

SCIENCE & RESEARCH INTERNAL REPORT NO.111

**GOATS' AND POSSUMS' EFFECTS
ON THREATENED
NORTH ISLAND PLANTS:
A PRELIMINARY REPORT**

by

Peter J. de Lange

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CONTENTS

ABSTRACT	1
1 INTRODUCTION	1
1.1 Setting Priorities	1
1.2 Further Ranking	2
1.3 Anomalies	2
1.4 General Comments	2
1.5 Acknowledgements	2
1.6 References	3
2 NORTHLAND CONSERVANCY	3
2.1 Priority A DOC Estate	3
2.2 Priority B DOC Estate	4
2.3 Priority C DOC Estate	5
2.4 Priority D DOC Estate	6
2.5 Conclusions	8
2.6 References	9
3 AUCKLAND CONSERVANCY	9
3.1 Priority A DOC Estate	9
3.2 Priority C DOC Estate	10
3.3 References	11
4 WAIKATO CONSERVANCY	11
4.1 Priority A DOC Estate	12
4.2 Priority B DOC Estate	14
4.3 Priority D DOC Estate	17
4.4 Conclusions	19
4.5 References	20
5 BAY OF PLENTY CONSERVANCY	21
5.1 Priority A DOC Estate	21
5.2 Priority B DOC Estate	22
5.3 Conclusions	24
5.4 References	25
6 EAST COAST CONSERVANCY	25
6.1 Priority A DOC Estate	25
6.2 Priority B DOC Estate	26
6.3 Conclusions	27
6.4 Further Ranking	28
6.5 References	28

7 TONGARIRO/TAUPO CONSERVANCY	29
7.1 Priority A DOC Estate	29
7.2 Priority B DOC Estate	29
7.3 Priority C DOC Estate	30
7.4 Priority D DOC Estate	30
7.5 Conclusions	31
7.6 References	31
8 WANGANUI CONSERVANCY	31
8.1 Priority A DOC Estate	31
8.2 Priority B Estate	31
8.3 Conclusions	33
8.4 References	34
9 HAWKE'S BAY CONSERVANCY	34
9.1 The Scene	34
9.2 The Priorities	34
9.3 Summary	36
9.4 Additional Notes and Conclusions	36
10 WELLINGTON CONSERVANCY	37
10.1 Priority A DOC Estate	37
10.2 Priority B DOC Estate	39
10.3 Priority C DOC Estate	41
10.4 Priority D DOC Estate	41
10.5 Conclusions	41
10.6 References	42

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ABSTRACT

This report is a preliminary priority assessment, as at 15 June 1990, of those plants and species associations on the DOC estate considered threatened by goats (*Capra hircus*) and possums (*Trichosurus vulpecula*). Preliminary priorities are set out by conservancy, and threatened plants are commented on individually. This survey has been restricted to the North Island only.

1 INTRODUCTION

This report is a preliminary attempt at defining some of those areas of DOC estate known to contain populations of threatened plants (*sensu* Given, 1990) or unusual species associations known to be endangered from goats and/or possum browse. It is a draft and reflects the various conservancies' botanical knowledge as at 15 June 1990. An attempt to set priorities for goat and possum control in terms of the threatened plants has also been made. These priorities are not final, and criticisms are anticipated and welcomed. Since this date, considerable progress has been made in improving conservancies' awareness of threatened plants and those plants' communities.

The report was prepared in part as a response to a budget increase in government spending on goat and possum control, with the result that the Estate Protection Policy Division (EPPD) was required to set policy for future control (G. Adams, pers. comm. 1991). In addition, EPPD was preparing a priority ranking system to be used to assist in animal-control decisions. Input from the Science & Research Division was requested, and this coincided with the author's appointment to a position in that Division.

1.1 Setting Priorities

Conservancies were asked to rank their DOC estate under a simple priority A, B, C system.

Priority A: those sites where the botanical contact in the conservancy felt total eradication of goats and/or possums was achievable.

Priority B: those areas where only long term commitment would result in a reduction of goat or possum numbers, or the total eradication of one of these pests.

Priority C: sites where even long term control could not guarantee a satisfactory result.

A further priority was necessary when results were compiled:

Priority D: no knowledge concerning; the documental threats (if any), present status or condition of the land or threatened species, and/or associations, or the feasibility of control taken. In some situations entire conservancies were ranked as Priority D.

1.2 Further Ranking

At completion further ranking of each priority grouping was attempted. The ranking in order of importance was based on number of endemic species present, number of endangered and vulnerable species, presence of unusual or unique species associations, and perceived importance to the development of a reserves network representative of the conservancies' known vegetation types. Each A, B, or C grouping was then ranked numerically.

1.3 Anomalies

It often became necessary to rank sites within sites. This usually arose when an area of DOC land ranked Priority B by conservancies contained sites with species or species associations insufficiently protected on a national basis and it was felt that such locations required Priority A status. Most examples involve the presence of the leafy mistletoe genera *Alepis*, *Peraxilla* and *Tupeia* which have recently become extinct or critically endangered over large parts of New Zealand (Ogle and Wilson 1985). In these situations intensive control (i.e. Priority A) was considered vital to the species in the conservancy.

1.4 General Comments

Throughout the gathering of data for this compilation, it became evident that the level of botanical information was low in a number of conservancies. In most situations this reflected the lack of botanical expertise. This survey has therefore been useful in defining DOC strengths and weaknesses and helping shape the direction that investigations and advice on endangered plants should take.

1.5 Acknowledgements

DOC staff and many botanists working outside DOC (both amateur and professional) made themselves available for this draft. It would be difficult to thank them all. I therefore hope those whom I accidentally omitted will excuse me. In particular, Lisa

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2 NORTHLAND CONSERVANCY

2.1 Priority A DOC Estate

2.1.1 Mt Manaia/Bream Head Scenic Reserve.

Twelve species of regional and national threatened status are known from this area. Most notable is *Celmisia adamsii* var. *rugosula*, a variety of the more widespread *C. adamsii* (Coromandel Peninsula only), which is confined to the reserve. The reserve also contains a few plants of *Pomaderris "novae-zelandiae"*, otherwise known only from North Cape on serpentinite, and a small population on Manganui Bluff (Wilson and Given 1989, and the local endemic *Hebe* 'Whangarei' (see Eagle 1982, as *Hebe* sp. 'm', Fig. 315).

The reserve is threatened by stock and goat browse, while possum are having a serious effect on pohutukawa (*Metrosideros excelsa*). Some fencing is required to stop stock and goats re-entering the area (Forester 1990). Information for this reserve is incomplete.

2.1.2 Puketi Forest.

Twenty-six threatened species are presently found here. The most significant is an undescribed *Davillia* (*D.* 'Puketi') which is endemic to the forest. Other significant threatened species include *Hebe acutiflora*, *Grammitis rawlingsii* and *Pittosporum virgatum*. The forest is described by Forester (1990) as "Largely pristine and floristically diverse," while possum damage is noted as "becoming a serious threat with widespread rata dieback."

The high number of significant plant species and the strong possibility of complete goat/possum control if adequate control measures are taken make Puketi Forest an important priority to the DOC Northland Conservancy (Forester, Hunt, pers. comm.).

2.1.3 Te Paki Farm

This is one of the most significant areas for threatened plants and communities in the North Island. At present c.60 species of national significance are known from the Farm Park of which c.21 are probably endemic to this area at present. Notable examples include Bartlett's rata (*Metrosideros bartlettii*) an endangered species, with a known population of seven trees (Dawson 1985, Wilson and Given 1989, Forester 1990) and *Hebe* sp. 'Unuwahao', an undescribed species restricted to three bluffs free from goat browse (Druce pers. comm.). Both species are under direct threat from goats and possums and we are in a very real danger of losing both. Other nationally threatened species include c.11 serpentinite endemics and several species of tropical affinity - viz. *Christella dentata* agg., *Doodia aspera*, *Hibiscus diversifolius* and *Ipomoea pes-caprae* subsp. *brasiliensis* and *Atriplex billiardi* agg.

Forester (1990) points out the main threat is from possums, which have only just reached the area. However, feral horses, pigs and cattle are also serious problems which need urgent control. While populations of possum remain low it is possible to eradicate them, provided a possum-proof fence can be developed and erected.

2.1.4 Waima Forest.

Nineteen threatened species have been reported from this forest. The most significant of these are the (as yet) undescribed *Olearia* 'Waima', and the newly described (Druce 1989) *Coprosma waima*. Both species are goat browsed and are listed as vulnerable and endangered by Given (1990). As a consequence of these local endemics some goat control measures have already been undertaken with spectacular regeneration of *Coprosma waima*. It is strongly recommended that this control continues. The erection of a goat-possum proof fence would enable complete eradication (Forester 1990) provided this step is taken soon (as the present goat/possum levels are still manageable).

2.1.5 Waipoua Forest.

Twenty-eight threatened species are known from this forest. Notable examples are: *Grammistis rawlinsii* (type locality), *Dracophyllum viride*, *Fuschia procumbens*, *Pittosporum pimelioides* subsp. *pimelioides*, *Pomaderris polifolia*, *Trilepidia adamsii* (presumed extinct), and *Yoania australis*; as well as a significant 'cool climate' element of which *Chionochloa conspicua* and *Leptopteris superba* are presently known only from Waipoua.

These botanical features make Waipoua the most significant forested area of Northland next to Te Paki. That Waipoua is of high priority is already well known and some control measures are in progress. There is a need, however, to continue this control further.

2.2 Priority B DOC Estate

2.2.1 Herekino Forest.

Fifteen threatened or regionally uncommon species are present in this forest, of which *Dracophyllum viride* (the largest population known), *Pomaderris rugosa* (only Northland site known on DOC land), and *Pittosporum virgatum* are the most

¹ A possum-proof fence can be constructed (C.D. Mackenzie, per. comm. 1990). The conservancy is keen to experiment with several models proposed by local, Te Paki people.

significant. The forest is also of national importance for the high number of endemic, undescribed mosses and liverworts found there. These plants are especially sensitive to forest disturbance (Braggins, pers. comm.). Forester (1990) states adequate possum-proof fencing is required before effective goat/possum control can be considered. Unfortunately, botanical information for Herekino is rather incomplete (also for adjoining Warawara Forest), so the exact botanical values of Herekino remain unassessed.

2.2.2 Omahuta Forest.

Contains nine threatened species, the most important of which are *Hebe acutiflora*, King fern (*Marattia salicina*). This forest, together with Mangamuka, Mangataniwha, and Raetea, would benefit most from the erection of possum/goat proof fences, followed by intensive control measures within the forests. Such control measures would be longterm, hence the ranking of B for these forests.

2.2.3 Russell State Forest.

Eleven species of regionally or nationally threatened status have been recorded from here. Most significant of these is the vulnerable *Calystegia marginata* and rare *Pittosporum pimeleoides* subsp. *pimeleoides* (Given 1990). The *Pittosporum* in particular is possum-and goat-browsed.

2.2.4 Warawara Forest.

Seventeen threatened species are known from this forest, although botanical data for this forest are incomplete (a full survey is urgently required). The most significant species found in this forest is *Leptinella rotundata*, long thought confined to Maunganui Bluff Scenic Reserve. This species is very susceptible to stock browse and is probably palatable to goats (see Given 1981, Wilson and Given 1989). In addition, the forest contains the largest populations of *Myosotis matthewsii* yet known on DOC estate.

2.3 Priority C DOC Estate

2.3.1 Houto Forest.

Good botanical data are incomplete for this forest, which was described by Hunt (pers. comm.) as in a 'serious condition' after a long period of goat and possum browse. Much of the canopy is now in a state of collapse. Only one species, the local Northland endemic *Hebe* 'Whangarei' (see Mt Manaia/Bream Head Scenic Reserve), is worthy of note. This species is palatable to goats, but occurs in reasonably large numbers elsewhere on DOC estate.

2.3.2 Kaihu Forest

This forest contains seven uncommon species. The most notable are southern rata (*Metrosideros umbellata*) - a possum-browsed species of very local distribution in the northern North Island, and *Blechnum colensoi*, presently known elsewhere in Northland from only one other site (Forester 1990). As with most of the category C forests, good botanical data are unavailable.

2.3.3 Mangakahia Forest.

Three threatened species have been recorded from here. Unfortunately, good botanical data are unavailable, as the forest is incompletely surveyed (Forester 1990).

2.3.4 Marlborough Forest.

Six uncommon species occur here. Two of these are likely to suffer some browse damage. However, botanical data for this forest are incomplete and the forest is reportedly in a serious condition due to a lack of fencing and control of goat/possums over a long period of time (Hunt pers. comm.).

2.3.5 Mataraua Forest.

Six species locally distributed in Northland have recorded from here. The most important of which is *Ascarina lucida* and southern rata (*Metrosideros umbellata*). Mataraua would first benefit from a thorough botanical survey.

2.3.6 Opua Forest.

Contains no species of regionally or nationally threatened status. Although *Schizaea dichotoma* is now a nationally uncommon species.

2.3.7 Pukenui Forest.

Four regionally or nationally threatened species have been recorded from Pukenui. One of these, *Marattia salicina* while widespread in some other conservancies is now very local in Northland. Data are incomplete for this forest.

2.3.8 Raetea Forest.

Five regional and one nationally threatened species have been recorded from Raetea. Although this makes the forest of low significance in terms of other Northland forested areas, the forest is described as relatively unmodified and worthy of intensive goat/possum control (Forester pers. comm.).

2.3.9 Tangihua Forest.

Three regionally and two nationally threatened species have been recorded here (viz. *Metrosideros carminea* and *Myosotis matthewsii*). The forest is described as severely goat/possum damaged. Urgent needs are for adequate fencing before control measures can be realistically considered. Very little botanical information is available for this forest.

2.4 Priority D DOC Estate

Botanical information for these forests and reserves is incomplete or lacking, so an adequate assessment is impossible. Forester (1990) states that all the East Cape Reserves have suffered from serious possum and goat damage. However, precise information on both the extent and effect of goat and possum depredation is lacking, as are data on the location of regionally or nationally threatened plants.

2.4.1 A.H. Reed Memorial Kauri Park.

One threatened species *Loxsoma cunninghamii* has been recorded from here. Although locally common in the Coromandel Ranges this species appears to have declined markedly in Northland (cf. Cheeseman 1925, with present distribution). It is unlikely that this species suffers much from goat/possum browse.

2.4.2 Akeake Scenic Reserve.

Pittosporum pimeleoides subsp. *pimeleoides* has been reported from here. This species is browsed, but exact details of its status in this reserve are unavailable.

2.4.3 Hikurangi Forest.

No botanical is available.

2.4.4 Kerikeri Falls Scenic Reserve.

Contains populations of *Hebe acutiflora* (type locality), which are reported as threatened by Mist flower (*Ageratina riparia*) (Given, pers. comm.). Whether goats or possums have an effect on this colony is unknown.

2.4.5 Lake Waiparaheka Scientific Reserve.

Established to protect the endangered sedge *Baumea complanata* at its last stronghold (Wilson and Given 1989), an additional threatened species, *Fimbristylis squarrosa*, was discovered here in December 1987. It is unknown whether these species are goat or possum browsed.

2.4.6 Mangamuka Forest.

No botanical information is available.

2.4.7 Maunganui Bluff Scenic Reserve.

Contains three threatened species susceptible to goat and possum browse; *Hebe speciosa*, *Pomaderris oraria "novae-zelandiae"* and *Leptinella rotundata*. Goats are present in the reserve and both species have suffered in the past from stock damage, especially the *Leptinella* (see Given 1981, Wilson and Given 1989). This scenic reserve requires fencing before serious control measures could be considered. A thorough botanical survey to map the main concentrations of these species may be necessary to help ascertain a suitable priority status. The reserve is probably worthy of priority A status but is presently placed here due to a lack of information.

2.4.8 Ngaiotonga Scenic Reserve.

One species, the vulnerable *Calystegia marginata*, is known from this reserve. It is presently unknown whether this species is affected by goat or possum browse. Further information is needed.

2.4.9 Otito Scenic Reserve.

Creeping fuchsia (*Fuchsia procumbens*) has been recorded from here, but exact details of the population and perceived threats are unavailable.

2.4.10 Ranfurly Bay Scenic Reserve.

Contains the only major colony of *Pseudopanax gilliesii* known. During May 1990 an undescribed, apparently endemic *Coprosma* (tag named 'Whangaroa') was discovered here by Forester. A recent survey in September 1990 was carried out by the Northland Conservancy. Numerous plants of both *Pseudopanax gilliesii* and the *Coprosma* were found in the area, as well as a possible undescribed *Gonocarpus*. Possums were noted in low numbers. It is quite likely this area is priority B DOC estate.

2.4.11 Te Toroa Bay Scenic Reserve.

Contains healthy colonies of *Fuchsia procumbens* but precise details are unavailable.

2.4.12 Tipatipa Scenic Reserve.

A small colony of *Calystegia marginata* was reported here. Exact details are unavailable (see Ngaiotonga Scenic Reserve).

2.4.13 *Todea barbara* State Forest Ecological Area.

Protects the southernmost mainland population of royal fern (*Todea barbara*). Whether this species is predated by goats or possums is uncertain and specific details of the reserve are unavailable.

2.4.14 Trouson Park

Thismia rodwayii has been collected from here (Moore and Edgar 1976) and the forest contains other threatened fauna. Precise botanical information is at present unavailable.

2.4.15 Whangamumu Peninsula Scenic Reserve.

Several healthy *Fuchsia procumbens* colonies have been recorded from here. These populations appear secure but more information is needed before an assessment of priority can be made.

2.5 Conclusions

Five areas of DOC Estate are ranked as priority A. These sites contain a high number of threatened and/or endemic plants directly under threat from goat/possum browse. If control measures were undertaken now it is likely that full extermination of these pests is achievable. In order of importance (by rank of endemic species) these sites are ranked as:

1. Te Pahi (21 endemics : 4 ranked as endangered)
2. Waima (2 endemics : 1 ranked as endangered)
3. Puketi (1 endemic : 1 ranked as endangered)
4. Waipoua (no endemics : 28 threatened species; one presumed extinct)
5. Mt Manaia/Bream Head (no endemics : 12 threatened species, one ranked as endangered) (data incomplete; further information might change this ranking).

Four areas of DOC estate are ranked as priority B. These sites contain a high number of threatened species but no endemic species. All four forests have been subject to a moderate level of modification but are still the stronghold of a number of threatened species now rare or extinct elsewhere in Northland. If management was carried out on 'long term basis' complete eradication of goats and possum is feasible.

In order of importance (by rank of regionally and nationally threatened species numbers) these areas are ranked as:

1. Warawara (15 species : one endangered) (data incomplete)
2. Herekino Forest (15 species one indeterminate). *Dracophyllum viride* formally listed as endangered (Given 1981) and currently a species of uncertain status. Herekino has the largest colony known.
3. Russell State Forest (11 species)
4. Omahuta Forest (9 species)

There are nine areas of DOC estate for which goat/possum control is at present considered unrealistic, unless guaranteed a definite longterm allocation of funds. All contain regionally or nationally threatened species but are largely in such a 'modified condition' that deterioration of the forest infrastructure has proceeded to the point where the species composition of the forests may have been altered 'permanently'. In addition, good botanical data is usually lacking for these forests which have often been only briefly surveyed (if at all). No further ranking is given for these areas as there is insufficient information to form a definite opinion.

Fifteen areas of DOC estate are ranked as priority D because there is at present insufficient information on the confirmed presence of, or present status of, threatened species in the past recorded there. Many of these sites are smaller scenic reserves which

nevertheless are of extreme importance botanically. An examples is the Ranfurly Bay Scenic Reserve, presently one of only two known sites for the endangered *Pseudopanax gilliesii* (Given 1990).

This assessment of the Northland Conservancy has been conducted under time constraints. It has, however, illustrated the need for good botanical surveys of those sites for which present information is lacking, research into the construction of possum-proof fences, and the employment of more hunters. All of these points are but echoes of those raised in Forester (1990).

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3 AUCKLAND CONSERVANCY

Most threatened plants and/or communities in this conservancy are on offshore islands presently free of goats and opossums. Periodic monitoring is still needed as further insurance against deliberate introductions (especially for Great Barrier Is.). Such monitoring is already carried out on a regular basis because of the unique fauna these islands conserve.

3.1 Priority A DOC Estate

3.1.1 'Northern Bush', Great Barrier Island.

The botanical values of this area are well documented by Wright and Cameron (1985) and Eadie and Broome (1990).

The northern bush is notable for the high number of nationally threatened plants and presence of several species at their northern distributional limits, e.g. *Arthropodium candidum* (northern limit), *Fuchsia procumbens*, *Leptinella dioica* subsp. *dioica*

(northern limit), *Nestegis apetala*, *Ophioglossum petiolatum* and *Yoania australis*. In addition, two undescribed *Hebe*, endemic to the island, are common here (Cameron pers. comm.). The present status of these is uncertain.

At present there are no possums, and the principal threat is from goats (D. Hunt pers. comm.). Complete eradication of these is feasible if adequate fencing is erected (Eadie and Broome 1990).

The national significance of the Barrier is already well known (Bartlett and Gardener 1983, Wright and Cameron 1985, Ogle 1980), but the present attitude towards the island's flora is too lax (Cameron, pers. comm.). Early in 1990 two possums arrived in an old house shipped from the mainland. No checks had been made of the house. The impact these animals would have had on the flora would have been devastating had they not been discovered by locals. It is necessary to educate the population on the national importance of their island's flora values so that further accidents are less likely.

While goat eradication is feasible for the Northern Bush (Eade and Broome 1990), professional opinion advocates incorporation of the island's forested DOC estate into part of the New Zealand National Park system.

3.1.2 Rangitoto/Motutapu Island.

The only nationally threatened species recorded from Rangitoto Island, *Lepidium flexicaule* was already extinct at the turn of the century (Cheeseman 1925). Despite this loss, the island is world famous for its unique flora - a colonising *Metrosideros* forest on a young basaltic cone. This forest is already under direct threat from possum and wallaby predation, the effects of which are most evident on the eastern side of the island and the central cone (Hunt 1989). In addition to the forest type, the island contains the northernmost colony of *Pellaea calidrupium* populations of *Pellaea falcata* - a very local fern in New Zealand (Brownsey and Lovis 1990).

Complete eradication of the possum/wallaby population is vital if the unique vegetation of the island is to survive; this includes eradication from both Rangitoto and Motutapu Islands to prevent the chance of reinfestation. Hunt (1989) outlines techniques and projected costs of such a project.

Professional opinion from outside DOC advocates complete eradication as the only viable option (Braggins, Cameron, Wright, pers. comm.). If further deliberate or misguided 'introductions' are to be avoided, such a move would also require an intensive media campaign to educate the public on the threat of possums and wallabies to the island flora.

3.2 Priority C DOC Estate

Cameron (pers. comm.) has drawn my attention to the plight of indigenous forested enclaves in the Forest, southern Kaipara Head. These forests contain the southernmost populations of *Hebe diosmifolia*, and threatened species such as *Mazus "novae-zelandiae"*, *Cyclosorus interruptus*, *Pseudopanax ferox*, *Thelypteris confluens* (Cameron and Bellingham 1986, Cameron 1987) and the undescribed *Pratia* 'Woodhill'. The forest remnants are threatened by deer and not goats nor possum. While deer are the only significant threat, both goats and possums could easily reach the area (possums are probably present), so some consideration of the area for goat/possum control should be made.

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4 WAIKATO CONSERVANCY

Botanical information for this conservancy is reasonably complete, especially for the western Waikato and Coromandel Ranges. The Coromandel Ranges have been the subject of a PNA survey for the last several years and at the time of writing the results of this survey are in press (Humphries pers. comm.). While much botanical information is available, there are still large parts of the conservancy, especially the Tainui Ecological District, which have received little attention by DOC workers. Botanical knowledge for this area has been obtained mainly from local amateur or professional botanists. This lack of botanical knowledge requires immediate attention for several reasons.

Recent botanical work by local amateurs and the Waikato Botanical Society have illustrated sites of unusually high botanical diversity or containing threatened species previously not recorded from the Waikato (see, for example, de Lange 1985a, 1986a,b, 1987a).

The Waikato has long been recognised as an important site for botanical limits of key New Zealand forest species. Recent mapping has led to several significant discoveries concerning such northern species as kauri (*Agathis australis*) (de Lange 1986b, 1986c), *Ranunculus urvilleanus* (Webb *et al* 1988), *Metrosideros albiflora*, *Rytidosperma buchananii*, and mangrove (*Avicennia marina* var. *resinifera*). Many other forested areas remain unassessed and these are rapidly being lost to loggers and farming practices.

Several unique vegetation types - coastal karst forest, coastal karst herbfield, and lowland karst forest - are inadequately represented by reserves. These support a number of undescribed species, including one threatened endemic which are, and have been already recognised as nationally significant by Wilde (1985) who proposed several sites be acquired for reserves (Wilde pers. comm.).

Proposals for a PNA survey in the Tainui Ecological District have been suggested before (Humphries pers. comm.), and it is to be hoped that such proposals will receive further consideration in the future.

4.1 Priority A DOC Estate

4.1.1 Awaroa Scenic Reserve (Upper Awaroa Valley).

A botanically significant reserve containing the largest reserved colony of an undescribed *Hebe* endemic to the valley (de Lange 1986d). The reserve also contains sizeable colonies of king fern (*Marattia salicina*), and *Metrosideros carminea*, a unique cool climate and coastal floral assemblage (de Lange 1988a), and a wide variety of vegetation types relating to the geology of the area (including lowland karst flora). A form of eyebright (*Euphrasia cuneata*) lacking a yellow 'eye' is also known from here and may warrant further taxonomic recognition. The reserve has a moderate to high goat population and a large possum population. In 1986 the reserve was inadequately fenced on the western boundary and stock were common in the forest. On the east, there were gates in the fences and severe stock damage in the forest. If fencing were improved, goats and possum populations could be reduced to acceptable levels.

4.1.2 Huikomako Scenic Reserve.

Requires urgent fencing, a heavy trapping regime to reduce the possum population, and then goats can be exterminated. Huikomako contains populations of *Myosotis "pansa"*, a species of indeterminate status (Given 1990), as well as pockets of black beech (*Nothofagus solandri* var. *solandri*) at or near its northern West Coast limit.

4.1.3 Koropupu Scenic Reserve.

Surveyed by Clarkson (1983) and King *et al.*, (1984) (checklist held by DSIR, Land Resources), Koropupu contains the only sizeable populations of *Teucrium parvifolium* (a goat-browsed species), and *Asplenium trichomanes* n.subsp. (hexaploid race) within the conservancy's reserves network. Small colonies of *Asplenium lyalli* and one plant of an undescribed hybrid combination *Asplenium flaccidum* x *A. lyalli* are also known from here (Brownsey pers. comm.). The reserve is ring-fenced but this needs updating before goats and possums can be controlled (Clegg. pers. comm.). A recent visit by Clegg in July 1990 reported severe deer, goat, damage as the result of a collapsed fence. *Teucrium parvifolium* was not seen, and may have been exterminated. Complete eradication of both pests is feasible.

4.1.4 Lake Whangape Wildlife Management Reserve.

Four threatened species are known from the reserve (*Amphibromus fluitans*, *Fimbristylis squarrosa*, *Pilularia novae-zelandiae*, and *Ranunculis urvilleanum*) and a fifth, *Myriophyllum robustum* occurs <200 m from the reserve boundary (de Lange 1985b). The most significant threatened species is *Amphibromus fluitans* a small, native grass with very specialised habitat requirements (Ogle 1987). The grass was discovered here in three sites in early 1990, the habitats occupied are small and threatened by animal browse when water levels are low in summer. The low lake levels

coincide with the plant's main flowering period so browsing pressure at this time effectively reduces sexual reproduction. The grass is highly palatable and at all sites it was seriously damaged. Fencing would exclude browsing pressure but, in turn, may threaten the plant by competition from other palatable adventive species also browsed. Obviously the long term management of this species is a complex issue. Research is needed urgently if we are to save this grass from extinction in the lowlands of New Zealand.

4.1.5 Mapara Scenic Reserve

Is fenced and contains ten plants of *Teucrium parvifolium*. The reserve is goat-free but contains possums. These should be removed (if possible) and the *Teucrium* plants monitored.

4.1.6 Pirongia Forest Park (including Te Toto Gorge Scenic Reserve).

Consisting of three blocks comprising Mt Karioi, the Pirongia massif and Pirongia South Forest (Te Rau-a-moa). Both Mt Karioi and the Pirongia Massif contains threatened plants (seven species) and at least 36 plants at or near their northern distribution limits, or regionally uncommon species. The flora of Pirongia in particular is well documented following extensive visits there by the author, Dr B.D. Clarkson and A.P. Druce. Pirongia is a known stronghold for woodrose (*Dactylanthus taylorii*) and contains several unnamed species: *Hymenophyllum* 'Burnett', *Pterostylis* "linearis", *Ourisia macrophylla* subsp. cf. *robusta*, *Alseuosmia* 'Hakarimata' and one plant of *Olearia virgata* n.subsp. None of these species are endemic here although several have yet to be found further north. One peculiar record, that of *Celmisia adamsii* var. *adamsii* (a single plant on ridge) observed here in 1987, 1988 and 1989 was possibly planted because this species is otherwise confined to the Coromandel Peninsula. (However, Druce - pers. comm. - accepts the plant as native.)

Pirongia has a low goat problem, mainly because the massif has been a priority area of the conservancy for some time. Unfortunately, control has lapsed of late through a lack of funds. Possums occur in moderate levels and could probably only be controlled at manageable levels. It is suggested that a concerted effort be made to remove goats from Karioi and Pirongia (a feasible exercise) while possums be controlled by managing at low levels. The south forest area is poorly known botanically and requires urgent survey.

4.1.7 Rakaunui Scenic Reserve.

Consisting of two blocks separated by a small area of farmland, the reserve has several important botanical values. The alpine bristle grass *Rytidosperma buchananii* occurs here at sea level as it also does at nearby Awaroa Scenic Reserve (coastal). Both sites are close to its northern limit in the country. Bristle grass is usually an alpine species but in the Kawhai Region it occurs at low elevations (Connor and Edgar 1979). A splendid saltmarsh ecotone with a lowland karst forest of mixed podocarp/broadleaved association is reserve here. The reserve was recently visited by the author and L. Humphries (July 1990) (when a vascular flora of c. 386 indigenous plants was compiled). Part of the reserve was thoroughly examined. In 1988, specimens of *Leptinella tenella* and *Myriophyllum votschii* had been discovered. *Leptinella tenella* occurs in two disjunct sites; Northern Northland and the Cook Strait Region (Lloyd 1972). The Rakaunui site is presently the southernmost of the northern population. *Metrosideros carminea* was also discovered in reasonable numbers throughout the reserve. Other significant species include *Asplenium northlandicum*, and

Scandia rosifolia var. 'T', *Coprosma spathulata* var. "spathulata" and *Ranunculus* 'Kawhia'.

This reserve is one of only three reserves which protect a unique coastal karst flora found nowhere else in New Zealand. Further botanical investigation is clearly needed to clarify the status of these reserves. In the meantime, Rakaunui (the least altered of these reserves) deserves immediate attention.

4.1.8 Tainui Scenic Reserve.

Tainui (*Pomaderris apetala*) a culturally significant tree, is reserved here. The population is healthy but the reserve requires fence maintenance to prevent goats and stock entering the land. This is a low cost project and therefore an easily affordable option. Because of the high cultural significance of Tainui to the Tainui people such fencing as is required should be a matter of high priority for DOC to promote further goodwill between the Tainui people and the Department.

4.1.9 Te Kauri Scenic Reserve.

This reserve is one of the most intensively surveyed reserves in the conservancy because of its long association with the Hamilton Junior Naturalist Club (Inc), who have their lodge there. The reserve contains a number of species both naturally and locally threatened, as well as several species near or at their southern distribution limits (de Lange 1987b). The threatened adder tongue fern *Ophioglossum petiolatum* was discovered here in 1986, and this colony is now the most secure mainland population known (de Lange 1988b). Goats have severely damaged parts of the reserve, restricting some species to enclosure sites. One such species is the highly palatable mairehau (*Phebalium nudum*) here at its natural southern limit. Possums are present in moderate to high numbers, while goats (after periods of intensive hunting) are mainly confined to the more difficult terrain of the reserve. Eradication is highly desirable. Possums levels could be kept down but reinvasion from nearby private bush is likely.

4.1.10 Te Umuroa Scenic Reserve.

Te Umuroa Scenic Reserve comprises a number of habitats inadequately reserved elsewhere in the region (de Lange 1984b). Several nationally and regionally threatened plants occur here: *Gratiola sexdentata*, *Gastrodia sesamoides*, *Metrosideros carminea*, *Drosera spathulata*, *Schoenus carsei*, *Pterostylis 'linearis'*, *Scandia rosifolia* var. 'T' and *Sparganium subglobosum*. The reserve preserves a number of excellent saltmarsh/freshwater wetlands, calcareous sandstone bluff associations with remnants of a lowland karst flora and a secondary regrowth dominated by kanuka (*Kunzea ericoides*). The reserve is inadequately fenced and has a large goat problem. Sheep and pigs also visit the reserve from the nearby Waipuna Farm Station. In 1984 possum numbers were quite low. Because the reserve is an isolated peninsula surrounded by water and open farmland the potential for eradicating both possums and goats is excellent.

4.2 Priority B DOC Estate

4.2.1 Coromandel Forest Park

(including Kapowai, Castle Rock, Waikawau, Stony Bay, Tapu, Papakai, Whenuakite, Moehau, Mahikarawi, Tairua, Upper Rangihau, Te Tipi, Wharekawa, and Waikawau Ecological/Conservation Areas and Farm Park. This extensive area contains a large number of threatened plants and vegetation types. The area has recently been the subject of a PNA survey, the results of which are in press, Humphries (pers. comm.). Documentation of the threatened species found in these areas would be a difficult task

for an exercise of this nature. Some of the more significant threatened species include: *Brachyglottis myrianthos*, woodrose (*Dactylanthus taylorii*), king fern (*Marattia salicina*), nau (*Lepidium oleraceum*), *Peraxilla tetrapetala*, *Pittosporum virgatum* and *Loxsoma cunninghamii*. The area is home to *Celmisia adamsii* var. *adamsii*, a threatened endemic, has the southernmost colonies of *Fuchsia procumbens*. The probably extinct mistletoe, *Trilepidia adamsii*, was described from specimens gathered from the peninsula. The ranges are the nation's stronghold for *Loxsoma* and *Pomaderris rugosa* both with contracting distributions outside the Coromandel region.

Much of the area is threatened by goats and possums, both of which are widespread. Fencing is largely non-existent and is seen as a vital necessity before further control measures can be implemented. Information regarding the present condition and status of the habitat is lacking for many sites, so a definitive ranking of priorities is not possible. Waikato Conservancy has suggested building of a possum-proof fence across the southern end of the Moehau Ecological District (Humphries, pers. comm.). This area has a low possum population and eradication is considered possible. With respect to goats and possums, most of the peninsula probably ranks Priority B. Some key areas may deserve A status but need to be defined.

4.2.2 Hakarimata Range Scenic Reserve.

Three threatened species (the most notable of which is *Thismia rodwayii*) and undescribed *Alseuosmia* 'Hakarimata' are known from the range, which is well populated by goats and possums, inadequately fenced and suffering from encroachment. The reserve needs fencing before any realistic chance of goat eradication is possible.

4.2.3 Hangatiki Scenic Reserve.

Appears to be the southern limit for mamangi (*Coprosma arborea*) and *Coprosma spathulata* subsp. "*spathulata*". The remains of a once extensive swamp are reserved here. The swamp contains large colonies of maru or burr reed (*Sparganium subglobosum*), *Epilobium palladiflorum* and *Gratiola sexdentata* (Clarkson 1983). *Gratiola nana* was discovered here in 1984 (de Lange 1986e) but has not been found since. Goats and possums are common in the reserve which is inadequately fenced and also visited by stock. This browsing threatens mamangi and *Coprosma spathulata* subsp. "*spathulata*" (both heavily browsed in 1987). Adequate fencing, followed by a programme of goat eradication and possum trapping, will go a long way toward improving the reserve.

4.2.4 Mt Hikurangi Scenic Reserve.

Woodrose (*Dactylanthus taylorii*) has been reported from here, although the exact location is as yet unknown (Clegg pers. comm.). Apparently the site is known to people outside DOC who are willing to assist with its preservation. To prevent possum damage cages placed over the flowering plants have been advocated.

4.2.5 Lake Waahi Wildlife Management Reserve.

A thriving population of *Pilularia novae-zelandiae* was discovered here in early 1989. In July 1990 the colony appeared to be under no immediate threat. *Myriophyllum robustum* reported from here in the 1950s is probably now extinct.

4.2.6 Mangatoa Scenic Reserve

(including Te Marama and Te Raumaku Caves Scenic Reserve). King fern (*Marattia salicina*) has been discovered in these reserves. Clegg says that "to protect any of these sites (including Awaroa) would require large amounts of fencing followed by intensive long-term hunting effort".

Te Marama Scenic Reserve has the largest population of king fern known to the Maniapoto Field Centre staff, while that reported from Whareorino has yet to be rediscovered. The remaining sites contain only a few plants (Awaroa Scenic Reserve has at least 80 specimens in a very small area), and further searches are needed.

4.2.7 Maungatautari Scenic Reserve

Two threatened species (both probably extinct) and two regionally local species have been recorded from here (Clarkson and Boase 1988). The reserve is fenced and has a moderate goat population. Possum are abundant. The mountain is of low priority with respect to other more urgent sites in the conservancy.

4.2.8 Moetoa Scenic Reserve.

Two nationally threatened species, *Metrosideros caminea* and *Myosotis "pansa"* have been recorded from here (Clegg pers. comm.). The range also includes a number of regionally significant species, including *Grammitis patagonica*, *Pittosporum crassifolium* (near the southern limit of its northern distribution), and the coastal tussock grass *Stipa stipoides* (near its disjunct southern limit Jacobs et al. 1989). The reserve is in a serious condition due to other stock browse. The reserve is one of several (Huikomako, Te Marama and Awakino Scenic Reserves) which have forest at or near the sea. This makes them very valuable reserves which need immediate attention since decades of damage is fast reducing their coastal fringe to an induced pasture with an associated tree land.

4.2.9 Motutara Bay (Kawhia Harbour Scenic Reserves).

A single tree of tawapou (*Planchonella costata*) was discovered here (de Lange 1988c). This is its most southerly site in New Zealand. The reserve is unfenced and over run with goats and farm stock. An urgent survey is required to see if the tree still survives and if there are any more.

4.2.10 Pureora Forest Park and Ecological Area.

Comprising the Pureora Mountain, Waipapa, Waihaha, Whenuakura Plain, Mangatutu, Maramataha Mire, Pikiariki, and Waimonoa Ecological areas. The area is a known stronghold for *Pittosporum turneri* (see Rodgers 1988), woodrose (*Dactyloctenium aegyptium*), *Prasophyllum* sp. aff. *patens*, and it has populations of *Meliccytus angustifolius*, *Myriophyllum robustum* and the third North Island locality for the predominantly South Island species *Gabnia rigida* (Leathwick 1984). *Pimelea tomentosa* occurs locally in the Waimiha Stream (Bartlett 1984) and in parts of the Waipapa Ecological Area. These two areas represent its stronghold in the western and central North Island. Much of this is Priority B land, although specific sites require Priority A status, particularly those with and *Pittosporum turneri*. Further research into both species and their predator relations is needed.

4.2.11 Puti Point Scenic Reserve.

It had large populations of *Metrosideros carminea* (see de Lange 1984c) and (until recently) a small number of plants *Pomaderris rugosa* plants near its western end (above the main Kawhia Road). The reserve is poorly fenced and in a shocking condition, it contains an interesting coastal forest dominated by puriri (*Vitex lucens*) and kohekohe (*Dysoxylum spectabile*), a type nearly extinct in the Kawhia Harbour because of severe possum browse. Upgrading the fencing and intensive trapping could eliminate possums from the reserve, which is surrounded by farmland and a main road. Small areas of bush between the reserved pieces need to be acquired to 'clean up' the fragmented boundaries of the reserve.

4.2.12 Tawarau State Forest.

Woodrose (*Dactylanthus taylorrii*) has been collected here from time to time. The forest contains several unique associations including flat vegetation containing *Clematis quadribracteolata*, *Peraxilla tetrapetala*, and *Elymus narduroides* (Ogle and Druce 1987). It has the largest area of lowland forest on karst in the conservancy, the southernmost west coast locality for tawari (*Ixerba brexioides*) (Ogle and Druce 1987) and many caves (Wilde 1985). The forest has a large goat and possum problem, although goats were heavily hunted before 1986. Fencing of the forest is required and then an intensive goat eradication campaign. It is probably unrealistic to try to eradicate, but levels could be reduced.

4.3 Priority D DOC Estate

The following areas contain threatened plant(s) and/or communities, but information regarding their status in the wild, their perceived threats or their taxonomic identity is in doubt. Descriptions are therefore brief.

4.3.1 Aotea Harbour Scientific Reserve.

One patch of pingao (*Desmoschoenus spiralis*) seen in 1989 (Humphries pers. comm.). This specimen was probably planted. A recent find of sand tussock (*Austrofestuca littoralis*) in November 1990 is significant. This species has not been recorded from the western Waikato before.

4.3.2 Awaroa River Scenic Reserve (coastal).

The reserve is unfenced and deteriorating rapidly, despite this elements of the coastal karst flora remain. These include a slender-leaved form of *Poa pusilla* considered extinct by Edgar (1984) but locally common around Kawhia, undescribed *Trisetum* 'ordinary'. *Rytidosperma buchananii*, a normally alpine bristle grass, and *Asplenium flaccidum* x *A. lyalli*, an undescribed hybrid combination (Brownsey, pers. comm.). A draft checklist is available (de Lange and Champion 1987).

4.3.2 Awaroa Wildlife Management Reserve.

Bulbophyllum tuberculatum was collected here in 1987 from a tree fall in a matai (*Prumnopitys taxifolia*)/kahikatea forest (*Dacrycarpus dacrydioides*).

4.3.3 Colebaker Scenic Reserve.

King fern (*Marattia salicina*) was collected here in 1985 by Robyn Irving.

4.3.4 Hot Water Beach and Hahei.

Pingao (*Desmoschoenus spiralis*) and *Pimelea arenaria* occur here (Humphries pers. comm.), but I am unaware of any threats from goats or possums. Both species are threatened by public disturbance.

4.3.5 Kaihere Scenic Reserve.

King fern (*Marattia salicina*) was collected here in 1987. The reserve is unfenced.

4.3.6 Kopouatai and Torehape Peat Bog.

Numerous threatened species known but no idea of threats. Possums do inhabit the restiad vegetation and browse orchids. One orchid, the bearded copper orchid (*Calochilus robertsonii*) was collected from nearby Torehape Peat Bog but has not been seen there since. In 1988 I saw it at Kopouatai, a single plant. Searches are needed to ascertain its current status.

4.3.7 Manu Bay Scenic Reserve.

Paul Champion collected *Ranunculus urvilleanus* here in 1984; it has not been searched for since.

4.3.8 Matarangi Spit.

Pimelea arenaria is still present, but just what threats (other than human) there are is uncertain.

4.3.9 Marokopa Natural Tunnel Scenic Reserve.

Woodrose (*Dactylanthus taylorii*) and *Asplenium lyalli* have been found here. Further assessment is needed.

4.3.10 Moerangi Scenic Reserve.

King fern (*Marattia salicina*) was reported from here by Eila Mackenzie (pers. comm.). No recent reports are available.

4.3.11 Opoutere.

Pimelea tomentosa, pingao and *Lagenifera stipitata* have been recorded from here (Humphries, Ogle pers. comm.). Only pingao has been seen recently. This is the southernmost site for *Lagenifera*.

4.3.12 Orokawi Scenic Reserve.

Metrosideros carminea occurs here and could be threatened by possum browse.

4.3.13 Port Waikato.

The major stronghold for pingao on the western Waikato coast. Two other species, *Fimbristylis squarrosa* and matagouri (*Discaria toumatou*) have been recorded from here in the past (see Moore and Edgar 1976, Allan 1961) but nothing is known of their distribution and status there now. A brief search in 1985 failed to locate matagouri, which is here at its northernmost site.

4.3.14 Te Karaka Scenic Reserve.

Gratiola sexdentata and *Halocarpus kirkii* (southern limit) have been recorded from here. In 1985 the reserve was in serious need of fencing, being overrun by stock and goats, and having a large possum population.

4.3.15 Te Tapui (Maungakawa Scenic Reserve).

Metrosideros carminea has been collected here. The reserve has a large amount of mamangi (*Coprosma arborea*) a palatable species near its southern limit. A checklist is reputedly available for the reserve (Champion pers. comm.).

4.3.16 Whangamarino Wetlands.

A large number of threatened species have been recorded from here; however, detailed surveys are needed before any assessment on their threats can be made. The population of *Ranunculus urvilleanus* discovered here by Irving needs to be surveyed to its extent. *Fuchsia perscandens* has its northern limit here (Bartlett 1984) and is possum browsed. Just how much possums pose a threat needs further study.

4.3.17 Whangamata Beach.

Large amounts of pingao and still survive here. The impacts are mainly from recreational use of the beach. Possible monitoring of the *Pimelea* could be tried as this species

appears more sensitive to habitat disturbance than pingao

4.4 Conclusions

Ranking takes account of endemism, number of national or regional threatened species, threatened habitats or vegetation types, and sites with important distribution limits for species. Where possible, feasibility of these rankings with respect to animal management has been considered.

Priority A DOC Estate

1. Koropupu Scenic Reserve
2. Awaroa Scenic Reserve
3. Te Kauri Scenic Reserve
4. Rakauni Scenic Reserve
5. Te Umuroa Scenic Reserve
6. Tainui Scenic Reserve
7. Huiokomako Scenic Reserve
8. Pirongia Forest Park (including Te Toto Gorge Scenic Reserve)
9. Mapara Scenic Reserve
10. Lake Whangape Wildlife Management Reserve

Priority B DOC Estate

1. Coromandel Forest Park (as described in text)
2. Moetoa Scenic Reserve
3. Pureora Forest Park and Ecological Area
4. Tawarau State Forest
5. Motutara Bays (Kawbai Harbour Scenic Reserves)
6. Puti Point Scenic Reserve
7. Mt Hikurangi Scenic Reserve
8. Hangatiki Scenic Reserve
9. Hakarimata Range Scenic Reserve
10. Te Marama Scenic Reserve
11. Mangatoa Scenic Reserve
12. Te Taumaku Caves Scenic Reserve
13. Maungatautari Scenic Reserve
14. Lake Waahi Wildlife Management Reserve

Priority D DOC Estate

1. Manu Bay Scenic Reserve
2. Moerangi Scenic Reserve
3. Marokopa Natural Tunnel Scenic Reserve
4. Opoutere
5. Matarangi Spit
6. Whangamata
7. Hot Water Beach and Hahei
8. Awarua River Scenic Reserve (coastal)
9. Awaroa Wildlife Management Reserve
10. Kaihere Scenic Reserve
11. Colebaker Scenic Reserve
12. Te Koraka Scenic Reserve
13. Port Waikato Scenic Reserve
14. Orokauri Scenic Reserve
15. Whangamarino Wetlands
16. Kopouatai Peat Bog.

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5 BAY OF PLENTY CONSERVANCY

The Bay of Plenty and East Cape Conservancies are particularly fortunate because of the wealth of published information on threatened plants.

5.1 Priority A DOC Estate

5.1.1 Kaharoa Conservation Area.

Under Kaharoa are included Ottawa and Otanewainuku Scenic Reserves because all three sites contain one threatened species, king fern (*Marattia salicina*), and all are threatened by goats. Complete eradication is possible.

5.1.2 Kaimai/Mamaku Forest Park.

A highly significant area for threatened plants and communities. Shaw (pers. comm.) has suggested the following priority areas.

- (i) Sites containing *Metrosideros carminea*, NZMS 260 T13 526039, T14 590990, T14 660645. Threats: goats and possums; control. Priority B.

- (ii) *Peraxilla colensoi*; NZMS 260 T13 c.526039. Threat: possums; control. Priority B.
- (iii) *Marattia salicina*, NZMS 260 T14 c.605955, threat: goats; control. Priority B.
- (iv) Opuiaki Ecological Area; NZMS 260 T15 c.695595. Dense podocarp forest. Threat: goat invasion; control. Priority A.
- (v) *Te Hunga* Ecological Areas, NZMS 260 T14 c.640880. Unique semi-swamp forest associations - tawari (*Ixerba brexiodes*), silver beech (*Nothofagus menziesii*) threat: goats; control. Priority B.
- (vi) Mangakino Stream and Hot Springs Road, NZMS 260 T13 c.540110, T14 c.626957. Kauri (*Agathis australis*) forest associations. Threat: goats; control Priority A.

The Forest Park contains a wealth of important plant associations, natural distribution (or near) limits for several plants including *Hymenophyllum peltatum*, kauri, *Gabnia rigida* (see Wallace 1986) and *Coprosma dodonaeifolia* (see Bartlett 1984). Much of the area is imperfectly known and is likely to prove a stronghold for other threatened plants. Although many of the areas have Priority B rankings it is felt targetting of specific areas as Priority A sites, as outlined above by Shaw, would be beneficial.

5.1.3 Mokaihaha Ecological Area and Conservation Area.

Mokaihaha contains a series of unique podocarp forest and bluff communities (NZMS 260 U16 755320 and U16 845356) under threat from goats. Their eradication is feasible.

5.1.4 Parimahana Scenic Reserve.

The vulnerable orchid (*Genoplesium pumilum*) (see Given 1990) is found within the reserve, but the species is poorly reserved in the region as a whole. Both possums and goats are present. Goats probably pose the most significant threat, and their eradication is possible. Possums can only be maintained at low levels.

5.1.5 Te Kopia Scenic Reserve.

A botanically significant reserve containing five threatened species including an undescribed *Drymoanthus* species known from very few North Island localities (B.P. Molloy pers. comm.). The reserve has the largest population of the geothermal fern *Dicranopteris linearis* known (Beadel 1988) and accordingly a number of valuable geothermal vegetation lowland forest and mosaics. Goats pose a significant threat through reinvasion but their eradication (which is absolutely essential) is possible.

5.1.6 Waipunga Conservation Area.

Goats threaten the podocarp/broadleaf forest of the area. Their eradication is possible.

5.1.7 Waiteariki Ecological Area.

Consists of a mosaic of dominant podocarp/broadleaved forest with patches of pure podocarp forest (NZMS 260 T14 674735). The main threat is goats, which can be eradicated.

5.2 Priority B DOC Estate

5.2.1 Mangaone Scenic Reserve.

Metrosideros carminea, the only threatened species recorded from here, is possibly threatened by possum browse. Possum populations could be maintained at manageable levels.

5.2.2 Matata Scenic Reserve.

Contains an unusual forest type – pohutakawa/hard beech (*Nothofagus truncata*), which is threatened by possums. *Pimelea tomentosa* is also found here. It is suggested that control take the form of reducing the population to very low levels.

5.2.3 Mokorua Scenic Reserve.

Of the two DOC administered reserves known to contain *Bulbophyllum tuberculatum*. Mokorua has the most plants. Possums are the only threat. They browse the orchid while it is small, in addition, forest denudation as a result of browsing increases the likelihood of the trees which support the orchid succumbing to wind damage. Reducing the possum population is advocated.

5.2.4 Ngatukituki Forest Sanctuary.

A unique association of kauri, podocarp/broadleaved forest of the beech forest type. Goats occur in high numbers and can only be reduced rather eradication.

5.2.5 Ohope Scenic Reserve.

Coastal pohutukawa forest here is adversely threatened by possums. Reduction to low population levels is suggested.

5.2.6 Pukerima Ecological Areas.

Woodrose (*Dactylanthus taylorii*) populations here are under threat from possum browse during the flowering season. Reduction of possum levels with specific targeting during the flowering period of is advocated. (DOC should work in conjunction with Chris Ecroyd (NZFRI) for the best course of management.)

5.2.7 Rainbow Mountain (Maungakakamea) Scenic Reserve.

Four nationally threatened species and sizeable areas of geothermal vegetation are protected within the reserve (Clarkson 1984, Beadel 1988). Pigs and possums threaten these communities. However, possum levels can be significantly controlled by a reduction in their numbers.

5.2.8 Rotoma Scenic Reserve.

Metrosideros carminea, the only threatened species recorded from here, is possibly threatened by possum browse. A reduction of possum levels is advocated.

5.2.9 Tauranga Scenic Reserve.

Inland pohutukawa forest is threatened by possums. A reduction of possum levels is advocated.

5.2.10 Tauranga Harbour Headlands (various localities).

Coastal pohutukawa forest at various sites (e.g. NZMS 260 U14 796927) is threatened by possum browse. Management of possums at low levels has been suggested.

5.2.11 Te Parikawa.

Three plants *Bulbophyllum tuberculatum* were discovered here. Both goats and possums threaten the reserve. Goats can be eradicated but the only realistic option for the possum is reduction.

5.2.12 Waimangu Thermal Area.

Eight nationally or regionally threatened species are known from the reserve (Ogle pers. comm.), which has the largest populations of an undescribed *Christella*, a geothermal fern in the country. Its affinities lie with the tropical *C. dentate* (see Brownsey and

Smith-Doddsworth 1989) which is itself endangered (Wilson and Given 1989, Given 1990). The reserve is greatly threatened by possums. One response to this has been the loss of the mistletoes *Ileostylus micranthus* and *Tupeia antarctica*, once common in the carpark area. Reduction of the possum population to low levels is strongly advised, lest further local extinctions take place.

5.2.13 Whirinaki Forest Park.

A relatively intact, podocarp-dominated forest of extreme botanical significance. (Shaw 1989) outlines the following areas as suggested priority conservation sites.

- (i) NZMS 260 V18 334737, podocarp/tawa forest with rata. Threat: possums; control, eradication (Priority A).
- (ii) NZMS 260 V18 334737. Podocarp/tawa forest with rata. Threat: possums; control. Reduce to low population levels (Priority B).
- (ii) NZMS 260 V18 340750. Podocarp forest with high totara element. Threat: possum; control. Reduce to low population levels (Priority B).

Exact placement of Whirinaki with a priority ranking such as the one devised is difficult. The Forest Park could perhaps be treated in the same way as the Mamaku Forest Park - targeting specific sites as Priority A sites with an overall Priority B ranking for the majority of the Forest Park.

5.3 Conclusions

Further ranking using numbers of endemic species, nationally threatened species, regionally threatened and important vegetation types -is considered. This may serve as a guide to settling priorities for management. It is tentative and based on purely botanical criteria.

Priority A Doc Estate

1. Te Kopia Scenic Reserve
2. Kaimai/Mamaku Forest Park - see target sites
3. Mokaihaha Ecological Area and Conservation Area
4. Orokawa Bay Scenic Reserve
5. Waiteariki Ecological Area
6. Parimahana Scenic Reserve
7. Waipunga Conservation Area
8. Other sites containing *Mararria salicinia* populations

Priority B DOC Estate

1. Mokorua Scenic Reserve
2. Matata Scenic Reserve
3. Whirinaki forest Park - see target sites
4. Ohope Scenic Reserve
5. Taurangi Coastal Reserves
6. Rainbow Mountain Scenic Reserve
7. Waimangu Thermal Reserve
8. Pukerimu - may shift up rank during flowering/fruiting season for *Dactylanthus*.
9. Tarawera Scenic Reserve
10. Ngatukituki Forest Sanctuary
11. Others all of low priority

5.4 References

- Beadel, S.M. 1988: A register of threatened plant and local plant taxa in the eastern region, Department of Conservation - their distribution and status -Department of Conservation, Rotorua, *Technical Report Series 6*. 73pp.
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- Wilson, C.M., Given, D.R. 1989: *Threatened plants of New Zealand* - DSIR Field Guide Series. DSIR Publishing, Wellington, New Zealand. 151 pp.

6 EAST COAST CONSERVANCY

For both Bay of Plenty and East Cape Conservancies we have been lucky in that much work on the location, distribution and status of threatened plants species and communities has already been prepared (e.g. Beadel 1988, Shaw 1989). This in part stems from the activities of the Rotorua Botanical Society and its team of keen amateur and professional botanists, the location of DSIR Botany Institute's regional station, and the excellent work of the East Cape PNA (Regnier *et al.* 1988). For these reasons coverage of the Bay of Plenty and East Cape Conservancies been unusually thorough.

Unfortunately, a number of threatened species of the conservancy are inadequately reserved or not reserved at all. This is especially evident in the vicinity of East Cape where *Carmichaelia williamsii*, *Brachyglottis peridicoides* var. '*peridicoides*', *Plantago spathulata* subsp. *picta* and *Olearia pachyphylla* are either not reserved or inadequately so.

6.1 Priority A DOC Estate

6.1.1 Te Urewera National Park.

About 15 nationally or regionally threatened species have been discovered here, although the exact total is probably more (see Shaw, pers. comm.). The Ureweras are the recognised stronghold of kakabeak (*Clianthus puniceas*) and *Myosotis 'pottsiana'* as well as the only known locality for an undescribed, woody subshrub of uncertain affinity (Beadel 1988, Shaw *et al.* 1989). The ranges also preserve some of the best lowland forest tracts in the East Cape Conservancy and perhaps in the entire North

Island. Shaw (1989) outlines sixteen areas of conservation priority, basing them on vegetation type, faunal and threatened flora values. Goats and possums are not the only animal threats to the park, but goats at least can be controlled. Every effort to restrict their advance into the park should be made before it is too late. Complete eradication is feasible and vital if the flora values of the park are to remain intact (Galilee, Shaw pers. comm.). Possums, unfortunately, are uncontrollable, but efforts to reduce possum levels in the vicinity of easily accessible threatened plant sites is worth some consideration. It is absolutely necessary that the islands of Lake Waikareiti remain possum free; Shaw (1989) outlines the significance of these sites and other sites.

6.2 Priority B DOC Estate

6.2.1 Hine Rae Historic Reserve.

Two nationally threatened species, king fern (*Marattia salicina*) and *Metrosideros carminea*, have been reported from here, although the *Marattia* record needs confirmation (1988). Possum control is possible at low levels. I am not aware of goats from the reserve. If *Marattia salicina* is confirmed, further control could be necessary as this species is very rare in the region (see Regnier *et al.* 1988). Further information is needed.

6.2.2 Hurumua Scenic Reserve.

This reserve supports a population of the vulnerable *Pittosporum obcordatum* subsp. *obcordatum* (Given 1990). This tree has been the subject of a continuing search carried on in conjunction with Bruce Clarkson of DSIR, Lands Resources, in the area (Galilee, Ward pers. comm.). A number of trees have been discovered but the status of these sites is at present unknown to me. The species is browsed by goats and possums, the presence of which I have not had confirmed. The small reserve size though, suggests that eradication of both (if present) is possible.

6.2.3 Pukeamaru Range Scenic Reserve.

Only one threatened species - *Mazus* sp. (*pumilio* of New Zealand authors) of vulnerable status (Williams and Given 1989) has been found here. A further six threatened species - *Brachyglottis perdicoides* var. "*perdicoides*", *Carmichaelia williamsii*, *Clianthus puniceas*, *Desmoschoenus spiralis*, *Marattia salicina*, and *Marattia salicina* have been found in the reserve vicinity (Regnier *et al.* 1988). Complete eradication of goats is possible only with fencing, public education, and long-term commitment. Removal of possums is probably unrealistic, but their management at low population levels is feasible.

6.2.4 Raukumara Conservation Park and Ecological Areas.

Shaw (1989) outlines seven areas of conservation priority for the Raukumara Ecological District; one of these areas, the Waioeka Ecological District, is described later (see Shaw 1989). Galilee (pers. comm.) has further ranked the area with respect to threatened species and plant communities. Goats are the main threat. The full impact of possums was evidenced by a spectacular decline of the leafy mistletoes *Peraxilla colensoi*, *P. tetrapetala*, *Ileostylus micranthus*, and *Tupeia antarctica* (Druce pers. comm.). Most of these species are now regionally extinct or nearly so. With respect to goats the most urgent area requiring control for threatened plants is Mt Hikurangi and Honokawa (Galilee pers. comm.). These are significant areas of alpine habitat, with Hikurangi the only confirmed locality for *Coriaria pottsiana* (a local endemic). Both peaks are

important as northern alpine plant distribution limits (Shaw and Beadel 1988) and decades of browsing animals have severely threatened the habitats. Galilee considers goat eradication a realistic proposition.

The eastern Motu has so many goats that only long term population management is possible; while the goat levels in the west are too high for control.

6.2.5 Tukainuku Scenic Reserve

Both woodrose (*Dactylanthus taylorii*) and *Myosotis 'pottsiana'* have been discovered here. Woodrose is browsed by possums during its flowering stage (this is the subject of ongoing research by Chris Ecroyd FRD), but it is not known if the *Myosotis* is browsed, although it probably is (Bowen 1985). Possums are present but currently it is unknown if goats are. Possums could be maintained at low levels only if a long term commitment were made.

6.2.6 Waioeka Gorge Scenic Reserve and Forest.

Four threatened species - *Hebe 'angustissima'*, king fern (*Marattia salicina*), *Metrosideros carminea*, and *Myosotis "pottsiana"* - are known from here. Goats are present locally but in levels only manageable, possums are widespread and control of these is considered unrealistic. Efforts to protect those areas containing king fern and *Myosotis "pottsiana"* could be considered a management priority. Shaw (1989) outlines the vegetation types of the Waioeka Ecological District and considers the gorge and forest a priority conservation area.

6.2.7 Waione Block Scenic Reserve.

The reserve contains populations of *Metrosideros carminea*, but is uncertain whether this species is browsed by possums. Possums are here, but I have not been able to confirm the presence of goats. The area is of low priority.

6.2.8 Waipare Highlands Scenic Reserve.

Five kakabeak (*Clianthus puniceus*) were discovered here by Lindsey Daniels in 1985. The reserve also contains populations of *Brachyglottis perdicoides* var. '*perdicoides*' and an East Cape endemic inadequately reserved elsewhere. The reserve is threatened by goat and possums. Goats probably can be managed at low population levels but the possum population has reached a level where control is probably not possible.

6.3 Conclusions

There is an urgent need to adequately reserve populations of the East Cape endemics *Brachyglottis perdicoides* var. *perdicoides*, and *Olearia pachyphylla*. *Plantago spathulata* subsp. *picta*, also an East Cape endemic, is not considered threatened by browsing animals. Beadel (1988) notes that *O. pachyphylla* was found near Coromandel, where it was possibly planted.

Mainland colonies of *Carmichaelia williamsii* at East Cape also need urgent attention. Reservation of these sites will ensure that the few surviving colonies known will be protected from browsing animals.

6.4 Further Ranking

Ranking of priority sites (based on number of endemic species, nationally threatened species, regionally threatened species, or species at their northern distribution limits) in order of management feasibility is as follows:

Priority A DOC Estate

1. Te Urewera National Park - Specific areas for animal control need targetting (see Beadel 1989, Shaw 1989).

Priority B DOC Estate

1. Waioeka Gorge Scenic Reserve and Forest - Four threatened species, most important ones being king fern (*Marattia salicina*) and *Myosotis 'pottsiana'*. Suggest targetting of sites containing these species as Priority A, and the rest as Priority B.
2. Tukainuku Scenic Reserve - Two threatened species, woodrose (*Dactylanthus taylorii*) and *Myosotis 'pottsiana'*. Woodrose is threatened only during its reproductive stage. Cages over flowering plants may reduce problem but only if area is not easily accessible to the public.
3. Raukumara Conservation Park and Ecological Areas
Suggest Priority A targetting of known sites for threatened plants, alpine communities and areas where goat populations are most easily removed. Priority B treatment of remaining areas as outlined.
4. Waipare Highlands Scenic Reserve
Priority A treatment of *Clianthus* and *Brachyglottis* sites. Priority A treatment where possible for goats. Management of possum levels.
5. Hurumua Scenic Reserve
Further assessment of other *Pittosporum obcordatum* localities is required. Maintain possum levels at low levels at in the meantime with a view to eradication.
6. Pukemaru Scenic Reserve
Fencing, public education to prevent 'farming of bush' extension of reserve boundary and creation of further reserves to protect other threatened species as outlined by Regnier et al. (1988). Attempt eradication of goats and reduction of possums.
7. Hine Rae Historic Reserve
Low priority. Need to confirm king fern (*Marattia salicina*) record. If present possum control required, and goats, if present, should be removed.
8. Waione Block Scenic Reserve
As above.

6.5 References

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Wilson and Given 1989: See Section 5.4 above.

7 TONGARIRO/TAUPO CONSERVANCY

Specific information on the distribution of threatened plants or regional local species and communities for sites other than Tongariro National Park is by and large unavailable. The following draft is therefore a very vague sketch of the situation as gathered from verbal conversation with conservancy flora contact Cam Speedy, and Conservation Advisory Scientists Harry Keys and Colin Ogle. With the June 1990 appointment of C. Jones as botanist, the situation is improving.

7.1 Priority A DOC Estate

Small areas of some large pieces of DOC estate - e.g. Tongariro National Park - could be ranked priority A but at present it seems wise to consider these sites as part of a whole. This is because these sites require intensive management which may (as yet) be impractical unless a long term commitment to funding is made. The sites are addressed under the relevant sections as follows.

7.2 Priority B DOC Estate

7.2.1 Hauhangaroa Ranges.

The eastern side of the ranges is part of the Taupo Conservancy and contains small populations of the nationally vulnerable volcanic plateau endemic *Pittosporum turneri* as well as the woodrose (*Dactylanthus taylorii*), also vulnerable (Rodgers 1988, Given 1990). The Ranges are probably the stronghold of the latter, although the subterranean nature of the plant renders a true assessment of population sizes virtually impossible. The ranges also contain a western outlier of *Toronia toru*, an endemic genus largely confined to the eastern northern North Island and small populations of *Pimelea tomentosa*.

Possoms are widespread and are known to browse *Pittosporum turneri* (Rodgers 1988) and woodrose (Ecroyd pers. comm.) while goats are locally established. Control of both is probably long term but not unrealistic.

7.2.2 Tokaanu Geothermal Reserve.

Three nationally threatened species - *Calochilus robertsonii*, *Christella* sp. (thermal areas Brownsey et al. 1985) and *Cyclosorus interruptus* have been discovered here. The reserve is also noteworthy for the presence of Oioi (*Leptocarpus similis*), a species more typical of saltmarshes (Edgar 1969), mistletoe (*Korthalsella salicoinioides*), and comb fern (*Schizaea bifida*). Present threats are minimal, with weeds and vandalism the main concern.

7.2.3 Tongariro National Park.

At present goats are restricted to small populations in the Erua Forest and adjacent Tongariro and Taurewa forests. Possums are widespread through the park and have largely modified the vegetation accordingly. At least twenty regionally and nationally threatened plants occur within the park, a number which includes *Pittosporum turnerii* (see Hauhangaroa Ranges), the critically threatened *Pterostylis furcata* and the leafy mistletoes *Alepis flavida*, *Peraxilla colensoi*, *P. tetrapetala*, and *Tupeia antarctica*.

Control of possums may come too late for the mistletoe plants left in the park. Their distribution was documented in de Lange (1987), who was probably the last to see *Alepis* in the park. If parts of Whakapapa Village were treated as priority A sites with trees carrying mistletoe 'marooned' by banding and suitable host trees seeded then it may just be possible to save *Peraxilla tetrapetala* from regional extinction. Similarly, the few known *Peraxilla colensoi* at Ohakune could also be protected. Concentrated possum trapping would give spectacular results, if trials elsewhere are anything to go by (see Ogle and Wilson 1985). While it is probably too late for *Alepis*, if any are found, seeding of suitable hosts in priority A sites could be attempted.

Most of the remaining species are under no immediate threat provided goats are not allowed to establish further. Erua Forest could possibly be zoned priority A with concentration on goats and deer which have damaged *Pittosporum turnerii* trees (Rodgers 1988) and probably browse *Coprosma walii*, *Melicytus augustifolius*, and *Olearia capillaris*.

Because of the complex nature of Tongariro National Park it is probably unrealistic to expect a complete reduction in possum numbers. It may well prove that maintaining localities of high botanical significance as target areas for intensive possum control is the only viable option. Although ranked priority B the park is probably of C status. Targetting small areas of national botanical significance would at least ensure the survival of some species whose present future in the National Park is tenuous.

7.3 Priority C DOC Estate

7.3.1 Kaimanawa Range.

The ranges support occasional specimens of mistletoe (*Peraxilla* spp.) (Speedy pers. comm.). Other information on the threatened plants of this range is lacking; however, effective possum control in this region is at best doubtful unless a long term of funding is guaranteed. Goats are not a threat (as yet) to the range.

7.4 Priority D DOC Estate

7.4.1 Lake Taupo Scenic Reserves.

Botanical data are sparse for these reserves, but they probably contain regionally significant plants. The nationally uncommon ferns *Hymenophyllum atrovirens*, *Lindsaea viridis* and the primitive fern ally *Psilotum nudum* occur in some reserves within joints of ignimbrite just above the lake edge. The leafy mistletoes *Ileostylus micranthus* and *Tupeia antarctica* are present, and are under direct threat from possum browse. Goats are present in most lake reserves, and it is here the conservancy has exercised most of its animal control. A botanical survey could help set further priorities.

7.4.2 Taurewa-Tongariro Forest.

A number of threatened species have been reported from these forests: (*Dactylanthus taylorii*), *Thismia rodwayii*, and *Tupeia antarctica*. However, the status of these and other regionally or nationally threatened species within the forests awaits further information.

7.5 Conclusions

Further ranking is impractical without more specific information. Of highest priority at the moment is an immediate survey of sites previously reported as sites for threatened plants.

7.6 References

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8 WANGANUI CONSERVANCY

8.1 Priority A DOC Estate

None of the areas known to contain regionally or nationally threatened species were considered by Ogle or Barkla as ranking priority A.

8.2 Priority B DOC Estate

8.2.1 Egmont National Park.

Three nationally threatened species (one of those endemic to Egmont) have been recorded from Mt Egmont: woodrose (*Dactylanthus taylorii*), *Melicytus* sp. 'Egmont', and *Olearia capillaris*. Of these, species *D. taylorii* is browsed by possum (Ecroyd pers. comm.), the *Melicytus* could be browsed by goats or possum. It is browsed by hares - see Clarkson 1986a. *Olearia capillaris* could also be browsed during its seedling stage (Ogle pers. comm.). Aside from these species, a further four or five taxa are considered endemic (Clarkson 1986a), while a further five are disjunct with the South Island (Clarkson 1986b). Goat levels are presently low, but possum levels are probably high.

8.2.1 Harakeke Scenic Reserve.

Four nationally threatened species occur here: Pingao (*Desmoschoenus spiralis*), *Mazus "novae-zelandiae"*, *Pimelea arenaria*, and *Sebaen ovata*. Only pingao is known to be goat browsed, but there are no goats in the area.

8.2.2 Hawkens Lake Stewardship Area.

Three nationally threatened species occur here: one, pingao, is browsed by goats. Goats are not known from the area, however, so at present no control measures are required.

8.2.3 Makerua Swamp Wildlife Management Reserve.

One species of 'local' threatened status, *Urtica linearifolia*, has been recorded from here. This species is cattle browsed but the danger from any browse pressure at Makerua Swamp is minimal.

8.2.4 Manawatu Gorge Scenic Reserve.

Protects the only known extant colony of *Adiantum formosum*, a species which may be browsed by goats, although this is quite unlikely.

8.2.5 Meeting of the Waters Scenic Reserve.

Dactylanthus taylorii was recorded from here. The species is possum browsed but at present it is not known whether it still survives.

8.2.6 Mimi Scenic Reserve.

Brachyglottis turneri, a regional endemic of local status, is here but at present it is not known whether it is affected by goat or possum browse.

8.2.7 Mohakatino Swamp Stewardship Area.

The size and extent of the population of *Pomaderris apetala* from this site remains unassessed. The species is goat browsed (see Kirk 1899), but it is not known whether goats are present in the area.

8.2.8 Moki Scenic Reserve.

One local species, *Metrosideros carminea*, has been recorded from here. It is near its natural southern limit (see Onaero S.R.) but is otherwise very well represented in the adjoining reserves of the Waikato Conservancy. It would appear that the species is not selectively possum browsed, although goats will eat it.

8.2.9 Mt Messenger Stewardship Area.

King fern (*Marattia salicina*) and *Hebe townsonii* and have been recorded from here. The *Hebe* record is the only North Island occurrence of this otherwise NW Nelson endemic and is probably erroneous (Druce pers. comm.). King fern is browsed heavily by pigs and occasionally by goats. It is nearing its natural southern limit in the North Island in this area, but is otherwise adequately reserved in the adjoining Waikato Conservancy.

8.2.10 Onaero Scenic Reserve.

Is the southernmost naturally occurring site for *Metrosideros carminea*, a species of local status. It is unknown how this species responds to goat/possum browse, as it is often common in coastal forest frequented by these species (see Moki S.R.).

8.2.11 Paengaroa Scenic Reserve.

Is a reserve of high botanical significance (Ogle pers. comm.), protecting many of the North Island's only known plants of *Coprosma obconica sensu stricto* - an otherwise northern South Island species. Both the *Coprosma*, *Melicytus augustifolius*, *Pittosporum obcordatum* subsp. *obcordatum* and *Teucrium parvifolium* found here are nationally threatened. The *Teucrium* is heavily browsed by stock and goats and is now rare throughout the western North Island outside fenced reserves. In addition to these species, 24 divaricating species have been recorded from the reserve which

appears under greater threat from weeds such as old man's beard (*Clematis vitalba*) and ivy (*Hedrea helix*) than goats or possum. The mistletoe *Tupeia antarctica* has been reported from the reserve and is present nearby. It could still survive here (Ogle pers. comm.).

8.2.12 Rerekino Stewardship Area.

Contains populations of *Brachyglottis turnerii* which might be goat browsed (see Mimi S.R.).

8.2.13 Tangarakau Scenic Reserve.

Has populations of *Brachyglottis turnerii* a cliff species unlikely to be seriously affected by possum browse (see also Mimi, Rerekino).

8.2.14 Totara Scenic Reserve.

Teucrium parvifolium was reported from here, but it is unknown whether it still survives here. It is goat browsed.

8.2.15 Waitaanga Stewardship Area.

The yellow flowered, leafy mistletoe *Alepis flviada* has been recorded from here. Although presently of indeterminate status (Given 1990) this species is all but extinct elsewhere in the North Island due to possum browse (Druce, Ogle pers. comm.). This makes Waitaanga of high botanical significance.

8.2.16 Whitecliffs Stewardship Area.

Two threatened species, king fern (*Marattia salicina*) and *Rorippa divaricata* have been reported from here. King fern is nearing its southernmost natural limit in the North Island, but it is doubtful if goats or possums are a problem here. It is also adequately reserved elsewhere (see Mt Messenger) and is of low priority here. *Rorippa*, however, is a vulnerable species rarely reported from the mainland and only recently recognised as endemic (Garnock-Jones and Jonsell). The species is browsed by goats and stock. Its presence here makes the reserve of priority for goat control.

8.3 Conclusions

Most of the threatened plants in the Wanganui Conservancy are not on the DOC Estate (Ogle and Barkla pers. comm.). This makes the setting of management priorities difficult, as many of the species critically threatened with respect to goats or possums are outside our control. That Ogle and Barkla consider none of the reserves priority A is disturbing. It is felt only long term management could control the possum/goat threat.

The reserves are ranked in relation to the presence of (a) endemic species, (b) endangered (vulnerable) species, (c) high number of regional or nationally threatened species (sensu Given 1990), and (d) perceived threat from goats/possums.

1. Paengaro Science Reserve - 3 threatened species.
2. Waitaanga Stewardship Area - 1 species, *Alepis flavida* (indeterminate).
3. Mohakatino Swamp Stewardship Area - 1 endangered species.
4. Egmont National Park - 6 endemic species, 3 threatened species (1 vulnerable, 1 indeterminate)
5. Whitecliffs Stewardship Area - 2 threatened species.
6. Harakeke Scenic Reserve - 4 threatened species, (1 endangered).
7. Hawkens Lake Stewardship Area - 3 threatened species (2 endangered).

The remaining reserves are of low priority or are those reserves which contain species for which we believe goats/possums pose little threat. Two could be ranked, except the records of threatened plants found within them are probably now historical.

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9 HAWKE'S BAY CONSERVANCY

9.1 The Scene

The axial mountainlands of the Ruahine and Kaweka Ranges are still largely clothed in native forests. The rest of the conservancy has lost its former forest cover, and now native vegetation occurs only in small highly-stressed remnants: bush patches on hillsides and flats, riparian strips of scrub and low forests, regenerating scrub and fernlands, open treelands, wetland margins, cliffs, wild coasts. These represent and contain the last vestiges of the primeval vegetation so are vital to protect in their own right. They also contain plants at risk, either-nationally or locally. All have possums, most have goats. Only some are protected and under DOC jurisdiction. There are thus three good reasons, using plant arguments alone, to support effective goat and possum control in the Hawke's Bay lowland remnants controlled by DOC.

9.2 The Priorities

The case for heightened goat and possum control in the Hawke's Bay Conservancy rests not just with rare or threatened plant species. It mainly lies in plant communities at risk. That is why the case has been framed by geographical areas. All the named areas need urgent action, because the consequences of delay or inaction are irreparable loss or degradation of remaining native plants and plant communities.

9.2.1 Northern Flanks of Maungaharuru Range.

Boundary Stream (B), Opouahi-Thomas Bush (B), Waikoau (B), Bellbird Bush (B), Waitere (B). These reserves all contain a range of forest types found nowhere else and under threat from both goats and possums.

9.2.2 Puketitiri Vicinity.

Ball's Clearing (B), Hutchinson (B), William Hartree (B). These contain the only remaining examples of the former majestic podocarp forests and a natural frost flat-wetland that has anomalous occurrences of red tussock, *Dracophyllum subulatum* and other plants. Mistletoe used to be common but has been reduced to very low numbers by possums; these ones here are the last populations in Hawke's Bay.

9.2.3 Coastal Lowlands, Tutira-Tongoio Area.

White Pine Bush (B), Tongoio (B), Waipatiki (B), Mangapukahu (B). These contain nikau forest and plants such as kiekie and *Jovellana sinclairii*, not found elsewhere in Hawke's Bay. The orchid *Bulbophyllum tuberculatum* is known in Hawke's Bay only from White Pine Bush. All reserves have goats and possums.

9.2.4 Maraetotara Plateau and Environs.

Mohi (B), Maraetotara (B), Maraetotara Gorge (B), Elsthorpe (B). The first three contain tawa-podocarp forests on a high wet limestone plateau, protecting a unique range of coastal and montane plants, including *Fuchsia perscandens*, which is rare in Hawke's Bay. Elsthorpe is the only remaining example of tall podocarp forest left on coastal valley alluvium in this part of New Zealand. It contains an unnamed *Pterostylis* orchid. All of these reserves have possums.

9.2.5 Central Hawke's Bay Inland Plains and Low Hills.

Springhill (B), A'Deane's Bush (B), Moncktons (B), Inglis (B), Puahanui Bush (B). All are the only remnants of the former great podocarp-broadleaved forests that grew here before European arrival; they contain three maires (*Nestegis* spp.), *Teucrium parviflorum*, *Olearia virgata* in swamps, and a tremendous range of other trees, shrubs, lianes, herbs, and ferns. Possums are common in all reserves.

9.2.6 Southern Hawke's Bay.

Mangapuaka (B), (B), Bush (B), Waikarea Bush (B). These reserves also contain the last remnants of former podocarp-broadleaved forests, characteristic of this area. The mistletoe *Tupeia antarctica*, now virtually gone from Hawke's Bay, is found here, but is under threat from the possums, which are common.

9.2.7 The Crest of the Maungaharuru Range (B).

Here, unique remnants of cloud-cap forests of mountain holly and broadleaf are found. So too are remnant red tussock lands. On the cliffs and summit outcrops are mountain daises (*Celmisia glandulosa*, *C. gracilentata* and *C. spectabilis*), speargrasses (*Aciphylla colensoi* and an unnamed *Aciphylla*), *Myosotis saxosa* and a distinctive endemic form of *Pimelea aridula*. Goats and possums are common and a severe threat to these special plants and vegetation types.

9.2.8 Eastern and Southern Kaweka Forest Park (A or B).

Small populations of goats are present in Longfellow Range, Gorge Stream, Burns Range, The Comet, Miroroa (Cattle Hill). Eradication of these is possible and would remove the threat posed to the vegetation of the entire park. Control to low levels would contain the problem. Possums are severely browsing vegetation, to the extent that mistletoes are almost gone, as are tree fuchsia and Hall's totara. Control now might save these plants in this area.

9.2.9 Western Ruahine Forest Park (B).

Similar to Kaweka Forest Park. Control of goats to low levels in the Diggers catchment, Opawe catchment, Mokai Patea area and Sixtus area will reduce the threat of damage to the forests of the entire western side of the park. There are some outliers of the park near Pohangina. These distinctive forests are under threat from possums.

9.2.10 North-west Ruahine Forest Park (Ruahine Corner) (B).

A unique forest of Hall's totara and kaikawaka (*Libocedrus biddiwillii*) is being damaged by possum browsing. Control is urgent before major deterioration occurs.

9.2.11 Southern Ruahine Forest Park

The once-dominant kamahi-northern rata forests collapsed during the 1950's due to possum browsing, with resulting accelerated erosion. A sustained possum control programme would significantly increase the regeneration that is occurring.

9.2.12 Eastern Ruahine Forest Park (B).

Goats on the eastern margin pose a large threat to the forests on the whole eastern side of the Park. Control would contain the problem.

9.2.13 Pingao (*Desmoschoenus spiralis*) Populations (B).

Pingao occurs in few places on the entire eastern North Island coast. The largest population is at Ocean Beach, Hawke's Bay. Other populations in the Conservancy are at Rangaika, Tait's Beach and Cape Turnagain. Goats and possums are threats to all: goats damage adult plants and browse seedlings; possums are a major browser of seedlings. As a result, regeneration is not happening and adult plants are deteriorating. There is thus a risk that this culturally and ecologically important plant will disappear from the coastline.

9.2.14 *Pittosporum obcordatum* Site, Tukituki R (B).

The sole plant of *Pittosporum obcordatum* known in Hawke's Bay is within a small isolated forest remnant. Possums are present and pose a threat to both the remnant and the individual *P. obcordatum*.

9.2.15 Cape Kidnappers Nature Reserve (A or B).

Although this reserve was established to protect the internationally famous gannet colony, it has considerable potential for rare plant conservation. Cook's-scurvy grass (*Lepidium oleraceum*) was collected there about 50 years ago. If goats and possums were eradicated or controlled to low levels, the reserve would be an excellent site for re-establishment of such plants as Cook's scurvy grass, speargrass (*Aciphylla squarrosa*), renga lily (*Anthropodium squarrosa*), renga lily (*Anthropodium cirratum*), and others formerly growing on these coasts but now either gone or severely reduced in number and under threat.

9.3 Summary

Eradication of goats or possums is not a feasible option anywhere in the conservancy except in small sites, because there are no ecological islands or effective barriers to goat and possum movement. This means that one-off control measures, no matter how thorough, are merely temporary in their effects. Commitment to on-going management, so that goat and possum numbers are held to low enough levels to enable protection of the plant conservation values in the sensitive and important sites listed, is essential.

9.4 Additional Notes and Conclusions

Wall's report has concisely spelled out the situation in Hawke's Bay. All forested remnants under control by DOC require urgent management. However few are envisaged as priority A (two cases of possible A status). The fact that all areas mentioned by Walls of DOC estate in Hawke's Bay are ranked as high as B serves to illustrate the urgent need to implement control measures on a long term basis if we are not to lose

the remaining vestiges of the conservancies flora. In terms of threatened species/communities the ten most important areas appear to be:

1. Crest of the Maungaharuru Range: Three regional and nationally threatened species, two of these endemic.
2. Central Hawke's Bay inland plains and low hills: Five sites containing five regionally local or nationally threatened species and vegetation types.
3. North-West Forest Park: Unique forest type under severe threat from possum browse. Urgent control is needed.
4. Puketitiri area: Three sites containing unusual podocarp forest, (Red Tussock/*Dracophyllum subulatum*) and major concentration of mistletoes.
5. Eastern and Southern Range: If immediate control measures are undertaken it is feasible to eradicate goats. A reduction in possum levels could save the only major area of mistletoes left in the conservancy.
6. Southern Hawke's Bay: Four sites, only known populations of *Tupeia antarctica* left in conservancy. Urgent need for goat and possum control.
7. Tutira Tongoio area: Four sites, one containing only known population of the orchid *Bulbophyllum tuberculatum* in the conservancy.
8. Maraetotara Plateau: Four sites containing two regionally local species, one of these an orchid.
9. Northern flanks of the Maungaharuru Range: Five forests containing vegetation types not represented elsewhere in the conservancy.
10. Pingao (*Desmoschoenus spiralis*) sites: Pingao is uncommon along the eastern North Island coast. Its high palatability to goats, hares and stock is cause for concern. Urgent commitment to fencing representative sites in the conservancy from these threats is required not only for conservation purposes but for cultural reasons.

Of the remaining areas, control should first be carried out in the Ruahines and Kidnappers Areas, as outlined by Walls, before consideration of the *Pittosporum obcordatum* subsp. *obcordatum* reserve is taken. Spending money to save a single tree of a species with a dioecious habit and therefore already reproductively extinct would be pointless when there are areas of greater national significance elsewhere in the conservancy.

10 WELLINGTON CONSERVANCY

One of the intriguing features of the Wellington Conservancy is the lack of botanical knowledge for quite extensive areas of the Wellington coastline, eastern Wairarapa and East Coast, while information on the lower western third of the conservancy is particularly rich.

For those areas where recent records exist, it would appear that the conservancy has lost much of its distinctive flora, and it is poised to lose more (Ogle 1987). Many of the key areas are not reserved and either threatened by quarrying or other types of development.

10.1 Priority A DOC Estate

10.1.1 Carter's Bush Scenic Reserve.

This reserve is considered the best surviving remnant of the former lowland forest of the Wellington, Hutt Valley and Wairarapa (Tom Moss pers. comm.). Eight threatened species have been recorded from here, including the only specimens of *Teucrium parvifolium* (highly palatable to goats) left in the conservancy, a large population of the summer-dormant annual fern *Anogramma leptophylla*, a healthy colony of *Melicytus*

micranthus, a regionally local species and large amounts of the rare (Given 1990) *Crassula ruamahanga*. The reserve contains no goats and a moderate possum population. Complete eradication of this population is definitely feasible.

10.1.2 Hemi Matenga Scenic Reserve.

Contains the last extensive kohekohe (*Dysoxylum spectabile*) forest left in the conservancy. In addition, the forest is a feature of the Waikanae coastline. Empson (pers. comm.) has provided data by Adams of the feasibility and projected cost of possum eradication in the reserve. It is a high priority site for possum control and needs immediate attention. No detailed botanical information on the species present in the reserve is available.

10.1.3 Kahutoa Scenic Reserve.

Contains specimens of towai (*Streblus banksii*) and *Melicytus micranthus*. Towai is a highly palatable species to goats and possums, and the fruits are eaten by rats. It is likely that the best future for *Streblus* is on Mana Island, which is rat free. However Kahutoa is presently infested by possums, whose eradication is believed possible. It would be a worthwhile exercise and could be followed by establishment of nursery-raised seedlings.

10.1.4 Kiripiti Scenic Reserve.

Kiripiti, together with Kahutoa, Nikau, Raroa (see Pukerua Bay) and Waikanae scenic reserves, contain *Streblus banksii* and a probably controllable possum threat. This reserve has problems similar to those of Kahutoa Scenic Reserve.

10.1.5 Nikau Scenic Reserve.

This reserve also contains *Streblus banksii* and has a possum problem. Control and management as advocated for Kahutoa Scenic Reserve is suggested (see above).

10.1.6 Pukerua Bay Reserves.

Comprise a number of thoroughly botanised reserves, the most important appears to be Raroa S.R., which supports the newly described *Acaena juvenca* (see Macmillan 1989). *Dodonaea viscosa*, *Lophomyrtus obcordata* and *Streblus banksii* are also recorded from here. Possums which are present could be eradicated but this would require the goodwill of local residents. The Whitaker's Skink Reserve has been planted with *Melicytus obovatus* from seed obtained from a plant collected by Druce from what is now the carpark. *Plagianthus divaricatus* is also known from here. Wairaka Scenic Reserve contains a distinct form of *Pelagonium inodorum* not known elsewhere in the Wellington region.

10.1.7 Speargrass Weevil Wildlife Management Reserve.

Four regionally and three nationally threatened species have been recorded from here including *Austrofestuca littoralis*, *Acaena pallida*, *Brachyglottis lagopus*, *Desmoschoenus spiralis*, *Epilobium microphyllum*, *Microseris scapigera* and an undescribed form of *Senecio* (Druce pers. comm.). Goats pose the most significant threat to the reserve as most of these species are only marginally palatable to possums. Eradication of goats, is possible and would be a worthwhile exercise, not only for the above mentioned species but for the survival of *Aciphylla squarrosa*, upon which the speargrass weevil is so dependent.

10.1.8 Waikanae Scenic Reserve.

Has a small colony of *Streblus banksii*. Suggested control measures are exactly the same as those described for Kahutoa, Kiripiri and Nikau reserves.

10.2 Priority B DOC Estate

10.2.1 Castle Point Scenic Reserve.

The only known locality (Druce 1989) for *Brachyglottis monroi* var. '*compacta*', a species which is browsed by livestock and possums but usually only when more palatable species have been removed first. Currently only possums are known in the area, and these could be removed (Empson pers. comm.). At present it is suggested that possum levels be maintained until other more urgent sites have been controlled. Further information on this reserve is also necessary before a definite priority can be set.

10.2.2 Haukopua Scenic Reserve.

Included here are Tiraumea, Ohinereia, Oporua, Rewa 'Reserve' and Tora Bush reserves, all of which contain *Meliccytus micranthus*. All of them contain possums, but only Tora Bush has goats. Management of the possum populations and eradication of the goats is advocated by Empson. These reserves are of low priority until other more urgent sites have first been controlled.

10.2.3 Lake Papaitonga Scenic Reserve.

Several nationally or regionally threatened species have been recorded from here, one of which, the mistletoe *Ileostylus micranthus* is probably now extinct (Duguid 1985). The reserve is especially significant for the presence of the nationally local species *Urtica linearifolia* (see Given 1990). This nettle is also present in small numbers at the Taupo Swamp and at Lake Wairarapa (Ogle *et al.* 1990) where it is cattle grazed. The reserve is threatened by possums, which are of concern mainly because of the large numbers of maire-tawaka found in the reserve. This species has become very localised in the conservancy and is highly palatable to possums. Empson considers the reserve Priority B, recommending that possum populations be kept at manageable levels. With further assessment the reserve may qualify as Priority A on the basis of its isolation and high number of threatened species; clearly, further information is needed.

10.2.4 Lake Wairarapa and Associated Reserves.

About 24 regionally or nationally threatened species have been reported from here (Ogle *et al.* 1990). Of these, few are threatened by the agents considered here, although stock have browsed *Urtica linearifolia* in the past (Ogle pers. comm.). The only species which could be threatened are the mistletoes *Korthalsella lindsayi*, *K. salicornioides* and *Ileostylus micranthus*. We have no recent records of *Korthalsella lindsayi* or *Ileostylus* (although the *Ileostylus* is known locally (Moss pers. comm.)), and we are presently unsure of the impact possums might have on *Korthalsella*. However, the main host tree for the mistletoe *K. lindsayii* is *Melicope simplex*, which is possum browsed. Goats are not recorded for the area. While removal of possums could be considered this is a matter of low priority when compared with other situations elsewhere in the conservancy.

10.2.5 Rimutaka Forest Park.

Eleven species of regional or national threatened status have been recorded from here. *Alepis flavida*, *Ileostylus micranthus*, and *Peraxilla colensoi* are undoubtedly extinct, and *Peraxilla tetrapetala* and *Teucrium parvifolium* are very close to it. Of the remaining species, *Pseudopanax ferox* is nationally threatened, and one *Coriaria*

'Rimutaka' is undescribed but not endemic. Both goats and possums occur here; the goats could be eradicated, but the possums are probably manageable only (Empson pers. comm.).

10.2.6 Sinclair Head Scientific Reserve.

Contains only one regionally threatened species, *Melicytus obovatus* var. "*obovatus*", of which a single specimen was discovered amongst *Coprosma crassifolia*. Protection of this reserve is not really viable unless the reserve boundaries are extended to protect the vegetated cliffs north of the road. This area formally contained a large population of *Brachyglottis lagopus*, *Craspedia 'maritima'* and *Microseris scapigera*. On 26 June 1990 most were restricted to inaccessible sites, goats having destroyed the rest. If the adjoining land were acquired, it would enhance the features of the reserve and help protect an already dwindling unique coastal vegetation. Only goat control is required, and complete eradication is wholly feasible if the area is fenced.

10.2.7 Tararua Forest Park

Eleven nationally or regionally threatened species have been recorded from here. Woodrose (*Dactylanthus taylorii*), *Ileostylus micranthus*, *Peraxilla colensoi*, *P. tetrapetala*, and *Pterostylis nana* are now probably extinct, not having been seen for some time (Ogle, Druce, pers. comm.). The threat to the park involves goats and possums, both of which occur in numbers which could possibly be controlled on a long term basis.

10.2.8 Turakirae Head Scientific Reserve.

Small populations of *Austrofestuca littoralis*, *Crassula peduncularis* and *C. ruamabanga* are known from the reserve. In December 1990 *Muehlenbeckia astonii* was discovered here. In addition to these nationally threatened species a number of regionally local species have been reported from here, several of which are otherwise confined to the South Island - e.g. *Carex appressa*, and *C. flaviformis* (see Rodgers 1989). The vulnerable shore spurge (*Euphorbia glauca*) may also survive here although the species has not been confirmed since it was recorded as uncommon by Bagnall (1975). Shore spurge may already be extinct in the conservancy.

Although a large number of nationally threatened or regionally uncommon plant species have been recorded from here (Bagnall 1975; Druce unpublished) the reserve is inadequately fenced and consequently suffers from serious goat and sheep browse. This has allowed pasture weeds unpalatable to stock to establish within the reserve, a factor which may have further contributed to the apparent regional extinction of such species as *Leptinella pusilla*, *Carex appressa* and possibly *Euphorbia glauca*. The erection of a stock proof fence would go a long way in preventing a continuation of browse damage.

10.2.9 Whitireia Park.

Possums are the only threat to the park (Empson pers. comm.), and the threatened species found here are not likely to be adversely affected, with the possible exception of *Melicytus obovatus* var. "*obovatus*", which appears to be suffering more from the spread of *Senecio angulatus* and trampling by people than else. It is presently unknown if possum browse *Hebe elliptica* var. *crassifolia* or *Asplenium obtusatum*. If they do then some control is needed in the vicinity of these plants. Such measures would be

difficult because of the close proximity of the park to a large residential area. For the present, monitoring of both *Hebe* and *Melicytis* sites is recommended.

10.3 Priority C DOC Estate

10.3.1 Red Rocks Scientific Reserve.

Modification by quarrying of the unreserved headland has been so extreme that any potential for acquiring further land nearby for protection of the unusual flora has been lost. *Acaena pallida*, *Clematis afoliata* and *Crassula kirkii*, formerly growing on the reserve, have been destroyed by the further development of the access road. A recently discovered *Acaena* site nearby is also on the point of collapse. Neither goats nor possums could pose any more significant threats on an already seriously altered landscape adjoining the reserve.

10.4 Priority D DOC Estate

10.4.1 Haurangi State Forest Park.

Currently protects one of only two known North island sites for the orchid *Drymoanthus* 'Spotted Leaf', a newly recognised, undescribed species otherwise confined to the South Island, although not threatened in a national context, this species is uncommon in the North island and very few plants seen in the Haurangi Ranges. The Forest Park also protects large populations of *Brachyglottis greyii* var. "*greyii*" and is considered "an area of high ecological and botanical importance" (Atkinson, pers. comm.).

The park is heavily infested with goats and possums, as well as deer and pigs. All of these species have had significant effects on the forest infrastructure. Extensive areas of rata (*Metrosideros robusta*)/kamahi (*Weinmannia "racemosa"*) forest have been destroyed through possum browse (Druce pers. comm.). This factor alone has resulted in severe erosion and the loss of suitable habitat for a number of species, including the *Drymoanthus*.

10.5 Conclusions

The following areas are ranked in order of importance.

Priority A DOC Estate

1. Speargrass Weevil Wildlife management Reserve (high number of threatened species known).
2. Carter's Bush Scenic (high number of threatened species known).
3. Hemi Matenga Scenic Reserve (kohekohe forest).
4. Pukerua Bay Scenic Reserves - Raroa Scenic Reserve in particular.
5. Kahutoa Scenic Reserve - contains both *Melicytis micranthus*; seedling establishment of *Streblus* is in doubt.

As the rest of the Priority A reserves have similar values, they cannot rank further.

Priority B DOC Estate

1. Lake Papitonga Scenic Reserve - *Syzyium maire*, *Streblus banksii*, *Uritica linearifolia*.
2. Whitireia Park - *Melicytus obovatus* var. '*obovatus*', *Asplenium obtusatum* s.s., *Hebe elliptica* var. *crassifolia*.

The rest need further assessment before ranking can be better defined.

Priority D DOC Estate

The status of Haurangi Range needs to be clarified.

1. Additions to Head Scientific Reserve and Speargrass Weevil Wildlife Management Reserve are needed to adequately protect *Aystrofestuca littoralis*, *Acaena pallida*, *Senecio rufigliandulosus* unnamed variety, *Scandia geniculatum*, *Brachyglottis lagopus* and *Muehlenbeckia astonii*.
2. Pipinui Pt needs a detailed botanical investigation to sort out status of unnamed entity in the *Pimelea aridula* agg. apparently to this site (Druce 1989, Druce pers. comm.). This site should be considered for reservation.

Surprisingly little of the Wellington coastal flora is under DOC control. It is all under severe threat development, adventive weeds and browsing pressure. In addition to those species listed as extinct, there are many that have yet to be rediscovered along the coast; some of these (e.g. *Lepidum obtusatum* and *Runex neglectus* were first described from this coastline. Clearly more detailed mapping of the coastline is needed so that DOC is aware of areas of high botanical significance. Once this is done we will be in a better position to protect and advise on the conservancy's flora.

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