ECOLOGY AND FLORA OF MYSTERY HILLS, IANTHE FOREST, SOUTH WESTLAND

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INTRODUCTION

This article describes the key features of the 212 ha Mystery Hills area of Ianthe Forest, south Westland (centred on grid reference NZMS1 S64 195175). This area is Crown land managed by Timberlands West Coast Ltd. as part of their south Westland sustained yield forest management area. The National School of Forestry at the University of Canterbury has used this area of forest for teaching and research since the early 1980's. The Mystery Hills block is bounded to the south by Ianthe Road, and to the west, north and east by predominantly partially logged and clearfelled forest. Access is easiest from Ianthe Road (the road to Green's Beach), although the Mystery Hills area can be approached from Reserve Road to the north.

LANDFORMS AND SOILS

Three main landforms: outwash terraces, moraine ridges, and a central basin, dominate the area. Two prominent moraine ridges run approximately southeast-northwest, while a higher area of undulating moraine links them. A large basin draining to the northwest is located between the two moraine ridges. Outwash terrace is present along the southern edge of the area. The highest point is 130 m a.s.l. and the lowest 30 m a.s.l. The landforms present have resulted from advances of the Wanganui River glacier, and date from the latter part of the last (Otira) glaciation. The moraine ridges are thought to predate the last major period of glacial advance (>14 000 years old), but the outwash terrace is likely to have been formed at the time of this advance.

Soil distribution within the area is closely related to landform. On the level outwash terrace soils are mosaics of very poorly drained humic muck soils; poorly drained gley soils; and imperfectly drained gley-podzols. In contrast the soils of the steeply-sloping moraine ridges are well drained yellow-brown earths. On the crests of the moraine ridges, shallow podzol soils are present. On the high area of moraine in the southeast, the dissected landscape contains numerous catenary sequences of soils with relatively well drained podzols on the ridge crests trending to poorly drained gley soils in the gullies. The soils of the central basin are typically deep gley-podzols.

FOREST PATTERN

The vegetation pattern is closely related to both the soil and landform pattern and four main forest types can be recognised. The southern terrace area and around the upper part of the central basin is characterised by 'rimu forest' (cf. type ML1 of McKelvey 1984) with a high canopy dominated by rimu (*Dacrydium*

cupressinum) and lesser amounts of miro (*Prumnopitys ferruginea*). The subcanopy is dominated by kamahi (*Weinmannia racemosa*) and quintinia (*Quintinia acutifolia*). Other subcanopy species include pokaka (*Elaeocarpus hookerianus*), silver pine (*Lagarostrobos colensoi*), occasional southern rata (*Metrosideros umbellata*), and thin-barked totara (*Podocarpus hallii*). Several species including kamahi, quintinia, toro (*Myrsine salicina*), *Neomyrtus pedunculata*, *Coprosma* spp., pigeonwood (*Hedycarya arborea*), hutu (*Ascarina lucida*), and *Dicksonia squarrosa* are present in the understorey. A dense assemblage of bryophytes, often dominated by species of *Schistochila* and *Mniodendron* covers the forest floor. The dominant forest floor fern is *Blechnum procerum*. Considerable variation occurs in both the structure and floristics of this forest type as a result of stand replacement processes.

On the better drained moraine ridge slopes, 'rimu/kamahi-quintinia forest' (cf. type MF1 in McKelvey 1984) is present. The most obvious difference between this forest type and 'rimu forest' is in the density of rimu. Rimu has a density of about 200 spha (stems per ha) on the terrace, while only about 25 spha are present on the moraine ridge slopes. 'Rimu/kamahi-quintinia forest' has a canopy of angiosperm trees including kamahi, quintinia, hinau (*Elaeocarpus dentatus*), toro, pigeonwood, and lancewood (*Pseudopanax crassifolius*), with rimu and miro present as scattered emergents above this. A diverse range of subcanopy and shrub species occurs including kamahi, quintinia, putaputaweta (*Carpodetus serratus*), *Alseuosmia pusilla*, *Coprosma* spp, and both *Cyathea smithii* and *Dicksonia squarrosa*. *Cyathea smithii* tends to be more common on the lower 'toe' slopes, where the fern *Leptopteris superba* is also common. The percentage of bryophytes on the forest floor is low, but a dense cover of ferns, especially *Blechnum* "black-spot lowland", *B. discolor*, *Lastreopsis hispida* and *Sticherus cunninghamii* occurs. The climbing ratas, *Metrosideros fulgens* and *M. perforata*, are largely confined to this and the next forest type. 'Rimu/kamahi-quintinia forest' is the most widespread forest type in the area, and shows considerable variation in floristics and structure depending largely on landform. In particular, much denser stands of rimu occur on the large, undulating moraine in the east, and these forests have compositional and structural similarities to 'rimu forest'.

The third forest type occurs on the narrow crests of the two terminal moraine ridges. Here a 'southern rata-miro-rimu forest' (cf. type MF4 of McKelvey 1984) is present, being characterised by an approximately equal density of miro, southern rata and rimu. The lower tiers of the forest are similar to those described for the 'rimu/kamahi-quintinia forest', although the 'southern rata-miro-rimu forest' is often more open and the forest floor commonly free of plants. *Rumohra adiantiformis* is a common forest floor fern. While occupying only a relatively small area, this forest type is very distinctive.

The final forest type, 'rimu/southern rata-silver pine forest' (cf. type ML5 of McKelvey 1984), occurs in the gently sloping central basin, and grades back into 'rimu forest' with increasing slope angle. 'Rimu/southern rata-silver pine forest' is characterised by high densities of rimu and silver pine, and lesser amounts of southern rata. Kamahi and quintinia are still dominant subcanopy species, but a number of species uncommon in the other three forest types are also present. In some areas, manuka (*Leptospermum scoparium*) is the dominant shrub species

while the fern *Gleichenia microphylla* is common throughout this forest type. *Gahnia xanthocarpa* was recorded at several sites.

A small area of yellow-silver pine (*Lepidothamnus intermedius*) is present on a low knoll in the northwest part of the Mystery Hills block. This species is associated with stunted rimu and occasional southern rata and forms a minor but botanically significant forest type.

As with all vegetation, considerable variation in the structure and floristics of the main forest types occurs and intergrades between all four types are common. Natural regeneration processes within these forests have a pronounced influence on forest structure. Much of the variation in forest structure reflects different stages of stand replacement within the same forest type. The overriding factor influencing forest distribution is, however, landform. Landform appears to influence vegetation pattern through its influence on soil drainage, with 'rimu forest' on the very poorly drained terrace sites, and structurally and compositionally more diverse forests on the better drained moraine sites (Norton 1994, Norton & Adams in prep.). Landform also modifies disturbance regimes, which also influence forest composition and structure.

FLORA

A full list of the indigenous vascular flora is appended. In total 132 species of vascular plants have been recorded, of which 46 are pteridophytes, 8 conifers, 45 dicots, and 33 monocots. Two species uncommon in Westland, *Drymoanthus adversus* and *Hypolepis distans* are present. A distinctive feature of the Mystery Hills forests is the high percentage of pteridophytes (34.8 % of total vascular flora).

BIRDLIFE

Although no detailed bird surveys have been undertaken, a preliminary survey in 1986, coupled with general observations, suggests that a varied avifauna is present. Birds commonly seen include piwakawaka (*Rhipidura fuliginosa*), tomtit (*Petroica macrocephala*), grey warbler (*Gerygone igata*) and robin (*Petroica australis*) bellbirds (*Anthornis melanura*) are often heard. Other species seen or heard include chaffinch (*Fringilla coelebs*), silver-eye (*Zosterops lateralis*), brown creeper (*Mohoua novaeseelandiae*), blackbird (*Turdus merula*), kaka (*Nestor meridionalis*), kakariki (*Cyanoramphus auriceps*), and shining cuckoo (*Chrysococcyx lucidus*). This area is likely to be an important refuge for many bird species, because of the clearfelling of the surrounding forest.

SPECIAL FEATURES OF THE MYSTERY HILLS AREA

1. It is the only remaining area of largely unmodified forest in Ianthe Forest and contains examples of several forest types once widespread throughout this area.

2. Present in this area is an excellent example of soil and vegetation types across a range of landforms, typical of those occurring more widely in South Westland.

3. Four vascular plant species are of particular botanical significance:

   - Ianthe Forest is the southern limit for the common occurrence of toro (*Myrsine salicina*), a small tree in the forest subcanopy. This species is well represented in the Mystery Hills.

   - The only known lowland locality of yellow-silver pine (*Lepidothamnus intermedius*) between Okarito and Hokitika occurs here.

   - The uncommon fern *Hypolepis distans* is close to its known southern limit in Westland here.

   - The small perching orchid *Drymoanthus adversus* has been recorded from the canopy of a large windthrown miro. This species has been recorded only sporadically in the beech-free area of south Westland.

FUTURE

Timberlands West Coast Ltd. intend to include this area within their sustainable logging programme (James 1992), but have indicated that they are prepared to undertake this in full consultation with the School of Forestry. As a first step towards this, a group of final year undergraduate students at the School are developing a sustained-yield management plan for the Mystery Hills area as part of their course work. In preparing this management plan the students have been asked to ensure that their proposed harvesting level is low impact (probably helicopter logging) and to ensure that the ecological integrity of the forest is sustained.

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Indigenous vascular plants recorded in the Mystery Hills, Ianthe Forest

Nomenclature follows Druce (1992) unless otherwise indicated. Species for which herbarium vouchers have been collected and lodged at the University of Canterbury herbarium, CANU, are indicated by an asterisk.

Ferns and fern allies (46 species)

*Asplenium bulbiferum**
A. flaccidum
A. polyodon
*Blechnum discolor**
B. fluviatile
Bl. nigrum
B. procerum
B. vulcanicum
B. sp. "black-spot lowland"
(*B. capense* of Allan 1961)
Ctenopteris heterophylla
*Cyathea smithii**
*Dicksonia squarrosa**
Gleichenia microphylla
Grammitis billardierii
Histiopteris incisa
Hymenophyllum armstrongii
H. demissum
H. dilatatum
H. ferrugineum
H. flabellatum
H. flexuosum
H. lyallii
H. multifidum
H. rarum
H. revolutum
H. sanguinolentum
*Hypolepis distans**
*H. rufobarbata**
*Lastreopsis hispida**
Leptolepia novae-zelandiae
*Leptopteris superba**
Lindsaea trichomanoides
*Lycopodium ramulosum**
(cf. *L. laterale* in Druce)
L. varium
L. volubile
Phymatosorus pustulatus
(*P. diversifolius* of Allan 1961)
Pneumatopteris pennigera
Polystichum vestitum
Pyrrosia eleagnifolia
*Rumohra adiantiformis**
Sticherus cunninghamii
Tmesipteris elongata
T. tannensis
Trichomanes reniforme
T. strictum
T. venosum

Conifer trees and shrubs (8 species)

*Dacrycarpus dacrydioides**
*Dacrydium cupressinum**
*Lagarostrobos colensoi**
*Lepidothamnus intermedius**
Libocedrus bidwillii
Phyllocladus alpinus "lowland"
*Podocarpus hallii**
Prumnopitys ferruginea

Dicot trees and shrubs (35 species)

Alseuosmia pusilla
Aristotelia serrata
Ascarina lucida
Brachyglottis rotundifolia var. *"buchananii"*
(seedling only)
Carpodetus serratus
*Coprosma ciliata**
C. colensoi
*C. foetidissima**
*C. lucida**
*C. rhamnoides**
C. sp. *"tayloriae"**
(*C. parviflora* var. *dumosa* of Cheeseman 1906)
*Elaeocarpus dentatus**
*E. hookerianus**
Fuchsia excorticata
*Griselinia littoralis**
G. lucida
*Hedycarya arborea**
Leptospermum scoparium
Melicytus ramiflorus
*Metrosideros umbellata**
*Myrsine australis**
*M. divaricata**
*M. salicina**
Neomyrtus pedunculata
Olearia arborescens
O. ilicifolia (seedling only)
Pittosporum rigidum var. *"crassicaule"*
(*P. crassicaule* of Allan 1961)
Pseudopanax anomalus
*P. colensoi**
P. crassifolius
P. simplex
*Pseudowintera colorata**
Quintinia acutifolia
*Schefflera digitata**
*Weinmannia racemosa**

Dicot lianes (7 species)

Clematis paniculata
Metrosideros diffusa
*M. fulgens**
*M. perforata**
Parsonsia heterophylla
*Rubus australis**
R. cissoides

Dicot herbs (3 species)

Gonocarpus aggregatus
*Nertera depressa**
Nertera sp. 'forest"*
(aff. *Nertera dichondrifolia*)

Monocot lianes (2 species)

Freycinetia baueriana
*Ripogonum scandens**

Rushes, sedges and related plants (13 species)

Baumea tenax
Carex dissita
C. geminata
Gahnia xanthocarpa
Isolepis aucklandica
I. reticularis
Juncus novae-zelandiae
J. planifolius
Schoenus maschalinus
Uncinia gracilenta
*U. rupestris**
U. uncinata
U. zotovii

Grasses (2 species)

Cortaderia richardii
Microlaena avenacea

Orchids (9 species)

*Bulbophyllum pygmaeum**
*Chiloglottis cornuta**
Corybas acuminatus
C. oblongus
Dendrobium cunninghamii
*Drymoanthus adversus**
*Earina autumnalis**
E. mucronata
Pterostylis banksii

Other monocot herbs (7 species)

Astelia fragrans
A. nervosa
A. solandri
Dianella nigra
Libertia pulchella
Luzuriaga parviflora
Phormium tenax