West Cape area does however have many similarities to the Five Fingers Peninsula of Resolution Island.

An interesting feature of the flora is the relationship between southwestern Fiordland and southeastern Australia. This relationship is typified by the prescence of *Sprengelia incarnata* and *Sticherus tener*. Both species were initially considered as adventive however they are now considered as a part of New Zealand's indigenous flora (Moore 1969).

6.1 Notable species

Notable plants found include six threatened species, thirteen nationally uncommon species and a few additional species. The threat status of these plants follows de Lange et al. (2009). No plants found are classified as 'Threatened' but many were in the 'At Risk' categories.

The qualifiers for each species' threat status are listed below:

CD - Conservation Dependent

DP - Data Poor

EF - Extreme Fluctuations

Inc - Increasing

RR - Range Restricted

SO - Secure Overseas

Sp - Sparse

At Risk – Declining species

Carex littorosa. Recorded from Duck Creek, Disappointment Cove and Goose/Woodhen Cove.

Yellow-flowered mistletoe/*Alepis flavida*. (CD). Recorded in small numbers from several scattered sites.

Scarlet mistletoe/*Peraxilla colensoi*. (CD). Recorded in small numbers from a few scattered sites.

Red mistletoe/*Peraxilla tetrapetala*. (CD). Recorded in small numbers from a few scattered sites.

At Risk – Relict species

Pingao/*Ficinia spiralis*. (CD, Inc, Sp). Only recorded from Disappointment Cove, where it is uncommon.

Native sow thistle/*Sonchus kirkii*. Previously recorded from Disappointment Cove and recorded in this survey from Five Fingers Peninsula.

At Risk - Naturally Uncommon species

Abrotanella muscosa. (RR). Recorded locally from Mt Roa from within moss on wet rock. Note: previously thought to be a Stewart Island endemic species.

Anisotome lyallii. (Sp). Recorded from coastal habitat.

Brachyglottis bifistulosus. (Sp). Very localised.

Carex pleiostachys. (RR, Sp). Recorded from coastal habitat.

Crassula helmsii. (SO, Sp). Recorded locally from saltmarsh areas.

Gentianella lineata. (Sp). Recorded from alpine bogs.

Grammitis rigida. (Sp). Recorded from coastal rocks.

Myosotis rakiura. (RR, Sp). Recorded from coastal habitat. Note: This appears to be the first Fiordland record for this species.

Myosotis spathulata. (DP, EF, Sp). Very localised.

Sprengelia incarnata. (SP, SO). Recorded from lowland bogs.

Uncinia viridis. (DP, Sp). Recorded from alpine tussockland.

Other notable species

Celmisia holosericera. Fiordland endemic.

Dracophyllum fiordense. Fiordland endemic.

Drymoanthus adversus. This species is uncommon in Southland and is probably impacted by possum browsing. Note this record was by P. N. Johnson (1992).

Sticherus tener. This fern had previously been recorded from Fiver Fingers Peninsula (a single specimen) and this site was the only recorded site for this otherwise Australian species (hence its current status as vagrant). During the current survey it was recorded and collected from a few sites on Five Fingers Peninsula and also from near Centre Biv. The identification of the specimens was confirmed by Dr. Patrick Brownsey (Te Papa Tongarewa, Museum of New Zealand), confirming the presence of this species in New Zealand. Another specimen subsequently collected from the outlet of the lake on Indian Island (nearby in Dusky Sound) may be this species or another species of *Sticherus*, previously unrecorded from New Zealand (Dr. Patrick Brownsey, pers. comm, 26 August, 2011). *Sticherus tener* is classified as a Non-Resident Native-Vagrant (DP, Sp) by de Lange et al. (2009).

Absent/localised species

A number of alpine species were localised in distribution, often with these being found only on the eastern ridge (or much more common there) rather than Mt Roa. These species included *Chionochloa rigida* var. *amara, C. pallens, Ranunculus lyallii, Brachyglottis bellidoides, Celmisia ramulosa, C. walkerii, Crasedia uniflora, Geum uniflorum, Ourisia caespitosa* and *Poa colensoi*. There is a paucity of alpine *Hebe* spp. (only *H. odora* and no whipcord species), alpine *Carex* (only one species), bidibid (one species) and speargrass (two species). For these groups this represents low diversity for Fiordland. No *Dolichoglottis lyallii* or alpine bidibid were recorded either.

6.2 Weeds

A total of 23 exotic species were recorded from Resolution Island. Most of these exotic species were confined to open coastal areas. Only two rush species were found in natural areas within the alpine and wetland habitats. The only weed of conservation concern recorded was gorse, recorded from Disappointment Cove and Woodhen Cove (see Appendix 3). Both of these gorse sites are currently managed with annual visits to locate and spray gorse by Biodiversity Threats staff from the Te Anau Area Office.

The sites containing the most exotic species were Goose/Woodhen Cove (16 species) and Disappointment Cove Beach (11 species). These findings were not unexpected as both of these sites frequently receive hunting parties and face the northerly swells which wash up seed (such as gorse) among the driftwood debris. They are therefore key access and establishment points for weeds on the island. Exotic species could potentially spread from these sites to other sites with suitable habitat. The only exotic species recorded from upland non-forest sites were two exotic rushes - jointed rush (*Juncus articulatus*) and bulbous rush (*J. bulbosus*). Both were localised in natural wetland areas; Mt Roa bivvy area for jointed rush and on the margin of the lake north of Mt Lort for bulbous rush. These were most likely introduced by avifauna using the lake.

The bivvy sites are a centre for human activity and associated disturbance (e.g. pugging and trampling) and/ or vegetation clearance (e.g. helicopter landing pads). On Secretary Island (8140 ha.) in Doubtful Sound, where a similar pest eradication operation has been underway for longer, weeds have been introduced by human activity to virtually all of the newly established bivvy sites (Department of Conservation Te Anau Area Office, unpublished data). Therefore the Resolution Island bivvy sites are likely sites for weed invasion. Eleven of the twelve bivvies on the island were visited during the course of the survey and checked for weeds (only Duck Cove bivvy was not inspected). There was no evidence of exotic plant invasion at any of these sites, except for the Disappointment Cove bivvy where some tomato plants were recorded beside the outside tap. The bivvies of greatest concern for weed invasion are the alpine bivvies and those in non-forest habitats. At these sites exotic plants that establish have few barriers to restrict their invasion into surrounding intact habitat. Bivvies in forest environments are less likely to facilitate weed spread as forest is a barrier to the spread of most exotic species. A check of the bivvy sites and other at risk sites in December 2010 found weeds at most bivvy sites and at the lighthouse (Five Fingers Peninsula) and repeater sites. A strategy for dealing with the weed threat on Resolution Island has been recently implemented (Department of Conservation Te Anau Area Office 2010).

7. Fauna

7.1 Birds

Kiwi call counts were conducted as part of the survey work and numerous kiwi were heard from the call sites. Sporadic kiwi sign was seen when conducting our vegetation surveys.

Other birds seen were:

NZ falcon, kaka, kea, rifleman, bellbird, waxeye, grey warbler, tomtit, shining cuckoo, blackbird, greenfinch, brown creeper, wood pigeon, pied shag, whiteface heron, skua, red billed gull, pipit, fantail, oystercatcher, parakeet, sooty shearwater, morepork, fernbird.

7.2 Invertebrates

Entomological studies on the island have been limited to isolated collections and one formal study. Bremner et al. (1984) investigated invertebrate levels on Resolution Island, which has stoats and deer, in comparison to Breaksea Island (rats only) and Gilbert Island No. 6 (no mammals). It was found that both Breaksea Island and Resolution Island had lower populations of some species and this finding was thought to be from increased disturbance and predation by these mammals.

Collections were made of a few insects during the survey. One species collected was the stag beetle (*Geodorcus helmsi*). Those that have spent much time on the island thought that these may be confined to the north of the island (Pete Kirkman, pers. comm., 23 November 2008). During this survey a specimen was observed and collected from south-east of the The Basin bivvy (Track 3). This finding indicates that they are likely to be widespread on the island though their density is likely to vary considerably. Two other stag beetles were collected along the north coast.

Large snail shells (*Powelliphanta fiordlandica*) appeared to be confined to the southern half of both the main part of the island and Five-Fingers Peninsula, where caches of empty shells were found at various sites. Waypoints were taken when such shells were discovered (see Appendix 3). Several shells were collected on Five-Fingers Peninsula and Mt Clerke ridge and passed on to DOC Te Anau Biodiversity Assets staff (Hannah Edmonds) to be sent away for identification.

7.3 Fauna habitat

Several bird species such as the kakapo, North Island kokako, Snares Is. snipe, pateke and takahe have been identified as potential candidates for transfer to Resolution Island (Wickes & Edge 2009). The vegetation associations and habitats encountered over the island varied greatly providing a diverse habitat.

Although the island was not fully investigated by the team, certain vegetation associations stood out as being valuable habitat for avifauna. Readers should be aware the following

observations were made by staff with primarily a botanical focus so any recommendations and conclusions should be verified by someone with an ornithological background.

Alpine areas consist primarily of tussockland with areas of bluffs and rock outcropping, boulder fields, wetlands and tarns. In these alpine areas the ranges to the east from Mt Wales through to Mt Lyall appear to be more fertile, supporting a wide range of palatable species, albeit this habitat is limited in size. Further to the west the extensive alpine areas of Mt Roa, Mt Lort and Mt Phillips are relatively infertile, being dominated by *Chionochloa acicularis*, with relatively few palatable species present.

Fertile, lowland, broadleaf-podocarp forest is known to support diverse numbers of frugivorous bird species (O'Donnell & Dilks, 1994) and appeared to hold the highest numbers of fruit and nectar bearing plant species on the island. Large tracts of this forest type are known to be present along the north coast and Five Fingers Peninsula, particularly on the valley floors and lower elevated, stable slopes (c. <100m a.s.l.). Bird-preferred species such as mahoe, pate, wineberry, fuschia, and pigeonwood were present in moderate numbers in the canopy however were depleted within the browse tier. Supplejack was common in the canopy with kiekie locally common around the coast.

Taller podocarp forest containing species such as miro and rimu was scattered around the island. We are unable to build up a clear picture of where large tracts of this forest exist however areas such as the valley inland of Duck Cove, and elevated flat areas behind Disappointment Cove, held large tracts of forest with numerous emergent podocarps.

By far the most dominant forest type was the beech–broadleaved forest occupying all but the least fertile sites from sea level to 650m a.s.l. This forest type contained scattered podocarps and fruit bearing broadleaved species. Disturbance is a major factor in the dynamics of this forest system and numerous slips and wind throws were present. These sites are prime habitat for early successional, fruit bearing shrubs and trees such as *Coprosma* spp. and wineberry. Unfortunately these species are present in only low numbers due to heavy deer browse. Infertile sites dominated by stunted podocarps and broadleaf species held very low numbers of fruiting species.

Coastal areas were diverse. Along the southern coastline, in areas such as The Basin, tidal flats and estuarine systems were present. There were forests and shrublands close to shore that looked like suitable habitat for burrowing birds all along the coastline. Refining the location and extent of these and other habitats would be further benefitted with the production of a vegetation map of the island.

Major modifications to these habitats have occurred from deer browsing; this impact has led to the localised reduction in some plant species, including food sources. Deer browsing has also led to a modification and simplificationof some habitats, such as forests, shrublands, and herb fields, through the preferential selection of some plant species. How deer removal will improve faunal habitat is difficult to quantify with certainty, however the vegetation improvement as a result of deer removal will generally improve fauna habitat.

8. Deer Impacts

Deer sign was present over the whole island, however there were areas where there were noticeably higher deer numbers.

The tussock grassland surrounding Mt Roa, Mt Wales, and Mt Phillips showed light deer sign although palatable species still showed moderate amounts of browse. It was interesting to note that the grasslands were dominated by *Chionochloa acicularis* which is rather unpalatable. The normally avoided *Celmisia petreii* also exhibited some browse. It appears as though these areas are nutrient deficient and any deer are forced to feed on the less palatable species. Most browse and deer sign was seen around the deer trails on the ridges. It was also interesting to note that there was more sign and browse encountered on the tops around Mt Clerke – perhaps there is higher fertility here. Palatable species such as *Dolichoglottis scorzoneroides, Ranunculus lyallii, Anisotome haastii* and *Celmisia holosericea* were largely limited to inaccessible areas and plants encountered outside of these areas were small in size. This is likely to be because of a combination of both browse and poor soil fertility, with vegetation on parts of the island being influenced by deer browse e.g. Mt Clerke, while others most likely are being influenced by the lack of favourable habitat and/or soil fertility e.g. Mt Roa and Mt Lort.

High deer numbers and sign were observed in lowland coastal areas, particularly on the North Coast, at Disappointment Cove and around Goose Cove. High levels of browse were encountered in these locations and there was a noticeable lack of palatable species within the browse tier on what would otherwise be fertile, productive sites. This observation is consistent with findings from other studies which show that mesic, fertile sites such as these can support fast growth rates. Species that are associated with these sites often have fast growth rates and are highly palatable. As a result these highly productive sites are preferred by deer as they require low search effort to obtain highly nutritious food (Coomes et al. 2003).

Another area where deer are having selective pressure on regenerating species were slips and wind throw sites. Here, accessible and palatable early successional species, such as wineberry and fuchsia, were generally absent. If the current level of selective pressure is maintained in the long term, the structure and composition of the forest on Resolution Island could be permanently altered with the loss of key food species for avifauna.

Upper montane forest areas did not appear to get a lot of use as sign was low and in many places numerous palatable species were present within the browse tier. There are several possibilities why deer do not use this area; the lower fertility and difficult access through tight scrub may hinder them. Also, it may be that there is not enough pressure for them to access this area purely because the deer present at lower altitudes are not restricted by resources yet. An increase in deer numbers on the island may express a correlative increase in use of this habitat as food resources decline at lower altitudes. Possible sites and methods for deer outcome monitoring will be discussed later in the report.

From our observations no species and habitats on the island have been completely lost due to deer browsing. Deer-preferred sites are clearly showing the impacts of browsing pressure and conversely we would expect these areas to show the greatest recovery. In general, these preferred sites are the warmer, north facing lowland forests, coastal areas, lowland flats, fertile alpine areas and slips. Coastal herb fields may be the possible exception as browsers

can maintain the diversity of these sites and prevent the encroachment of taller woody species (Rogers 1999). However, the original extent of these herb fields is unknown likewise their recovery uncertain, particularly *Anisotome lyallii* which is localised but a feature of the Fiordland coast.

8.1 Palatable species

Deer palatable species encountered are listed below with associated abundance codes (a=abundant, f=frequent, c=common, o=occasional, u=uncommon, l=local). Note that the abundance code 'l' is often used in conjunction with other codes e.g. lc=locally common.

Palatable forest species recorded included the ferns hen and chicken fern/*Asplenium bulbiferum* (o, lc) and *Lastreopsis glabella* (u); trees and shrubs: wineberry/*Aristotelia serrata* (u), marbleleaf/*Carpodetus serratus* (o), *Coprosma colensoi* (c), stinkwood/*Coprosma foetidissima* (f), glossy karamu/*Coprosma lucida* (o), tree fuchsia/*Fuchsia excorticata*, (o), broadleaf/*Griselinia littoralis* (o), pigeonwood/*Hedycaria arborea* (o), red mapou/*Myrsine australis* (u), mahoe/*Melicytus ramiflorus* (lc), southern five finger/*Pseudopanax colensoi* var. *fiordense* (c), three finger/ *P. colensoi* var. *ternatus* (o), lancewood/*P. crassifolius* (o), mountain lancewood/*P. lineare* (c), haumakoroa/*Raukaua simplex* (c), *Pittosporum crassicaule* (lc), and pate/*Schefflera digitata* (u).

Of note was the absence of ferns: *Pneumatopteris pennigera* and *Pteris macilenta*; trees and shrubs: *Coprosma rotundifolia*, *Melicytus lanceolatus* and *Pittosporum tenuifolium*.

Disappointment Cove contained several locally rare shrubs along the beach, kowhai/*Sophora microphylla*, *Coprosma rugosa*, mingimingi/*C. propinqua* and saltmarsh ribbonwood/*Plagianthus divaricat*us. Moderate browse on these species was noted and there was no regeneration present in the area, which is heavily used by deer.

Palatable alpine species recorded included *Anisotome haastii* (c), *Astelia petrieii* (o), *Celmisia holosericea* (c), *C. petrieii* (c), *C. verbascifolia* (o, lc), *Chionochloa pallens* (c), *C. ovata* (u), *C. rigida*, *Coprosma serrulata* (o) and *Dolichoglottis scorzoneroides* (o), *Ranunculus lyallii*. No large (i.e. mature) plants of *Anisotome haastii*, *Celmisia holosericea*, *Ranunculus lyallii* (u) or *Dolychoglottis scorzoneroides* were observed except in inaccessible sites (e.g. rock faces).

Palatable coastal species recorded included *Anisotome lyallii* which was restricted to sites inaccessible to deer.

8.2 What are the likely vegetation changes on Resolution Island post deer eradication?

To date, there has been a significant amount of vegetation outcome monitoring relating to deer control established on offshore islands in Fiordland (see the Recommendations section for a précis of these studies). This information and other studies can tell us much about what we could expect to see post deer eradication on Resolution Island. A key aim of eradicating deer from Resolution Island is to protect its ecological values and to restore biotic values. Even if eradication is not achieved, then the aim is to keep deer at such low numbers that they no longer impact on the flora of the island (Wickes and Edge, 2009). One

of the main questions to address is: Are there factors that will prevent the island recovering to its pre-deer state? This question is discussed in detail in Coomes et al. (2003), however the main points are outlined here.

Will palatable species recruit through into the canopy? The short answer is yes, if deer eradication is achieved and sustained. If deer remain on the island, even in very low numbers, there is a chance that some highly palatable species will still remain highly browsed and subject to regeneration failure as a result of preferential browsing on these species.

Will the rate of recruitment into the canopy be affected? This question is hard to answer without long-term monitoring. Strong browse pressure on palatable species can create a vacant niche which becomes occupied by plant species not eaten by deer. This succession can happen with shrubs such as *Pseudowintera colorata* and *Neomyrtus pedunculata* or with ferns such as *Blechnum discolor* and *B. procerum*. There were dense patches of *Blechnum* ferns throughout the island and at some localities *Pseudowintera colorata* was also present at high densities. This dominance by certain species may lead to an irreversible shift in vegetation dynamics in these areas and prevent the recruitment of more palatable species. In the case of palatable ferns such as *Asplenium bulbiferum* the damage may have already been done in some areas. *A. bulbiferum* was an uncommon plant species and the high presence of crown fern and other non-palatable ground cover species suggest that its niche has already been filled in some areas. This finding has also been documented in many instances including Secretary Island where large numbers of *A. bulbiferum* were only noted in deer-free areas (Mark & Baylis 1982).

Will there be local extinction of seed sources? This outcome is unlikely as most of the forest types still have an adequate cover of palatable species above the browse tier. With the increased abundance of birds and the absence of deer these plants should have the ability to recolonise vacant areas. Naturally uncommon and rare plants, especially alpine plants, may not do so well. These plants often have different mechanisms of spread and may never recover and re-establish into their original range and habitats – e.g. in alpine areas where plants such as *Ranunculus lyallii* and *Anisotome haasti* are uncommon, small in size, and localised. If this distribution is due to deer browse this retraction in range may be irreversible.

While we can speculate that the vegetation changes observed on other Fiordland islands where deer have been removed will likely occur on Resolution Island, no two islands will show the exact same response. However, any significant reduction in deer must provide for increased regeneration and therefore some level of ecosystem recovery. There are a number of studies in the wider Fiordland region that document the recovery of forests and alpine areas with a reduction in deer numbers e.g. Stewart et al. (1987) and Rose & Platt (1987), but see Ledgard (2007) or Coomes et al. (2007) for a synopsis. These studies have highlighted that unless most or all of the deer are removed, recovery will be limited. In the absence of vegetation outcome monitoring, results from plots and transects on Anchor and Secretary Islands would provide some indication as to what general changes could happen but statements made about Resolution Island will have little scientific credibility without robust monitoring to support them.

9. Conclusions

This inventory of the vegetation and flora on Resolution Island was a major achievement considering the time constraints and logistical considerations involved with such an operation. All major vegetation communities and habitats were described along with a number of other uncommon and rare habitats such as gravel beach communities and marble sink holes. Over 400 plant species were recorded which puts Resolution Island ahead of any other island in the Fiordland region for species richness. A number of these species are locally rare with several new recordings for the Preservation Ecological District. Indeed, there are likely to be more plant species recorded in the future as the scope of the survey was limited by time and logistics and further exploration is desirable in a few key areas.

The survey identified that the island is not only rich in plant species but also that it bears little impact from weed species. Coastal sites exhibited the most weed species with long shore drift a likely key source of weeds such as gorse washed down from northern Fiordland and beyond. Key human visitation points such as Goose Cove and Disappointment Cove were other sites of weediness and need to be surveyed and controlled regularly. Other access points such as bivvys and mooring sites will need to be included in any weed surveillance.

The impact of introduced fauna on the island was most visible in the effects of deer on vegetation condition. Deer appear to be present in high numbers on the island and their distribution is patchy with the highest impacts of deer observed on the northern coast of the island in fertile mesic forests. Other sites where deer impacts were highly visible were on slips, regenerating clearings, coastal clearings and beaches, and alpine areas around Mt Lort and Mt Clerke. Outcome monitoring should be conducted to measure the impacts of the deer eradication program on vegetation and this proposal is discussed in the following section. A number of bird species were observed along with sporadic sign of kiwi in localised areas.

Along with outcome monitoring, further trips to complete the flora inventory are recommended. Although not the highest priority, if the opportunity arose it should be taken to ensure that this inventory of the island achieves its full potential.

10. Recommendations

These recommendations have been listed in order of priority. We believe that monitoring vegetation recovery in response to deer removal is essential to assess the success of the eradication project. Monitoring is the only means by which we can quantify the outcomes of the deer eradication programme.

10.1 High priority tasks

10.1.1 Outcome monitoring for deer control:

To put this monitoring in context with deer outcome monitoring on other islands in coastal Fiordland we have included a brief outline of vegetation monitoring projects occurring on nearby islands.

On Secretary Island (8140 ha) in Doubtful Sound; 43 permanent 20x20m plots, 30 Wraight 20x20m grassland quadrats, 17 Seedling Ratio Index (SRI) transects, and 6 variable size browse plots are present. All of these were established or re-measured in the two years immediately prior to the current deer eradication programme which began in 2006.

On Coal Island (c.1200 ha.) in Preservation Inlet; 20 SRI transects were established before deer eradication began in 2006 (Geoff Rogers, DOC RD&I, pers. comm., 20 December 2008).

On Anchor Island (1380 ha.) in Dusky Sound, adjacent to Resolution Island; 9 permanent 20x20m plots established before deer eradication began in 2002. The plots have been re-measured once in 2007.

Along with the vegetation outcome monitoring recommended for Resolution Island these studies will provide valuable information on the response of a range of Fiordland island vegetation communities to the removal of deer, or presence of deer at very low densities. Collectively, they should also allow for a comparison of the strengths and weaknesses of two main methods (permanent plots and SRI transects) in terms of their efficacy and efficiency in recording vegetation responses.

Establish Seedling Ratio Index (SRI) lines to monitor vegetation recovery of the forest understorey associated with deer eradication.

In order to justify the removal of deer from the island a recovery in vegetation condition should be demonstrated. To measure a change in vegetation condition there are several monitoring methods available, however there are limitations in time and money dictating which method to choose. The Seedling Ratio Index (SRI) method (Sweetapple and Nugent, 2004) is most suited to the Resolution Island situation when taking into consideration a limited budget and very remote site. The SRI method is designed as a rapid monitoring method to provide an indication of whether ungulate control is having the desired effect, in the short-to-medium-term, on forest understoreys. It is a rapid method, requiring few resources that, if replicated and measured correctly, provide a quick reliable estimate of

palatable plant health within the browse tier. The SRI is not designed to follow long-term trends in forest structure (Sweetapple & Nugent 2004).

It is recommended that approximately 30 SRI lines be established on the island in the areas of the highest deer concentrations such as the north coast and at Woodhen Cove. These are also the sites where we would be likely to see a corresponding rapid recovery with deer control. It is possible to locate lines in other areas, however the response of vegetation is likely to take longer and it would be harder to determine any significant change within a short timeframe. Also, being pragmatic, if we are to use this island as refugia for birds it seems more sensible to be able to quantify the recovery of palatable species in these fertile sites, which are prime habitat and feeding locations for a number of frugivorous and insectivorous bird species.

Establish formal vegetation monitoring to document the recovery of alpine tussocklands following the removal of deer.

In the alpine tops around Mt Roa there is a noticeable absence of palatable species such as *Anisotome haastii* and *Ranunculus lyallii*. There is a possibility that there may be a soil fertility effect influencing this, however deer could be restricting the number of palatable species. On Mt Clerke the vegetation is heavily impacted by deer and formal monitoring would highlight how much of an impact they have been having. Without monitoring, the effects of deer eradication on alpine tussockland health cannot be answered.

There are two methods recommended by Wiser & Rose (1997) to measure changes in grassland structure and composition. Wraight plots involve collecting plant frequency data, cover data, and tussock stature measurements, over a 20x20m quadrat. Scott Height-Frequency transects involve collecting height and frequency data from different height tiers in small quadrats along a 50m transect (Wiser & Rose 1997). Each method has its different attributes but both are suited to our objective of quantifying grassland structure and composition before and after deer eradication. Wraight Plots are a coarser method, better at detecting large changes in tussock grasslands (Wiser & Rose 1997), however these plots have been used on Secretary Island and would provide a useful comparison between the two sites. Scott Height-Frequency transects have not been used in the area however they are a more sensitive method and may highlight more subtle changes in a shorter timeframe. Both take approximately the same amount of time to establish. The decision as to which method is most suitable will require further discussion with scientists experienced in this field.

Six sites on the Mt Roa tops, six on the Mt Wales tops, and six on the Mt Clerke tops should give us enough power to make a statement on changes in grassland condition in those areas.

10.1.2 Weed monitoring:

Prepare a weed surveillance plan for Resolution Island

This plan could be modelled on the Secretary Island Weed Management Strategy (Department of Conservation Te Anau Area Office, 2008) and should include a regular survey at each bivvy for the invasion of exotic plants.

10.2 Medium priority tasks

Prepare a vegetation map for the island (i.e. to map the vegetation types recorded from the island)

A vegetation map would enable anyone to calculate approximate areas of vegetation types for the island. The most recent example of this technique being applied in the Conservancy was calculating areas of potential North Island kokako habitat on Secretary Island prior to their translocation. Waikato University have also created a vegetation map of Whenua Hou taken from detailed aerial photos and a ground truthing exercise.

This map would also make it easier for anyone wishing to study or visit a vegetation or habitat type for further exploration.

There will likely be further interest in the work on Resolution Island as it progresses, particularly from external organisations, and any biophysical information would be a welcome addition to the 1:50000 topo series.

Carry out additional vegetation/flora inventory in the future as the opportunity arises

It is important, when the opportunity arises, to continue to conduct flora assessments on the island. This survey, although thorough, did not cover all parts of the island and there still remain some habitats that have not been documented. The importance of this work lies in building a wider knowledge of flora in the south-western Fiordland region. Currently, aside from the West Cape study conducted in 1963, the present study is the most thorough survey done in the Preservation Ecological District. Knowledge gained from surveys such as this will add to the body of literature surrounding the flora of this part of New Zealand. It also enables observations to be made on species distributions and abundance and allows comparisons to be made with other areas of New Zealand.

Establish more comprehensive vegetation monitoring of representative vegetation on the island.

It has been argued that a network of permanent plots is the only adequate way to accurately describe vegetation changes on Resolution Island. We support this notion, however we appreciate that comprehensive monitoring, such as a network of permanent forest plots or an extension of the alpine plot network, is resource intensive.

The value of this monitoring lies in the increased ability to detect more subtle vegetation changes in long term structure, growth and composition, and gives a more comprehensive overview of vegetation changes across the island. Permanently marked plots with tagged trees are currently the only way with which to measure fundamental population parameters such as recruitment, growth or mortality rates (Bellingham et al. 1999). As such, data can only be obtained when following the fate of individual trees through time (Hurst and Allen 2007b).

If the opportunity to conduct such research arose, either from within DOC or through an external organisation, it should be strongly considered.

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12. References

Allen, R. B.; Lee W. G.; Johnson. P. N.; Rance B. D. 1990: Breaksea Island vegetation and monitoring studies. Unpublished report prepared for the Department of Conservation by Botany Division, DSIR, Dunedin. 17p.

Allibone, A. H.; Turnbull, I. M.; Tulloch, A. J.; Cooper, A. F. 2007: Plutonic rocks of the Median Batholith in southwest Fiordland, New Zealand: Field relations, geochemistry, and correlation. New Zealand Journal of Geology & Geophysics 2007, Vol. 50: 283–314.

Baylis, G. T. S; Wardle, P.; Mark, A. F. 1963: Vegetation studies on Secretary Island, Fiordland. Part 1: General Introduction. New Zealand Journal of Botany 1: 167-170.

Bellingham, P. J.; Stewart, G. H.; Allen, R. B. 1999: Tree species richness and turnover throughout New Zealand's forests. Journal of vegetation science 10: 825-832.

Bremner, A. G.; Butcher, C. F.; Patterson, G. B. 1984: The density of indigenous invertebrates on three islands in Breaksea Sound, Fiordland, in relation to the distribution of introduced mammals. Journal of the Royal Society of New Zealand 14: 379-386.

Coomes, D. A.; Allen, R. B.; Forsyth, D. M.; Lee, W. G. 2003: Factors preventing the recovery of New Zealand forests following the control of invasive deer. Conservation Biology 17: 450-459.

Coomes, D. A.; Mark, A. F.; Bee, J. 2007: Animal control and ecosystem recovery. Pp 339-350 in Allen, R. B.; Lee, W. G. (Eds): Biological Invasions in New Zealand. Springer Publishing, Germany. 2007. 457p.

de Lange, P.J.; Norton, D.A.; Courtney, S.P.; Heenan, P.B.; Barkla, J.W.; Cameron, E.K.; Hitchmough, R.; Townsend, A.J. 2009: Threatened and uncommon plants of New Zealnd (2008 revision). New Zealand Journal of Botany 47; 61-96.

de Lange, P.J.; Rolfe, J.R. 2010: New Zealand Indigenous Vascular Plant Checklist. Wellington, New Zealand Plant Conservation Network. 164p.

Department of Conservation Te Anau Area Office. 2010: Resolution Island Weed Management Strategy 2010-2020. Unpublished internal document, Department of Conservation, Te Anau Area Office, September 2010. 23p.

Department of Conservation Te Anau Area Office. 2008: Secretary Island Weed Management Strategy 2008-2018. Unpublished internal document, Department of Conservation, Te Anau Area Office, July 2008. 34p.

Hewitt, A. E. 1998: New Zealand Soil Classification. Landcare Research Science Series No. 1. Manaaki Whenua Landcare Research. 133p.

Hurst, J. H.; Allen, R. B. 2007a: The Recce Method for describing New Zealand Vegetation – Field Protocols. Manaaki Whenua Landcare Research. 39p.

Hurst, J. H.; Allen, R. B. 2007b: The Permanent Plot Method for monitoring indigenous forests – Field Protocols. Manaaki Whenua Landcare Research. 68p.

Johnson, P. N. 1992: The sand dune and beach vegetation inventory of New Zealand. II South Island and Stewart Island. DSIR Land Resources Scientific Report No. 16. DSIR Land Resources, Christchurch.

Ledgard, G. A. 2007: Fiordland Wapiti Area: A review of past vegetation monitoring within the Wapiti Area and recommendations for the future. Internal report, Department of Conservation, Southland Conservancy. 24p.

Mark, A. F.; Baylis, G. T. S, 1975: Impact of deer on Secretary Island, Fiordland, New Zealand. Proceedings of the NZ Ecological Society 22: 19-24.

Mark, A. F.; Baylis, G. T. S. 1982: Further studies on the impact of deer on Secretary Island, Fiordland, New Zealand. New Zealand Journal of Ecology 5: 67-75.

Mark, A. F.; Baylis, G. T. S.; Dickinson, K. J. M. 1991: Monitoring the impacts of deer on the vegetation condition of Secretary Island, Fiordland National Park: A clear case for deer control and ecological restoration. Journal of the Royal Society of New Zealand 21: 43-54.

McLaren, R. G.; Cameron, K. C. 1990: Soil Science: An introduction to the properties and management of New Zealand soils. Oxford University Press, Auckland. 294p.

Monks, A.; Lee, W. B.; Burrows, L. B.; McNutt, K. M.; Edge, K. 2005: Assessment of forest changes on Secretary Island, Fiordland National Park, from 1975 to 2003, based on long term plot measurements, in relation to the presence of deer. Landcare Research contract report LC0506/007. 19p.

Moore, L. B. 1969: *Sprengelia incarnata* Sm.: An Australian plant in Fiordland. New Zealand Journal of Botany 7: 96-99.

Newsome, P. F. J. 1987: The vegetation cover of New Zealand. Water and soil miscellaneous publication 112.

New Zealand geological survey. Geological map of New Zealand. 1957. DSIR, Wellington.

O'Donnell, C. F. J.; Dilks, P. J. 1993: Foods and foraging of forest birds in temperate rainforest, South Westland, New Zealand. New Zealand Journal of Ecology 18(2): 87-107.

Rogers, G. M. 1999: Coastal turfs of mainland New Zealand -their composition, environmental character, and conservation needs. Science for Conservation 107. Department of Conservation, Wellington, N.Z..

Rose, A. B.; Platt, K. H. 1987: recovery of Northern Fiordland alpine grasslands after reduction in the deer population. New Zealand Journal of Ecology 10: 23-33.

Soil map of the South Island, New Zealand: Sheet 12. 1964. DSIR, Wellington.

Stewart, G.H.; Wardle, J.A.; Burrows, L.E. 1987: Forest understorey changes after reduction in deer numbers, Northern Fiordland, New Zealand. New Zealand Journal of Ecology 10: 35–42.

Sweetapple, P. J.; Nugent, G. 2004: Seedling Ratios: a simple method for assessing ungulate impacts on forest understories. Wildlife Society Bulletin 32(1): 137-147.

Taylor, N. H.; Pohlen, I. 1962: Soils of New Zealand, Part 1. Soil Bureau Bulletin 26(1). 142pp., with 1:1000 000 scale soil map of New Zealand. DSIR, Wellington.

Turnbull, I. J.; Lindqvist, J. K. 1981: Visit to tertiary outcrops on Five Fingers Peninsula, 19/23 August 1981. N.Z. Geological Service Immediate Report. 5p.

Wardle, P. A.; Mark, A. F.; Baylis, G. T. S. 1973: Vegetation and Landscape of the West Cape District, Fiordland, New Zealand. New Zealand Journal of Botany 11: 599-626.

Wickes, C.; Edge, K-A. 2009: Secretary and Resolution Islands Restoration Plan. Updated 11/2/2011. Unpublished internal document, Department of Conservation Te Anau Area Office, October 2009.

Wiser, S. K.; Rose, A. B. 1997: Two permanent plot methods for monitoring changes in grasslands: A field manual. Manaaki Whenua Landcare Research. 51p.

Appendix 1. Birds recorded

Bellbird	widespread and common
Blackbird	widespread but occasional
Brown creeper	widespread and common
Chaffinch	widespread but occasional
Fantail	widespread but occasional
Fernbird	rare
Greenfinch	widespread but occasional
Grey warbler	widespread but occasional
Kaka	occasional, recorded from several sites
Kea	occasional, recorded from several sites
Kiwi (Southern tokoeka)	widespread but occasional
Mallard duck	occasional
Morepork	occasional
NZ falcon	uncommon
Paradise Duck	uncommon
Parakeet spp.	widespread but occasional
Pied shag	locally common
Pigeon	widespread but occasional
Pipit	occasional on the tops
Red billed gull	occasional around the coast
Rifleman	locally common
Shining cuckoo	occasional
Skua	occasional
Sooty shearwater	occasional
South Island pied oystercatcher	uncommon
Tomtit	widespread but occasional
Waxeye	widespread but occasional
White-faced heron	uncommon

Appendix 2. Mini Recce and NZVCM description

DATE: 5/Mar 08	OBS: GL
GPS WAYPOINT 009	E 2012502
2D / (3D)	N 5486461
PHYSIOGRAPHY:	Ridge, (Face), Gully, Terrace
NZVCM CLASS: S3	
ASPECT: North /0°	
ALTITUDE: 738	

FLORA NOTES:

Hal bif	20	GEN mon	+	THE spp	+
LEP sco	25	CEL lig	12	DRO spa	+
NOT alp	2	CAR alp	1	DRO ste	+
PHY coo	+	ORE imp	+		
OLE col	1	CEL pet	+		
[illegible] lon	3	CHI enup	+		
CHI aci	20	SCH pan	+		
Hebadda	+	SCH fis	+		
NOT men	+	SCI [illegible]	+		

FAUNA: NIL

BROWSE (Note herbivore, severity – L, M, H & Species): NIL

CROPLAND
- C1 Orchards or vineyards and pasture
- C2 Horticultural crops and pasture

GRASSLAND
- G1 Improved pasture
- G2 Unimproved pasture
- G3 Short tussock grassland
- G4 Snow tussock grassland
- G5 Short tussock—snow tussock grassland
- G6 Red tussock grassland

GRASSLAND-SCRUB
- GS1 Grassland and mixed indigenous scrub
- GS2 Grassland and *Leptospermum* scrub or fern
- GS3 Grassland and *Cassinia* scrub
- GS4 Tussock grassland and sub-alpine scrub
- GS5 Grassland and *Dracophyllum* scrub
- GS6 Grassland and gorse scrub
- GS7 Grassland and matagouri
- GS8 Grassland with sweet brier or sweet brier and matagouri

SCRUB
- S1 Mixed indigenous scrub
- S2 *Leptospermum* scrub or fern
- S3 Sub-alpine scrub
- S4 Gorse scrub

GRASSLAND-FOREST
- GF1 Pasture and podocarp-broadleaved forest
- GF2 Pasture and broadleaved forest
- GF3 Pasture and beech or podocarp forest
- GF4 Pasture and exotic forest

GRASSLAND-FOREST (cntd)
- GF5 Tussock grassland and beech forest
- GF6 Tussock grassland and podocarp-broadleaved-beech forest

FOREST-SCRUB
- FS1 Kauri and *Leptospermum* or mixed indigenous scrub
- FS2 Podocarp-broadleaved forest and scrub
- FS3 Podocarp-broadleaved-beech forest and scrub
- FS4 Beech forest and scrub
- FS5 Beech-broadleaved forest and scrub
- FS6 Broadleaved forest and scrub
- FS7 Sub-alpine scrub and indigenous forest
- FSE Exotic forest and scrub

FOREST
- F1 Podocarp forest
- F2 Lowland podocarp-broadleaved forest
- F3 Highland podocarp-broadleaved forest
- F4 Lowland podocarp-broadleaved-beech forest
- F5 Highland podocarp-broadleaved-beech forest
- F6 Beech forest
- F7 Beech-broadleaved forest
- F8 Broadleaved forest
- F9 Exotic forest

MISCELLANEOUS
- M1 Sub-alpine or alpine herbfield
- M2 Wetland communities
- M3 Sand-dune communities
- M4 Pakihi heathland communities

Figure 7: Legend of Vegetative Cover Classes.

Appendix 3. List of waypoints

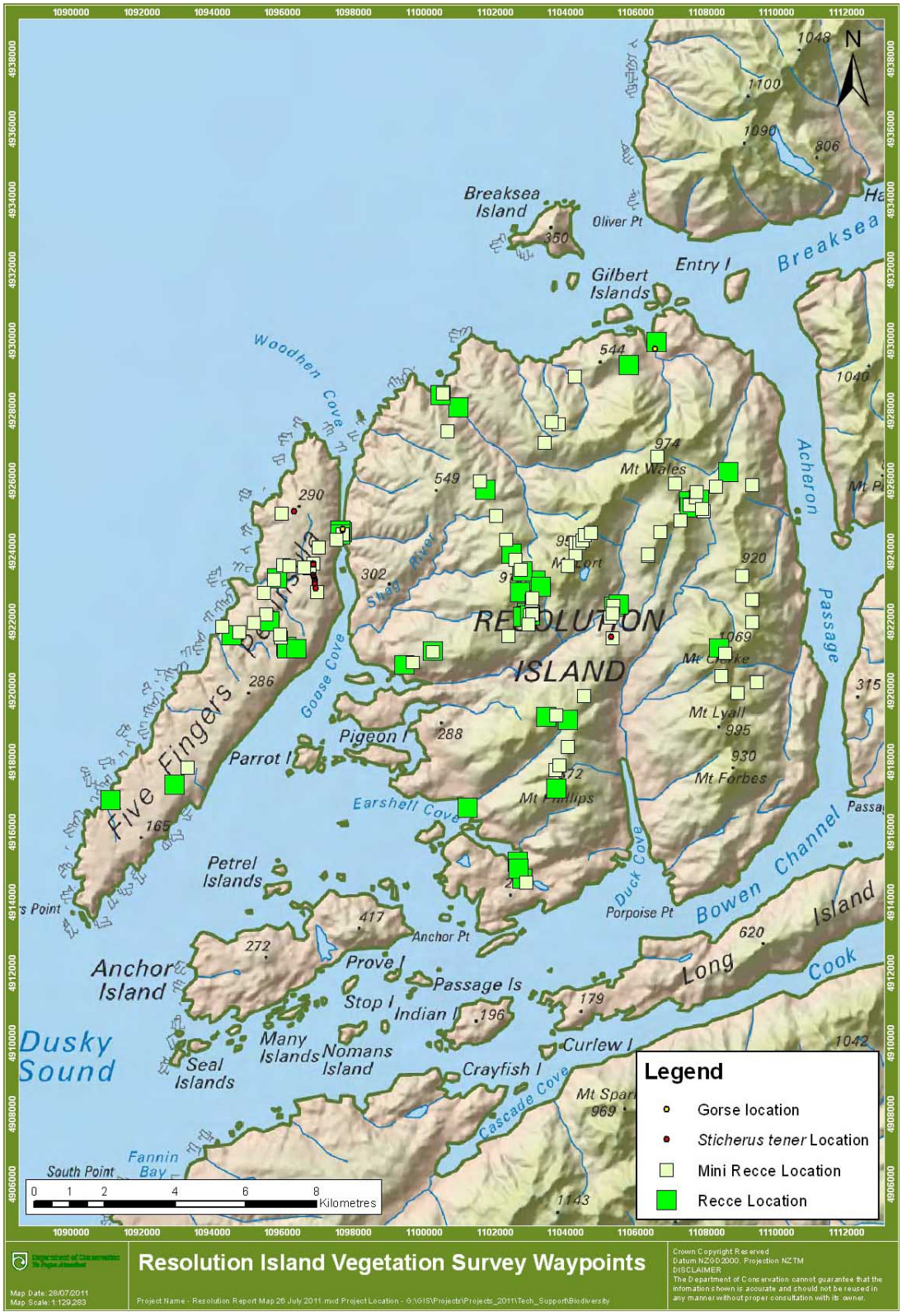
Waypoint ID	Collected By	Date	Easting	Northing	Altitude	Description
8	Richard Ewans	03-MAR-08 1:49:28PM	2005789	5485160	71	spp. list
9	Richard Ewans	03-MAR-08 4:22:48PM	2006747	5485681	205.4	spp. list
12	Richard Ewans	06-MAR-08 2:31:56PM	2006051	5486212	244.5	spp. list
13	Richard Ewans	06-MAR-08 2:57:57PM	2006424	5486850	240.2	spp. list
15	Richard Ewans	06-MAR-08 4:36:38PM	2006510	5487274	247.7	*Sticherus* Location
16	Richard Ewans	08-MAR-08 4:12:40PM	2007764	5486457	10.7	spp. list
17	Richard Ewans	09-MAR-08 10:23:29AM	2007047	5485792	264.7	mini RECCE'/Sticherus Location
18	Richard Ewans	09-MAR-08 10:30:47AM	2007054	5485763	261.6	*Sticherus* Location
19	Richard Ewans	09-MAR-08 10:46:10AM	2007043	5485461	277.2	*Sticherus* Location
20	Richard Ewans	09-MAR-08 10:48:17AM	2007078	5485387	276.5	*Sticherus* Location
21	Richard Ewans	09-MAR-08 10:49:43AM	2007097	5485319	275.8	*Sticherus* Location
22	Richard Ewans	09-MAR-08 10:50:43AM	2007099	5485275	279.6	*Sticherus* Location
23	Richard Ewans	09-MAR-08 10:51:49AM	2007093	5485216	279.6	*Sticherus* Location
24	Richard Ewans	09-MAR-08 5:40:26PM	2003472	5479991	167.9	mini RECCE'
27	Richard Ewans	10-MAR-08 12:07:21PM	2001264	5479093	9.7	spp. list
BIV5	Richard Ewans	02-MAR-08 8:46:59PM	2006277	5483393	273.6	North 5-fingers biv
BOGCACI	Richard Ewans	09-MAR-08 3:26:21PM	2005887	5482602	222.4	northernmost CHI aci bog
CREEEK	Richard Ewans	03-MAR-08 4:32:06PM	2006792	5485685	197.4	spp. list
GORSE	Richard Ewans	08-MAR-08 2:57:31PM	2007883	5486740	5.4	gorse location
GORSE2	Richard Ewans	08-MAR-08 2:59:32PM	2007882	5486755	5.9	gorse location
GORSE3	Richard Ewans	08-MAR-08 3:00:41PM	2007878	5486761	7.6	gorse location
GORSE4	Richard Ewans	08-MAR-08 3:02:40PM	2007889	5486765	7.3	gorse location
R1	Richard Ewans	03-MAR-08 10:30:06AM	2006137	5483693	269.5	mini RECCE'
R10	Richard Ewans	04-MAR-08 2:51:38PM	2004478	5484000	14.8	mini RECCE'
R11	Richard Ewans	06-MAR-08 12:09:13PM	2007161	5484986	280.3	mini RECCE'
R12	Richard Ewans	06-MAR-08 12:44:23PM	2006941	5485648	222.7	mini RECCE'
R13	Richard Ewans	06-MAR-08 1:02:16PM	2006798	5485678	190.2	mini RECCE'
R14	Richard Ewans	06-MAR-08 4:13:13PM	2006164	5487203	235.4	mini RECCE'
R15	Richard Ewans	08-MAR-08 1:24:30PM	2007886	5486615	1.6	mini RECCE'
R16	Richard Ewans	09-MAR-08 9:20:07AM	2007701	5486468	59.7	mini RECCE'
R17	Richard Ewans	09-MAR-08 9:58:22AM	2007202	5486251	236.4	mini RECCE'
R2	Richard Ewans	03-MAR-08 10:53:42AM	2006105	5483773	262.6	mini RECCE'
R3	Richard Ewans	03-MAR-08 12:34:04PM	2005725	5484352	250.1	mini RECCE'
R4	Richard Ewans	03-MAR-08 1:20:47PM	2005652	5484950	176.8	mini RECCE'
R5	Richard Ewans	03-MAR-08 2:55:45PM	2005937	5485329	150.6	mini RECCE'
R6	Richard Ewans	03-MAR-08 4:07:14PM	2006208	5485744	243.1	mini RECCE'
R7	Richard Ewans	03-MAR-08 4:11:44PM	2006364	5485725	246.5	mini RECCE'
R8	Richard Ewans	04-MAR-08 10:51:17AM	2005376	5484107	247.7	mini RECCE'
R9	Richard Ewans	04-MAR-08 11:16:54AM	2004952	5483852	200.6	mini RECCE'
ROPE	Richard Ewans	03-MAR-08 2:25:04PM	2005832	5485206	114.5	spp. List
RR1	Richard Ewans	03-MAR-08 11:33:46AM	2005799	5484144	250.5	RECCE
RR10	Richard Ewans	10-MAR-08 12:50:46PM	2001307	5479080	11.4	RECCE
RR11	Richard Ewans	10-MAR-08 5:04:21PM	2003117	5479511	195.8	RECCE
RR2	Richard Ewans	03-MAR-08 3:06:44PM	2006021	5485376	193.8	RECCE
RR3	Richard Ewans	04-MAR-08 11:56:11AM	2004723	5483770	128.2	RECCE

Waypoint ID	Collected By	Date	Easting	Northing	Altitude	Description
RR4	Richard Ewans	05-MAR-08 3:51:09PM	2006286	5483431	272.4	RECCE
RR5	Richard Ewans	05-MAR-08 4:28:47PM	2006301	5483371	276.3	RECCE
RR6	Richard Ewans	06-MAR-08 10:07:04AM	2006568	5483373	259	RECCE
RR7	Richard Ewans	08-MAR-08 12:32:44PM	2007853	5486675	11.2	RECCE
RR8	Richard Ewans	08-MAR-08 2:13:11PM	2007826	5486721	5.7	RECCE
RR9	Richard Ewans	08-MAR-08 3:31:01PM	2007815	5486606	0.1	RECCE
SCR R1	Richard Ewans	06-MAR-08 1:45:13PM	2006356	5485726	257	spp. list
SCRRR5	Richard Ewans	06-MAR-08 2:39:16PM	2006177	5486365	254.4	spp. list
SN3	Richard Ewans	10-MAR-08 9:59:53AM	2002330	5480075	71.7	snail shell location
SN4	Richard Ewans	10-MAR-08 2:18:38PM	2001866	5478853	146.2	snail shell location
SNAIL	Richard Ewans	10-MAR-08 8:43:52AM	2002953	5479831	180.6	snail shell location
SNAIL2	Richard Ewans	10-MAR-08 9:11:34AM	2002675	5480313	154.9	snail shell location
STITEN	Richard Ewans	06-MAR-08 12:22:35PM	2007107	5485080	291.2	*Sticherus* Location
G1	George Ledgard	03-MAR-08 3:44:29PM	2013175	5484321	908.1	mini RECCE'
G2	George Ledgard	03-MAR-08 4:11:48PM	2014483	5486026	913.1	mini RECCE'
G3	George Ledgard	03-MAR-08 5:44:05PM	2014479	5486366	830.9	mini RECCE'
G4	George Ledgard	03-MAR-08 6:14:46PM	2014593	5486358	823.2	mini RECCE'
G5	George Ledgard	03-MAR-08 6:33:43PM	2014683	5486420	747.1	mini RECCE'
G6	George Ledgard	03-MAR-08 7:24:36PM	2014731	5486587	675.4	mini RECCE'
G7	George Ledgard	03-MAR-08 8:18:00PM	2014923	5486655	702.8	mini RECCE'
G8	George Ledgard	03-MAR-08 9:37:29PM	2014267	5485713	896.8	mini RECCE'
G9	George Ledgard	04-MAR-08 4:51:36PM	2012502	5486461	738.2	mini RECCE'
G10	George Ledgard	04-MAR-08 5:40:10PM	2012225	5487131	485.6	mini RECCE'
G11	George Ledgard	04-MAR-08 8:17:59PM	2011782	5488125	466.1	mini RECCE'
G12	George Ledgard	05-MAR-08 3:13:49PM	2010865	5489546	386.6	mini RECCE'
G13	George Ledgard	05-MAR-08 8:02:56PM	2010726	5490606	7.8	mini RECCE'
G14	George Ledgard	07-MAR-08 6:49:49PM	2013604	5489206	544	mini RECCE'
G15	George Ledgard	07-MAR-08 8:28:57PM	2014003	5489718	550.7	mini RECCE'
G16	George Ledgard	08-MAR-08 4:26:55PM	2014460	5491080	165.7	mini RECCE'
DISS1	George Ledgard	08-MAR-08 7:38:16PM	2015999	5491402	307.3	RECCE
DISS2	George Ledgard	09-MAR-08 8:12:29PM	2016773	5492061	10.7	RECCE
DISSGORSE1	George Ledgard	09-MAR-08 8:48:33PM	2016728	5491862	7.8	Gorse Bush
NW1	George Ledgard	04-MAR-08 4:04:08PM	2012667	5486056	659.3	RECCE
NW2	George Ledgard	04-MAR-08 7:49:23PM	2011921	5487878	512.3	RECCE
NW3	George Ledgard	05-MAR-08 5:48:16PM	2011174	5490207	70.8	RECCE
NW4	George Ledgard	05-MAR-08 8:25:58PM	2010670	5490565	7.8	RECCE
PLATEAU BIV	George Ledgard	07-MAR-08 3:19:12PM	2013803	5489796	532.5	BIV + mini RECCE'
ROA1	George Ledgard	02-MAR-08 2:10:44PM	2013120	5484361	586.5	RECCE
ROA2	George Ledgard	02-MAR-08 3:16:54PM	2013088	5484383	607	RECCE
ROA3	George Ledgard	02-MAR-08 4:15:05PM	2013077	5484290	577.6	RECCE
ROA4	George Ledgard	02-MAR-08 5:04:03PM	2012978	5484261	620.2	RECCE
ROA5	George Ledgard	02-MAR-08 7:49:46PM	2013340	5485292	792.7	RECCE
ROA6	George Ledgard	02-MAR-08 9:27:29PM	2012907	5484971	888.1	RECCE
ROA7	George Ledgard	03-MAR-08 1:29:21AM	2013176	5484320	603.6	RECCE
ROA8	George Ledgard	04-MAR-08 3:08:49PM	2012971	5485568	771.6	RECCE
SL1	Sue Lake	03-MAR-08	2017285	5488047	800	mini RECCE'
SL2	Sue Lake	03-MAR-08	2016788	5488810	974	mini RECCE'
SL3	Sue Lake	04-MAR-08	2017699	5487436	631	mini RECCE'
SL4	Sue Lake	04-MAR-08	2017456	5486993	796	mini RECCE'
SL5	Sue Lake	04-MAR-08	2016884	5486671	745	mini RECCE'

Waypoint ID	Collected By	Date	Easting	Northing	Altitude	Description
SL6	Sue Lake	04-MAR-08	2016530	5485994	660	mini RECCE'
SL7	Sue Lake	04-MAR-08	2016538	5486027	661	mini RECCE'
SL8	Sue Lake	05-MAR-08	2017893	5487641	564	mini RECCE'
SL9	Sue Lake	05-MAR-08	2018096	5487244	478	mini RECCE'
SL10	Sue Lake	05-MAR-08	2018063	5487315	485	mini RECCE'
SL11	Sue Lake	06-MAR-08	2017908	5487797	651	mini RECCE'
SL12	Sue Lake	06-MAR-08	2018448	5487956	600	mini RECCE'
SL13	Sue Lake	06-MAR-08	2019477	5487997	607	mini RECCE'
SL14	Sue Lake	07-MAR-08	2019195	5485406	906	mini RECCE'
SL15	Sue Lake	07-MAR-08	2019466	5484735	835	mini RECCE'
SL16	Sue Lake	07-MAR-08	2019468	5484101	755	mini RECCE'
SL17	Sue Lake	08-MAR-08	2018715	5483209	963	mini RECCE'
SL18	Sue Lake	10-MAR-08	2019053	5482069	769	mini RECCE'
SL19	Sue Lake	10-MAR-08	2019609	5482371	512	mini RECCE'
SL20	Sue Lake	10-MAR-08	2018588	5482552	842	mini RECCE'
WALES1	Sue Lake	03-MAR-08	2017698	5487529	628	RECCE
WALES2	Sue Lake	04-MAR-08	2017707	5487371	675	RECCE
WALES3	Sue Lake	05-MAR-08	2017977	5487577	535	RECCE
WALES4	Sue Lake	06-MAR-08	2018797	5488355	498	RECCE
CLERKE1	Sue Lake	08-MAR-08	2018531	5483371	1073	RECCE
032	Brian Rance		2010433	5483280		*Alepis flavida*
033	Brian Rance		2015629	5484135		*Alepis flavida*
034	Brian Rance		2013981	5481443		Snail shell location
035	Brian Rance		2011954	5478271		*Alepis flavida*
036	Brian Rance		2012414	5478028		*Alepis flavida*
ROAA1	Brian Rance	05-MAR-08	2012773	5485895	680	mini RECCE'
ROAA3	Brian Rance	05-MAR-08	2012926	5485591	747	mini RECCE'
ROAA4	Brian Rance	05-MAR-08	2013227	5484721	700	mini RECCE'
ROAA5	Brian Rance	05-MAR-08	2013261	5484792	680	mini RECCE'
ROAA6	Brian Rance	05-MAR-08	2013250	5484330	650	mini RECCE'
ROAA7	Brian Rance	06-MAR-08	2013141	5484047	587	mini RECCE'
ROAA8	Brian Rance	06-MAR-08	2012566	5483729	478	mini RECCE'
ROA9	Brian Rance	03-MAR-08	2013497	5485112	720	RECCE
SW1	Brian Rance	06-MAR-08	2009629	5482896	300	RECCE
SW2	Brian Rance	06-MAR-08	2010441	5483297	410	RECCE
SW10	Brian Rance	10-MAR-08	2012960	5476820	130	RECCE
SW11	Brian Rance	11-MAR-08	2012829	5477304	20	RECCE
SW12	Brian Rance	11-MAR-08	2012839	5477098	117	RECCE
SW3	Brian Rance	08-MAR-08	2015559	5484544	208	RECCE
SW4	Brian Rance	08-MAR-08	2015702	5484605	220	RECCE
SW5	Brian Rance	09-MAR-08	2013915	5479370	849	RECCE
SW6	Brian Rance	09-MAR-08	2014245	5481313	699	RECCE
SW7	Brian Rance	09-MAR-08	2013628	5481416		RECCE
SW9	Brian Rance	10-MAR-08	2011415	5478836	350	RECCE
SWA1	Brian Rance	06-MAR-08	2009865	5482972	320	mini RECCE'
SWA10	Brian Rance	09-MAR-08	2014249	5480554		mini RECCE'
SWA11	Brian Rance	09-MAR-08	2013916	5481447	775	mini RECCE'
SWA12	Brian Rance	10-MAR-08	2013067	5476724		mini RECCE'
SWA2	Brian Rance	06-MAR-08	2010441	5483279	532	mini RECCE'
SWA3	Brian Rance	08-MAR-08	2015452	5484237	204	mini RECCE'

Waypoint ID	Collected By	Date	Easting	Northing	Altitude	Description
SWA4	Brian Rance	08-MAR-08	2015545	5484569	205	mini RECCE'
SWA5	Brian Rance	08-MAR-08	2015525	5484358	209	mini RECCE'
SWA6	Brian Rance	08-MAR-08	2015521	5483655	351	mini RECCE'
SWA7	Brian Rance	08-MAR-08	2014717	5482005	576	mini RECCE'
SWA8	Brian Rance	09-MAR-08	2013897	5479896	783	mini RECCE'
SWA9	Brian Rance	10-MAR-08	2014015	5480035	2	mini RECCE'

Appendix 4. Map of waypoints



Appendix 5. Species recorded on Resolution Island and other sites in the Preservation Ecological District

Resolution Island Vascular flora list

ABUNDANCE
a - abundant
f - frequent
c - common
o - occasional
u - uncommon
l - local
√ - present

* = introduced species
? = unconfirmed identification

HABITAT
F - Forest
S - Shrubland
T - Tussockland
W - Wetland
Fe - Fellfield
A - Alpine
R - Rock
B - Boulderfield
St - Stream
L - Lake
C - Coastal

CODES SPECIFIC TO OTHER SURVEY COLUMNS IN TABLE
R = plants recorded from Resolution Island (Duck Cove) (by B. D. Rance, 2001)
F = plants recorded from Five Fingers Peninsula (by B. D. Rance, 2001)
D = plants recorded from Disappointment Cove by Johnson (1992)
WC = plants recorded from West Cape district by Wardle et al. (1973)
P = plants recorded from Preservation Ecological District (species list, B. D. Rance)
I = plants recorded from Breaksea Island and islands in Dusky Sound (by B. D. Rance & others)
S = plants recorded from Secretary Island (various surveys)

Note: Taxonomy follows de Lange & Rolfe (2010)

Note: codes are sometimes used in conjunction with each other e.g. lc – locally common, or CF – coastal forest

	South-west Resolution Island						**South-east Resolution Island**					**Northern Resolution Island**			**Five Fingers Peninsula**			**Other**			
	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
FERNS																					
Adiantum cunninghamii						*R*								*D*				*P*	*I*		*S*
Asplenium appendiculatum ssp. *appendiculatum*																		*P*	*I*		
Asplenium bulbiferum ssp. *bulbiferum*					F,o,lc	*R*	u				F,o	F,o		*D*	F,u		*F*	*P*	*I*	*WC*	*S*
Asplenium flaccidum	F,o	F,o	F,o			*R*	f		c		F,o	F,o		*D*	F,S,c	F,o	*F*	*P*	*I*	*WC*	*S*
Asplenium obtusatum												C,u	C,u	*D*	C,lc	C,o	*F*	*P*	*I*	*WC*	*S*
Asplenium polyodon																		*P*	*I*		

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Asplenium scleroprium																		*P*	*I*		
Asplenium appendiculatum ssp. *appendiculatum*																		*P*	*I*		
Blechnum blechoides											C, lo	C,u		*D*	C,lo	C,o		*P*	*I*		*S*
Blechnum chambersii	F,l,o				F,o,lc	*R*	lc		u		F,o	F,u	F,C,o	*D*	F,u	F,u		*P*	*I*		*S*
Blechnum colensoi					F,u	*R*	u		u		F,o	F,o		*D*				*P*	*I*		*S*
Blechum discolor	F,o	F,c	F,o		F,f	*R*	c		lo		F,f	F,a	F,f	*D*	F,a	F,o	*F*	*P*	*I*	*WC*	*S*
Blechnum durum												C,u		*D*				*P*	*I*	*WC*	*S*
Blechnum fluviatile	F,o	F,o	F,o		F,o	*R*	c		o		F,o	F,f		*D*	F,o	F,o	*F*	*P*	*I*	*WC*	*S*
Blechnum minus							u							*D*				*P*		*WC*	
Blechnum montanum	F,S,T			F,o			u			u		F,lo						*P*			*S*
Blechnum nigrum					F,o	*R*												*P*	*I*		*S*
Blechnum novae-zelandiae	F,o	F,o	St,lc		F,o,lf	*R*	o		u	o	F,o	F,o			F,lc	F,c		*P*	*I*	*WC*	*S*
Blechnum penna-marina												F,C,u						*P*			
Blechnum procerum	F,S,f	F,f	F,f	F,c	F,f	*R*	f	f	c	c	F,o	F,f	F,C,a	*D*	F,S,a	F,C,c	*F*	*P*	*I*	*WC*	*S*
Blechnum vulcanicum	F,lo				F,lc	*R*								*D*				*P*	*I*	*WC*	*S*
Ctenopteris heterophylla		F,o			F,o	*R*			u		F,o			*D*	F,S,f	F,o		*P*	*I*	*WC*	*S*
Cyathea colensoi	F,u	F,o	F,o		U,o		u					F,o						*P*			*S*
Cyathea medularis												F,u		*D*				*P*	*I*		*S*
Cyathea smithii	F,o	F,o	F,o		F,c	*R*	lc		o			F,f	F,C,c	*D*	F,c	F,c	*F*	*P*	*I*	*WC*	*S*
Cystopteris tasmanicus							u			l								*P*			
Dicksonia fibrosa												C,o	C,f								
Dicksonia squarrosa		F,o			F,o				u		F,c	F,c		*D*	F,f	F,c	*F*	*P*	*I*	*WC*	*S*
Gleichenia dicarpa					F,lc													*P*		*WC*	*S*
Gleichenia microphylla					F,lo									*D*	W,f		*F*	*P*	*I*		
Grammitis billardierii	F,c	F,c	F,c		F,f	*R*	f		c		F,c	F,f			F,Sa	F,C,o	*F*	*P*	*I*	*WC*	*S*
Grammitis givenii	R,lo			F,lo	F,o			lo										*P*			*S*
Grammitis poepiggiana	R,lo									u								*P*			*S*
Grammitis rigida						*R*								*D*	C,lo			*P*	*I*		*S*
Histiopteris incisa					F,o	*R*	o				F,o	C,u		*D*	C,lo	C,lc	*F*	*P*	*I*	*WC*	*S*
Huperzia australiana	T,u			Fe,lo				o		o								*P*			*S*
Huperzia varia	F,S,c	F,o	F,o	S,o	F,o, lc		c	o	c	o	F,o	F,f	F,W, o	*D*	S,F,f	C,o	*F*	*P*	*I*	*WC*	*S*
Hymenophyllum atrovirens																		*P*	*I*		
Hymenophyllum bivalve											F,o							*P*	*I*	*WC*	*S*
Hymenophyllum cupressiforme?																					*S*
Hymenophyllum demissum		F,c			F,c	*R*	c		f	c	F,c	F,c	F,c	*D*	F,f	F,c	*F*	*P*	*I*	*WC*	*S*
Hymenophyllum dilatatum		F,lc			F,c	*R*	u		u		F,o			*D*	F,lc	F,c	*F*	*P*	*I*	*WC*	*S*
Hymenophyllum ferrugineum					F,c	*R*					F,c	F,o		*D*			*F*	*P*	*I*		*S*

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Hymenophyllum flabellatum		F,c			F,c	*R*	u		o		F,o	F,f		*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Hymenophyllum flexuosum														*D*				*P*			*S*
Hymenophyllum lyallii		F,c	F,o,lc		F,o,lc	*R*			u			F,c		*D*	F,o			*P*	*I*	*WC*	*S*
Hymenophyllum minimum														*D*	F,u			*P*	*I*	*WC*	*S*
Hymenophyllum multifidum	F,S,R,c	F,f	F,f	F,c	F,f	*R*	c	c	o	c	F,c	F,o	F,c	*D*	F,S,c			*P*	*I*	*WC*	*S*
Hymenophyllum peltatum																					*S*
Hymenophyllum pulcherrimum													F,o					*P*	*I*		
Hymenophyllum rarum	F,c	F,c	F,o		F,c	*R*	o		c		F,o	F,o		*D*	F,c		*F*	*P*	*I*		*S*
Hymenophyllum revolutum		F,o			F,o	*R*			u		F,o	F,o		*D*			*F*	*P*	*I*		*S*
Hymenophyllum rufescens					F,u		u											*P*			
Hymenophyllum sanguinolentum		F,o			F,c	*R*					F,f	F,f	F,C,o	*D*	F,c	F,o	*F*	*P*	*I*	*WC*	*S*
Hymenophyllum scabrum					F,o	*R*	u		u		F,c	F,o	F,u	*D*				*P*	*I*	*WC*	*S*
Hymenophyllum villosum	F,lc	F,o		F,o			u		u	o								*P*			*S*
Hypolepis amaurorachis																		*P*	*I*		
Hypolepis ambigua?													F,u					*P*			
Hypolepis millefolium										u				*D*				*P*			*S*
Hypolepis rufo-barbata							o											*P*	*I*		*S*
Isoetes alpina																		*P*		*WC*	
Lastreopsis glabella					CF,u							F,u	F,o	*D*				*P*	*I*		*S*
Lastreopsis hispida					F,f							F,c	C,F,o	*D*	F,o		*F*	*P*	*I*	*WC*	*S*
Leptolepia novae-zelandiae					F,o		U				F,o							*P*			*S*
Leptopteris hymenophylloides																		*P*	*I*		
Leptopteris superba		F,o	F,o		F,o	*R*	o		o		F,o	F,o		*D*				*P*	*I*		*S*
Lindsaea trichomanoides					F,c	*R*									F,u			*P*	*I*		*S*
Lycopodiellar diffusa	W,o,lf	F,o,lc	F,W,c, lf	T,u	B,F,c ,lf										W,f		*F*	*P*	*I*	*WC*	*S*
Lycopodium fastigiatum	T,o		W,lc	T,o			c	c	o	c								*P*		*WC*	*S*
Lycopodium scariosum	S,o,lc		S,o,lf	T,Fe,o, lc								F,u						*P*	*I*		*S*
Lycopodium voluble			F,o,lc		F,o,lf	*R*		u	u	u	F,o		C,o	*D*	F,S,o	C,o	*F*	*P*	*I*	*WC*	*S*
Ophioglossum coriaceum													C,o			C,u		*P*			*S*
Microsorum pustulatum ssp. *pustulatum*		F,o			F,o						F,o	F,c	C,c	*D*	F,lf	C,F,c	*F*	*P*	*I*	*WC*	*S*
Pnuematopteris pennigera																C,lc		*P*	*I*		*S*
Polystichum cystostegia										u								*P*			*S*
Polystichum neozelandicum												F,u						*P*			
Polystichum vestitum	F,u		F,u				u	o	u	o	F,o	F,C,o	C,F,c	*D*				*P*	*I*		*S*
Pteris macilenta														*D*				*P*	*I*		*S*
Pyrrosia elaegnifolia					C,F,o								C,u	*D*		F,o		*P*	*I*		*S*
Rumohra adiantiformis		F,o			F,c	*R*	u		u		F,c	F,lo	F,o	*D*	F,c	F,o		*P*	*I*		*S*

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Schizaea australis	S,W,o	F,u	S,o	T,o	F,S,o			u				W,F, o			W,o		*F*	*P*	*I*	*WC*	*S*
Sticherus cunninghamii																		*P*			
Sticherus tener			F,lc	lo											lc			*P*			
Tmesipteris elongata		F,c	F,o		F,c						F,o							*P*	*I*		*S*
Tmesipteris tannensis	S,F,u	F,c	F,c		F,o	*R*	o		c		F,o	F,u		*D*	F,S,c		*F*	*P*	*I*	*WC*	*S*
Trichomanes reniforme		F,f	F,o,lc		F,f	*R*	u		lc		F,o	F,c	F,C,o	*D*	F,S,lf	C,F,o	*F*	*P*	*I*	*WC*	*S*
Trichomanes strictum		F,o			F,c	*R*	u		u								*F*	*P*	*I*	*WC*	*S*
Trichomanes venosum					F,o								F,o	*D*				*P*	*I*		*S*
TREES AND SHRUBS																					
Podocarps																					
Dacrycarpus dacrydioides																		*P*			*S*
Dacrydium cupressinum		F,c	F,c		F,f	*R*			lc		F,c	F,o	F,o	*D*	F,f	F,c	*F*	*P*	*I*	*WC*	*S*
Halocarpus biforme	S,F,T, W,a	F,f	F,f	S,T,f	F,f		a	a	u	o		F,S, W, c	F,W, o		S,a		*F*	*P*	*I*	*WC*	*S*
Lepidothamnus intermedius	S,lc	F,lc	F,f		F,c,lf	*R*							W,o	*D*	S,f		*F*	*P*	*I*	*WC*	*S*
Lepidothamnus intermedius x *laxiflora*																		*P*			*S*
Phyllocladus alpinus			F,o			*R*												*P*	*I*		*S*
Podocarpus cumminghamii (=P. hallii)		F,c	F,c		F,c	*R*	u		u		F,o	F,o	F,o	*D*	F,f	F,C,o	*F*	*P*	*I*	*WC*	*S*
Prumnopitys ferruginea		F,o			F,c	*R*	u		u		F,o	F,o	F,o	*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Other																					
Alepis flavida		F,u	F,u		F,o				u						F,u			*P*	*I*		*S*
Androstoma empetrifolia	S,lo	F,lo	S,lc	T,o,lc	W,o			o		o		S,u			W,c		*F*	*P*	*I*	*WC*	*S*
Archeria traversii	F,o	F,c	F,c	F,o	F,c	*R*	lc	lc	f	o	F,o	F,S,o		*D*	F,f		*F*	*P*	*I*	*WC*	*S*
Aristotelia fruticosa			F,o											*D*				*P*	*I*		*S*
Arisotelia serrata					F,u	*R*						F,o		*D*	F,o		*F*	*P*	*I*		*S*
Ascarina lucida		F,o			F,c	*R*			u			F,C,c	F,c	*D*	F,lc	F,c	*F*	*P*	*I*	*WC*	*S*
Brachyglottis bifistulosus										u								*P*			
Brachyglottis buchananii	F,o	F,o	F,o	F,o	F,o		o		o			F,o						*P*	*I*		*S*
Brachyglottis rotundifolia var. *rotundifolia*					C,lc	*R*						F,C,u		*D*	C,lo	C,F,o		*P*	*I*	*WC*	*S*
Carmichaelia arborea																					*S*
Carmichaelia australis																					*S*
Carpodetus serratus					F,lo				u			F,f	F,c	*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Coprosma cheesemanii	T,o			T,lo				o		u								*P*			*S*
Coprosma ciliata											F,o	F,C,f		*D*	F,f	F,c	*F*	*P*	*I*		*S*
Coprosma colensoi	F,S,f	F,c	F,c	F,o	F,c	*R*	o	o	o		F,o	F,S,f		*D*	F,S,f		*F*	*P*	*I*	*WC*	*S*
Coprosma crenulata	T,S,o,lc			T,o,lc			c	c	u	o								*P*		*WC*	*S*

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Coprosma cuneata	F,S,c	F,o	F,o,lc	F,S,c	F,c		o		o	c	F,o	F,f		*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Coprosma decurva															F,lo			*P*			*S*
Coprosma elatirioides	W,lo		W,lc	TW,o														*P*			*S*
Coprosma foetidissima	F,c	F,f	F,c		F,f	*R*	o		o		F,c	F,S,f	F,o	*D*	F,S,f	F,c	*F*	*P*	*I*	*WC*	*S*
Coprosma lucida		F,o			F,o	*R*					F,o	F,C,f		*D*	F,o	F,o	*F*	*P*	*I*	*WC*	*S*
Coprosma perpusilla	T,L,o			lc				o		c								*P*			*S*
Coprosma propinqua			F,o		C,o						C, la		C,u	*D*		C,c		*P*	*I*		*S*
Coprosma pseudociliata		F,o	F,o									F,C,f						*P*			
Coprosma pseudocuneata	F,o	F,o	F,c	F,o	F,c		o	o	o	o		F,S,f			F,o			*P*			*S*
Coprosma rhamnoides			F,o		C,F,o		u		o		F,c				F,u			*P*	*I*		*S*
Coprosma rotundifolia																		*P*	*I*		*S*
Coprosma rugosa													C,o	*D*				*P*		*WC*	
Coprosma serrulata	R,B,o								u	o								*P*			*S*
Coprosma tayloriae														*D*	F,u			*P*	*I*		
Coprosma wallii																		*P*		*WC*	
Coriaria arborea						*R*						F,o		*D*	F,lo	F,c		*P*	*I*	*WC*	*S*
Coriaria plumosa	St,lc		St,o																		*S*
Dracophyllum fiordense	S,T,o								u									*P*			*S*
Dracophyllum longifolium	S,F,T,f	F,c	F,f	F,S,T,c	F,W,c	*R*	o	o	o	o	F o	F,S,C ,f	C,F,o	*D*	C,a	F,C,c	*F*	*P*	*I*	*WC*	*S*
Dracophyllum menziesii	S,F,T,f	F,c	F,f	F,S,o	F,c	*R*	a	f	f	c		F,S,C ,f	C,F,o		S,f		*F*	*P*	*I*	*WC*	*S*
Dracophyllum pearsonii	T,S,o			T,o,lc			o	f	u									*P*		*WC*	
Dracophyllum politum	W,R,f		T,lc	Fe,T,R, c			u	f		c			W,u					*P*		*WC*	*S*
Dracophyllum pronum?																		*P*			*S*
Dracophyllum prostratum								c										*P*			
Dracophyllum rosmarinifolium (= D. uniflorum)	T,S,c		S,o	S,o				o	u	o								*P*		*WC*	*S*
Elaeocarpus hookerianus		F,o	F,c		F,c	*R*			u		F,o		F,o	*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Fuchsia excorticata					F,o	*R*	lc		u		F,o	F,o	F,o	*D*	F,lu	F,o		*P*	*I*	*WC*	*S*
Gaultheria antipoda			St,o								F,o							*P*	*I*		*S*
Gaultheris crassa	Fe,R,lo			Fe,R,lc				u	u	o								*P*			*S*
Gaultheria depressa	T,o			T,o,lc						c								*P*		*WC*	*S*
Gaultheria rupestris						*R*								*D*	F,u		*F*	*P*	*I*	*WC*	*S*
Griselinia littoralis	F,o	F,o	F,o		F,o	*R*	o	√	o		F,o	F,C,c		*D*	F,c	F,c		*P*	*I*	*WC*	*S*
Griselinia lucida?																		*P*	*I*		
Haloragis erecta																		*P*			*S*

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Hebe cockayneana																		*P*			*S*
Hebe elliptica												F,C,c	C,F,o	*D*	C,o	C,c		*P*	*I*	*WC*	*S*
Hebe hectorii ssp. *laingii*																		*P*			*S*
Hebe mooreae																		*P*			*S*
Hebe odora	S,T,c		S,o	T,S,c			o	c	o	c								*P*			*S*
Hebe pauciflora																		*P*			*S*
Hebe salicifolia							u				F,o			*D*	F,lo	F,o		*P*	*I*		*S*
Hebe subalpina																		*P*			*S*
Hedycaria arborea					CF,o							F,c	F,o	*D*				*P*	*I*		*S*
Hoberia glabrata							u					F,u		*D*		F,u		*P*	*I*		*S*
Ileostylis micranthus																		*P*	*I*		
Kelleria crouzatii	Fe,lc			Fe,lo				f										*P*			*S*
Kelleria dieffenbachii										o								*P*			*S*
Leptecophylla juniperina ssp. *juniperina*	S,o	F,o	F,c		F,c	*R*	o	o			F,o	F,S,o	F,o	*D*	S,c		*F*	*P*	*I*	*WC*	*S*
Leptospermum scoparium	S,T,a	F,c	S,T,W, F,a	F,S,T,a	W,F,f	*R*	f	a		o		F,S,lc	C,W, c	*D*	S,W,f	C,o	*F*	*P*	*I*	*WC*	*S*
Melicytus alpinus	T,o																	*P*			*S*
Melicytus lanceolatus																		*P*	*I*		*S*
Melicytus ramiflorus													F,o	*D*		F,o		*P*	*I*		*S*
Metrosideros umbellata	F,S,c	F,f	F,f		F,f	*R*	f	o	c	u	F,C ,c	F,o	F,o	*D*	F,a	F,c	*F*	*P*	*I*	*WC*	*S*
Montitega dealbata (Cyathodes pumila)																		*P*			*S*
Myrsine australis		F,o			C,F,o	*R*					F,o		F,o	*D*	F,lo	F,c		*P*	*I*	*WC*	*S*
Myrsine divaricata	F,S,o	F,c	F,c	F,o	F,c	*R*	o	o	o	u	F,o	F,f	F,c	*D*	F,S,f	F,c	*F*	*P*	*I*	*WC*	*S*
Myrsine nummularia	T,S,c			T,c			o	o	u	o								*P*		*WC*	*S*
Neomyrtus pedunculata		F,c	F,o		F,c	*R*					F,o	F,u	F,o	*D*	F,f		*F*	*P*	*I*	*WC*	*S*
Nothofagus menziesii	F,a	F,c	F,c	F,c	F,a	*R*	f	o	f	o	F,f	F,f	F,a	*D*	F,lc		*F*	*P*	*I*	*WC*	*S*
Nothofagus solandri var. *cliffortioides*	F,S,a	F,a	F,a	F,a	F,a	*R*	f	f	lc	o	F,c	F,S,f	F,W, c	*D*	F,a	F,f	*F*	*P*	*I*	*WC*	*S*
Olearia arborescens	F,u							√	u			F,C,o	C,o	*D*	F,lu		*F*	*P*	*I*	*WC*	*S*
Olearia avicennaiefolia												F,C,u	F,C,c	*D*		C,o		*P*	*I*		*S*
Olearia colensoi	S,F,a	F,f	F,c	F,S,f	F,f		a	a		f		F,o		*D*	F,lc			*P*	*I*	*WC*	*S*
Olearia ilicifolia							u											*P*			
Olearia lacunosa																		*P*			*S*
Olearia laxiflora																		*P*			*S*
Olearia oporina					C,lc	*R*						F,C,f	F,C,c	*D*	C,la	C,f	*F*	*P*	*I*	*WC*	*S*
Ozothamnus vauvilliersii																		*P*	*I*		*S*
Pentachondra pumila	T,W,c	F,lo	S,W,c	T,c	W,c		o	f				S,u	S,u		W,c		*F*	*P*	*I*	*WC*	*S*
Peraxilla colensoi					F,u				lo		F,o							*P*	*I*		*S*
Peraxilla tetrapetala					F,u				u									*P*			

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Pimelea gnidia	T,S,F,c	F,o	F,S,c	F,c	F,C,o		c	c	u	c				*D*	F,o		*F*	*P*	*I*	*WC*	*S*
Pimelea urvilleana															C,lc			*P*			
Pittosporum rigidum (= P. crassicaule)	F,S,o	F,o	F,o	F,o	F,o		o	u	o	u		F,f		*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Pittosporum tenuifolium						*R*								*D*	F,lo	F,o		*P*	*I*	*WC*	*S*
Plagianthus divaricatus													C,u			F,o					
Pseudopanax colensoi var. *fiordense*	F,o	F,o	F,o	F,o	F,o		o	u	o	o		F,c	F,c	*D*	F,o		*F*	*P*	*I*	*WC*	*S*
Pseudopanax colensoi var. *ternatus*					F,o	*R*					F,o							*P*	*I*	*WC*	*S*
Pseudopanax crassifolius		F,o	F,o		F,o	*R*	o	u	o		F,o		F,c	*D*	F,f		*F*	*P*	*I*	*WC*	*S*
Pseudopanax lineare	F,o	F,c	F,c	F,o	F,o	*R*	o		c	u		F,o		*D*	F,S,f		*F*	*P*	*I*	*WC*	*S*
Pseudowintera colorata	F,u	F,o	F,o,lc		F,c	*R*	u		lc		F,o	F,a	F,C,f	*D*	F,c	F,c	*F*	*P*	*I*	*WC*	*S*
Raukaua anomalis																		*P*		*WC*	
Raukaua simplex	F,o	F,c			F,c	*R*	c	u	c		F,o	F,c		*D*	F,f		*F*	*P*	*I*	*WC*	*S*
Schefflera digitata					F,o		lo		u				F,o	*D*	F,lo	F,o		*P*	*I*	*WC*	*S*
Sophora microphylla													C,u	*D*		C,u		*P*			
Sprengelia incanata					W,lc										W,c		*F*	*P*	*I*	*WC*	
**Ulex europaeus*													C,u	*D*		C,u		*P*			
Urtica ferox												F,C,c	C,o	*D*				*P*	*I*		*S*
Weinmannia racemosa	F,o	F,f	F,f		F,a	*R*	o	u	lc		F,f	F,S,a	F,c	*D*	F,S,f	F,c	*F*	*P*	*I*	*WC*	*S*
VINES AND CLIMBERS																					
Clematis paniculata														*D*				*P*	*I*		*S*
Metrosideros diffusa					F,f	*R*			lc		F,c	F,c	F,o	*D*	F,lc	F,c	*F*	*P*	*I*	*WC*	*S*
Metrosideros fulgens																		*P*		*WC*	
Metrosideros perforata																		*P*	*I*		
Muehlenbeckia australis												C,lc	C,lc	*D*				*P*	*I*		*S*
Muehlenbeckia complexa															C,o	C,o					
Parsonsia sp.																		*P*			*S*
Rubus australis												F,u						*P*		*WC*	
Rubus cissoides					F,o		u					F,c		*D*	F,o	F,o		*P*	*I*	*WC*	*S*
HERBS																					
Abrotanella inconsicua	Fe,o			Fe,lo																	
Abrotanella muscosa	RW,o							o													*S*
Abrotanella linearis	W,o			W,lc					u						F,l,u			*P*			*S*
Acaena anserinifolia					C,CF, o,lc			√					C,o	*D*	C,c	C,f			*I*		
Acaena novae-zelandiae																		*P*			*S*
Aciphylla crosby-smithiana																					*S*
Aciphylla lyallii	T,o,lc			T,lo				u	u	lc								*P*			*S*
Aciphylla pinnatifida	St,W,o																	*P*			
Actinotus novae-zelandiae	W,c		W,c	T,o				o		o			W,u		W,f			*P*	*I*	*WC*	*S*

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Anaphalioides bellidioides	L,lc										C,lo				C,F,u			*P*			*S*
Anaphalioides hookerii	R,lc											C,u		*D*				*P*			*S*
Anisotome aromatica	Fe,o			Fe,lo				o													
Anisotome flexuosa																		*P*			*S*
Anisotome haastii				R,Fe,o, lc				o	u	c								*P*			*S*
Anisotome imbricata var. *prostrata?*	Fe,o			Fe,lo				u													
Anisotome lyallii														*D*	C,c			*P*	*I*	*WC*	*S*
Apium prostratum													C,u		C,lo	C,o		*P*			
Brachyglottis bellidioides								c		o								*P*			*S*
Callitriche petriei														*D*				*P*			
**Callitriche stagnalis*											F,o										
Calystegis soldanella														*D*				*P*			
Cardamine sp. aff. *debilis*										o		F,u		*D*	C,o	C,o		*P*	*I*		*S*
Celmisia argentia																		*P*			*S*
Celmisia bonplandii	R,u																	*P*			
Celmisia coriacea	T,S,o		S,o	S,o			o	o	u	c		S,o						*P*			
Celmisia discolor?																		*P*			*S*
Celmisia du-rietzii	T,R,c							o		u								*P*			*S*
Celmisia glandulosa	WR,lo							u										*P*			*S*
Celmisia gracilenta	T,W,o			T,o					u	o								*P*			*S*
Celmisia graminifolia																		*P*			*S*
Celmisia holosericea	R,T,c		R,o	Fe,T,o, lc			u	f	u	c								*P*	*I*	*WC*	*S*
Celmisia x *linearis*												S,u									
Celmisia petriei	T,c			T,c			u	c	u	f		S,o						*P*			*S*
Celmisia ramulosa										u								*P*			*S*
Celmisia semicordata var. *semicordata*	T,u																	*P*			
Celmisia sessiliflora	Fe,R,o, lc							c		o								*P*			*S*
Celmisia verbacifolia	T,c							lc		o								*P*			*S*
Celmisia walkerii										lc								*P*			*S*
Centella uniflora					C,lf							C,o	C,o	*D*		C,f		*P*	*I*		
**Cerastium fontanum*												C,o	C,o	*D*	C,u	C,c		*P*			*S*
Chaerophyllum colensoi											u								*P*		
Chionohebe ciliolata var. *fiordensis*																		*P*			*S*
**Cirsium arvense*														*D*				*P*			
**Cirsium vulgare*												C,u	C,o		C,o	C,o		*P*			
Colobanthus affinus	A,lc							c		u								*P*	*I*		*S*
Colobanthus apetalus												C,u			C,c	C,c		*P*		*WC*	

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Colobanthus meulleri											C,lc							*P*			
Craspedia aff. uniflora										lc											*S*
Crassula helmsii?											C,lf							*P*	*I*		
Crassula moschata					C,o									*D*	C,c	C,lf		*P*	*I*		
Crassula ruamahanga?											C,lf										
**Crepis capillaris*																C,o					
Dolchoglottis lyallii																		*P*			*S*
Dolchoglottis scorzoneroides	T,St,R,o			T,o				lc	u	o								*P*			*S*
Dolchoglottis scorzoneroides x *lyallii*																					*S*
Donatia novae-zelandiae	W,T,f		W,lc	W,T,c,lf			o	a		c		W,lo			W,a			*P*		*WC*	*S*
Drosera arcturii	W,c	F,lo	W,lc	W,lo			u	o		o								*P*			*S*
Drosera spathulata	T,W,c	F,lc	WS,lc	T,c	W,c			o		u		W,S,lo	W,lc		W,f		*F*	*P*	*I*	*WC*	*S*
Drosera stenopetala	T,R,o	F,lo	S,o	T,c	F,lc		o	c	u	c		W,S,lo	W,lc		W,o			*P*		*WC*	*S*
Epilobium alsinoides var. *alsinoides*	A,lc									u											*S*
Epilobium brunnescens ssp. *brunnescens*	St,lo													*D*	F,C,o	C,u		*P*	*I*		*S*
Epilobium komarovianum															C,o	C,u		*P*	*I*	*WC*	
Epilobium nummularifolium												F,u									
Epilobium pedunculare					C,o		u					F,o		*D*		C,c		*P*	*I*		*S*
Epilobium pernitens	W,o			W,lc					u	lc		C,o	C,u					*P*			*S*
Euchiton limosum												C,F,o	C,o					*P*			*S*
Euchiton ruabinicus												C,F,c	C,o	*D*		C,c		*P*	*I*		*S*
Euphrasia dyerii	W,lo									u					W,u			*P*		*WC*	*S*
Euphrasia petriei	T,o,lc			Fe,lo				o	u	c											*S*
Euphrasia repens													W,u								*S*
Euphrasia zelandica																					*S*
Forstera sedifolia	T,R,c		R,lo	T,f				a	u	c								*P*		*WC*	*S*
**Galium aparine*																C,o					
**Galium palustre*														*D*							
Gentiana divisa								√										*P*			*S*
Gentiana lineata	W,o									u								*P*		*WC*	*S*
Gentiana montana var. *montana*	T,S,W,c	F,lo	W,S,o	T,S,f	W,o		f	f	u	o		S,lc			W,c			*P*		*WC*	*S*
Gentianella patula																					*S*
Gentianella saxosa														*D*	C,o			*P*	*I*		*S*

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Geranium aff. *microphyllum*										u								*P*			
Geum leiospermum	L,lc									u								*P*			
Geum uniflorum								u										*P*			*S*
Glossostigma elatinoides																		*P*		*WC*	
Gonocarpus aggregatus	W,o			T,o						o								*P*			*S*
Gonocarpus micranthus																					*S*
Gunnera dentata?																		*P*	*I*		
Gunnera monoica	A,lo		St,o		C,lc			u		c				*D*	C,F,o	C,o		*P*			*S*
Hydocotyle microphylla												C,F,o	C,o		C,o	C,o		*P*			
Hydrocotyle moschata												C,F,o						*P*			
Hydrocotyle novae-zelandiae var. *montana*					C,f							F,u		*D*	C,c	C,a		*P*	*I*		*S*
Hydrocotyle salcata																		*P*			*S*
Hydrocotyle sp.								lc											*I*		
Lagenifera petiolata																C,c		*P*			
Leptinella dioica					C,lc						C,f				C,o	C,f		*P*	*I*		
Leptinella squalida var. *mediana*														*D*		C,f		*P*		*WC*	
Leucogenes grandiceps	R,o						u			u								*P*			*S*
Lilaeopsis novae-zelandiae														*D*		C,lf		*P*	*I*	*WC*	
Liparophyllum gunnii	W,o,lc		W,lc	W,lo											W,lo			*P*		*WC*	*S*
**Lotus pedunculare*																C,c		*P*			*S*
Lobelia anceps														*D*	C,c	C,c		*P*	*I*		*S*
Lobelia angulata					C,lf			lc			C,c	F,c	C,c	*D*	C,F,lc	C,o		*P*	*I*	*WC*	*S*
Mitrasacme novae-zelandiae	W,o			W,o														*P*			*S*
Myosotis rakiura															C,o						
Myosotis spathulata								u													
Myriophyllum propinquum																		*P*		*WC*	
Myriophyllum triphyllum	L,lc																	*P*			
Nertera ciliata	W,T,o									u		C,o						*P*			
Nertera depressa	F,lo		F,o		C,F,o lf	*R*	c		o		C,c	C,F,a	c	*D*	C,F,c	C,c	*F*		*I*		*S*
Nertera villosa		F,c	F,c		F,c	*R*	o		o		F,c	F,c		*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Oreostylidium subulatum																		*P*		*WC*	
Ourisia caespitosa										u								*P*			
Ourisia crosbyi	F,lc		St,o	S,lo	F,o		o		lc	u		F,lf		*D*	F,o			*P*	*I*	*WC*	*S*
Ourisia macrocarpa	T,o			T,lo				o	lu	c								*P*			*S*
Ourisia sessiliflora var. *sessiliflora*																		*P*			*S*
Oxalis exilis												C,o		*D*	C,o	C,o		*P*	*I*		
Oxalis magellanica	L,lo							lc		la				*D*				*P*			
Pachycladon crenatus																					*S*
Parahebe cataractae	R, St,lc		St,c	R,lo								St,u	C,u	*D*				*P*	*I*	*WC*	*S*

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Phyllachne colensoi	Fe,o																	*P*			*S*
Plantago lanigera	T,o			Fe,lo				u													*S*
**Plantago major*																		*P*	*I*		
Plantago triandra											C,o				C,c	C,c		*P*	*I*		*S*
Plantago uniflora	W,o			W,lo				c	u	c						C,f		*P*			*S*
Pseudognaphalium luteo-album												C,o	C,f	*D*	C,o			*P*	*I*		*S*
Psychrophylla novae-zelandiae	W,o			Fe,lo						u								*P*			*S*
Ranunculus acaulis											C,o			*D*				*P*	*I*		
Ranunculus glabrifolius																		*P*		*WC*	
Ranunculus lyallii										o								*P*			*S*
Ranunculus membranifolius							lo							*D*				*P*	*I*		*S*
Ranunculus multiscapus																		*P*			*S*
**Ranunculus repens*																c		*P*			
Ranunculus sp.	L,lc												u						*I*		
Raoulia buchananii	Fe,o,lc							u													*S*
Raoulia grandiflora	Fe,o			Fe,c				u		u								*P*			*S*
Raoulia subulata	A,lo																				
Raoulia youngii																					*S*
Rumex flexuosus																C,o		*P*			*S*
Rumex neglectus													C,u					*P*		*WC*	*S*
**Sagina procumbens*												C,u	C,o		C,u	C,o		*P*	*I*		*S*
Samolus repens					C,o,l, c						C,o			*D*	C,lo	C,la		*P*	*I*		
Schizeilema haastii var. *cyanopetalum*	R,lc							√		u								*P*			
Schizeilema nitens																		*P*		*WC*	
Scleranthus biflorus																					*S*
Selliera radicans											c,f							*P*			*S*
Senecio biserratus?																		*P*	*I*		*S*
Senecio glomeratus														*D*				*P*	*I*		
Senecio lautus																		*P*			*S*
Senecio minimus																		*P*			*S*
Senecio wairauensis												C,u				C,o		*P*	*I*		*S*
**Sonchus aspera*												C,o						*P*			*S*
Sonchus kirkii														*D*				*P*	*I*		*S*
**Sonchus oleraceus*												C,u	C,o	*D*	C,u			*P*	*I*		*S*
Stackhousia minima?								u		u											
**Stellaria media*																C,o		*P*			
Stellaria parviflora												F,o	C,u	*D*		C,o		*P*	*I*	*WC*	*S*
**Trifolium repens*													C,o			C,o		*P*	*I*		

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Viola cunninghamii																		*P*			*S*
Viola filicaulis	F,o				CF,o							F,u			F,lo			*P*			*S*
MONOCOTS																					
Grasses																					
**Agrostis capillaris*																		*P*	*I*		*S*
Agrostis dyeri	T,lc		St,o	W,o														*P*			*S*
Agrostis meulleriana	Fe,o			Fe,o														*P*			*S*
**Agrostis stolonifera*																C,o		*P*			
**Anthoxanthus odoratum*														*D*		C,lc		*P*			*S*
Chionochloa acicularis	T,S,W, a	F,lo	W,f	T,S,a	W,lf		o	a	o	a		W,F, o			W,a		*F*	*P*	*I*	*WC*	*S*
Chionochloa conspicua			St,o								C,o		C,u					*P*		*WC*	
Chionochloa crassiuscula var. *torta*	T,W,f			T,c				c		o								*P*		*WC*	*S*
Chionochloa ovata	St,lo									u								*P*			*S*
Chionochloa pallens	T,o,lc			T,u				o	u	o								*P*			*S*
Chionochloa rigida var. *amara*								u		lc								*P*			*S*
Austroderia richardii												C,o			F,lo	C,c		*P*		*WC*	*S*
**Dactylis glomerata*																		*P*			*S*
Deschampsia chapmanii							u				C,o					C,o					*S*
Deyeuxia aucklandica	T,o,lc			T,o				o	u	c			C,o					*P*		*WC*	*S*
Dichelachne crinita													C,u					*P*			
Hierochloe novae-zelandiae	T,o							u										*P*			*S*
Hierochloe recurvata	T,o																	*P*			*S*
Hierochloa redolens																		*P*			*S*
**Holcus lanatus*													C,o	*D*		C,lc		*P*	*I*		*S*
Lachnogrostis pilosa							u			o		F,u		*D*				*P*	*I*		*S*
Lachnogrostis striata					C,lc						C,o					C,o		*P*			*S*
**Lolium perenne*																C,o		*P*			
Microlaena avenacea			F,c		F,o		u		lc		F,o	F,f	C,f	*D*	F,c	F,C,f	*F*	*P*	*I*	*WC*	*S*
**Poa annua*																C,o		*P*	*I*		*S*
Poa astonii					C,o							C,c		*D*	C,lo			*P*	*I*	*WC*	*S*
Poa breviglumis															C,c	C,o		*P*		*WC*	
Poa colensoi				T,lc				u		o								*P*			*S*
Poa hesperia/kirkii	W,T,o			T,o				u										*P*			*S*
Poa novae-zelandiae	R,u,o																	*P*			
**Poa pratensis*																C,u		*P*			
Rytidosperme gracile					C,o						C,o	C,o	C,o	*D*	C,o			*P*	*I*		*S*
Rytidosperme nigricans	W,o							u				W,o						*P*			*S*
Rytidosperme setifolia	R,o			T,o				u						*D*	C,c			*P*	*I*	*WC*	*S*
Trisetum tenellum?	T,o																	*P*			*S*

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**Vulpeia* sp.																		*P*			*S*
Zotovia acicularis	R,u																	*P*			*S*
Zotovia colensoi	T ,o,lc							u		f								*P*			*S*
Zotovia thomsonii	W,c	F,lo	W,o	W,C,T, c			o	a		o		W,c			W,c			*P*		*WC*	*S*
Sedges																					
Baumea tenax					W,lf										W,a		*F*	*P*	*I*	*WC*	
Carex appressa					C,lc	*R*					C,c	C,o	C,c	*D*	C,o	C,a		*P*	*I*		*S*
Carex acicularis	R,o			Fe,u																	*S*
Carex berggrenii														*D*				*P*			
Carex comans																C,o		*P*			*S*
Carex coriacea																		*P*			*S*
Carex dissita	L,o,lc		F,lc								C,l c			*D*	F,o			*P*	*I*		*S*
Carex flagellifera?											C,o							*P*	*I*		
Carex gaudicaudiana																		*P*			*S*
Carex geminata																C,o		*P*	*I*		
Carex inversa															C,o						
Carex littorosa											C,o		C,o	*D*		C,o		*P*			
Carex lucida																					*S*
Carex pleiostachys					C,o							C,lc	C,o	*D*	C,la			*P*	*I*	*WC*	*S*
Carex pyrenoica var. *cephalotes*																		*P*			*S*
Carex secta					W,o									*D*				*P*			
Carex solandri												C,c	C,o	*D*	C,o			*P*	*I*		*S*
Carex ternaria																		*P*	*I*		
Carex trifida														*D*				*P*	*I*		
Carex virgata																		*P*			*S*
Carpha alpina	W,T,f	F,lo	W,c	W,T,f	W,c		o	f	u	f		W,lf	B,lf		W,a		*F*	*P*	*I*	*WC*	*S*
Eleocharis acuta	L,W,O, lc				L,c													*P*	*I*		
Eleocharis gracilis	W,lo		W,lo																*I*		
Eleocharis sphacelata					L,c													*P*	*I*		
Ficinias nodosus												W,lc						*P*			
Ficinia spiralis														*D*				*P*			
Gahnia procera	S,c	F,o,lc	F,f	F,S,c	F,c	*R*	o	f	u			S,o	C,o	*D*	S,W,a		*F*	*P*	*I*	*WC*	*S*
Isolepis aucklandica	W,T,o, lc		W,o	W,o					o			F,C, o	C,o		F,u			*P*		*WC*	*S*
Isolepis cernuua					C,lc						C,o	W,o	W,o	*D*	C,f	C,c		*P*	*I*		
Isolepis habrus	F,lc		F,o		F,o		o											*P*	*I*	*WC*	*S*
Isolepis inundata																		*P*			*S*
Isolepis preatextatus					C,o							CW, u		*D*	C,lc	C,c		*P*	*I*	*WC*	*S*
Lepidosperme australe	W,lc		W,lf		W,c									*D*	W,c		*F*	*P*	*I*	*WC*	*S*

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Dusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Oreobolus impar	T,W,R, f		R,o	T,f				c	u			W,S,l ,c			W,f			*P*	*I*	*WC*	*S*
Oreobolus pectinatus	W,T,c		W,o	W,c,lf			u	o					W,lo		W,o			*P*	*I*		*S*
Oreobolus strictus	W,c	F,lo	W,o	W,c,lf	W,c					u		W,lc	W,u		W,c		*F*	*P*	*I*	*WC*	*S*
Schoenus pauciflorus	T,Wo			T,W,c				o	u			S,lc	W,u			C,c		*P*	*I*	*WC*	*S*
Uncinia angustifolia																		*P*		*WC*	*S*
Uncinia aucklandica					CF,o									*D*	F,c			*P*	*I*		
Uncinia caespitosa									U									*P*			*S*
Uncinia drucei	T,R,o			R,o														*P*			*S*
Uncinia egmontana?																	*F*	*P*	*I*		*S*
Uncinia filiformis	F,o	F,c	F,o	F,o	F,c	*R*	c		u	o	F,o	F,c	F,o	*D*	F,f		*F*	*P*	*I*		*S*
Uncinia fuscovaginata	T,o								u	u		F,u						*P*			
Uncinia gracilenta			F,o				o		c	o	F,o			*D*				*P*	*I*		*S*
Uncinia rubra																C,f		*P*			
Uncinia rupestris																		*P*			*S*
Uncinia uncinata	F,o						o		u			F,u	C,o	*D*	F,o			*P*	*I*		*S*
Uncinia viridis	T,c	F,o		T,c					u			F,o						*P*		*WC*	*S*
Uncinia sp.	S,o	F,c	F,o	F,o	F,o			u		u									*I*	*WC*	*S*
Orchids																					
Adenochilus gracilis															F,u			*P*			
Aporostylis bifolia	F,S,c	F,o	F,c	T,c	F,Wo		o		u	o		F,c	W,u		S,lf		*F*	*P*	*I*	*WC*	*S*
Corybas cheesemanii																		*P*	*I*		
Drymoanthus adversus														*D*				*P*	*I*	*WC*	
Earina autumnalis		F,o			F,c	*R*			lc		F,o	F,f	C,f	*D*	F,c	F,o	*F*	*P*	*I*	*WC*	*S*
Earina mucronata		F,o			F,o	*R*		√	lc		F,o	F,o		*D*				*P*	*I*	*WC*	*S*
Ichthyostonum pygmaeum					F,u												*F*	*P*	*I*	*WC*	*S*
Microtis unifolia																					*S*
Nematocerus acuminatus		F,o			F,o	*R*								*D*	F,lo		*F*	*P*	*I*		*S*
Nematocerus macranthus												F,u						*P*			
Nematocerus trilobus						*R*	u							*D*	F,lc			*P*	*I*		
Petalochilis spp.														*D*				*P*			*S*
Prasophyllum colensoi	T,o		R,o	Fe,o	W,o		u	u							W,o		*F*	*P*	*I*	*WC*	*S*
Pterostylis australis														*D*				*P*			*S*
Pterostylis banksii?																		*P*	*I*		
Pterostylis graminea					F,o													*P*		*WC*	
Pterostylis montana?			F,o		F,o																*S*
Singularybas oblongus		F,c	F,o		F,o	*R*								*D*			*F*	*P*	*I*	*WC*	*S*

	Mt Roa - Mt Lort	Mt Roa-Cormorant Cove	Centre bivvy to North Phillips	North Phillips to Mt Phillips	North Phillips to The Basin	*Resolution Is. (B. D. Rance, 2001)*	Mt Wales forest	Mt Wales alpine	Mt Clerk forest	Mt Clerk alpine	Duck Cove	North Coast forests	Disappointment Cove	*Disappointment Cove (Johnson, 1992)*	Five Fingers Peninsula	Goose/ Woodhen Cove	*Five Fingers Peninsula (B. D. Rance, 2001)*	*Preservation E. D. (species list, B. D. Rance)*	*Duusky/ Breaksea (B. D. Rance & others)*	*West Cape (Wardle et al., 1973)*	*Secretary Island (various surveys)*
Thelymitra cyanea	W,T,R, c	F,lo	W,c	T,c	W,o		o	c				S,lc	S,u		W,a			*P*		*WC*	*S*
Thelymitra longifolia	T,o									o				*D*			*F*	*P*	*I*	*WC*	*S*
Thelymitra pachyphylla																					*S*
Townsonia deflexa															S,o				*I*		
Waireia stenopetala	T,W,o			T,o			u	u		u								*P*		*WC*	*S*
Winika cunninghamii		F,c			F,c	*R*			u		F,o	F,o		*D*	F,c		*F*	*P*	*I*	*WC*	*S*
Rushes																					
Apodasmia similis											C,o					C,la		*P*	*I*		*S*
Centrolepis ciliata	W,c		W,o	W,o,lc	W,o		o	o		o			W,lo		W,f		*F*	*P*	*I*	*WC*	*S*
Centrolepis minima																					*S*
Centrolepis pallida	W,o																	*P*			*S*
Empodisma minus	W,lc			T,lo	W,lf			u							W,f		*F*	*P*	*I*	*WC*	
Gaimardia setacea	W,c		W,c	W,o,lc				u		o			W,lc		W,o			*P*	*I*	*WC*	*S*
Juncus antarcticus	W,o,lc			W,lc			u		c	c								*P*			*S*
**Juncus articulatus*	W,L,o																	*P*			
**Juncus bufonius*													C,u			C,o		*P*			*S*
**Juncus bulbosus*	L,c																	*P*			
Juncus edgariae																C,c		*P*	*I*		
Juncus novae-zelandiae					C,lc							W,o			S,u	C,c		*P*			
Juncus pauciflorus?															C,o	C,o		*P*			
Juncus planifolius												C,F,o	C,u	*D*		C,o		*P*	*I*		
Apodasmia similis											C,o					C,la		*P*	*I*		*S*
Luzula banksiana var. *acra*														*D*				*P*	*I*		
Luzula congesta												F,u									
Luzula crinita var. *petrieana*	T,o,lc			Fe,lc				u		c								*P*			*S*
Luzula picta var. *limosa*																		*P*			*S*
Luzula pumila	Fe,lo																	*P*			*S*
Luzula rufa																		*P*			*S*
Rostkovia magellanica	W,lc																				
Triglochin striatum					C,lf						C,o			*D*		C,lf		*P*			
Other monocots																					
Astelia fragrans	F,o,lf	F,o	F,o	F,o	F,o	*R*			c		F,o	F,o	C,c	*D*	F,o	F,c	*F*	*P*	*I*		*S*
Astelia linearis	T,W,f	F,lc	S,F,lc	T,f	W,o		f	c	o	f								*P*	*I*	*WC*	*S*
Astelia nervosa	F,S,o	F,c	F,c	F,o			f	o	o			F,f						*P*		*WC*	*S*
Astelia nivicola var. *moriceae*																		*P*			*S*
Astelia petrieii	S,B,o			S,u						o								*P*			*S*
Astelia subulata?	W,o,lc																				*S*
Bulbinella gibbsii var. *balanifera*	T,o			T,c					u	c								*P*		*WC*	*S*

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Cordyline indivisa																		*P*	*I*		*S*
Freycinetia baueriana												o,lc	o,lc	*D*	F,lo	F,o		*P*	*I*		
Libertia micrantha		F,o	F,o		F,o,lc	*R*			u		F,o				F,lc			*P*	*I*	*WC*	*S*
Luzuriaga parviflora	F,o	F,o	F,o		F,o,lc	*R*	o		lc		F,o	F,o		*D*	F,lc		*F*	*P*	*I*	*WC*	*S*
Phormium cookianum	S,T,o	F,o	S,o	S,T,o	F,o	*R*	c	o	c		C,o	F,C,S ,o	C,o	*D*	C,F,S, o	C,c	*F*	*P*	*I*	*WC*	*S*
Potamogeton cheesemanii			St,lc		St,lc				c						F,lu			*P*			*S*
Potamogeton suboblongus	St,o													*D*				*P*		*WC*	
Rhipogonum scandens			F,o		F,o	*R*					F,o	F,o		*D*	F,lo		*F*	*P*	*I*	*WC*	*S*