

<i>C. juniperina</i>	<i>Pseudopanax crassifolius</i> x <i>P.</i>
<i>Geniostoma rupestre</i>	<i>lessonii</i>
<i>Hebe diosmifolia</i>	<i>P. lessonii</i>
<i>Hypochaeris radicata</i>	<i>Senecio bipinnatisectus</i>
<i>Kunzea ericoides</i>	<i>S. biserratus</i>
<i>Lagenifera stipitata</i> (AKU 19797)	<i>Solanum americanum</i> m
<i>Leucopogon fasciculatus</i>	<i>Sonchus oleraceus</i>

#### Monocotyledons

<i>Carex testacea</i>	<i>Holcus lanatus</i>
<i>Cortaderia jubata</i> m	<i>Oplismenus imbecillis</i>
<i>C. selloana</i>	<i>Poa pusilla</i>
<i>C. splendens</i> m	<i>Rytidosperma unarede</i>
<i>Corybas trilobus</i>	<i>Scirpus nodosus</i> m
<i>Deyeuxia billardieri</i> m	<i>Sporobolus africanus</i> m
<i>Dichelachne crinita</i>	<i>Zoysia pauciflora</i> m

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## THE INDIGENOUS VASCULAR FLORA OF A LARGE GULLY SYSTEM BORDERING THE SOUTH EASTERN SUBURBS OF HAMILTON CITY

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#### INTRODUCTION

The gully systems of the Hamilton basin have in the past been ignored by botanists and naturalists alike, primarily because of the problems of access and the unsanitary conditions of some of the systems e.g. effluent discharging and rubbish tips. However during surveys of several gully systems in the Hamilton basin it has become increasingly apparent that the indigenous flora of some of these systems is much better preserved than the remnants on the drier table land from which the gully's drain. This point was well illustrated by de Lange (1986) who examined the flora of the Koromatua gully systems and found an indigenous vascular flora of 205 species and hybrids including the vulnerable king fern (Marattia salicina) (Given 1981), kauri (Agathis australis) - a species thought extinct within the basin and a number of

species with very localised occurrences within the present basin flora e.g. horopito (Pseudowintera colorata).

During 1975, for reasons of plain botanical curiosity the largest gully system bordering Hamilton City was examined by the author. This system drains the Newstead, Tauwhare, Bruntwood and northern Cambridge basin - which the author has elected to call the "Matangi Basin". The gully contains the catchments of the Mangaone, Mangaharakeke, Mangaomapu and Mangaonua streams, of which the Mangaone and Mangaoharakeke contain the better forested remnants. The combined waters of the system drain into the Waikato river below Riverlea, flowing past the suburbs of Silverdale, Hillcrest and Riverlea and receiving much drainwater from these areas.

In addition the Matangi Milk Factory, until comparatively recently dumped excess milk products and effluent into the Mangaonua system and numerous cowsheds and farms also discharged effluent from the greater Matangi area. Subsequently the gully systems were very polluted until PEP schemes started willow removal and the effects of these "illegal" discharges became all too obvious. The system has now been cleared up, although the water is far from drinkable.

Since the 1975 investigations started much of the gully system has been damaged by the activities of PEP workers clearing willows, people trail biking on the unstable Taupo pumice alluvium that forms the lower terraces of the gully system, unchecked clearance by land developers with the resulting increased erosion and overstocking by goat farmers and "inexperienced" 10 acre block dwellers (for want of a better name). Subsequently 3 species have become locally extinct and others can be expected to follow.

At the time of writing the largest swamp containing Astelia grandis and the Gahnia species G. setifolia and G. xanthocarpa, yet known in the Hamilton basin is directly under threat from sand quarrying and browsing by livestock. The largest population of Astelia fragrans yet known may now be extinct due to PEP clearance and two areas of regenerating kahikatea (Dacrycarpus dacrydioides) have been felled. If these processes continue unchecked then it is likely that even these gully systems may no longer serve the useful purpose of preserving what little indigenous flora remains in the Basin.

For this reason the author has established in conjunction with Dr P. Morris of the University of Waikato an area within the Mangaharakeke in which the relocation and protection of the remaining Hamilton basin flora is being practised. Already the fern Adiantum aethiopicum has been relocated thereby preventing its probable extinction in the gully. This species has not yet been found anywhere else in the basin. Similar projects have started with other such threatened species within the basin.

Despite the problems of gully development, a flora of 225 species and hybrids has been prepared from an estimated 85% coverage of the gully system (utilising an airplane, photographs and old maps to locate some of the remaining remnants). Such a high species diversity in comparison to the remaining forested remnants on the drier table land, endorsed the feeling first pointed out in de Lange (1986) that the current reserves designed to protect the Hamilton Basin flora are not serving their full purpose. It is the gully systems with their abundant moisture and until recently, isolation from development, that serve as important refugia of our basins flora.

## THE CHECKLIST

An indigenous vascular flora of 225 species and hybrids has been prepared from surveys started in 1975 and finished in December 1986. Of these 224 species, three, Ctenopteris heterophylla, Gleichenia microphylla and Fuchsia perscandens have not been relocated for five years and are now considered locally extinct. A fern flora of 60 species (and hybrids) dominates the gully system of which the "weedy" ferns Diplazium australe and Deparia petersenii ssp. congrua (incl. tripinnate forms (D. tenuifolia)) are the most abundant species. Of the 60 ferns listed, only one, an unidentified Christella sp. is probably not native. It is included because it has been found in kahikatea forest at Hauturu, Kawhia and at Tokaanu Geothermal Reserve and so may be indigenous. This Christella, although closely related to, is not part of the N.Z. C. dentata complex from which it differs in having a stout caudex, larger sori, and when specimens are old enough a deep black stipe. Specimens noted do not possess a creeping rhizome and are too stout for the geothermal species of the Taupo Volcanic Zone. This Christella is identical to a form popular in gardens centres and is represented by collections in WAI and WELT where it is labelled as C. dentata by the author. Specimens are possibly C. subpubescens which is a popular pot plant in this country. Plants are reputedly easily confused with C. dentata (Jones & Clemenesh, 1976).

An interesting cold climate element in the flora is present, this flora contains species thought restricted to high altitudes in the western Waikato (e.g. 800 m a.s.l.). In particular the ferns Blechnum penna-marina and Hymenophyllum armstrongii, the lily Astelia fragrans and Epilobium alsinoides s.s. are considered relictual species of a past cooler climate. All are of very restricted occurrences, being confined to kahikatea forest remnants. It would seem the open nature of these forests, and their damp cool atmosphere provides conditions suitable for these species to survive. In the Koromatua Gully system Pseudowintera colorata was found in kahikatea forest (de Lange 1986), and most of the Blechnum penna-marina sites known for the basin are in kahikatea remnants. The fern Blechnum colensoi is also present in one site (where it is restricted to three plants) and is included in the checklist as a cool climate element as it behaves in this manner in the western Waikato.

An unusual find was that of a Davallia species growing on a kahikatea tree in the vicinity of the sand quarry, Matangi Rd. The Davallia is probably part of the D. feejeensis complex, and is certainly adventive. The tree containing the specimen was felled late last year (1986), but a specimen is in cultivation and herbarium specimens are in WAI and WELT, awaiting determination.

Other species with localised or restricted distributions within the basin found within this system are: Adiantum aethiopicum, hinau (Elaeocarpus dentatus), ti ngahere (Cordyline banksii), Garmichaelia aligera (incl. C. cunninghamii), ramarama (Lophomyrtus bullata), Adiantum hispidulum, Hymenophyllum flexuosum, Fuchsia perscandens, Corybas trilobus, Potamogeton suboblongus, Sparganium subglobosum, Lilaeopsis lacustris and Urtica incisa (which may now be extinct).

Some specimens collected have been lodged in the following herbaria: AK, WAIK, WELT & CHR.

## VEGETATION ASSOCIATIONS

The Mangaonua system contains excellent profiles down the gully sides of native vegetation, enabling one to see what the past forest composition of the area may have been. Typically, the drier, free draining Horotiu Sandy Loam soils on the outer edge of the gully support totara (Podocarpus totara), tawa (Beilschmiedia tawa), titoki (Alectryon excelsus var. excelsus). Sites containing these trees are few, but this pattern ties in well with similar profiles on the free draining soils near Gordonton. Near the edge of the gully the outcropping Te Kowhai Siltloam supports vegetation tolerant of alternating wetting and drying conditions. This vegetation is often dominated by kahikatea, but tawa and matai (Prumnopitys taxifolia) are often co-dominant. Matai seems less tolerant of waterlogging than kahikatea and is more often seen on sandy soils in the gully proper or on the more drained gully edges. Rimu (Dacrydium cupressinum) may once have been an important associate of this forest type. Only one tree survives, but it seems likely that rimu and matai would have once been co-dominant with kahikatea on the gully slopes and colluvial terraces.

At the edge of the stream a swamp vegetation dominated by Astelia grandis, Gahnia setifolia, Cordyline australis, Coprosma spp. and Carex secta s.s. seems to have been usual. Harakeke (Phormium tenax), despite the gully system named Mangaharakeke, may only have been important where the stream had dammed itself off, forming a small, shallow lake. This is the site where it is found today, being rare or absent elsewhere.

On the low lying outwash terraces and terraces formed from Taupo Pumice Alluvium, which are prone to flooding, kotukutuku (Fuchsia excorticata), manatu (Plagianthus regius) and putaputaweta (Carpodetus serratus) seem to have formed a distinctive community. These forests supported an understorey dominated by various Coprosma species and sedges and are often flooded permanently for 6 months of the year.

On the drier, steep slopes of the gully a short scrubby vegetation dominated by kanuka (Kunzea ericoides var. ericoides), mapou (Myrsine australis), rangiora (Brachyglottis repanda var. repanda) and mingimingi (Leucopogon fasciculatus) is often present. If a small spring empties at the base of these sites kotukutuku and mahoe (Meliccytus ramiflorus var. ramiflorus) are nearly always present.

These vegetation patterns are similar to those observed at Gordonton, Whitikahu and Koromatua, however the Koromatua gully system is notable in that it contains more tanekaha (Phyllocladus trichomanoides var. trichomanoides) and more northern species of which Coprosma spathulata, Marattia salicina and kauri are examples (de Lange 1986).

## CONCLUSIONS

The indigenous vascular flora of the "Matangi" Basin gully systems contains a diverse assemblage of species now either extinct or very restricted in the drier forest remnants of the upper terraces of the Hamilton basin. This can be attributed to the isolation of the gully remnants from stock browsing and land development (until comparatively recently) and the more moist environment of the gullies themselves. A comparison of the remnants on the table land of the "Matangi" Basin is in preparation, it is notable that only two of the 10 remnants examined contain greater than 50 species, and that all remnants lack the

characteristic species of the wetter lowland forests of the greater Waikato e.g. Mangapu Kahikatea Forest, Awaroa Wildlife Management Reserve (de Lange in prep.).

For this reason the gully systems are important areas, protecting the wetland flora now extinct on the drier ground. In addition the forest remnants provide an excellent cover preventing erosion of the loose gully banks, are considerably more attractive than the willow forests which now dominate most gully systems and enable indigenous wildlife to survive in a basin now otherwise dominated by pastoralism.

Although containing no nationally threatened species, the "Matangi" Basin gully system contains many species of now very localised occurrences in the Hamilton Basin. It also serves as a useful genetic "bank" if revegetation of the remaining forest remnants is to be seriously considered. It is therefore a matter of necessity that the remaining gully remnants of indigenous flora be reserved.

#### REFERENCES

- de Lange, P.J. 1986. Two interesting Gully Systems near Koromatu. Rotorua Botanical Society Newsletter No. 8 p. 29-38.  
 de Lange, P.J. in prep. The indigenous flora of Wet Kahikatea Remnants - a note on absent species from the dry remnants.  
 Given, D.R. 1981. Rare and Endangered Plants of New Zealand. Reed, Wellington.  
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#### THE INDIGENOUS VASCULAR FLORA OF THE MANGAONE, MANGAONUA, MANGAHARAKEKE AND MANGAOMAPU GULLY CATCHMENTS

Based on observations and collections made by the author during the years 1975-1986. Some specimens have been lodged in the University of Waikato Herbarium (WAIK), with duplicates of some fern records in WELT.

+ = uncommon or local within gully systems

ex = specimen not recorded within recent years from the gully systems. Locality extinctions being caused by land drainage and clearance, quarrying, browsing and grazing and willow clearance by PEP workers.

# = cold climate or montane species in the western Waikato.

N.B. Many indigenous species present in the "developed" gully parts have been planted. In these cases the species have been excluded from the list.

#### Gymnosperms

Dacrydium cupressinum +	Podocarpus totara +
Dacrycarpus dacrydioides	Prumnopitys taxifolia +

#### Dicot trees

Alectryon excelsus var. excelsus +	Melicytus ramiflorus ssp. ramiflorus
Aristotelia serrata +	Myrsine australis
Beilschmiedia tawa +	Paratrophis microphylla +
Carpodetus serratus +	Pittosporum eugenioides +
Elaeocarpus dentatus +	P. tenuifolium ssp. tenuifolium +

E. hookerianus +  
 Fuchsia excorticata  
 Hedycarya arborea  
 Melicope simplex +

Monocot trees & shrubs

Cordyline australis  
 C. banksii +

Dicot shrubs

Brachyglottis repanda var. repanda +  
 Carmichaelia aligera  
 (incl. C. cunninghamii)  
 Coprosma areolata +  
 C. lucida  
 C. rigida +  
 C. rotundifolia +  
 C. robusta  
 C. tenuicaulis +  
 C. propinqua +  
 C. grandifolia +  
 C. areolata x rotundifolia +

Psilopods & lycopods

Lycopodium varium  
 (incl. L. billardieri) +

Ferns

Adiantum aethiopicum +  
 A. cunninghamii +  
 A. hispidulum +  
 Anarthropteris lanceolata +  
 Asplenium bulbiferum s.s.  
 A. gracillimum +  
 A. flaccidum ssp. flaccidum  
 A. oblongifolium  
 A. polyodon  
 A. bulbiferum x flaccidum ssp.  
 flaccidum  
 A. bulbiferum x oblongifolium +  
 A. oblongifolium x flaccidum ssp.  
 flaccidum +  
 Azolla filiculoides  
 Blechnum chambersii  
 B. discolor +  
 B. filiforme  
 B. fluviatile  
 B. membranaceum  
 B. minus  
 B. penna-marina + #  
 B. coler-soi + #  
 B. sp. (B. capense sensu Allan 1961)  
 Christella sp. ?adventive (long

Pseudopanax arboreus var. arboreus +  
 P. crassifolius +  
 Schefflera digitata  
 Weinmannia racemosa var. racemosa +

C. banksii x australis +  
 Rhopalostylis sapida +

C. robusta x propinqua  
 Geniostoma rupestre +  
 Hebe stricta var. stricta  
 Kunzea ericoides var. ericoides  
 Leptospermum scoparium +  
 Leucopogon fasciculatus  
 L. fraseri +  
 Lophomyrtus bullata +  
 Melicytus micranthus +  
 Pomaderris ericifolia  
 Solanum aviculare +

Tmesipteris elongata  
 T. lanceolata +

Deperia petersenii ssp. congrua  
 (incl. D. tenuifolia "frond forms")  
 Dicksonia fibrosa  
 D. squarrosa  
 Gleichenia microphylla ex  
 Histiopteris incisa  
 Hymenophyllum armstrongii + #  
 H. flabellatum +  
 H. flexuosum +  
 Hypolepis ambigua  
 H. distans  
 H. lactea +  
 H. rufobarbata +  
 H. ambigua x rufobarbata +  
 Lastreopsis glabella  
 L. hispida +  
 L. microsoria ssp. pentangularis  
 Paesia scaberula  
 Pellaea rotundifolia (incl. forms  
 approaching P. falcata but too  
 variable to assign to this species)  
 Pneumatopteris pennigera  
 Pteridium esculentum  
 Pteris macilentata  
 P. tremula

fronds, black stipes) +  
*Ctenopteris heterophylla* ex  
*Cyathea cunninghamii* +  
*C. dealbata*  
*C. medullaris*  
*C. smithii* +  
*Doodia media* ssp. *australis*  
*Diplazium australe*

Monocot lianes

*Freycinetia baueriana* ssp.  
*banksii* +

Dicot lianes

*Calystegia sepium* agg.  
*C. tuguriorum* +  
*Metrosideros diffusa*  
*M. perforata* +  
*Muehlenbeckia australis*  
*Fuchsia x colensoi*

Grasses

*Dichelachne crinita*  
*Ehrharta diplax*  
*E. stipoides*  
*Isachne globosa*

Rushes

*Juncus australis*  
*J. gregiflorus*  
*J. pallidus* +

Orchids

*Bulbophyllum pygmaeum* +  
*Corybas trilobus* +  
*Drymoanthus adversus*  
*Earina autumnalis* +

Sedges

*Baumea articulata*  
*B. rubiginosa*  
*B. teretifolia* +  
*B. tenax*  
*Carex breviculmis*  
*C. dissita*  
*C. forsteri* + #  
*C. lambertiana*  
*C. lessoniana*  
*C. fascicularis*  
*C. inversa*  
*C. maorica*  
*C. subdola*  
*C. secta* s.s.

*Polystichum richardii*  
*P. silvaticum* +  
*P. vestitum*  
*Phymatosorus diversifolius*  
*P. scandens*  
*Pyrrosia serpens*  
*Rumohra adiantiformis*  
*Trichomanes venosum*

*Ripogonum scandens* +

*F. perscandens* ex  
*Passiflora tetrandra* +  
*Parsonsia heterophylla* +  
*Rubus australis* +  
*R. schmidelioides* +

*Oplismenus hirtellus* ssp. *imbecillus*  
*Poa anceps* var. *anceps*  
*Rytidosperma unarede* +

*J. planifolius*  
*J. prismatocarpus*  
*J. sarophorus*

*E. mucronata*  
*Microtis uniflora*  
*Thelymitra longifolia*

*C. sp. geminata* agg. (cmn sp.; lvs  
 2 - 2.5 cm wide)

*Cyperus ustulatus*  
*Eleocharis acuta*  
*E. gracilis*  
*E. spaelata*  
*Gahnia setifolia* +  
*Gahnia xanthocarpa* +  
*Isolepis prolifer*  
*I. inundatus*  
*I. reticularis*  
*I. sp. (sulcatus* var. *distigmatus)*  
*Schoenus maschalinus*  
*Scirpus lacustris*

*C. virgata*

*Uncinia ferruginea*

*U. uncinata*

Monocot herbs (other than grasses, orchids, rushes & sedges)

*Astelia fragrans* + #

*Phormium tenax*

*A. grandis*

*Potamogeton cheesemanii*

*A. solandri* +

*P. ochreatus* +

*Collospermum hastatum* +

*P. suboblongus* +

*Dianella nigra* +

*Typha orientalis*

*Lemna minor*

*Sparganium subglobosum* +

Composite herbs

*Gnaphalium audax* s.s.

*Pseudognaphalium* sp.

*G. gymnocephalum*

(*P. luteo-album* agg; com form)

*G. involucratum*

*Senecio glomeratus*

*G. limosum* +

*S. hispidulus* +

*G. sphaericum*

*S. minimus*

*Lagenophora pumila*

*S. minimus* x *bipinnatisectus*

*S. quadridentatus* +

Dicot herbs (other than composites)

*Acaena novae-zelandiae*

*Haloragis erecta* ssp. *erecta*

*Callitriche muelleri*

*Hydrocotyle heteromeria*

*Cardimine debilis* +

*H. microphylla* (lvs mostly glab. cf.

*Epilobium alsinoides* + #

*H. sp. moschata* agg.) +

*E. chionanthum*

*H. moschata* s.s.

*E. pallidiflorum* +

*H. sp. moschata* agg. (undersurface

*E. pubens* +

of leaves glab.)

*E. nummularifolium*

*H. novae-zelandiae* s.s.

*E. rotundifolium*

*H. pterocarpa*

*Galium trilobum*

*Lilaeopsis lacustris* +

*G. sp.* (small leaves and fruits, confined to open sites or low peaty turf. Part of the *G. tenuicaule* complex) +

*Myriophyllum propinquum*

*Pratia angulata*

*P. perpusilla* +

*Gonocarpus micranthus*

*Urtica incisa* +

*Gratiola sexdentata* +

*Ranunculus amphitrica* +

*R. hirtus* +

*Stellaria parviflora* +

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