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Plant Communities at Lake Edgar South West Tasmania

Michael Macphail

Robert R. Shepherd

BOTANY DEPT.
UNIVERSITY OF TASMANIA
G. P. O. BOX 252 C,
HOBART 7001

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INTRODUCTION

Lake Edgar is situated in south-west Tasmania approximately four miles (6.5 km) north-east of Scotts Peak 900 ft. (274 m) above sea level in south eastern corner of the region generally known as the Huon Plains. This area is being inundated by waters backing up, behind a dam at Scotts Peak and when flooded will form part of the "new Lake Pedder" of the Middle Gordon Hydro-Electric Scheme. The existing lake, although of geologically recent origin, contains perhaps the most advanced stages in the natural succession of plant communities in filling lakes in the "button grass" plains and consequently may provide as unique an environment as Lake Pedder nine miles to the north-west. A biological survey of lake and immediate surrounds was therefore carried out by botanists and zoologists from the University of Tasmania on 24th May, 1972 two weeks before closure of the diversion tunnel at the Scotts Peak Dam. In the following paper an account of the plant communities present at Lake Edgar is presented. We wish to gratefully acknowledge the considerable assistance of Jean Jarman and the University Botany Department in identifying the plant species present.

TOPOGRAPHY AND CLIMATE

At present Lake Edgar consists of two shallow lakes, each less than 4 feet deep (1.2 m); these being the remnants of a larger but still shallow "sag pond" (Fish and Yaxley, 1966). The surrounding region consists of extensive button grass plains between and extending onto highly dissected ridges of strongly tilted Precambrian strata - predominantly metasediments such as quartzites to the west of Lake Edgar but unmetamorphosed to the east (Corbett, 1969). Dolomite outcrops under Mt. Anne 4675 feet (1425 m), 6-7 miles (11 km) to the north east. Formation of a normal fault trending north-south with a throw of 15-25 feet (4.6-7.6 m) during the Pleistocene or possibly the Post-Glacial (Sutherland, 1971) created a basin on the down-thrown block east of the fault scarp; downwarping of the margin, along the fault line created the sag pond within which Lake Edgar has developed. Initially the basin appears to have been partially infilled by fine quartzite sands derived from local colluvium and alluvium (outwash sands) originating from Pleistocene periglacial

and glacial activity on the surrounding mountains. Under a cool temperate oceanic climate (Table 1) the fault-impeded drainage has resulted in considerable peat accumulation over the inorganic infill; the organic sediments ranging from some four feet (1.2 m) of limnic muds eastward of the fault scarp, and deep terrigenous peats to moor podsol peats grading into the shallow infertile skeletal soils on the more freely draining quartzite ridge slopes and deeper more fertile yellow-brown podzolic soils on the Cambrian sediments and unmetamorphosed Pre-cambrian sediments (Nicholls, in Atlas of Tasmania 1965; Corbett, 1969).

Climate

South-western Tasmania has a cool temperate maritime climate strongly influenced by the prevailing westerly winds. The region is classified under Thornthwaite's criteria (Davies, 1967) as superhumid.

Only short term meteorological data are available for the region as a whole, and none for the Lake Edgar area. Rainfall data for Strathgordon 23 miles (37 km) to the north-west of the lake and for Mt. Wedge 15 miles (24 km) to the north is compiled in Table 1: mean maximum and minimum temperatures for Strathgordon since 1970 are compiled in Table 2. Meteorological conditions for the Lake Edgar area are expected to approximate to Strathgordon and Mt. Wedge.

Average rainfall exceeds 2.5" (635 mm) in all months of the year, with a definite winter maximum between July and October (inclusive). Temperature fluctuations on monthly averages are low; the range between mean maximum and mean minimum for the summer months being approximately 20° F (11.1°C) and for the winter months 10° F (5.6°C). A few frosts would be expected at Lake Edgar during the winter period each year.

SURVEY TECHNIQUE

Because of limited time and terrain difficulty only a subjective assessment of the plant associations was possible. The vegetation around the southern lake was investigated by 'scrub-bashing' around its perimeter and compiling as complete a species-list as possible at selected localities and a similar survey was undertaken for the northern end of the north lake. Species lists from the various localities sampled are presented in the Appendix. In the broader regional context, the survey is limited because the density of fringing scrub prevented insight into communities west of the fault scarp. It is believed however that examples of all the major communities present in the vicinity of the lake were recorded.

TABLE 1. RAINFALL STATISTICS - STRATHGORDON AND MT. WEDGE. (points of rain)

| STATION | Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | TOTAL |
|--------------|---------|------|-------|------|-------|------|------|------|------|-------|------|-------|------|-------|
| | 1968 | - | - | - | - | - | 1180 | 776 | 1535 | 1375 | 1570 | 2064 | 538 | N. A. |
| | 1969 | 647 | 889 | 654 | 1390 | 576 | 844 | 1074 | 1040 | 1121 | 468 | 318 | 1065 | 10086 |
| | 1970 | 278 | 220 | 370 | 1064 | 856 | 417 | 2232 | 1304 | 1194 | 1201 | 296 | 756 | 10188 |
| Strathgordon | 1971 | 307 | 347 | 255 | 683 | 1018 | 1196 | 727 | 1006 | 1253 | 1594 | 835 | 709 | 9930 |
| | 1972 | 240 | 276 | 600 | 922 | 625 | 649 | | | | | | | |
| | Average | 368 | 433 | 470 | 1015 | 769 | 857 | 1202 | 1221 | 1236 | 1208 | 878 | 767 | 10068 |
| | 1968 | 216 | 595 | 343 | 655 | 1285 | 1135 | 584 | 1120 | 956 | 1152 | 1408 | 403 | 9852 |
| | 1969 | 490 | N. A. | 674 | N. A. | 363 | 614 | 762 | 757 | 844 | 315 | N. A. | 729 | N. A. |
| | 1970 | 261 | 189 | 304 | 899 | 698 | 282 | 1764 | 1092 | 767 | 864 | 249 | 510 | 7879 |
| Mt. Wedge | 1971 | 274 | 276 | 182 | 428 | 692 | 967 | 403 | 767 | 932 | 1114 | 577 | 456 | 7068 |
| | 1972 | 166 | 148 | | | | | | | | | | | |
| | Average | 281 | 302 | 376 | 661 | 760 | 750 | 878 | 934 | 875 | 861 | 745 | 525 | 8266 |

Compiled from data supplied by:

- (1) Commonwealth Bureau of Meteorology, Hobart.
- (2) Hydro-Electric Commission, Hobart.

TABLE 2. TEMPERATURE STATISTICS - STRATHGORDON (°F)

| | Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|---------|------|------|------|------|------|------|------|------|-------|-------|-------|------|
| | 1970 | - | - | - | - | - | - | 47.6 | 49.2 | 49.1 | N. A. | N. A. | 62.4 |
| MEAN | 1971 | 71.6 | 74.8 | 67.8 | 61.4 | 52.9 | 48.8 | 48.3 | 48.0 | 49.7 | 54.1 | 55.6 | 60.8 |
| MAXIMUM | 1972 | 65.4 | 70.9 | 60.4 | | | | | | | | | |
| | Average | 68.5 | 72.9 | 64.1 | 61.4 | 52.9 | 48.8 | 48.0 | 48.6 | 49.4 | 54.1 | 55.6 | 61.6 |
| | 1970 | - | - | - | - | - | - | 39.3 | 35.9 | 35.3 | N. A. | 43.2 | 47.1 |
| MEAN | 1971 | 50.2 | 50.1 | 46.7 | 43.8 | 37.8 | 37.5 | 35.5 | 35.3 | 38.0 | 40.6 | 40.5 | 44.8 |
| MINIMUM | 1972 | 47.0 | 50.6 | 44.1 | | | | | | | | | |
| | Average | 48.6 | 50.4 | 45.4 | 43.8 | 37.8 | 37.5 | 37.4 | 35.6 | 36.7 | 40.6 | 41.9 | 46.0 |

Compiled from data supplied by:

- (1) Commonwealth Bureau of Meteorology, Hobart.
- (2) Hydro-Electric Commission, Hobart.

RESULTS

The plant communities around Lake Edgar fall into four broad categories based mainly on height and density of (subjectively) dominant plant forms although several different plant associations (i. e. the regular occurrence of certain species together form a distinct plant grouping) occur within the one category. These are (i) wet sclerophyll forest (ii) wet scrub (iii) ectones of low shrubs, heath-like in formation, merging into tussock sedgeland, this continuum being generally known as "button grass" plains due to the universal abundance of button grass Gymnoschoenus sphaerocephalus and (iv) the lake community merging into fringing sedge swamps. The distribution of these categories around Lake Edgar are presented in the map.

(i) Wet Sclerophyll Forest (Localities 14, 5a)

West and south-eastward facing slopes of the foothills below the Mt. Anne-Schnell's Ridge complex support wet sclerophyll forest ranging from tall open forest (height < 30 m., canopy cover 30-70%) on the protected upper slopes and sheltered gullies to low open forest (height 6-10 m cover 30-70%) on the more exposed areas and lower slopes. The habitats are characterized by well drained moderately fertile podzolic soils in infrequently fired areas. One plant association Eucalyptus simmondsii is present. On areas with poorer soil drainage and a medium fire frequency Eucalyptus simmondsii occurs as a small emergent tree above an open scrub of Banksia marginata, Casuarina monilifera, Melaleuca squarrosa above Sprengelia incamata and (entangled) Bauera rubioides. This ecotone is seen along the fault scarp (locality 5a), above (east) Scotts Peak Road locality 14, and in wet drainage gullies below this road as a mallee (height 8 m) in open scrubland (height 2-8 m cover 30-70%).

Observations of vegetation in deep well-sheltered gullies, such as 48 Creek along Scotts Peak Road, suggest that given long term absence of fires mixed forest and tall closed temperate rainforest of Nothofagus cunninghamii may develop.

(ii) Wet Scrub communities

Closed and open scrubland occurs as a fringe zone below the Eucalyptus simmondsii forest on hillslopes and drainage gullies adjacent to the easily fired "button grass" plains and in similar moderately well drained deep peats such as creek margins within the plains. The scrub also fringes extensive stretches of the western margin of southern lake, the fault scarp slopes and reaches low forest proportions in the dense 10 m high growth forming an island in this lake; this event reflects the control of fire over the area in general. Two plant associations form wet scrub.

(a) Banksia marginata - Casuarina monilifera - (Melaleuca squarrosa)

These species generally with a substratum of Sprengelia incamata and Bauera rubioides form open scrub (height 2-8 m cover 30-70%) on shallow moor podzol peats and skeletal soils on lower hillslopes (localities 13, 5a) and generally have a sharp boundary with the button grass plains. It is of interest that the separate elements of this association occur as emergent shrubs within the button grass plains:

Banksia up to 10 m on the western shore of southern lake, with Casuarina below the fault scarp and, Melaleuca squarrosa of various sizes occurring at almost all localities examined.

(b) Leptospermum lanigerum - Melaleuca squamea - Melaleuca squarrosa - Hakea epiglottis - (Lomatia polymorpha) - Bauera rubioides

Closed scrub (height 2-8 m cover 70%) of the above species forms an almost impenetrable thicket on deep muds fringing the western margin of Lake Edgar south (localities 2-5), along creeks inflowing on the eastern side of this lake - and indeed all creeks draining the "button grass" plains -, and has developed into low closed forest on the island in the south lake. Outlines of this scrub association also form 'jetties' into the lake on the eastern shore (locality 8-9), correlating possibly with several creeks inflowing here, and is present as a less dense low community on the above water level peat bank forming the south eastern shore (locality 1d). The scrub supports dense growths of Hypolaema longissima (bull's wool), Leptocarpus tenax, Restio tetraphyllus, Gahnia psittacorum and Sprengelia incamata are common. Mostly woody shrubs appear to arise in 'coppice' fashion from swollen lignotubers approximately at water level. Consequently the poor drainage is relatively unimportant for this association except in the protection from fire an above surface water table affords. The coalescing of contiguous lignotubers into 'platforms' has allowed extensive establishment of Drimys on the island, and sporadically elsewhere, along with Phyllocladus asplenifolius, Gaultheria hispida and an orchid Cryptostylis sp.

(iii) Button Grass Communities

Because of the fire promoting properties of Gymnoschoenus sphaerocephalus, this species has the ability to dominate extensive areas of impeded drainage under the present climate; the floristic diversity of this very stable disclimax community being related to the extent of soil drainage (a function of topographical position) and the period elapsed since the last intense fire. In the vicinity of Lake Edgar Gymnoschoenus sphaerocephalus is extremely abundant in continuous sedgeland (very dense cover, 70-100%) intergrading to open hummock sedgeland (tussock heights 1 m cover 10-30%) usually with a variety of emergent shrubs. Two poorly defined associations within the main Gymnoschoenus sphaerocephalus - Xyris operculata association are recognized, both possibly of short temporal duration (a) the "button grass moor" and (b) the "button grass swamp".

(a) Leptospermum nitidum - Sprengelia incamata - Boronia pilosa⁺ - Lepyrodia? - (Bauera rubioides): Button grass moor.

On shallow skeletal soils and ca 20-30° slopes (locality 1a) emergent shrubs (height 0.5 m) from the Myrtaceae and Epacridaceae, along with sedges from the Restionaceae and Cyperaceae, form an important heath-like 'super-stratum' above very low abundant Gymnoschoenus plants. Bauera rubioides and Xyris operculata are abundant and similarly reduced in height. Bare but moist channels in the peaty soil between plant clumps are colonized by Actinotus bellidioides, locally abundant Selaginella uliginosa or a profuse growth of fruticose soil lichens including Cladia retipora, C. sullivanii, C. aggregata, Cladina leptoclada, and Cladonia spp. in slightly more sheltered areas (Bratt, 1972). Terecette formation and exposure of quartzite gravels suggests soil creep is currently active. Lower down the slope (locality 1(b)) in the deeper wetter peat soils, Gymnoschoenus tussocks are distinctly taller and more

⁺ possibly an undescribed variety of B. pilosa.

widely spaced with fewer emergent shrubs in between the plants. Leptospermum nitidum is replaced by Melaleuca squamea; Boronia citriodora occurs sporadically as does Blandfordia marginata.

(b) Lepidosperma longitudinale - Leptocarpus tenax - Xyris operculata association.

In low lying areas within the button grass plains with a water table permanently above the peat surface, the sedge Lepidosperma longitudinale replaces Gymnoschoenus to a marked degree. Such a shallow swamp sedgeland occurs in an arcuate depression behind the south eastern bank of south lake being separated from the lake proper by a gently sloping expansive 'levee' above the water table and supporting Gymnoschoenus tussock sedgeland with a low open scrub of Leptospermum lanigerum - Melaleuca squamea and scattered Banksia marginata (Locality 1c). Associated with Lepidosperma longitudinale are abundant growths of other 'sedges', Leptocarpus tenax, Restio complanatus, Lepyrodia tasmanica, and Xyris operculata, together with scattered woody shrubs Melaleuca squamea, Sprengelia incarnata, Leptospermum lanigerum and Boronia citriodora. Restio tetraphyllus and Gleichenia microcarpa form locally dense stands.

(c) Gymnoschoenus sphaerocephalus - (Xyris operculata) association

This association is by far the most extensive around Lake Edgar, and indeed of the south west of Tasmania in general, forming the stable disclimax community on infertile acidic peats in areas with the climatic potential to support temperate rain-forest. Once established, cessation of fires on Gymnoschoenus tussock sedgeland produces the monospecific open hummock sedgeland - individual Gymnoschoenus tussocks higher than 2 m and with deep 'muck' filled channels between plants. An increased frequency of fires in the Huon Plains area over the last thirty years has decreased the tussock height from approximately 2 m to less than 1 m at present, and correspondingly increased the floristic composition of the association (Professor Jackson personal communication). At present Xyris operculata is a constant and abundant associate of Gymnoschoenus. Suppression of Gymnoschoenus by shrub shading, as under Banksia marginata on better drained slopes, seems probable (Locality 13).

(iv) Lake Communities

The south lake varying in depth from 0.5 m near the bank to > 1 m further out is flooded by a variety of sediments - pure quartzite sands on the eastern and southern sides and deep lake muds partially covered by a rhizome mat on the western and northern sides. The north lake seems primarily an infill of 1-2 m of fine organic mud over quartzite sands. Terrigenous peats up to 1 m deep overlie (presumed) lake muds in the hinterland (Locality 11). The hydrophyte and heliophyte flora of Lake Edgar is exceedingly poor both in numbers of species and abundance, reflecting possibly a low pH and mineral status in common with the surrounding peats. Sedges predominate on both sands and organic infills, with a rudimentary zonation reflecting probably a depth gradient:

(a) Cladium glomeratum occurring in water deeper than 0.5 m and sparsely distributed over the area of both lakes. An extensive stand occurs on the quartzite sands at the southern end of the south lake (Locality 2).

(b) Lepidosperma longitudinale and Chorisandra cymbaria occurring in waters generally shallower than 0.5 m around the periphery of the southern lake. Both sedges are found colonizing muds and sands: Chorisandra in locally dense stands on the north eastern sector of the south lake and Lepidosperma more generally and sparsely distributed. The detritus produced by decay of, and entrapped by, these sedges appear to form the most important organic sediment accumulating within the lake.

(c) Restio tetraphyllus forming the marginal fringe vegetation of the southern lake. Narrow dense clumps of this sedge, arising from a barely submerged rhizome mat, occur within and border the Melaleuca spp. - Leptospernum lanigerum scrub on the western shore. This community broadens out on the north western section (locality 5-6) into an extensive sedge swampland of large dense Restio tetraphyllus tussocks interspersed with diffuse Lepidosperma longitudinale growth; the combined submerged rhizome mat being sufficiently shallow to allow colonization by isolated woody shrubs of Callistemon and Melaleuca squarrosa. Nests of Cormorants Phalacrocorax sp. were observed in these plants. A similar encroachment of fringe sedge swamps by shrubs was observed on the north eastern edge of the north lake (locality 12).

(d) Myriophyllum propinquum occurring in locally dense patches floating adjacent to the Restio tetraphyllus margin on the western shore of Lake Edgar south. This, the only true hydrophyte found, appears to be dependent on sheltered eutrophic conditions, co-related with a deep organic infill and tall wet scrub development.

Discussion

In common with other "button grass" areas of south western and western Tasmania, the present mosaic of forest, scrub and sedgeland in the vicinity of Lake Edgar cannot be explained solely in terms of climatic and edaphic factors (such as exposure to wind and water table variation with topography as suggested by Davis (1940) since well developed scrub has developed on both well drained soils and submerged substrata in both sheltered and exposed situations. Fire, presumably anthropogenic, appears the most plausible factor able to irregularly extend sedgelands as a stable disclimax community into areas otherwise capable of supporting woody vegetation. Therefore fire has been regarded as having been a major recurrent environmental factor in Tasmania (Jackson, 1968). The development of a low forest of Melaleuca - Leptospernum spp. within the southern lake, when contrasted with the reduced sporadic scrub of these same species in the less fire-protected hinterland, provides good evidence for the deflecting effect of fires on the vegetation. Similar evidence is provided by the densely vegetated islands of Bathurst Harbour. It is accordingly difficult to postulate orderly potential successions leading to forest climax communities as "natural" if fire-caused disclimax associations are the rule rather than the exception. However observations suggest that variation in the intensity of fires has in fact 'preserved' various stages within the "natural" (1) xerosere and (2) hydrosere successions possible within the area under the post-glacial climatic fluctuations. Palaeofloristic data relevant to the establishment of the Gymnoschoenus sphaerocephalus communities are discussed in Appendix 2.

(1) Fine quartzite sands probably formed the primary substratum available for colonization; these submerged by blocking of the pre-fault drainage network. One depositional feature relict from former lake activity is suspected from its influence on the present distribution of vegetation around the southern sector of the south lake: Banksia marginata, characteristic of well drained soils, and present on the levee bank at locality 1 (d) to 3 is well established as a small tree in Melaleuca - Leptospermum scrub, although the water table level is above ground level here. At present, wave activity within the exposed south eastern sector of the southern lake has maintained an area of shallow submerged quartzite sand. The primary hydrosere is a sequence of sedges Cladium glomeratum, Lepidosperma longitudinale and Chorisandra cymbria as shoaling of the lake occurs by sand movements and accumulation of sedge trapped organic detritus. In deeper settled waters deposition of inwashed fine organic matter occurs and is again colonized by Lepidosperma longitudinale and Chorisandra cymbria with establishment of Restio tetraphyllus then isolated woody shrubs Melaleuca spp. and Callistemon as the lake depth decreases. These nuclei of small sedge-shrub 'islands' have apparently coalesced into a dense fringe zone of wet scrub by further detritus accumulation and further invasion by other woody species, Sprengelia incarnata, Leptospermum lanigerum, Hakea epiglottis, and Lomatia polymorpha. These support climbing species e. g. Bauera rubioides, Hypolaena longissima. The stems of these woody shrubs undergo considerable thickening just below water level, forming 'lignotuber platforms' at water level in dense scrub. Several outcomes of this appear important (a) submerged epicormic cells can quickly produce regeneration of the scrub after all but very intense fires (b) shrubs requiring a water table level effectively below 'ground' surface can become established on the 'lignotuber platform'. The abundant Drimys (a rainforest species) on the island in the southern lake, and sporadically around the shore, Gaultheria and Phyllocladus are examples, (c) the establishment of a scrub margin protects the shore from erosion and once this scrub is destroyed, wave erosion into the hinterland is accelerated. This is seen as one reason for the outliers of wet scrub extending into deep water on the eastern shore of the southern lake at localities 7 to 9, orientated in the direction of the prevailing westerly wind. Protection of this area of the south lake by the island seems probable. Given protection from fire, the Melaleuca - Leptospermum scrub could develop into low forest covering much of the area of impeded drainage extending to the Eucalyptus forest equally possible on the surrounding hill slopes: a possible example of such a development is seen at Melaleuca Flats along the Scotts Peak Road. Establishment of Gymnoschoenus sphaerocephalus by destruction of the shrub community creates conditions preventing the re-establishment of the woody species - either by hummock formation under a low fire frequency or by the more effective fire survival adaptations of Gymnoschoenus relative to those of woody shrubs under a high fire frequency (see also Sutton, 1928). In this latter case the establishment of emergent shrubs is limited to growth between fires and produces the short-lived heath-like low shrub Gymnoschoenus - Xyris "button grass moor" seen on freely draining hillslopes (locality 1 a and b) and the taller but more isolated shrubs between button grass tussocks in poorly drained peats (locality 11 and 12).

(2) Early stages in xerosere (and psammosere) successions were not recorded around Lake Edgar, continuous sedgeland abuts directly onto bare skeletal soils. As elsewhere (Gilbert, 1959) soil pH and fertility restricts vegetation development beyond Eucalyptus forest of mixed age on the quartzitic ridges and lower shallow acid soils. A probable stage in development of the wet sclerophyll sub-climax is the Banksia marginata - Casuarina monilifera scrub: the community also occurs when the Eucalyptus simmondsii forest is burnt. With an increase in soil fertility, as occurs on non-metamorphic strata and deeper unleached soils in fire protected sites, replacement of xeromorphic vegetation by more mesomorphic types leads to the mixed forest seen in the sheltered south eastern slopes of the foothills below Mt. Anne. Given a very low incidence of fire, establishment of temperate Nothofagus cunningghamii rain forest is possible.

In the vicinity of Lake Edgar therefore, on habitats ranging from pure submerged quartzite sands, through various depths of peat-soils, to the exposed bare quartzite rock on ridge tops, drainage variation, high acidity, and low mineral nutrient availability, primarily control the rate and direction of development of plant communities possible. However, periodic fires of various intensity have created the observed mosaic of ecotonal disclimax association out of various stages in the Hydarch and xerarch plant successions present. Correlated with this, exposure to the prevailing winds, (and also winds predominant during periods of high fire risk), have been fundamental in the distribution of the woody plant associations.

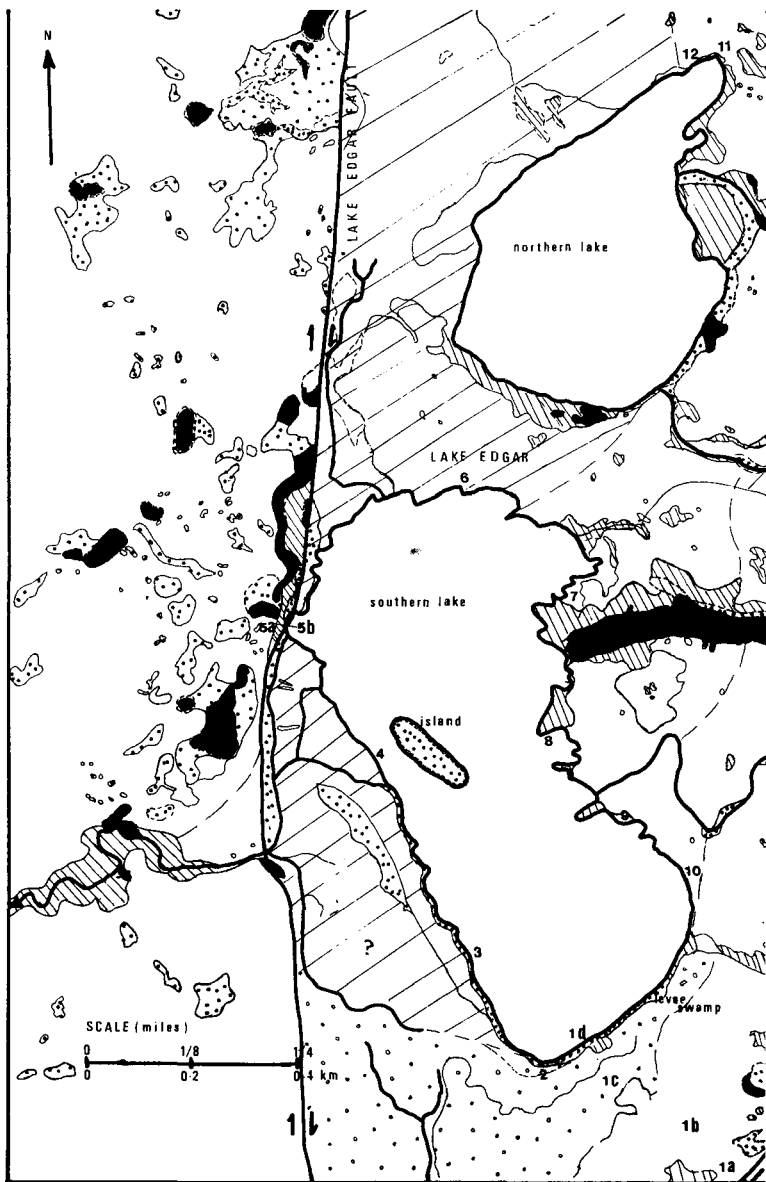
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APPENDIX

Species lists for :-

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SCOTT'S PEAK ROAD

SPECIES LISTS FROM SELECTED LOCATIONS AROUND
LAKE EDGAR

LAKE EDGAR (South)

Location 1(a) - Heath-sedgeland with emergent shrubs

- common - Myrtaceae: *Leptospermum nitidum*
Epacridaceae: *Sprengelia incarnata*
Rutaceae: *Boronia pilosa*
Cunoniaceae: *Bauera rubioides*
Umbelliferae: *Actinopus bellidioides*
- Cyperaceae: *Lepidosperma filiforme*, *Gymnoschoenus sphaerocephalus*
Restionaceae: *Restio complanatus*, *R. oligocephalus*
Xridaceae: *Xyris* sp.
- occasional - Epacridaceae: *Epacris corymbiflora*
Cyperaceae: *Elynanthus capillaceus*, *Schoenus* sp.
Lycopodiaceae: *Selaginella uliginosa*
- rare - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Leptospermum scoparium*, *Baeckea leptocaulis*
Casuarinaceae: *Casuarina monilifera*
Proteaceae: *Banksia marginata*
Dilleniaceae: *Hibbertia procumbens*
Stylidiaceae: *Stylidium graminifolium*
Liliaceae: *Blandfordia marginata*

Location 1(b) - Tussock sedgeland

Dominated by *Gymnoschoenus*. Species list as above but many of the species were less frequent. Additional species included :-

- Loganiaceae: *Mitrasacme montana*
Cyperaceae: *Cladium tetraquetrum*
Iridaceae: *Diplarrhena moraea*
Restionaceae: *Lepyrodia tasmanica*
Gramineae: 2 unidentified species

Location 1(c) - Sedge swamp

- common - Epacridaceae: *Sprengelia incarnata*
Cyperaceae: *Lepidosperma longitudinale*, *Gymnoschoenus sphaerocephalus*
Restionaceae: *Leptocarpus tenax*, *Lepyrodia tasmanica*
Xyridaceae: *Xyris* sp.
Gleicheniaceae: *Gleichenia microcarpa*

- occasional - Myrtaceae: *Leptospermum nitida*, *Melaleuca squamea*
Cunoniaceae: *Bauera rubioides*
- rare - Centrolepidaceae: *Centrolepis monogyna*
Lycopodiaceae: *Lycopodium laterale*
- Location 1(d) - Tussock sedgeland with scattered marginal shrubs
 Species list similar in Location 1(b), including additional species:-
Rutaceae: *Boronia citriodora*
Proteaceae: *Banksia marginata*
- Location 1(e) - Lake community on fine quartzite sand
Cyperaceae: *Lepidosperma longitudinale*, *Cladium glomeratum*, *Chorisandra cymbaria*
Restionaceae: *Restio tetraphyllus*
- Location 2 - Closed scrub near the lake margin
 common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*,
Leptospermum lanigerum
Restionaceae: *Restio tetraphyllus*, *Leptocarpus tenax*,
Hypolaena longissima
Cyperaceae: *Lepidosperma longitudinale*
Xyridaceae: *Xyris* sp.
- occasional - Proteaceae: *Hakea epiglottis*
Epacridaceae: *Sprengelia incarnata*
Cunoniaceae: *Bauera rubioides*
Cyperaceae: *Gymnoschoenus sphaerophalus*, *Gahnia psittaconum*
Gleicheniaceae: *Gleichenia* sp.
- rare - Juncaceae: *Juncus planifolius*
- Location 3 - Closed scrub
 common - Myrtaceae: *Leptospermum lanigerum*, *Melaleuca squarrosa*
Epacridaceae: *Sprengelia incarnata*
Cunoniaceae: *Bauera rubioides*
Haloragaceae: *Myriophyllum propinquum*
Cyperaceae: *Lepidosperma longitudinale*, *Chorisandra cymbaria*
Restionaceae: *Restio tetraphyllus*, *Hypolaena longissima*

- occasional - Proteaceae: *Banksia marginata*, *Lomatia polymorpha*
Cyperaceae: *Cladium tetraquetrum*
Bryophyta: *Sphagnum contortum*
- rare - Ericaceae: *Gaultheria hispida*
Naiadeae: *Triglochin striata*
- Location 4 - Closed scrub
- common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*
Proteaceae: *Hakea epiglottis*
Epacridaceae: *Sprengelia incarnata*
Cunoniaceae: *Bauera rubioides*
Restionaceae: *Restio tetraphyllus*
- occasional - Cyperaceae: *Gahnia psittacorum*, *Heleocharis sphacelata*
- rare - Orchidaceae: *Cryptostylis subulata*
- Location 5(a) - Closed scrub on fault scarp
- common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Leptospermum nitida*
Epacridaceae: *Sprengelia incarnata*
Rutaceae: *Boronia citriodora*
Cyperaceae: *Gymnoschoenus sphaerocephalus*
Restionaceae: *Leptocarpus tenax*
Xyridaceae: *Xyris* sp.
- occasional - Myrtaceae: *Eucalyptus simmondsii*
Proteaceae: *Banksia marginata*, *Hakea epiglottis*
Casuarinaceae: *Casuarina monilifera*
Leguminosae: *Oxylobium ellipticum*
Umbelliferae: *Actinotus bellidioides*
Restionaceae: *Lepyrodia tasmanica*
Liliaceae: *Blandfordia marginata*
- Location 5(b) - Emergent shrubs in sedge swamp
- Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Callistemon* sp.
Epacridaceae: *Monotoca glauca*
- Location 6 - Tussock sedgeland with emergent shrubs (cover c. 30%)
- common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Leptospermum lanigerum*.
Proteaceae: *Hakea epiglottis*
Epacridaceae: *Sprengelia incarnata*

- Cyperaceae : *Gymnoschoenus sphaerocephalus*, *Cladium glomeratum*, *Lepidosperma longitudinale*
Restionaceae : *Restio tetraphyllus*, *Leptocarpus tenax*,
Lepyrodia tasmanica
Xyridaceae : *Xyris operculata*
Gleicheniaceae : *Gleichenia microcarpa*
- occasional - Cyperaceae : *Elynanthus capillaceus*
Naiadeae : *Triglochin striata*
Gramineae : unidentified species
- Location 7 - Patchy, open scrub
- common - Myrtaceae : *Leptospermum lanigerum*, *L. scoparium*,
Melaleuca squarrosa
Proteaceae : *Hakea epiglottis*
Casuarinaceae : *Casuarina monilifera*
Epacridaceae : *Sprengelia incarnata*
Rutaceae : *Boronia citriodora*
Restionaceae : *Restio tetraphyllus*, *Leptocarpus tenax*
Cyperaceae : *Gymnoschoenus sphaerocephalus*
Gleicheniaceae : *Gleichenia* sp.
- occasional - Proteaceae : *Banksia marginata*, *Lomatia polymorpha*
Myrtaceae : *Leptospermum nitida*
- rare - Myrtaceae : *Eucalyptus simmondsii*
- Location 8 - Low closed scrub, fringing the shore on
"sedimentary jetties" overlying the sand
- common - Myrtaceae : *Melaleuca squarrosa*, *M. squamea*, *Leptospermum lanigerum*
Epacridaceae : *Sprengelia incarnata*
Cunoniaceae : *Bauera rubioides*
Cyperaceae : *Gymnoschoenus sphaerocephalus*
Restionaceae : *Restio tetraphyllus*
- occasional - Casuarinaceae : *Casuarina monilifera*
Cyperaceae : *Cladium tetragetrum*, *Carex appressa*
- rare - Leguminosae : *Pultenaea juniperina*
Haloragaceae : *Myriophyllum propinquum*
Lentibulariaceae : *Utricularia* sp.
Podocarpaceae : *Phyllocladus asplenifolius*

- Location 9 - Low closed scrub fringing the shore
- common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Leptospermum lanigerum*
Proteaceae: *Lomatia polymorpha*
Epacridaceae: *Sprengelia incarnata*
Cunoniaceae: *Bauera rubioides*
Cyperaceae: *Lepidosperma longitudinale*, *Chorisandra cymbaria*
Restionaceae: *Restio tetraphyllus*
- occasional - Filicinae: *Gleichenia* sp.
- Location 10 - Low closed scrub with tussock-sedgeland sporadically opening onto the lake
- (a) Scrub
- common - Myrtaceae: *Melaleuca squarrosa*, *M. squamea*, *Leptospermum lanigerum*
Epacridaceae: *Sprengelia incarnata*
Cunoniaceae: *Bauera rubioides*
Restionaceae: *Restio tetraphyllus*
- rare - Lentibulariaceae: *Utricularia* sp.
- (b) Sedgeland
- common - Myrtaceae: *Leptospermum scoparium*
Epacridaceae: *Sprengelia incarnata*
Rutaceae: *Boronia citriodora*
Cyperaceae: *Gymnoschoenus sphaerocephalus*
Filicinae: *Gleichenia microcarpa*
- occasional - Myrtaceae: *Eucalyptus ovata*
Thymeliaceae: *Pimelea lindleyana*
- (c) Aquatics Cyperaceae: *Cladium glomeratum*, *Lepidosperma longitudinale*

LAKE EDGAR (North)

- Location 11 - Low tussock sedgeland with emergent shrubs
- common - Myrtaceae: *Leptospermum nitidum*, *Melaleuca squamea*
Rutaceae: *Boronia pilosa*
Cunoniaceae: *Bauera rubioides*
Cyperaceae: *Gymnoschoenus sphaerocephalus*
Lepidosperma filiforme
Restionaceae: *Lepyrodia tasmanica*
Xyridaceae: *Xyris* sp.
- occasional - Proteaceae: *Banksia marginata*
Myrtaceae: *Baeckea leptocaulis*
Epacridaceae: *Epacris lanuginosa*
Umbelliferae: *Actinotus bellidioides*
- rare - Stylidiferae: *Stylidium graminifolium*
- Location 12 - Tussock sedgeland with emergent shrubs
- common - Myrtaceae: *Melaleuca squamea*
Epacridaceae: *Sprengelia incarnata*
Cyperaceae: *Gymnoschoenus sphaerophalus*
Restionaceae: *Leptocarpus tenax*
- occasional - Myrtaceae: *Leptospermum lanigerum*, *L. scoparium*,
Melaleuca squarrosa
Proteaceae: *Lomatia polymorpha*, *Hakea epiglottis*
Epacridaceae: *Epacris lanuginosa*
Cunoniaceae: *Bauera rubioides*
Restionaceae: *Hypolaena longissima*, *Restio tetraphyllus*,
R. complanatus, *Lepyrodia tasmanica*
Cyperaceae: *Elynanthus capillaceus*
Iridaceae: *Diplarrhena moraea*
Gleicheniaceae: *Gleichenia* sp.
- rare - Leguminosae: *Pultenaea subumbellata*
Rubiaceae: *Coprosma nitida*
Haloragaceae: *Haloragis serpyllifolia*
Restionaceae: *Restio* sp.
Gramineae: unidentified sp.
- Location 13 - Closed scrub fringing tussock sedgeland
- (a) Closed scrub Myrtaceae: *Eucalyptus simmondsii*, *Melaleuca squarrosa*
Proteaceae: *Banksia marginata*
Casuarinaceae: *Casuarina monilifera*

(b) Tussock Sedgeland

- common - Myrtaceae: *Melaleuca squarrosa*, *Leptospermum nitidum*
Epacridaceae: *Sprengelia incamata*
Cunoniaceae: *Bauera rubioides*
Cyperaceae: *Gymnoschoenus sphaerocephalus*
 filiforme
Xyridaceae: *Xyris* sp.
- occasional - Proteaceae: *Agastachys odorata*
Rutaceae: *Boronia citriodora*
- rare - Thymeliaceae: *Pimelia lindleyana*

Location 14 - Closed scrub

- common - Myrtaceae: *Leptospermum scoparium*, *L. nitidum*, *Eucalyptus*
simmondsii, *Melaleuca squarrosa*
Proteaceae: *Banksia marginata*, *Agastachys odorata*
Leguminosae: *Acacia mucronata*
Epacridaceae: *Sprengelia incamata*
Cyperaceae: *Gymnoschoenus sphaerophalus*
Restionaceae: *Lepyrodia tasmanica*
Gleicheniaceae: *Gleichenia* sp.
- occasional - Leguminosae: *Pultenaea juniperina*
Rutaceae: *Boronia citriodora*
Cyperaceae: *Gahnia psittacorum*

SPECIES LIST FOR THE ISLAND IN LAKE EDGAR (SOUTH)

(This island was not visited. The species list is compiled from specimens collected by other research workers).

- Myrtaceae: *Melaleuca squarrosa*, *Leptospermum lanigerum*
Proteaceae: *Lomatia polymorpha*
Cunoniaceae: *Bauera rubioides*
Winteraceae: *Brymis lanceolata*
Ericaceae: *Gaultheria hispida*
Restionaceae: *Restio tetraphyllus*
Liliaceae: *Drymophila cyanocarpa*
Gleicheniaceae: *Gleichenia microphylla*
Dennstaedtiaceae: *Blechnum procerum*

GENERAL SPECIES LIST FROM LOCATIONS AROUND L. EDGAR

Common name, if any, in brackets

A. SPERMATOPHYTA1. GymnospermaePodocarpaceae*Phyllocladus asplenifolius* (Celery-top Pine)2. Angiospermae(a) DicotyledonesCasuarinaceae (She-Oak Family)*Casuarina monilifera*Cunoniaceae*Bauera rubioides* - (Bauera or native rose)Dilleniaceae*Hibbertia procumbens*Epacridaceae - (Heath family)*Epacris corymbiflora**E. lanuginosa* - (Native Rocket)*Monotoca glauca**Sprengelia incarnata*Ericaceae*Gaultheria hispida* - (Snow berry)Haloragaceae*Haloragis seryllifolia* - (Raspwort)*Myriophyllum propinquum*Leguminosae (Pea flower family)*Acacia mucronata* (Wattle)*Oxylobium ellipticum* - (Golden Rosemary)*Pultenaea juniperina* - (Prickly Beauty)*P. subumbellata* - (Native Wallflower)Lentibulariaceae*Utricularia* sp. (Bladderwort)Loganiaceae*Mitrasacme montana*

Myrtaceae

- Baeckea leptocaulis
 Callistemon sp. - (Bottlebrush)
 Eucalyptus ovata - (Swamp Gum, (N. Tas.), Marrawah Gum
 (N. W. Tas.), Black Gum (S. Tas.)).
 E. simmondsii - (Smithton Peppermint)
 Leptospermum lanigerum (Woolly Tea-tree)
 L. nitidum
 L. scoparium - (Manuka)
 Melaleuca squamea
 M. squarrosa

Proteaceae

- Agastachys odorata - (White Waratah)
 Banksia marginata - (Honeysuckle)
 Hakea epiglottis
 Lomatia polymorpha - (relative of the Guitar plant)

Rubiaceae

- Coprosma nitida

Rutaceae

- Boronia citriodora (lemon scented Boronia)
 B. pilosa

Stylidiaceae

- Stylidium graminifolium - (Trigger plant)

Thymeliaceae

- Pimelia lindleyana

Umbelliferae

- Actinotus bellidioides (relative of the N. S. W. flannel flower)

Winteraceae

- Drimys lanceolata (Mountain Pepper)

(b) MonocotyledonesCentrolepidaceae (a Sedge family)

- Centrolepis monogyna

Cyperaceae (a Sedge family)

- Carex appressa
 Chorisandra cymbaria
 Cladium glomeratum
 Cladium tetraquetrum
 Elynanthus capillaceus
 Gahnia psittacorum - (Cutting grass)
 Gymnoschoenus sphaerophalus

Cyperaceae (cont'd.)

- Heleocharis sphacelata
 Lepidosperma filiforme
 L. longitudinale
 Schoenus sp.
 Scirpus sp.

Iridaceae

- Diplarrhena moraea - (White Iris)

Juncaceae - (Rush family)

- Juncus planifolius

Liliaceae

- Blandfordia marginata - (Gordon Lily or Christmas Bells)
 Drymophila cyanocarpa - (Solomon's seal)

Naiadeae

- Triglochin striata

Orchidaceae

- Cryptostylis subulata - Duckbill Orchid)

Restionaceae (a Sedge family)

- Hypolaena lateriflora
 H. longissima - (Bullswool)
 Leptocarpus tenax
 Lepyrodia tasmanica
 Restio complanatus
 R. oligocephalus
 R. tetraphyllus

Xyridaceae - (Flowering rush family)

- Xyris operculata
 Xyris sp.

B. PTERIDOPHYTA (Ferns)(a) FilicinaeGleicheniaceae

- Gleichenia microphylla - (Umbrella Fern)
 Gleichenia sp. - (~~Asplenium~~)

Dennstaedtiaceae

- Blechnum procerum

(b) Lycopodiinae (Club mosses)Lycopodiaceae

- Lycopodium laterale
 Lycopodium sp.

Lycopiaceae (cont'd.)SelaginellaceaeSelaginella uliginosaC. BRYOPHYTA (Mosses)SphagnaceaeSphagnum contortumAPPENDIX 2

Paleofloristic data for establishment of the Gymnoschoenus sphaerocephalus sedgeland is as yet very limited. Gymnoschoenus pollens are preserved infrequently in post-Glacial deposits - Lake Tiberias, Bronte Park on the southern edge of the Central Plateau, and the Tam Shelf and Beattie's Tam on Mt. Field. In Beattie's Tam, records of the pollen type extend beyond 9000 C¹⁴ years BP (Macphail unpublished results, Peterson 1968). In the Broad River Valley, Mt. Field, up to 40 cms of black peaty soil vegetated by Gymnoschoenus sphaerocephalus occur above reworked glaciofluvial sands containing unidentified sedge remains apparently deposited contemporaneously with the sands. Samples of 100 cms and 125 cms below the present surface gave carbon - 14 dates of 3,050 ± 104 C¹⁴ years BP and 3,500 ± 80 C¹⁴ years BP respectively (Caine, 1969). Establishment of the extensive button grass plains between retreat moraines in the Broad River Valley is therefore quite recent, but the poor drainage conditions favouring the development of the sedgeland may have required formation of impermeable clay stratus found below 40 cms. It is however possible that this clay results from insitu weathering of dolerite sands under the highly acidic peaty soil.

Excavations of aboriginal middens on the West Coast have yielded faunal remains characteristic of the present coastal sedgeland environment. The Gymnoschoenus sphaerocephalus plains - as a "pyrogenic artefact of the Tasmanian (aboriginals) or not" - has consequently existed at West Point since approximately 2,350 C¹⁴ years BP (Rhys Jones, 1966). Aboriginal remains however extend back to 8000 C¹⁴ years BP at Rocky Cape South on the North West coast.

References

- Caine, N. (1969) Carbon 14 dates from the Broad River Valley River, Mt. Field National Park Tasmania. Aust. J. Sci 31 3, 119.
- Peterson (1968). Cirque Morphology and Pleistocene Ice Formation Conditions in South eastern Australia. Aust. Geog. Studies 6 67.
- Rhys Jones (1966) A Speculative Archaeological sequence for North West Tasmania. Records Q. Victoria Museum Launceston, N.S. 25.

DISTRIBUTION OF VEGETATION CATEGORIES
AROUND LAKE EDGAR. MAP



Wet Schlerophyll Forest. Eucalyptus simmondsii association. height $> 10\text{m}$; (includes patches of rain-forest on ridges to east of Scotts Peak Road).



Wet Scrub. height 2 - 10m; Banksia marginata - Casuarina monolifera association, (with scattered emergent Eucalyptus simmondsii) on hill slopes Leptospermum lanigerum, Melaleuca squamea - Hakea epiglottis - Melaleuca squarrosa association on creek margins and around lake.



Low Wet Scrub. height $< 2\text{m}$; of above association



Gymnoschoenus sphaerocephalus - Xyris operculata association (tussock height $> 0.5\text{m}$) with abundant emergent shrubs (Epacridaceae, Myrtaceae).



Ecotones of low Gymnoschoenus sphaerocephalus - Xyris operculata association and Rutaceae - Myrtaceae Epacridaceae (button grass heath) association.

Lepidosperma longitudinale (button grass swamp).

1 etc

Localities at which species lists were made.