https://doi.org/10.26749/rstpp.111.1.55

NATIVE VEGETATION OF THE WEST COAST REGION OF TASMANIA

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ABSTRACT

The native vegetation of the West Coast consists of alpine heaths and herbfields, closed-forests dominated mainly by *Nothofagus* and *Athrotaxis*, open communities dominated by *Eucalyptus*, and scrub, heath, sedgeland and herbland in which the main species belong to the Myrtaceae, Epacridaceae, Cyperaceae and Restionaceae. The species composition of the alpine and closed-forest communities is strongly influenced by fire history, as is the relative distribution of the closed-forest and more fire-resistant communities. Edaphic conditions, particularly drainage, play an important role in the spatial differentiation of the vegetation of the region.

INTRODUCTION

The environment of the western part of Tasmania contrasts vividly with both the environment of eastern Tasmania and the continent of Australia, not least in its vegetation which resembles more closely that of the South Island of New Zealand and southern Chile than that of the remainder of Australia. Yet, while the vascular plant species of the region are reasonably well-known, their patterns of distribution and aggregation and the environmental factors and processes effecting these have been little studied. The major contribution to our understanding of the vegetation of the west of the state has come from Jackson (1965, 1968) who formulated a model of the probabilistic interactions of vegetation and environment. Other studies have concerned themselves with the ecotone between the ash (*Eucalyptus regnans, E. delegatensis* and *E. obliqua*) tall open-forests of the east and the closed-forest (temperate rainforest) of the west (Cremer and Mount 1965; Gilbert 1959, 1960), or with the vegetation of small areas (Gibbs 1921; Sutton 1929; Davis 1941; MacPhail and Shepherd 1973; Kirkpatrick 1975a).

This paper provides a description of the vegetation of that part of western Tasmania between the Pieman and Gordon Rivers and bounded inland by a north-south line following the trend of the King River (fig. 7). This region has a precipitation range from 1250 mm p.a. to over 3500 mm p.a. including the station with the highest mean annual rainfall in the state, and an altitudinal range from sealevel of 1274 metres. The vegetation of this area has been briefly described by Casson (1952) in the larger context of forestry prospects. However, this paper is based on vegetation data gained from 213 sample areas in the West Coast Range in 1973-4 and notes on the vegetation of the remainder of the study area made during other visits, rather than on the limited literature directly relevant to the vegetation of the region (Gibbs 1921; Casson 1952; Jackson 1968; Kirkpatrick 1975a). Nomenclature of plant species follows Curtis (1963, 1967), Curtis and Morris (1975), Willis (1970) and Wakefield (1975) except where authorities are given, and structural nomenclature follows Specht (1970). To facilitate description of the plant communities the vegetation of the region is divided into four partially overlapping sets: alpine, rainforest, eucalypt-dominated and shrub and herb-dominated. The gross community range of native species known to occur in the region is shown in the Appendix. This list can be expected to be far from complete.

West coast vegetation

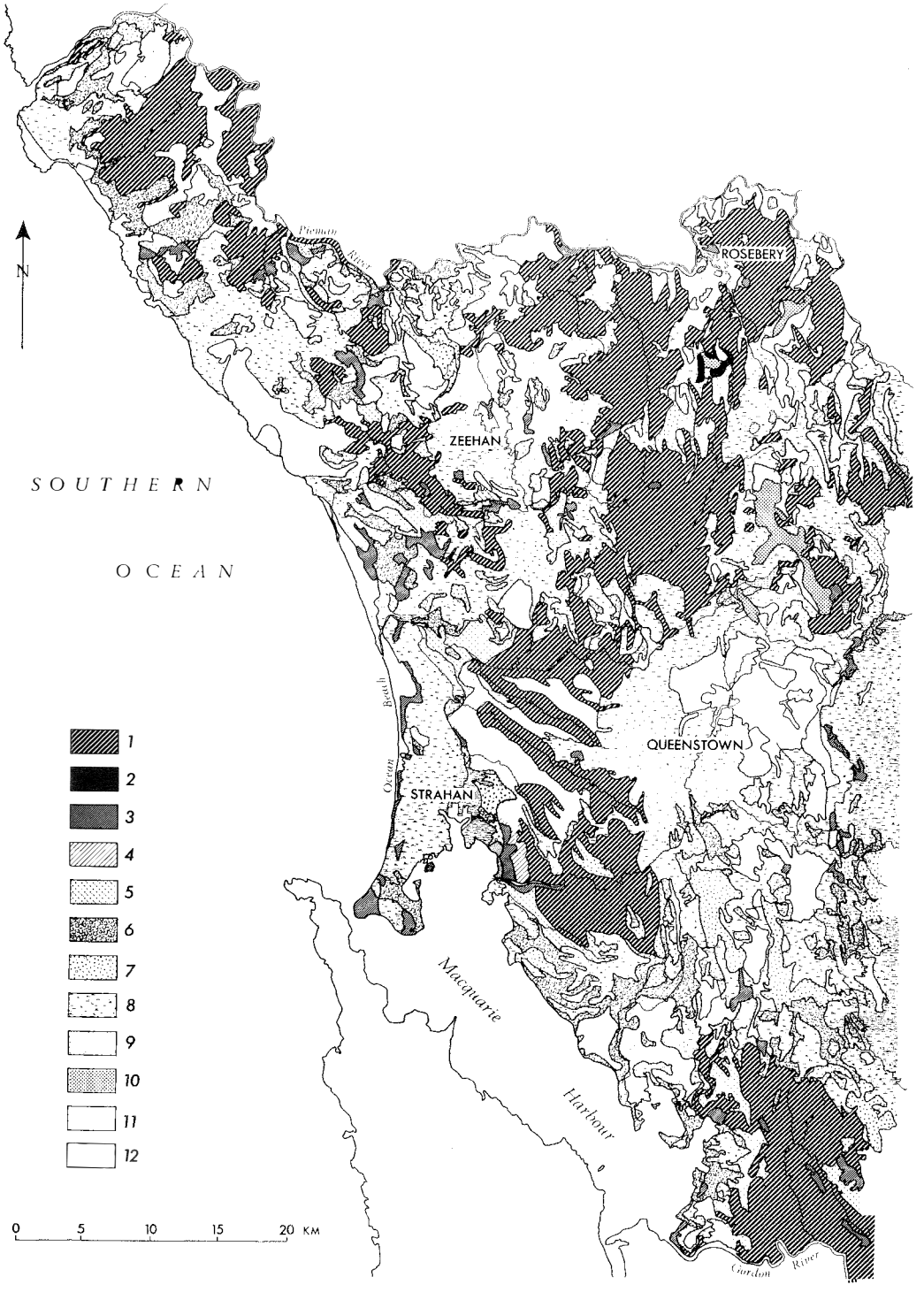


FIG. 7 - The vegetation map is based on interpretation of the 1953 King-Franklin and the 1956 Pieman panchromatic aerial photographs. Structural and floristic characteristics of the vegetation that can be distinguished on these photographs have been used to define mapping categories and boundaries. The major characteristics of each mapping unit are described below:

1. Large-crowned rainforest largely consisting of *Nothofagus cunninghamii* closed-forest and *Athrotaxis selaginoides-N. cunninghamii* closed-forest. This unit includes tall closed-forest, closed-forest and low closed-forest dominated by species that do not readily recover from fire. *A. selaginoides-N. cunninghamii* closed-forest could not be readily distinguished from *N. cunninghamii* closed-forest, but occurs mainly in the rainforests mapped between Queenstown and Rosebery, with a small outlier at low altitude in the large rainforest to the north of the Gordon River. Restricted areas dominated by *Dacrydium*, *Phyllocladus* and *Eucryphia lucida* are included within this unit.

2. Small-crowned high altitude rainforest largely consisting of *Athrotaxis selaginoides-Nothofagus gunnii* low closed-forest. This unit also includes a small area of *Athrotaxis cupressoides-N. gunnii* low closed forest.

3. Closed-scrub. This unit includes areas dominated by *Acacia mucronata*, *A. melanoxylon*, *A. dealbata*, *Phebalium squameum*, *Leptospermum lanigerum*, *L. scoparium*, *L. nitidum*, *Melaleuca ericifolia* and *M. squarrosa* and variable mixtures of these species. *L. lanigerum* and *M. ericifolia* form almost pure stands in coastal areas, while the other species occur mixed further inland. The unit also includes burnt rainforest in which the tree species are regenerating beneath closed-scrub and rainforest which has been temporarily converted to sedgeland.

4. Closed-scrub and *N. cunninghamii* closed-forest. In the areas mapped in this unit there is an intimate mosaic of closed-scrub and closed-forest with the closed-forest usually occuring in valleys.

5. Mixed forest. This unit includes areas where eucalypts are sparsely emergent from a closed-forest understory.

6. *Eucalyptus* forest. This unit includes tall open-forest, open-forest and low open-forest dominated mainly by *E. nitida*.

7. *Eucalyptus* woodland. This unit includes woodland, low woodland, open-woodland and low open-woodland largely dominated by *E. nitida*, with an understory of heath or sedgeland.

8. Closed-sedgeland and closed-heath. This unit is highly heterogeneous in dominant lifeform. It includes large areas of closed-sedgeland dominated by *Gymnoschoenus*, and the eucalypt-dotted heaths on Holocene sands behind Ocean Beach, as well as communities dominated by *Leptocarpus tenax*, *Diplarrena moraea* and *Gleichenia dicarpa* that are not strictly either heath or sedgeland.

9. Sedgeland and open-heath. This unit includes much of the heathy sedgeland referred to in the body of the paper. It also includes the heathlands to the north of Trial Harbour. Areas of tall and low shrubland around Queenstown fall within this unit.

10. Alpine vegetation. This includes the wide variety of communities outlined in the body of the paper.

11. Cleared land. This unit includes only land cleared for agriculture or grazing.

12. Bare. This unit includes sand-dunes and areas bereft of vegetation as a result of mining and smelting activities.

PLATE 6. - Unburnt alpine vegetation on the Tyndall Plateau. A complex of fernland, rushland, sedgeland and coniferous heath is visible in the foreground. *Athrotaxis cupressoides* and *A. selaginoides* dominate the woodland and heath in the background.

PLATE 7. - A previously burnt area on the Tyndall Plateau. The dense, low community growing on the flats in the foreground is dominated by *Calorophus lateriflorus*, *Restio complanatus*, *Oreobolus pumilio* and *Donatia*. The open-heath in the background is dominated by *Richea*, *Orites* and *Olearia*.

ALPINE VEGETATION

The tree line on most Tasmanian mountains appears to be more a product of impeded drainage and exposure to strong, often ice-bearing, winds than of temperature decline with altitude. In the West Coast Range, wherever fire has not obscured the altitudinal sequence and where slopes are steep enough to avoid the inhibiting effects of poor drainage and cold air accumulation on the growth of tree species, the dominants of the high altitude closed-forest persist as the dominants in the closed-scrub and closed-heath to the top of the highest peaks. Thus, the tree line can only be defined arbitrarily by the height of the dominants and is a point within a continuum of structural variation. However, the alpine areas are clearly recognizable, once beyond their somewhat diffuse boundaries, by their generally treeless nature and the species composition of their vegetation. Above 1030 m above sealevel, only alpine vegetation can be found. Between 850 m and 1030 m the proportion of alpine vegetation increases from close to zero to one hundred per cent. The low altitude of alpine vegetation on the west coast when compared with Mt. Wellington and Ben Lomond on the east coast may be related to the depression of summer temperatures resulting from the cloudiness of the climate and the close windward proximity of the temperature-ameliorating Southern Ocean. However, the low altitude of alpine vegetation on the Tyndall and Sedgwick Plateaus may also result from their exposure and the shallowness of the soils formed since the Last Glacial when both areas were heavily eroded by ice.

The greater part of the alpine area of the west coast has been burnt since white settlement and the resulting plant communities bear little resemblance to those found in the unburnt areas such as the Tyndall Plateau and some small parts of Mt. Murchison, Mt. Read and the Sedgwick Plateau. These unburnt areas carry a vegetation in which a virtually continuous variation in floristic composition and structure can be closely related to drainage conditions and exposure (plates 6, 8). A community in which the bolster plants form a prominent, but seldom dominant component covers a large proportion of the remaining unburnt alpine areas. This community resembles closely the vegetation of the Owen conglomerate plateau below Cradle Mountain described by

Sutton (1928), and occurs in a closely similar environment on the Tyndall Plateau and Mt. Murchison, although it also occurs on the slightly more fertile soils formed on the Mt. Read volcanics.

PLATE 8. - *Athrotaxis selaginoides-Nothofagus gunnii* woodland behind a rocky scarp on the Tyndall Plateau. *Astelia, Donatia, Michrocachrys* and *Epacris serpyllifolia* dominate the closed-heath in the foreground. A belt of *Diselma archeri* separates the heath from the woodland.

The community consists of a tightly knit mosaic of bolster plants, dwarf conifers, sclerophyll shrubs and herbs. *Donatia novae-zelandiae* accounts for over 90% of the bolster plants, with minor admixtures of *Ewartia meredithae, Pterygopappus lawrencii, Mitrasacme archeri* and *Dracophyllum minimum* in declining order of importance. *Oreobolus pumilio*, the dwarf form of *Calorophus lateriflorus*, miniature *Sprengelia incarnata, Drosera arcturi, Helichrysum milliganii, Erigeron stellulatus* and *Euphrasia hookeri* are the most prominent of the many species whose colonization makes the bolster plants micro-communities. The bolster plants are usually over-ridden by the prostrate gymnosperm *Michrocachrys tetragona*, and the interstices between the bolsters are variously dominated by *Oreobolus pumilio, Pentachondra pumila, Epacris serpyllifolia, Diselma archeri, Microcachrys, Isophysis tasmanica, Dracophyllum milliganii*, dwarf *Restio complanatus*, and mats of dwarf *Calorophus*.

In the West Coast Range there is no evidence of the cyclic successional process initiated by blockage of drainage by bolsters suggested by Martin (1940) for Mt. Wellington and Jackson (1973) for the Central Plateau. The shallowness of the soils, which consist mainly of the remains of previous plant generations, the weathering resistent Owen conglomerate substrate, the extremely high precipitation and the gentle slopes on which the bolster plants are found appear to have resulted in an essentially stable community in the absence of fire.

The community occupying better-drained and usually slightly more broken surfaces, including morainic deposits, maintains a strong gymnosperm component, while losing the bolster plants. The community varies from an open to closed-heath consisting in the tallest layer of a variable mixture of krumholtz *Athrotaxis selaginoides, Diselma archeri, Richea scoparia, Archeria serpyllifolia, Orites milliganii, Nothofagus gunnii* and *Epacris serpyllifolia*. *Drimys lanceolata* occurs ubiquitously beneath the taller shrubs or in sheltered cracks between rocks. The often extensive spaces between the taller shrubs are occupied most characteristically by the prostrate shrubs *Microcachrys, Cyathodes petiolaris, Pentachondra pumila, Leucopogon milliganii, Exocarpos humifusus* and *Richea sprengeloides*, mat-forming herbs such as *Oreobolus pumilio, Astelia alpina*, and *Isophysis tasmanica*, rosette plants including *Actinotus moorei, Helichrysum pumilum, Erigeron stellulatus, Gentianella diemensis* and *Celmisia longifolia*, all interspersed and intermingled with an often spectacular crust of lichen.

On bouldery areas with moderate to steep slopes and a consistent water supply, *Nothofagus gunnii*, often espalier in form, dominates a closed-heath. The deciduous beech is most commonly mixed with *Richea scoparia, Drimys lanceolata*, again hiding under the shelter of the taller shrubs, *Diselma archeri*, krumholtz *Athrotaxis*

selaginoides or *A. cupressoides* (plate 6) depending on the situation of the stand, *Orites milliganii*, *Trochocarpa gunnii*, *Archeria serpyllifolia* and *Olearia alpina*. The most frequent species in the usually sparse ground layer are *Astelia* and *Carpha alpina*.

On the exposed and well-insolated scree slopes and boulder streams another prostrate gymnosperm, *Podocarpus lawrencii*, dominates, smothering rocky surfaces from the base of its footholds in crevices between rocks. The characteristic associates of *Podocarpus* in the West Coast Range include *Olearia pinifolia*, *O. ledifolia*, *Archeria serpyllifolia*, *Orites milliganii*, *Drimys* and *Nothofagus gunnii* in boulder streams, and *Richea sprengeloides* and *Carpha alpina* on scree slopes.

The unburnt alpine vegetation usually forms a complete cover over all but the largest boulders, the main exception being the fjaeldmark community found in a few of the high altitude wind-gaps. Here the vegetation forms stripes parallel to the prevailing wind direction, their location being controlled by the location of large relatively stable boulders. Similar control of vegetation form by the location of boulders can be seen on the lower plateaus, suggesting that the low stature of the bolster plant and dwarf pine-dominated community may be partially due to abrasion of the vegetation by wind-transported ice particles and/or the transpiration stress induced by exposure to strong winds.

Firing of the alpine vegetation results in complete elimination of the fire-sensitive gymnosperms and *Nothofagus gunnii*, in an immediate conversion of shrub-dominated communities to herb-dominated communities, and in the creation of much bare ground which is only slowly recolonized because of the effects of needle ice formation and frost-heaving on the root systems of germinates.

The cushion plant-dwarf pine dominated closed-heath on the Mt. Read volcanics is converted by fire into an open-grassland dominated by *Microlaena tasmanica*, *Astelia alpina*, and *Helichrysum milliganii* with an occasional small shrub of *Epacris serpyllifolia*, and small mats of *Bauera rubioides*. In slightly better drained areas on the same substrate, the herbaceous species mentioned above are still prominent, but there is also considerable regeneration of the shrub species *Coprosma nitida*, *Cyathodes petiolaris*, *Olearia alpina*, *Richea scoparia* and *Olearia ledifolia*. *Nothofagus gunnii* heath on the volcanics is replaced by a herbaceous sward dominated by *Carpha alpina*, *Microlaena tasmanica*, *Calorophus* and *Astelia alpina* in order of importance, with regeneration of *Richea scoparia*, *Drimys* and *Olearia pinifolia* providing a sparse shrub layer.

Although the gymnosperms and deciduous beech are totally eliminated by fire, the bolster plants have survived recent fires in some situations on the Sedgwick Plateau, Mt. Murchison and Mt. Read. However, surviving plants seem to be confined to ill-drained areas with deeper soils than is the norm for their occurrence in unfired areas. *Microlaena tasmanica* is not an important colonizer of burnt cushion plant-dwarf pine heaths on the Owen Conglomerate, where *Astelia*, *Calorophus*, *Gleichenia alpina* and *Restio complanatus* become prominent. In better-drained areas on the same substrate the shrub species found widely in burnt areas include *Pentachondra pumila*, *Epacris serpyllifolia*, *Coprosma nitida*, *Cyathodes petiolaris*, *Richea scoparia*, *R. milliganii*, *Helichrysum backhousei*, *Drimys*, *Leucopogon milliganii*, *Eucalyptus vernicosa*, and, in the lower alpine country, *Leptospermum nitidum*. There is usually a rich herbaceous flora including *Astelia*, *Oreobolus pumilio*, *O. acutifolius*, *Rubus gunnianus*, *Dislapsis cordifolia*, *Gentianella diemensis*, *Erigeron pappachroma*, *E. stellulatus*, *Celmisia longifolia*, *Carpha alpina*, and *Helichrysum milliganii*. The alpine vegetation burnt since white settlement varies enormously in shrub and herb cover and dominance. Part of this variation is undoubtedly the result of variation in the period elapsed since the last fire, and the frequency and intensity of firing. The variation in vegetation resulting from different fire histories makes it somewhat difficult to

recognise and describe variation related to drainage and exposure. However, the vegetation that replaces a previously unburnt alpine community is predominantly composed of species present in that community with the addition of several, usually herbaceous, invaders from either lower altitudes or better-drained sites. The invasion of sedgeland species is particularly marked in the low altitude alpine areas such as the Sedgwick Plateau where even *Gymnoschoenus* has gained a foothold, perhaps indicating a response to a deterioration in soil conditions following fire.

RAINFOREST

The Tasmanian temperate rainforests attain their maximum diversity in the West Coast region, but even here occupy only a relatively small proportion of the total area (fig. 7). The typical structural form is closed-forest dominated by *Nothofagus cunninghamii* or *Athrotaxis*, which seldom exceeds 40 m in height, the height of the closed canopy more typically being 10-30 m. However, there is considerable floristic and structural variation within even those closed-forests showing no evidence of being subject in the past to the ravages of fire. This variation is continuous where the rainforest extends through the environmental gradients associated with both altitude and variation in topography.

The rainforest occupying well-drained sites with reasonably fertile and deep soils below 620 m a.s.l. is a tall closed-forest of simple structure and low species diversity. *Nothofagus cunninghamii* is almost totally dominant in a tree layer of almost uniform height, being mixed with an occasional *Atherosperma moschatum*. Mosses and a few ferns carpet decaying logs, the soil surface and the trunks of trees. Only the boles of trees and an occasional umbrella-like *Dicksonia antarctica* impede the view through the green dankness and gloom of the forest beneath the canopy.

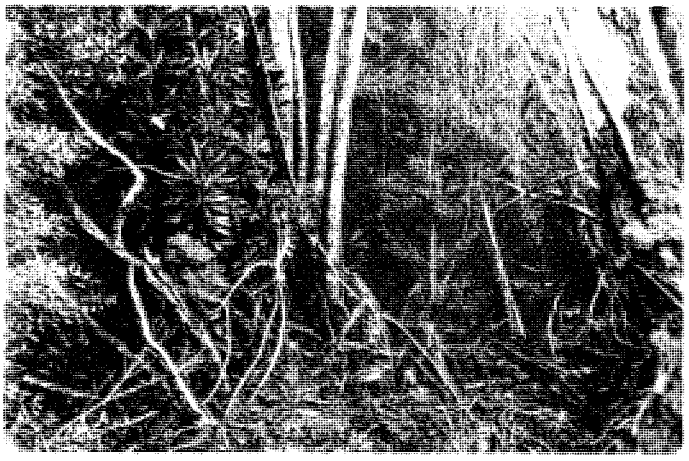
With a decrease in site quality the forest becomes less tall, the canopy slightly more broken, the dominance of *N. cunninghamii* not quite as absolute, and a number of higher plants appear in a previously absent shrub layer. *N. cunninghamii* shares the tree layer with *Eucryphia lucida*, *Phyllocladus asplenifolius* and *Atherosperma*. The diffuse shrubs found in the understory are restricted in number, most notably the broad and glossy-leaved *Anopterus glandulosus* and the epacrid *Archeria eriocarpa*.

With a further decrease in site quality below approximately 610 m a.s.l. the *N. cunninghamii* rainforest decreases further in stature, becomes much more species rich, and the relatively open forest floor progresses into a tangled and twisted mass of stems of trees and shrubs (plate 9). These include those mentioned in the previous paragraph, the notorious *Anodopetalum biglandulosum* which can join the tree layer (plate 9), the shrubs *Cyathodes juniperina*, *Agastachys odorata*, *Cenarrhenes nitida* and *Trochocarpa cunninghamii*, the climbing heath *Prionotes cerinthoides*, the palm-like epacrid *Richea pandanifolia*, and the sedge *Gahnia grandis*.

N. cunninghamii can also be found in mixture with *Dacrydium franklinii*, the Huon pine, near streams and on alluvial flats, generally at low altitudes. The best development of this association, in which *Dacrydium* is usually the subordinate partner, was found before logging along the rivers flowing into Macquarie Harbour, although it is also found on the lower Pieman River, and gains an altitude of 670 m near Lake Margaret. *Acradenia franklinii*, a small tree of restricted range is found in similar situations to *Dacrydium*.

Above approximately 610 m a.s.l. *Athrotaxis selaginoides* (King Billy pine) becomes an important component of the tree layer of the rainforest. It seldom accounts for more than thirty per cent of the cover in the tallest stratum, but is generally taller than the associated species such as *N. cunninghamii*, *Atherosperma*, *Phyllocladus* and *Eucryphia lucida* (plate 9). Where *A. selaginoides* dominates tall closed-forest it is

West coast vegetation



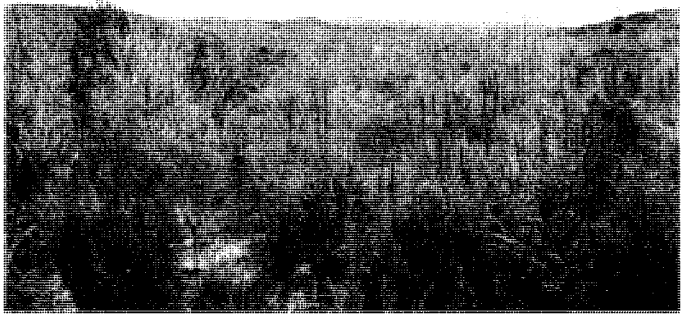


PLATE 9. - Low closed-forest dominated by *Nothofagus cunninghamii* and *Anodopetalum biglandulosum* (top left); the interior of *Athrotaxis selaginoides-Nothofagus cunninghamii* closed-forest (top right); *Athrotaxis selaginoides-Nothofagus cunninghamii* closed-forest (middle right); a former *A. selaginoides-N. cunninghamii* low closed-forest. The standing dead tree is *Athrotaxis*. *Leptospermum nitidum* and *Gahnia grandis* dominate the present vegetation (bottom left); *Gahnia grandis* tussock sedgeland on a site formerly occupied by rainforest (bottom right).

often forked in habit, and other tree species such as *Phyllocladus* can occasionally establish themselves epiphytically in the junction of the two major branches.

The tall closed-forest dominated by *A. selaginoides* grades into closed-forest and then low closed-forest with increases in altitude and exposure. This decrease in stature is associated with an equally gradual increase in the diversity of higher plants. The species found in *N. cunninghamii*-dominated rainforest on the poorest sites are also found in the *A. selaginoides-N. cunninghamii* dominated rainforests, but are joined increasingly by others above approximately 670 m. Most notably *Nothofagus gunnii* becomes the most important associate of *Athrotaxis*, although *N. cunninghamii* persists to all but the highest altitudes, and *Eucryphia milliganii* replaces *E. lucida*. Shrub species such as *Telopea truncata*, *Drimys* and *Coprosma nitida* increase the diversity of the high altitude closed-forest.

A. selaginoides-N. gunnii rainforest is also found at altitudes as low as 520 m where there is a combination of deep moraine deposits and impeded drainage, suggesting that *N. gunnii* may have a competitive advantage over *N. cunninghamii* in severe environments, apart from those associated with high altitudes. Extreme fire sensitivity probably explains the restricted range of *N. gunnii* better than inability to occupy low altitude sites, although its moisture requirements might be greater than those of *N. cunninghamii*, judging on its absence from *Athrotaxis*-dominated communities over most of the Central Plateau (Jackson 1973).

The *A. selaginoides-N. gunnii* closed-forest grades into the *A. selaginoides-N. gunnii* closed-heath described earlier, but a structurally distinct vegetation dominated by *Athrotaxis* that could either be considered as rainforest or alpine vegetation also occurs at high altitudes in topographically sheltered positions. This is an open-forest or woodland in which the tallest stratum consists either totally of *A. selaginoides* or *A. cupressoides* (plates 6 and 8). *A. cupressoides* dominates on stream flats or lake banks, and is underlain by a sporadic shrub layer dominated by *Eucryphia milliganii*, *Richea scoparia*, *Diselma*, *N. gunnii* and *N. cunninghamii*, which is in turn underlain by a herbaceous mat dominated by *Calorophus lateriflorus*, *Astelia alpina*, *Bauera rubioides* and *Carpha alpina*. *A. cupressoides* also dominates low closed-forest near lakes and streams on the clay soils formed on the Mt. Read volcanics, on which the more open community is lacking. The *A. selaginoides* open-forest occurs on steep rocky slopes, and *N. gunnii* dominates the understory with other alpine shrubs such as *Epacris serpyllifolia*, *Archeria serpyllifolia* and *Persoonia gunnii*. Occasional trees referable to *Athrotaxis laxifolia*, exhibiting the intermediacy, variability and segregation typical of hybrids, are found wherever *A. selaginoides* and *A. cupressoides* occur in close proximity.

The rainforest appears to be a stable vegetation type within which the deaths of individual plants of particular species are compensated by the growth of individuals of the same species. Seedlings and saplings of all species can be found in undisturbed forest, even where the canopy is extremely dense. The effects of fire on the rainforests of the west coast are almost uniformly disastrous. The closed canopy of the rainforest, the low inflammability of the foliage of the rainforest species, the lack of a dense ground layer and the almost constantly humid beneath canopy microclimate

prevent most fires from penetrating far into the rainforest. However, periods of several weeks without rain in the height of summer dry the rainforest sufficiently to allow the penetration of creeping fires which consume the litter layer, ringbark trees at their bases, and which may occasionally burst into crown fires, especially in the rainforest on poor quality sites with its low canopy and relatively high biomass near ground level. The longterm impact of a single low intensity fire in rainforest varies with site and species composition. Among the tree species *Athrotaxis*, *Phyllocladus* and *N. gunnii* are invariably killed (plate 9) and regenerate in only a restricted range of circumstances. *Phyllocladus* is the only one of these species found at all widely in areas that have been subjected to burning, possibly because it is dispersed by birds. *Athrotaxis* regenerates reasonably well near the boundaries of burns where the boundaries are contiguous with unburnt trees, its dispersal range appearing to be no greater than 50 m in normal circumstances. There is also a possibility that *Athrotaxis* may regenerate where a low intensity fire immediately precedes the period of seed shed. *N. cunninghamii* and *Anodopetalum* coppice readily after fire in the high altitude rainforests. *N. cunninghamii* has survived two fires within thirty years in the large cirque basin on Mt. Murchison almost purely through vegetative recovery. However, recovery of *N. cunninghamii* through coppicing after fire appears not to be common in rainforests at medium and low elevations, although seedling regrowth can be prolific.

While a single low intensity fire can convert high altitude closed-forest dominated by *Athrotaxis* and *N. gunnii* into a *N. cunninghamii* shrubland, the major immediate effect of such an event in the low altitude forests is a temporary increase in species diversity with the invasion of wind-dispersed shrubs such as *Olearia argophylla* and species from adjacent vegetation types such as *Phebalium squameum*, *Leptospermum* spp., *Melaleuca* spp., *Eucalyptus* spp. and *Acacia* spp., as well as seedling regeneration of the rainforest species. Eventually such regrowth will revert in structure and floristics to the original type present before fire, as the invading species are incapable of regeneration in shaded conditions. However, the regrowth is more inflammable than the original rainforest. Thus, the probability of a second fire is reasonably high (Jackson 1968). Depending on the time elapsed since the first burn and the intensity of the second fire, the vegetation may be converted to a thicket of fire-resistant shrubs with or without eucalypts or, in the extreme case, *Gahnia grandis* sedgeland (plate 9). Re-invasion of thickets and sedgeland by rainforest species can and does occur. *Nothofagus gunnii* is capable of invading even the extreme case of groundwater podzols occupied by *Gymnoschoenus* hummock sedgeland, and *N. cunninghamii* is a frequent understory component of the thicket vegetation. However, the inflammability of the sedgeland and thicket is such that there is a low probability of the recovery of rainforest (Jackson 1968).

The major part of the area of rainforest is on argillaceous and igneous rocks rather than on siliceous rocks (Casson 1952), except where the rainforest occupies sites topographically protected from fire such as the smaller cirques of Mt. Murchison, protected from the fire-bearing north-westerlies by the jagged ridge of the mountain and the rainforests on its northern slopes, or the rainforests protected by the rocky escarpments of the Tyndall Ranges. The likelihood of recovery of rainforest on siliceous rocks after fire is small owing to the depletion by leaching of nutrients accumulated over long periods, and the slow-growing and open rainforest species regeneration mixed with more inflammable and fire resistant species.

VEGETATION DOMINATED BY EUCALYPTS

Communities dominated by eucalypts are widespread from sealevel to 1080 m. They vary enormously in structure and floristics. The gross structural range in communities dominated by one species of eucalypt is tall open-forest to open-shrubland, and the understories can be dominated by any of sedges, ferns, sclerophyll shrubs, broad-leaved shrubs or rainforest trees. Mixtures of eucalypt species are rare, in marked

PLATE 10. - *Eucalyptus viminalis* open-forest at Strahan. *Melaleuca ericifolia* dominates the tall understory.

PLATE 11. - *Eucalyptus nitida* open-scrub on the Holocene sand dunes behind Ocean Beach.

contrast to the dry forests and woodlands of the east (Hogg and Kirkpatrick 1974).

E. globulus dominates several small stands including one in the lower reaches of the Little Henty River and another on the shores of Kelly Basin. Casson (1952) describes the understory of the Henty stand as light, and reports a persistent local rumour that the trees were planted in the convict days. However, similar small stands occur along the west coast to the south and north as well as within the study area (Kirkpatrick 1975b), and two other eucalypts, *E. viminalis* and *E. obliqua*, more typical of the dry east than the humid west, also occur in the region.

The remnants of an open-forest dominated by *E. viminalis* with an understory of tall sclerophyll shrubs such as *Acacia verticillata*, *A. melanoxylon* and *Melaleuca ericifolia* can be seen in and around Strahan on weakly leached Holocene sands (plate 10). *E. obliqua* is found on the lower northern foothills of Mt. Read where it dominates an open-forest with a 2-4 m tall understory of sclerophyllous shrubs such as *Acacia mucronata*, *A. verticillata*, *Melaleuca squarrosa* and *Oxylobium arborescens*, underlain by a medium-dense herbaceous layer dominated by *Gahnia grandis*, *Microsorium diversifolium*, *Pteridium esculentum* and *Dianella tasmanica*. *E. obliqua* also occurs as a small straggly tree along drainage lines in the sedgelands around Zeehan, and as

the dominant of open-forest and tall open-forest on soils formed on dolerite and granite to the west and northeast of Zeehan. On south-facing slopes the understory to *E. obliqua* consists of 5-7 m tall broad-leaved shrubs and trees such as *Prosanthera lasianthos, Phebalium squameum, Anopterus glandulosus, Acacia melanoxylon, Pomaderris apetala* and *Atherosperma* underlain by *Gahnia grandis, Pimelea drupacea, Coprosma quadrifida* and ferns, particularly *Microsorium* and *Blechnum*. On north and west-facing slopes the shrub component of the understory is sparse and *Pteridium* dominates, possibly because of a history of frequent firing (Casson 1952). There are also some small outliers of *E. delegatensis* forest in the study area. Stands are found adjacent to *E. obliqua* open-forest near Rosebery and Zeehan. The *E. delegatensis* stand on the Zeehan-Granville Harbour road has a dense 3-5 m tall understory composed of *L. scoparium, L. riparium, Olearia phlogopappa, P. lasianthos, Acacia mucronata, A. verticillata, Pomaderris apetala, Cyathodes juniperina* and *Correa lawrenciana* with *Bauera rubioides, Gahnia grandis* and *Lepidosperma elatius* beneath.

The most widespread species dominating the eucalypt communities at altitudes below 150 m are *E. nitida* and *E. ovata*. *E. ovata* occupies sites where drainage is better than those occupied by sedgeland, but poorer than those occupied by *E. nitida*. Where *E. ovata* forms an open-forest, as at the mouth of the Henty River and on basalt at Granville Harbour, the understory consists of a dense 10-15 m tall thicket dominated by *Melaleuca ericifolia* and *Pomaderris apetala*. Other species found in *E. ovata* open-forest include *Acacia melanoxylon, Prosanthera lasianthos, Melaleuca squarrosa, Leptospermum lanigerum, Coprosma quadrifida, Gahnia grandis* and *Dicksonia antarctica*. *E. ovata* also dominates the less well-drained parts of the open-heath to open-scrub found on the Holocene sand-dunes between Ocean Beach and the Henty peneplain. Rounded 2-3 m tall eucalypts emerge sparsely from a probably fire-induced dense cover of *Pteridium esculentum* over most of this area. In the few areas that have avoided fire for over 7 years the eucalypts are interspersed by closed-heath in which the shrubs *Aotus ericoides, Acacia suaveolens, A. verticillata, A. melanoxylon, Banksia marginata, Epacris impressa, Leucopogon australis, L. ericoides, Pultenaea juniperina* and *Amperea xiphoclada*, and the herbs *Pteridium, Lepidosperma concavum* and *Tetraria capillaris* are the most common species. The better drained parts of the dunes are covered by a similar community dominated by *E. nitida* (plates 11 and 12).

E. nitida is the most common eucalypt in the region at all altitudes below 610 m and is found 100-200 m higher in many localities. The species varies from a multi-stemmed shrub to a forest tree up to 40 m tall. In its taller form the species can be found emergent over rainforest in which the most frequent species are *N. cunninghamii, Atherosperma, Eucryphia lucida* and *Phyllocladus*. More often, however, the rainforest species are mixed with species such as *Acacia melanoxylon, A. mucronata, A. verticillata, Pomaderris apetala, Leptospermum scoparium, Melaleuca squarrosa, Phebalium squameum, Prosanthera lasianthos, Pimelea drupacea, P. cinerea* and *Cyathodes juniperina*, or absent with these latter species dominant in the understory. Alternatively, where firing has been frequent, the understory may be dominated by *Gahnia grandis* or *Pteridium esculentum*.

The low open-forest and open-scrub communities dominated by *E. nitida* often grade into *E. nitida* open-forest on one side and sedgeland or heath on the other, the latter transition being much sharper than the former (plate 13). They also occur in isolated areas of better drainage, deeper soil and more shelter than the surrounding heath or sedgeland, along streams, around rock outcrops (plate 13), and on the leeward slopes and swales of tall coastal dunes. The floristic composition of the understory varies considerably although *Pteridium, Gahnia grandis, Epacris impressa, Banksia* and *Pultenaea juniperina* occur in most stands. *Daviesia ulicifolia, Casuarina monilifera* and *Eriostemon virgatus* are three species which seem to be confined to coastal stands, the latter being only found in the granite coastal hills between Remine and Granville Harbour. At higher altitudes *Bauera rubioides, Acacia mucronata* and *Telopea truncata*

are frequent in the understory, the former species often forming a virtually impenetrable tangled mass.

E. nitida also dominates some relatively small areas of woodland, as to the west of Zeehan on a small area of mudstone, where the species occurs sparsely in forest form with a dense but low understory of sedges, rushes, ferns and small shrubs (plate 14). The openness of the tree layer may be due to the low probability of eucalypt seedlings achieving sufficient height and bark thickness between fires to avoid relying solely on lignotubers for recovery, or alternatively may relate to microhabitat conditions.

E. subcrenulata and *E. vernicosa*, two species that have been shown to intergrade (Jackson 1960), dominate parts of the West Coast Range. *E. subcrenulata* occurs on limestone and metamorphosed volcanic rocks at

PLATE 12. - Vegetation of the Holocene dunes behind Ocean Beach. The swale in the middleground is occupied largely by *Leptocarpus tenax*. *Eucalyptus nitida* dominates the open-heath on the dunes.

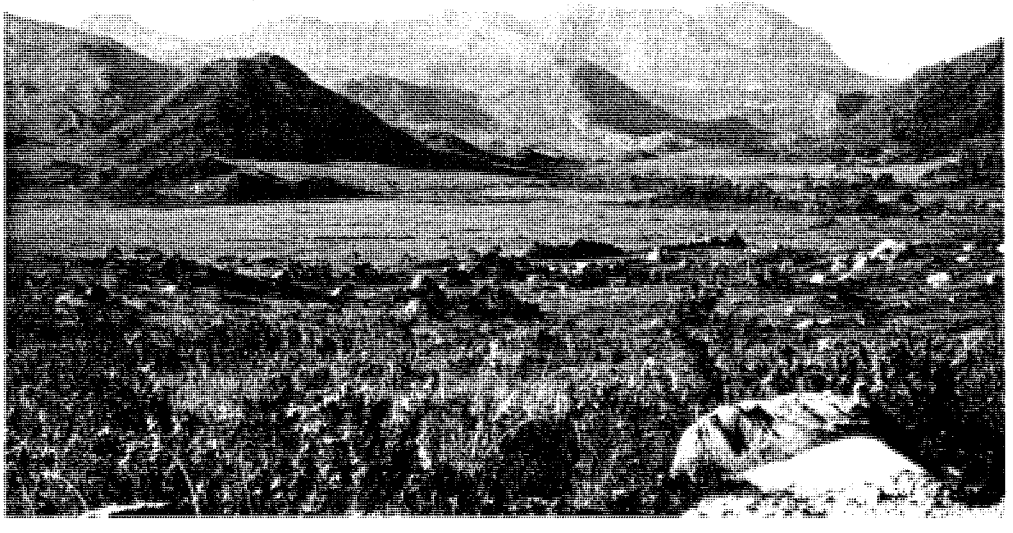


PLATE 13. - Mt. Murchison viewed from the Lake Rolleston moraines. *Leptospermum nitidum* and *Gymnoschoenus sphaerocephalus* dominate the heathy sedgeland in the foreground. Closed-forest, open-forest and scrub are localized on steep south-facing slopes and along the drainage lines that wend through the ill-drained flat.

PLATE 14. - *Eucalyptus nitida* woodland with a heath, rush and sedge understory.

PLATE 15. - *Gymnoschoenus sphaerocephalus* hummock sedgeland.

medium altitudes where as a tall tree it emerges from a rainforest understory, or as a shorter tree is mixed with *E. nitida* in open-scrub or low open-forest. *E. vernicosa* is a rounded alpine shrub and occurs in both the burnt and unburnt facies of the alpine vegetation on well-drained sites, although it is most common in the burnt vegetation. The association of *E. vernicosa* with apparently old individuals of fire-susceptible species such as *A. selaginoides* and *N. gunnii* suggests that *E. vernicosa* may be capable of regeneration and establishment in the absence of the deflecting influence of fire. Possibly there is sufficient bare ground provided by natural forces in the alpine areas to allow eucalypt establishment where the associated vegetation does not attain enough height to cast much shade.

VEGETATION DOMINATED BY SHRUBS AND HERBS

The area of treeless vegetation on the west coast far exceeds the area of any of the types described earlier (fig. 7). Whether the treeless vegetation is referable to scrub, heath, sedgeland, rushland, fernland or herbland is largely dependent on the time elapsed since the last fire, as is the percentage cover. However, sedges and sclerophyll shrubs, mainly Myrtaceae, dominate or codominate over almost all the area, with Epacridaceae and Restionaceae as their most frequent associates.

Sedgeland and heath occur in almost all topographic positions on soils formed on slow-weathering siliceous rocks, and siliceous deposits such as moraines and sand-dune complexes, but are far from restricted to these areas. The soil that forms under the sedgeland and heath is highly acid and organic, being a peat or peaty sand, usually overlying leached or reduced sand or gravels.

It is only on extremely ill-drained flats that shrub species capable of exceeding 2 m are absent or sparse. In these situations there is a mosaic pattern of dominance, probably related to minor variations in topography and soil as well as fire history. The most common dominant is *Gymnoschoenus* which, in prolonged absence of firing, can close out most other species, and which is the first major species to make a substantial recovery after fire. However, *Leptocarpus tenax*, *Diplarrena moraea*, *Gleichenia dicarpa* and *Baeckea gunniana* are all locally dominant, often within the one flat. Other characteristic species of the flats are the small shrubs *Epacris lanuginosa*, *Pultenaea dentata*, *Sprengelia incarnata* and *Melaleuca squamea*, two grasses, *Microlaena tasmanica* and *Poa gunnii*, the sedges, *Lepidosperma filiforme* and *Tetraria capillaris*, and a rush, *Restio complanatus*.

As well as dominating a large area of the ill-drained flats (plate 15) *Gymnoschoenus* is found on hillsides and ridges as a major component of a heathy sedgeland where mean annual precipitation exceeds approximately 1900 mm (plate 13). Even on slopes with shallow soils drainage may be impeded for part of the year as a result of the extremely heavy winter rainfall and the slow percolation of water through the peaty soils. However, the same sites are probably drought-prone for short periods during the drier months, placing a double stress on the vegetation which is sufficient to exclude eucalypts except where broken rock outcrops or deep soils allow free drainage and some storage of moisture.

Species of *Melaleuca* and *Leptospermum* may be capable of dominating much of the area of this vegetation type in the prolonged absence of fire, *Melaleuca* usually being more common than *Leptospermum* where the drainage is most poor, although they are most commonly mixed. In the areas of higher precipitation and altitude *Melaleuca squamea* and *Leptospermum nitidum* are found, whereas at lower altitudes where precipitation is less *Melaleuca squarrosa* and *Leptospermum scoparium* generally replace these two species. However, a transition to open or closed-scrub is evident in only a few areas, as the growth rate of the ti-trees on the peaty soils is slow and the fire frequency high.

The potentially large shrubs of the heathy sedgeland are the ti-trees, *Banksia marginata* and *Agastachys odorata*. Both *Banksia* and *Agastachys* occur extremely sporadically, but in some cases are sparsely emergent from a mixed sedge and shrub layer. The most common small, but upright shrubs are *Baeckea leptocaulis, Sprengelia incarnata, Boronia citriodora* and *Epacris corymbiflora*. These are mixed with the taller sedges and rushes; *Gymnoschoenus, Lepidosperma filiforme, Restio complanatus, R. monocephalus, Calorophus lateriflorus* and *Leptocarpus tenax*. These are underlain by prostrate *Bauera rubioides, Hibbertia procumbens, Stylidium graminifolium, Lycopodium laterale, Actinotus bellidioides, Schoenus tenuissimus* and *Tetraria capillaris*. This vegetation becomes extremely sparse on glacially eroded ridges and the tops of rocky moraines, and *Gymnoschoenus* declines in importance, *Baeckea leptocaulis* and *Restio monocephalus* becoming the most important species.

The sedgelands and heathy sedgelands maintain a constant physiognomy but vary to some extent in floristic composition both with altitude and surface geology. For example, *Dillwynia glaberrima, Patersonia fragilis, Leptospermum scoparium, Melaleuca squarrosa, Tetrarrhena distichophylla, Baumea acuta* and *Epacris obtusifolia* are confined to sedgeland and heathy sedgeland communities below 550 m, and *Microlaena tasmanica* is an important component of recently burnt sedgeland on Cambrian volcanic rocks but is largely absent from more siliceous substrates.

The only large area of heath without a substantial eucalypt component is found on granite near the coast between Trial and Granville Harbours. This area is burnt extremely frequently so the heath is low and open. The shrub species found in the heath include *Eriostemon virgatus, Leptospermum nitidum, Epacris impressa, E. lanuginosa, E. obtusifolia, Casuarina monilifera, Sprengelia incarnata, Leucopogon collinus, Banksia marginata* and *Boronia citriodora*. *Gymnoschoenus* is present but rare, although rushes such as *Restio complanatus* and *R. monocephalus* and other herbs such as *Microlaena tasmanica, Xyris* spp., *Selaginella uliginosa, Stylidium graminifolium, Xanthosia pusilla, Lepidosperma filiforme* and *Tetraria capillaris* occur mixed with or below the shrub layer. Heath lacking in eucalypts is also found on the Holocene dune complex behind Ocean Beach where the dunes are exposed to the full brunt of the salt-bearing westerly winds (plate 16).

Extensive areas of closed-scrub occur throughout the region (fig. 7). The closed-scrub is probably the product of a series of fires in former rainforest, as eucalypts are absent despite good drainage conditions, and rainforest species are commonly found invading the understory. The canopy is usually dominated by a variable mixture of *Leptospermum nitidum, L. lanigerum, L. scoparium, Acacia mucronata, A. melanoxylon,*

PLATE 16. - Ocean Beach dunes. *Carex* sedgeland in the swale and *Leptospermum lanigerum* closed-scrub and closed-heath on the seaward-facing slope of the second dune from the beach.

Banksia marginata and *Phebalium squameum*. Other common upright shrubs include *Oxylobium arborescens*, *Cassinia aculeata*, *Monotoca scoparia*, *Olearia phlogopappa* and *Hakea epiglottis*. The tangled stems of *Bauera rubioides*, *Gleichenia* and *Calorophus* and tussocks of *Gahnia grandis* make penetration of this vegetation type extremely difficult. *Blandfordia punicea*, *Restio tetraphyllus* and *Pteridium esculentum* are occasional components of the ground layer. Closed-scrub dominated by *Melaleuca ericifolia* is found in some ill-drained coastal areas.

Natural grassland is found only as a narrow coastal strip, or in a few swales in the Holocene sand dune complex. *Poa poiformis* dominates grassland with *Carex appressa*, *Scirpus nodosus*, *Acaena novae-zelandiae*, *Dianella tasmanica*, *Lobelia alata*, *Leucopogon parviflorus*, *Juncus* and *Ranunculus* on the rocky coasts north of Trial Harbour, and a similar community is found in the swale behind the foredune along some parts of Ocean Beach (plate 16). Further inland in the dune complex there are occasional small grasslands of *Hemarthria uncinata*, *Dichelachne*, *Agrostis* and *Deyeuxia* in swales.

Along the rocky sheltered shores of Macquarie Harbour saltmarsh dominated by *Juncus kraussii* or *Leptocarpus brownii* has developed (plate 17). The dominants are underlain by *Samolus repens*, *Centella cordifolia*, *Schoenus nitens*, *Cotula longipes* and *Selliera radicans*. Brackish and freshwater marsh communities and aquatic communities such as those described for the area directly north of the West Coast region by MacPhail, Shepherd and Brown (1975) may also be found in the study area.

DISCUSSION

Climatic, edaphic and topographic variables correlate well with the patterns of variation both within and between the major vegetation types found in the West Coast region. Within vegetation types the influence of these variables is for the most part direct, but between vegetation types their influences operate through their reciprocal relationships with fire frequency (Jackson 1968). The wide distribution of vegetation dominated by the fire-susceptible 'Antarctic' species, and the juxtaposition and intermingling of this vegetation with vegetation dominated by fire-resistant and fire-encouraging Australian species has inevitably meant that the relative distribution of the two types of vegetation is controlled by fire (plate 18). However, differences in fire frequency and intensity seem not to be so readily expressed in the relative distributions of eucalypt-dominated communities and those dominated by sclerophyllous shrubs and/or sedges. Eucalypts survive, as do sclerophyllous shrub and sedge species, fire frequencies of five to ten years in parts of the West Coast. Maintenance of this frequency would undoubtedly result in the local extinction of eucalypts by preventing replacement of trees dying from old age, but within a span of one or two centuries such consistency in firing could not be expected. The boundaries of areas dominated by eucalypts seem to be controlled by fire frequency only where the frequency is low

enough to allow the survival of rainforest. The boundaries with heath and sedgeland seem to be controlled by edaphic conditions, particularly drainage and fertility. The distribution of eucalypts is also negatively controlled by the past distribution of rainforest. There are large areas within which drainage is free enough and fire frequency is presently high enough to allow occupation by eucalypts, but the limited dispersal ability of the eucalypts has prevented their access after the original destruction of rainforest by a series of fires.

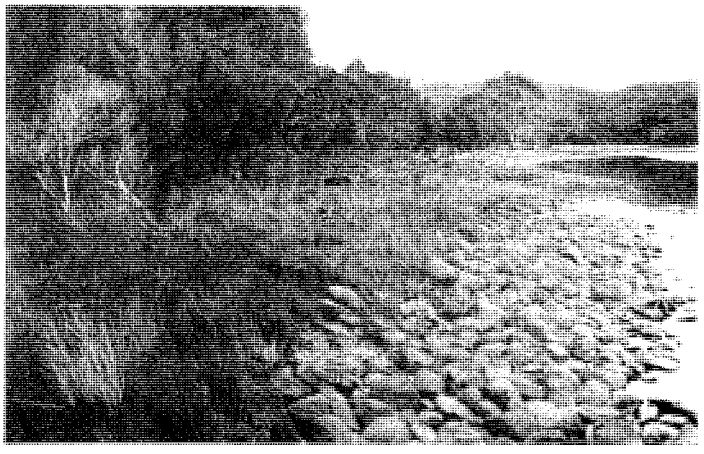


PLATE 17. - Saltmarsh on the shore of Macquarie Harbour.

ACKNOWLEDGEMENTS

I am grateful to Adrian Bowden and Paul Stoessinger for assistance in the field, Jean Jarman and Dave Ratkowski for help with some plant identifications, Stewart Bell for doing most of the aerial photograph interpretation for the vegetation map, Kate Morris for drawing it, Paul Crowther for most of the photographs and Terese Flannagan for typing the manuscript.

PLATE 18. - A fire controlled vegetation boundary in the Tyndall Range.

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APPENDIX

Native species observed in the West Coast region

1 = alpine; 2 = rainforest; 3 = eucalypt forest and woodland; 4 = scrub, heath, sedgeland and herbland; 5 = coastal; + = endemic.

	1	2	3	4	5
PTERIDOPHYTA					
ADIANTACEAE					
Anogramma leptophylla		x			
ASPIDIACEAE					
Lastreopsis hispida		x	x		
Polystichum proliferum		x	x		
Rumohra adiantiformis		x	x		
BLECHNACEAE					
Blechnum aggregatum		x			
B. cartilagineum			x		
B. nudum			x		
B. vulcanicum		x			
B. wattsii		x	x	x	
CYATHEACEAE					
Cyathea australis			x		
DENNSTAEDTIACEAE					
Histiopteris incisa		x	x		
Hypolepis australis		x			
Pteridium esculentum			x	x	
DICKSONIACEAE					
Dicksonia antarctica		x	x		
GLEICHENIACEAE					
Gleichenia alpina	x				
G. dicarpa		x	x	x	
Sticherus tener		x	x		
GRAMMITIDACEAE					
Grammitis armstrongii	x				
G. billardieri		x	x		
HYMENOPHYLLACEAE					
Apteropteris malingii		x	x		
Hymenophyllum australe			x	x	
H. cupressiforme		x			
H. flabellatum		x			
H. marginatum		x	x		
H. peltatum		x			
H. rarum		x	x		
ISOETACEAE					
Isoetes elatior	x				
LINDSAYACEAE					
Lindsaya linearis				x	
LYCOPODIACEAE					
Lycopodium laterale	x			x	
L. scariosum	x				
L. serpentinum				x	
OSMUNDACEAE					
Todea barbara			x		
POLYPODIACEAE					
Microsorium diversifolium		x	x	x	

PTERIDACEAE					
Pteris tremula			x		
SCHIZAEACEAE					
Schizaea asperula				x	
S. fistulosa				x	
SELAGINELLACEAE					
Selaginella uliginosa				x	
GYMNOSPERMAE					
CUPRESSACEAE					
+*Diselma archeri*	x				
PODOCARPACEAE					
+*Dacrydium franklinii*		x			
+*Microcachrys tetragona*	x				
+*Phyllocladus asplenifolius*	x	x	x		
Podocarpus lawrencii	x				
TAXODIACEAE					
+*Athrotaxis cupressoides*	x	x			
+*A. laxifolia*	x	x			
+*A. selaginoides*	x	x			
MONOCOTYLEDONEAE					
CENTROLEPIDACEAE					
+*Centrolepis monogyna* Benth.	x				
+*Gaimardia fitzgeraldii* F. Muell. & Rodway	x				
CYPERACEAE					
Baumea acuta				x	
B. tetragona				x	
Carex appressa					x
Carpha alpina	x				
Gahnia grandis		x	x	x	
Gymnoschoenus sphaerocephalus				x	
Lepidosperma concavum				x	
L. elatius			x		
L. filiforme				x	
L. gladiatum					x
L. laterale			x		
+*O. acutifolius* S.T. Blake	x				
Oreobolus pumilio	x				
Schoenus nitens					x
S. tenuissimus				x	
Scirpus aucklandicus		x		x	
S. fluitans				x	
S. inundatus				x	
S. nodosus					x
Tetraria capillaris				x	
+*Uncinia compacta* R. Br.	x				
U. tenella	x				
GRAMINEAE					
+*Agrostis rudis* Roem. & Schult.				x	
+*Danthonia* (undescribed)	x				
D. pauciflora	x				
Deyeuxia contracta				x	
D. gunniana				x	
D. monticola	x				
D. parviseta var. *boormanii*	x				
D. rodwayi	x				
Dichelachne crinita					x
Hemarthria uncinata				x	
+*Hierochloe fraseri* Hook.	x				
+*Microlaena tasmanica* Hook.	x		x	x	

+*Poa gunnii* J.W. Vickery				x
P. labillardieri			x	
P. poiformis				x
P. rodwayi J.W. Vickery				x
P. tenera				x
Stipa compacta				x
S. teretifolia				x
Tetrarrhena distichophylla				x
HYPOXIDACEAE				
+*Campynema lineare* Labill.				x
IRIDACEAE				
Diplarrena moraea			x	x
+*Isophysis tasmanica* (Hook.) T. Moore	x			
Libertia pulchella		x	x	
Patersonia fragilis				x
P. longiscapa				x
JUNCACEAE				
Juncus articulatus				x
J. kraussii Hochst.				x
J. pallidus				x
J. planifolius				x
J. prismatocarpus				x
J. sarophorus			x	
Luzula meridionalis var. *flaccida* (Buch.) Nordenskiold	x			
L. oldfieldii	x			
JUNCAGINACEAE				
Triglochin procera				x
LILIACEAE				
Astelia alpina	x			x
+*Blandfordia punicea* (Labill.) Sweet	x	x	x	x
Dianella tasmanica			x	
Drymophila cyanocarpa			x	
Lomandra longifolia			x	
+*Milligania densiflora* Hook.	x			
Stypandra caespitosa				x
ORCHIDACEAE				
Burnettia cuneata			x	
Caladenia carnea		x		
C. gracilis			x	x
Calochilus campestris				x
C. paludosus			x	x
C. robertsonii			x	x
Corybas dilatatus		x		
Cryptostylis subulata				x
Eriochilus cucullatus	x			x
Microtis oblonga			x	x
M. orbicularis				x
M. parviflora				x
Orthoceras strictum			x	x
Prasophyllum fuscum				x
Pterostylis barbata				x
P. longifolia			x	
P. vereenae			x	
Thelymitra azurea				x
T. carnea				x
T. cyanea			x	x
T. flexuosa			x	x
T. retecta			x	

T. rubra				x	
RESTIONACEAE					
Calorophus elongatus				x	
C. lateriflorus	x		x	x	
Leptocarpus brownii					x
L. tenax				x	
Lepyrodia tasmanica				x	
Restio australis	x			x	
R. complanatus	x			x	
+R. monocephalus Labill.				x	
R. tetraphyllus				x	
XYRIDACEAE					
+X. (undescribed)				x	
+X. marginata	x			x	
+X. muelleri				x	
X. operculata				x	
DICOTYLEDONEAE					
APOCYNACEAE					
Alyxia buxifolia					x
Parsonsia straminea			x		
ARALIACEAE					
+Nothopanax gunnii		x			
CASUARINACEAE					
Casuarina monilifera				x	
COMPOSITAE					
+Abrotonella scapigera	x				
Brachycome parvula				x	
Calocephalus brownii					x
Cassinia aculeata			x	x	
Celmisia longifolia	x				
+C. saxifraga	x				
Cotula coronopifolia					x
C. longipes					x
Erigeron pappochroma	x				
E. stellatus	x				
+Ewartia meredithae	x				
Gnaphalium (undescribed)	x				
+Helichrysum backhousii	x				
H. dealbatum				x	
+H. milliganii	x				
+H. pumilum	x			x	
H. rosmarinifolium			x	x	
+Nablonium calyceroides					x
+Olearia alpina	x	x	x		
O. argophylla			x		
+O. ledifolia	x				
O. lepidophylla					x
O. phlogopappa			x		
+O. pinifolia	x				
O. ramulosa				x	x
O. stellulata			x		
+Pterygopappus lawrencii	x				
Senecio hispidulus				x	
S. lautus					x
S. leptocarpus	x			x	
S. linearifolius			x		
S. pectinatus	x				
CUNONIACEAE					
+Anodopetalum biglandulosum		x			

Bauera rubioides	x		x	x	
DILLENIACEAE					
Hibbertia empetrifolia				x	
H. procumbens				x	
DROSERACEAE					
Drosera arcturi	x				
D. binata			x	x	
D. gracilis				x	
D. pygmaea	x				
ELAEOCARPACEAE					
+Aristotelia peduncularis			x	x	
EPACRIDACEAE					
+Archeria comberi	x				
+A. eriocarpa		x			
+A. hirtella		x			
+A. serpyllifolia	x				
+Cyathodes abietina					x
+C. dealbata	x				
+C. glauca			x		
C. juniperina		x	x		
+C. parvifolia	x				
+C. petiolaris	x				
+Dracophyllum milliganii	x				
+D. minimum	x				
+Epacris corymbiflora				x	
E. heteronema				x	
E. impressa			x	x	
E. lanuginosa				x	
+E. mucronulata		x	x		
E. obtusifolia				x	
E. serpyllifolia	x				
Leucopogon australis			x	x	
L. collinus			x	x	
L. ericoides				x	
+L. milliganii	x				
L. parviflorus					x
+Monotoca glauca			x		
M. scoparia var. *submutica*		x	x	x	
Pentachondra pumila	x			x	
+Prionotes cerinthoides		x			
+Richea angustifolia	x				
+R. milliganii	x				
+R. pandanifolia	x	x			
+R. scoparia					
+R. sprengelioides	x				
Sprengelia incarnata	x		x	x	
Styphelia adscendens				x	
+Trochocarpa cunninghamii		x			
+T. gunnii		x			
ERICACEAE					
+Gaultheria hispida	x	x	x		
ESCALLIONIACEAE					
+Anopterus glandulosus		x	x		
+Tetracarpaea tasmanica	x	x			
EUCRYPHIACEAE					
+Eucryphia lucida		x			
+E. milliganii		x			
EUPHORBIACEAE					
Amperea xiphoclada			x	x	

Micrantheum hexandrum			x		
FAGACEAE					
Nothofagus cunninghamii	x	x	x		
+N. gunnii	x	x			
FICOIDEAE					
Carpobrotus rossii					x
Tetragonia implexicoma					x
GENTIANACEAE					
Gentianella diemensis	x				
GERANIACEAE					
Geranium solanderi					x
Pelargonium australe					x
GOODENIACEAE					
Goodenia ovata			x	x	x
Selliera radicans					x
Scaevola hookeri	x			x	
HALORAGACEAE					
Haloragis brownii					x
H. micrantha				x	
H. montana	x				
+ H. serpyllifolia			x		
H. tetragyna			x	x	
H. teucrioides			x	x	
Myriophyllum pedunculatum				x	
LABIATAE					
Prosanthera lasianthos			x		
LAURACEAE					
Cassytha pubescens				x	
LEGUMINOSAE					
Acacia dealbata			x		
A. melanoxylon			x	x	
A. mucronata			x	x	
A. myrtifolia			x	x	
A. sophorae					x
A. suaveolens				x	
A. verticillata			x	x	x
Aotus ericoides				x	
Daviesia ulicifolia			x	x	
Dillwynia glaberrima				x	
Glycine latrobeana				x	
Oxylobium arborescens			x	x	
Oxylobium ellipticum	x		x		
Pultenaea daphnoides			x	x	
P. dentata				x	
P. gunnii			x		
P. juniperina			x		
LENTIBULARIACEAE					
Utricularia dichomata				x	
LOBELIACEAE					
Lobelia alata					x
Pratia platycalyx					x
LOGANIACEAE					
+Mitrasacme archeri	x				
M. montana	x				
MONIMIACEAE					
Atherosperma moschatum	x	x	x		
MYRTACEAE					
Baeckea gunniana	x			x	

+B. leptocaulis				x	
B. ramosissima				x	
+Callistemon viridiflorus			x	x	
Eucalyptus delegatensis			x		
E. globulus			x		
E. nitida			x	x	
E. obliqua			x		
E. ovata			x	x	
+E. subcrenulata			x		
+E. vernicosa	x				
E. viminalis			x		
+Leptospermum glaucescens			x	x	
L. lanigerum			x	x	x
L. nitidum			x	x	
+L. riparium			x		
L. scoparium			x	x	
Melaleuca ericifolia			x	x	
M. squamea				x	
M. squarrosa			x	x	
OLEACEAE					
Notelaea ligustrina			x		
ONAGRACEAE					
Epilobium billardierianum ssp. *billardierianum*				x	x
E. billardierianum ssp. *cinereum* (A. Rich.) Raven & Engelhorn				x	
E. billardierianum ssp. *intermedium* Raven and Engelhorn				x	
E. gunnianum				x	
OXALIDACEAE					
Oxalis lactea	x				
PITTOSPORACEAE					
Billardiera longiflora			x		
Pittosporum bicolor			x		
PLANTAGINACEAE					
Plantago triantha					x
POLYGALACEAE					
Comesperma retusum				x	
C. volubile			x		
POLYGONACEAE					
Muehlenbeckia adpressa					x
M. gunnii			x	x	
PRIMULACEAE					
Samolus repens					x
PROTEACEAE					
+Agastachys odorata		x		x	
Banksia marginata			x	x	x
+Bellendena montana	x				
+Cenarrhenes nitida		x		x	
+Hakea epiglottis			x	x	
+Lomatia polymorpha		x	x		
+Lomatia tinctoria			x		
+Orites acicularis	x				
+O. milliganii	x				
+O. revoluta	x				
+Persoonia gunnii	x				
P. juniperina				x	
+Telopea truncata		x	x	x	
RANUNCULACEAE					
+Anemone crassifolia	x				
+Ranunculus acaulis					x

RHAMNACEAE					
Pomaderris apetala			x		
+P. elliptica			x		
ROSACEAE					
+Acaena montana	x				
A. novae-zelandiae			x		x
+Rubus gunnianus	x			x	
RUBIACEAE					
Coprosma hirtella			x		
C. moorei	x				
C. nitida	x				
C. quadrifida			x		
Galium australe			x		
Opercularia varia				x	
RUTACEAE					
+Acradenia frankliniae		x			
Boronia citriodora				x	
B. parviflora				x	
Correa alba					x
C. lawrenciana			x		
Eriostemon virgatus			x	x	
Phebalium squameum			x		
+Spyridium gunnii					
Ziera arborescens			x		
SANTALACEAE					
+Exocarpos humifusus	x				
SCROPHULARIACEAE					
+Euphrasia diemenica				x	
+E. hookeri	x				
+E. striata	x				
SOLANACEAE					
Solanum laciniatum			x		
STYLIDIACEAE					
Donatia novae-zelandiae	x				
+Forstera bellidifolia	x				
Stylidium graminifolium	x		x	x	
THYMELACEAE					
+Pimelea cinerea			x		
P. drupacea			x		
+P. lindleyana			x	x	
+P. milliganii	x				
TREMANDRACEAE					
+Tetratheca procumbens				x	
UMBELLIFERAE					
Actinotus bellidioides				x	
+A. moorei	x				
A. suffocata	x				
Centella cordifolia				x	
Dichosciadium ranunculaceum	x				
+Dislapsis cordifolia	x				
D. hydrocotyle	x				
Hydrocotyle javanica				x	x
+Lilaeopsis brownii					x
+Oschatzia saxifraga				x	
Xanthosia dissecta				x	
X. pusilla				x	
VIOLACEAE					
Viola hederacea		x	x		
WINTERACEAE					
Drimys lanceolata	x	x	x		