

Edition 2 *From Forest to Fjaeldmark*

# The Vegetation Communities

**Macquarie Island vegetation**

*Pleurophyllum hookeri*



# Macquarie Island vegetation

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## General description

The vegetation mapping of Macquarie Island was prepared by P.M. Selkirk and D.A. Adamson in 1998 and is based on vegetation structure rather than community composition. Vegetation categories indicate foliage density and foliage height, similar to the scheme of Specht (Specht et al. 1995). Using Specht's classes, 'closed vegetation' equates to foliage projective cover >70%; and 'open vegetation' equates to foliage projective cover <70%. 'Tall vegetation' describes vegetation where the foliage stands higher than 0.4 to 0.5m above the ground, while 'short vegetation' has foliage <0.4m high. Seven structural vegetation types have been identified in the mapping of Macquarie Island vegetation. The mapping units often describe complex mosaics. Despite the fact that these mapping units have been defined on a structural classification system, the vegetation communities within them are readily identifiable.

A detailed account of the islands' flora and soils was published by Taylor in 1955. Taylor recognised five simplified vegetation formations.

There are 45 vascular plant species, of which 4 are endemic (with a further two weed species now thought to be extinct) on Macquarie Island. Mosses make up an important component of the flora, with over 79 species recorded. All the plant species have established on the island via long-distance dispersal – they are typically colonising species. Macquarie Island is geologically unique. It is the only location where geologically young oceanic crust is visible in-situ at

the surface and is part of its identified value as a World Heritage Area.

All of the vegetation of Macquarie Island is herbaceous, with no woody species present. Megaherbs are a distinctive and unique feature of the sub-Antarctic, occurring nowhere else in Tasmania. There are two megaherbs on Macquarie Island – *Stilbocarpa polaris* (Macquarie Island cabbage) and *Pleurophyllum hookeri*. In tall tussock grasslands dominated by *Poa foliosa*, there are often swathes of *Stilbocarpa polaris*.

The vegetation communities that make up the Coastal terrace mosaic are much more widespread than currently mapped. Components of this mosaic (mire, herbland, tall grassland, bryophytes, lakes, tarns and seal wallows) also occur on the south and east coasts. Short Tussock grassland/Rushland with herbs is presently widespread on the gentle slopes and flats of Macquarie Island. The present extent of the community is thought to be largely due to the significant impacts of rabbit and rodent grazing. This vegetation is likely to become less dominant as the tall tussock grasslands, ferns and megaherbs expand in the absence of rabbits and rodents.

The alpine mosaic of fjeldmark, open grassland, cushion moorland and open rocky slopes is distinctive and extensive on the windswept exposed plateau of Macquarie Island. The Cushion plant *Azorella macquariensis* and the cushion forming moss *Ditrichum strictum* dominate the vegetation. However, the composition and form of this community are changing in response to apparent

changes in climate and the extensive dieback that has occurred of the endangered *Azorella macquariensis* (Threatened Species Section 2012). This combination of events has often led to the replacement of dead *Azorella* cushions with *Agrostis magellanica* at drier sites and mosses at wetter sites (Visoiu & Whinam, unpubl. data).

The other communities present on Macquarie Island are Lichen lithosere (**ORO**), Sand, mud (**OSM**) and Water, sea (**OAQ**). There are extensive areas of penguin rookery on Macquarie Island which do not fit into TASVEG description for Rookery herbland (**SRH**) as they are entirely unvegetated. Similarly, extensive elephant seal wallows along the coast are unvegetated. Both should be mapped as **OSM**, although they are presently mapped within other vegetation polygons.

### General management issues

The most significant influence on the vegetation of Macquarie Island has been the impacts of rabbits and associated disturbance between the 1880's and 2011 (when the on-ground component of the Macquarie Island Pest Eradication Program commenced – PWS & BCB 2007). Rabbit numbers are estimated to have reached a peak of 150,000 in 1978-79 (Copson et al. 1981). This led to a direct decrease in the populations of palatable species while also contributing to large areas of slope disturbance and increased landslips (Scott 1988). Both megaherb species and *Poa* tussock are palatable to rabbits with populations substantially reduced as rabbit numbers increased (Copson & Whinam 1998). Rats are known to cache large amounts of *Pleurophyllum hookeri* seed (Shaw et al. 2005). It is anticipated that both the megaherbs and *Poa* tussock will rapidly increase in the absence of rabbits.

The dramatic decrease in rabbits and rodents since 2011 has already led to major increases in some (palatable) species. Less palatable species that are presently dominant in the landscape (such as *Agrostis magellanica* and *Acaena magellanica*) are likely to decline over time as the megaherbs and tussock increase in both extent and stature, outcompeting these adventitious species.

*Azorella* dieback has had a major impact on the endemic, endangered cushion plant, *Azorella macquariensis* (Threatened Species Section 2012). Climate change may also impact indirectly on

*Azorella macquariensis* through interspecies competition and interactions with plant diseases. Fjaldmark is the only vegetation community on Macquarie Island that is not currently showing significant adverse impacts of rabbit grazing. Rabbits occasionally 'scrape' the cushions but have not been observed to have major detrimental effects on *Azorella macquariensis*. Biosecurity has been identified as a major issue for sub-Antarctic islands, including Macquarie Island, especially with predicted changes in climate (Frenot et al. 2005).

### References and further reading

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## Key to the Macquarie Island vegetation

	Page
I Marine vegetation	
	<b>Kelp beds (QKB) 9</b>
I Terrestrial vegetation	
2 Vegetation cover greater than 70%	
3 Mosaic of low (< 0.5m) and tall (> 0.5m) vegetation on marine terraces	<b>Coastal terrace mosaic (QCT) 7</b>
3 Distinct expanse of uniform vegetation	
4 Tall vegetation (> 0.5m)	<b>Tall tussock grassland with megaherbs (QTT) 17</b>
4 Short vegetation (< 0.5m)	
5 Vegetation where the water table is below the surface, generally dominated by one, or a combination of <i>Agrostis magellanica</i> , <i>Acaena magellanica</i> and/or <i>Luzula crinita</i>	<b>Short tussock grassland/rushland with herbs (QST) 15</b>
5 Vegetation where the water table is at or above the surface	<b>Mire (QMI) 13</b>
2 Vegetation cover less than 70%	
3 Complex of patches of short and tall vegetation, interspersed with rock stacks, scree slopes and landslip scars on steep coastal slopes.	<b>Coastal slope complex (QCS) 5</b>
3 Sparsely vegetated areas on the Macquarie Island plateau where low dense growing plants occupy steps and rock interstices usually associated with extensive areas of gravel bed and exposed rock; moss and <i>Azorella macquariensis</i> cushions are common	<b>Macquarie alpine mosaic (QAM) 11</b>

## Coastal slope complex (QCS)

### General description

This is a geographically defined complex which is mapped extensively on the western and southern steep coastal slopes of Macquarie Island. Short, tall, open and closed vegetation is interspersed with active screes and rock stacks in this area.



South Mt Haswell. Geof Copson

### Example locality

Slopes east of Bauer Bay Hut, Macquarie Island.

### Distinguishing features and similar communities

The mapping of Coastal slope complex (QCS) is largely geographically defined. It comprises a complex of discrete patches of Tall tussock grassland with megaherbs (QTT), Short tussock grassland/rushland with herbs (QST), scree, rock stacks, landslide scars and some areas of Macquarie alpine mosaic (QAM).

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

QCS is mapped on the westerly and southerly facing coastal slopes of Macquarie Island.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

Coastal slope complex (QCS) occurs on the western and southern scarps of the Macquarie Island Plateau. Characteristically these landforms comprise steep slopes, cliffs and deeply incised gullies on a variety of geologies. Some areas of exposed substrate are highly mobile while in others the delicate peat mantle is subject to slipping and slumping, exacerbated by rabbit grazing and heavy rain events. Rocky outcrops occur regularly.

QCS is situated on exposed slopes that are subject to the full force of the prevailing weather. Upslope fog formation on these slopes is a frequent occurrence, often cloaking the vegetation for extended periods. Some areas of QCS are used for breeding by burrowing petrels and several species of albatross.

Rabbit and rodent disturbance are likely to have had a significant impact on this vegetation complex with development in the absence of these species being towards climax forms of vegetation such as Tall tussock grassland with megaherbs (QTT).

### **Successional pathway**

As for the constituent mapping units.

### **Vegetation composition and structure**

As a complex the vegetation composition and structure is similar to Tall tussock grassland with megaherbs (QTT) short tussock grassland/rushland with herbs (QST) and Macquarie alpine mosaic (QAM), depending on the locality.

### **Floristic communities known to occur in this mapping unit**

#### **The flora, vegetation and soils of Macquarie Island (Taylor 1955)**

Feldmark

Wet Tussock Grassland

Sub-glacial herbfield formation

#### **Serpentine, harzburgite, and vegetation on subantarctic Macquarie Island (Adamson et al 1993)**

Sparse vegetation on unfavourable soils

## Coastal terrace mosaic (QCT)

### General description

Fine scale mosaic of mire, herbland, tall grassland, bryophytes, lakes, tarns and seal wallows. Presently mapped only on wide marine terraces on the north-west and areas of the west coast of Macquarie Island.



Douglas Point. Geof Copson.

### Example localities

Mawson Point, Macquarie Island.

### Distinguishing features and similar communities

A structurally defined mosaic mapping unit defined by having greater than 70% vegetation cover with a fine scale mosaic of height classes between +/- prostrate mats and 1.5 m.

Mapping units that may be present in the mosaic are: Tall tussock grassland with megaherbs (QTT), Short tussock grassland/rushland with herbs (QST), Mire (QMI), Lichen lithosere (ORO) Sand/mud (OSM) and Water (OAQ).

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

QCT is confined to areas generally below 50 m altitude on coastal terraces. The present mapping extent is restricted to the north-western and western coasts of Macquarie Island however analogous vegetation is present in some areas of the east coast such as Lusitania Bay.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

Coastal terrace mosaic (QCT) occurs on exposed, poorly-drained, gentle slopes and flats on marine terraces, a landform which is characteristic of the western coast of Macquarie Island. In places this landform can extend inland as far as 1 km. These areas are highly exposed to marine influence with a fetch of > 5000 nautical miles. Faunal influence is significant with elephant seals modifying the vegetation and even landforms in some areas. Small royal penguin rookeries are also prevalent, with a range of other bird species nesting extensively in these areas.

### Successional pathway

As for the incorporated communities.

### Vegetation composition and structure

A fine scale mosaic of Tall tussock grassland with megaherbs (QTT), short tussock grassland/rushland with herbs (QST), Mire (QMI), Lichen lithosere (ORO) sand/mud (OSM) and Water (OAQ). The moss *Muelleriella crassifolia* often forms dense tufts on coastal rocks.

**Floristic communities known to occur in this mapping unit**

The following documented floristic communities are noted:

**The flora, vegetation and soils of Macquarie Island (Taylor 1955)**

Sub-glacial herbfield formation

Bog and Fen



## Kelp beds (QKB)

### General description

The eulittoral and sublittoral zone of rocky coastline of Macquarie Island where the vegetation is dominated by the circumpolar bull kelp species, *Durvillaea antarctica* (from high tide limit to more than 15 m depth) and *Macrocystis pyrifera* in deeper water.



Landing Beach. Micah Visoiu

### Example localities

Landing beach, Macquarie Island.

### Distinguishing features and similar communities

The only marine ecosystem that is mapped in TASVEG. QKB is dominated by a distinctive bull kelp.

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

Found on all areas of rocky coast on Macquarie Island between the intertidal zone and down to ~6 m depth.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

Rocky substrate on all aspect coasts of Macquarie Island. *Durvillaea antarctica* can survive in the surf zone and performs a significant function by reducing wave velocity and thereby protecting supralittoral communities. *Durvillaea antarctica* is a keystone species on which a range of marine organisms are heavily dependent. The very fast growth rates of this species make it an important primary producer.

### Successional pathway

This mapping unit is highly dynamic and includes many facies at different levels of establishment. Storm damage can clear large areas of QKB with re-establishment often vary rapid.

### Vegetation composition and structure

*Durvillaea antarctica* is a large macroalga that can attain lengths of up to 20 m. It provides protection where it occurs and allows the growth of a range of much smaller predominantly coralline red algae.

**Floristic communities known to occur in this mapping unit**

A comprehensive floristic analysis of this vegetation community has not been undertaken.

## Macquarie alpine mosaic (QAM)

### General description

A mosaic of fjaeldmark, fell field, open grassland, cushion moorland and open rocky slopes, often with alternating stripes of vegetation and bare ground on terraces, on the windswept exposed plateau of Macquarie Island.



Prion Lake, Mt Tulloch. Geof Copson

### Example localities

Southern slopes of Mt Tulloch, Macquarie Island

### Distinguishing features and similar communities

The high cover of rock and gravel that is often sorted via freeze-thaw action is characteristic of this mapping unit. Vegetation is confined to rock interstices or alternately on cross slope 'risers' with gravel forming the 'treads' of the stepped terraces. Where vegetation cover increases above 70% the resulting vegetation is mapped as short grassland/rushland with herbs (QST). These areas may be mapped as Lichen lithosere (ORO) where exposure has resulted in the vegetation almost disappearing from large areas.

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

Highly exposed areas of Macquarie Island.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

The mapping unit is confined to highly exposed, high altitude sites on Macquarie Island, generally above 200m asl. These areas are subjected to high frequency freeze-thaw cycles, continuous high to very high intensity winds and frequent occurrence of upslope fogs.

### Successional pathway

QAM is potentially climax vegetation with all successional pathways included in the same mapping unit.

### Vegetation composition and structure

Vegetation in these areas is generally low and compact with the most prevalent species being the endemic cushion plant *Azorella macquariensis*, the bolster forming moss *Ditrichum strictum* and turfs of *Racomitrium crispulum*, which contribute significantly to productivity and biomass. The grass *Agrostis magellanica* is usually present in and around the cushion forming species; the ferns *Grammitis poeppigiana* and *Hymenophyllum falklandicum* are also occasionally present. Vegetation cover can be below 10% or as high as 70%.

**Floristic communities known to occur in  
this mapping unit**

The flora, vegetation and soils of Macquarie Island  
(Taylor 1955)

Feldmark

Serpentinite, harzburgite, and vegetation on subantarctic  
Macquarie Island (Adamson et al 1993)

Sparse vegetation on unfavourable soils

## Mire (QMI)

### General description

Mire which includes bog and fen formations is short mat vegetation that is widespread on Macquarie Island in places where the water table is high and drainage restricted. It is presently only mapped where it occurs extensively on the plateau and in inland valleys, however smaller patches can be found across the island.



Valley north of Bauer Bay. Nic Fitzgerald

### Example locality

Green Gorge amphitheatre

### Distinguishing features and similar communities

This mapping unit has only been mapped where it occurs over large areas, however the community is wide-spread across the island. This is a short mat-forming community which occurs where the water table is at or near the surface. Vegetation cover is 100% and may be dominated by bryophytes with the vegetation layer often forming a fibrous blanket over very wet peat or water creating a quaking mire or 'featherbed'. QMI is present within Coastal terrace mosaic (QCT) and Coastal slope complex (QCS). Much of its extent has been mapped with Short tussock grassland/rushland with herbs (QST). It can be differentiated from QST by the prevalence of more mesophytic species such as *Juncus scheuchzerioides*, *Hydrocotyle nova-zeelandiae*, *Montia fontana* and very high moss cover.

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

Throughout Macquarie Island, however presently only mapped in its most extensive areas in inland valleys.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

QMI occurs in permanently saturated areas and infilled lakes, primarily on flats; however, it can occur on gentle slopes.

### Successional pathway

QMI is a relatively stable mapping unit which includes climax and early successional facies all of which would be included in QMI.

### Vegetation composition and structure

QMI is composed of a complete cover of low dense vegetation which includes a high proportion of moss, commonly *Breutelia pendula* and *Sanionia uncinatus*, and occasionally *Sphagnum falcatum*.

Dominant vascular species may be any of *Juncus scheuchzerioides*, *Hydrocotyle nova-zeelandiae*, *Montia fontana* and/or *Isolepis aucklandica*. Other less common species may include *Ranunculus crassipes*, *Callitriche antarctica*, *Pleurophyllum hookeri*, *Uncinia divaricata* and *Festuca contracta*. This is the habitat for the two most southerly orchids in the world, the endemic *Nematoceras dienemum* and *Nematoceras sulcatum*.

**Floristic communities known to occur in this mapping unit**

**The flora, vegetation and soils of Macquarie Island (Taylor 1955)**

Bog and fen

## Short tussock grassland/rushland with herbs (QST)

### General description

Short herbaceous vegetation with close to 100% cover and ranging from 0.2-0.5 m in height which presently occurs extensively on Macquarie Island, particularly on the plateau, in valleys and on gentler slopes.



North of Green Gorge. Nic Fitzgerald

### Example localities

Red River Valley, Macquarie Island

### Distinguishing features and similar communities

Distinguished from all other communities by the low structure and almost complete cover of rushes, grasses and herbs. This community generally occurs as extensive uniform cover.

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

Extensive on gentle slopes and valleys on Macquarie Island.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

Short Tussock grassland/rushland with herbs (QST) is presently one of the most wide-spread mapping units on Macquarie Island. It occurs extensively on gentle slopes and flats where the water table remains below the surface across the island. The present extent of the community is thought to be largely due to the significant impacts of rabbit and rodent grazing and disturbance between the 1880's and 2011 (when the Macquarie Island Pest Eradication Program commenced).

### Successional pathway

It is likely that the commoner facies of this mapping unit are disclimax communities and they will progress quite rapidly towards other communities, primarily Tall tussock grassland with megaherbs (QTT) in the absence of rabbit and rodent disturbance. In the absence of rabbit and rodent disturbance it is likely that QST will contract to landslip scars and exposed upper slopes and valleys.

## Vegetation composition and structure

QST is dominated by one or more of *Agrostis magellanica*, *Acaena magellanica* and or *Luzula crinita*. Other larger species may include *Uncinia* species, *Poa annua*, *Festuca contracta*, *Deschampsia chapmanii* and *Pleurophyllum hookeri*. Small herbs can be common in areas where there has been ground disturbance with *Epilobium brunnescens*, *E. pedunculare*, *Cardamine corymbosa* and *Montia fontana* usually present. Bryophytes, such as *Hypnum cupressiforme*, *Breutelia pendula* and *Syntrichia rubra*, are often common.

The most common facies of QST is dominated by a combination of *Agrostis magellanica* and *Luzula crinita* with a range of lesser species. In other areas *Acaena magellanica* can form more or less monospecific stands which can extend over several hectares in size.

Seedlings of the megaherbs *Pleurophyllum hookeri*, *Stilbocarpa polaris* and the large tussock grass *Poa foliosa* can be common. In the absence of grazing these species are likely to establish and succeed to QTT.

## Floristic communities known to occur in this mapping unit

### The flora, vegetation and soils of Macquarie Island (Taylor 1955)

Sub-glacial herbfield formation



## Tall tussock grassland with megaherbs (QTT)

### General description

Tall dense growth of *Poa foliosa* and/or *Stilbocarpa polaris* which has its greatest expression on steep easterly facing coastal slopes of Macquarie Island.



Slopes south of ANARE Station. Geof Copson.

### Example localities

Razorback Hill, just south of ANARE station, Macquarie Island

### Distinguishing features and similar communities

Tall tussock grassland with megaherbs (QTT) is easily distinguishable by the dominance of either large tussocks of *Poa foliosa* or swathes of *Stilbocarpa polaris*, or a combination of the two. These two species both individually or combined form a tall (1-1.5 m) closed vegetation community with nearly total cover. QTT in the current mapping has only been mapped on the eastern slopes of Macquarie Island however it is a component of both Coastal slope complex (QCS) and Coastal terrace mosaic (QCT).

### RFA mapping unit

Not covered by RFA mapping.

### Distribution

QTT occurs most extensively on easterly facing steeper slopes with present mapping extent restricted to these areas. Smaller patches of analogous vegetation are, however, also widespread on western facing coastal terraces and westerly facing slopes.



### Bioregional occurrence

SAI.

### Site characteristics, habitat and ecology

The community occurs on steep coastal slopes and lower lying areas with good drainage. In recent years de-vegetation by rabbit grazing has caused extensive landslips in some areas, significantly reducing the area of this mapping unit.

### Successional pathway

QTT is a climax community. It is expected that in the absence of high levels of disturbance large areas of short tussock grassland/rushland with herbs (QST) will progress towards QTT.

### **Vegetation composition and structure**

*Poa foliosa* and *Stilbocarpa polaris* are the defining species with nearly total cover composed of a combination of both, or by a single species. Very few plant species occur as understorey components of dense *Stilbocarpa polaris* stands on coastal slopes. However, small herbs can occur sparsely when the canopy is less dense, with *Cardamine corymbosa*, *Poa annua*, or *Epilobium* spp. occasional. Bryophytes can be significant; however terrestrial algae, litter and bare ground are most common.

### **Floristic communities known to occur in this mapping unit**

The flora, vegetation and soils of Macquarie Island  
(Taylor 1955)

Wet Tussock Grassland