



Flora Technical Note No. 6: *Sphagnum* communities

The *Flora Technical Note Series* provides information for Forest Practices Officers on flora management in production forests. These technical notes are advisory guidelines and should be read in conjunction with the requirements of the Tasmanian *Forest Practices Code*.

Technical notes can be accessed on the Forest Practices Authority's website: www.fpa.tas.gov.au

1. Introduction

Sphagnum peatlands are of special importance in Australia. They make up a small part of the landscape but they are ecologically unique and provide distinctive habitat for flora and fauna. Recent vegetation mapping indicates that there are 3,100 hectares of *Sphagnum* peatland in Tasmania, though this figure excludes many small sites not identifiable at the scale of mapping.

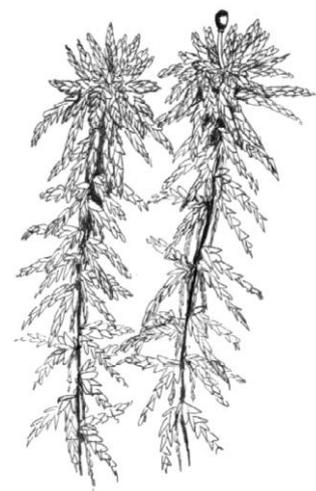
Sphagnum moss (sometimes called bog moss or peat moss) is a prominent component of *Sphagnum* peatlands. They include numerous other species, depending on the site conditions and location. *Sphagnum* moss is strongly associated with waterlogged sites, and with peat formation. Peat comprises a layer of dead material from bog plants. It may be several metres deep because the decomposition of dead peat material is inhibited by the waterlogged environment and the highly acidic chemistry of *Sphagnum*.

Sphagnum moss has an extremely high water holding capacity, making it a useful commodity in the nursery industry. It is used in potting media, and to wrap rootstock for transportation. The major sources of *Sphagnum* are in the northern hemisphere, where *Sphagnum* peatlands are extensive. Harvesting occurs at a relatively small scale in Tasmania (and on the Australian mainland), however the scarcity of *Sphagnum* peatlands means that the impacts of harvesting can be high. Peat is also an economically valued resource, used in the nursery trade and, in the northern hemisphere where it is more abundant, as a fuel. Very little peat mining occurs in Tasmania.

Sphagnum peatlands have at least 30% cover of *Sphagnum* and are generally greater than 0.1 hectare. However *Sphagnum* may also occur in very small patches (e.g. 10 x 10 m). This technical note gives management guidelines for *Sphagnum* peatland and patches of *Sphagnum* which may occur within other vegetation communities, including forest communities. Note that these guidelines do not apply to small patches where the dominance of *Sphagnum* is clearly the result of past land use (e.g. tracks across poorly drained sites).

'*Sphagnum* peatland' is identified as a TASVEG community (coded MSP) and described in *From Forest to Fjeldmark* [Harris and Kitchener 2005 - available as a pdf file on the Department of Primary Industries, Parks, Water and Environment website (www.dpipwe.tas.gov.au)]. This community is listed as a threatened vegetation community under the *Nature Conservation Act 2002* – this means that it cannot be cleared or converted unless exceptional circumstances have been approved by the Forest Practices Authority. A *Threatened Native Vegetation Community Information Sheet on Sphagnum* peatland is available from the Forest Practices Authority website.

In addition to giving management advice, this technical note is designed to assist in the identification of *Sphagnum* community types, and provide information about their distribution, ecological function and other important values. This information is based largely on *Conservation and Reservation Assessment of Tasmanian Sphagnum Peatlands* (Whinam and Chilcott 2000) and *Ecology and Conservation of Tasmanian Sphagnum Peatlands* (Whinam et al. 1989).



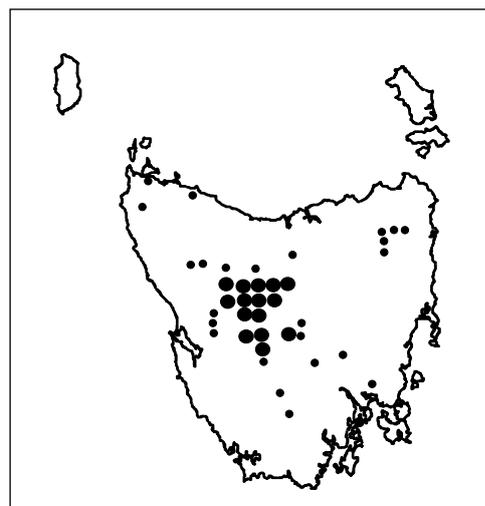
Sphagnum moss close up.
Drawing: Nina Roberts

2. Distribution of *Sphagnum* peatlands in Tasmania

Sphagnum peatlands are widespread in Tasmania (relative to mainland Australia), but their total area (around 3100 ha) is small compared to other non-forest communities.

Sphagnum peatlands usually form on constantly wet sites (i.e. areas of high rainfall and low evaporation). Most occur on the Central Plateau and in the Mersey River catchment (see map). Typical locations include river valleys, sandstone shelves with impeded drainage and sites adjacent to lakes and streams. Most sites occur at altitudes above 600 m (up to 1360 m). Less commonly, *Sphagnum* peatlands occur at lower altitudes on limestone and basalt in the north-west or south-east of the state.

A general guide to the location of *Sphagnum* peatlands is shown on the map (based on Whinam et al. 2001). Large dots indicate parts of the state with more substantial cover. *Sphagnum* peatlands may occur outside the indicated areas.



3. Identification of *Sphagnum* peatlands

All *Sphagnum* peatlands contain one or more species of *Sphagnum* moss. There are five true *Sphagnum* species in Tasmania (i.e. mosses belonging to the genus *Sphagnum*), plus a distantly related species that was formerly considered to belong to the genus (*Ambuchanania leucobryoides*, formerly *Sphagnum leucobryoides*). The five species are: *Sphagnum fuscovinosum*, *S. cristatum*, *S. australe*, *S. falcatulum* and *S. novo-zelandicum*. *Sphagnum cristatum* is the most common species in Tasmania (and Australia).

Sphagnum moss is distinctive due to the spongy texture of the moss tendrils, and its hummock-forming growth habit. Some species tend to grow in shallow aquatic environments such as pools of water. The typical structure of *Sphagnum* consists of a main stem that is sometimes quite hard, with short clusters of branches arranged along its length (see figure). The clusters of branches are closer together at the tip of the stem, forming a mop-like head. When these stems are growing densely together in a hummock, only the mop-heads are visible, and below the top branches the moss can be brown, due to decomposition, or white.

Identification of a specimen of *Sphagnum* to the species level usually requires examination of microscopic features such as leaf and stem cells. Species identification is not necessary for classification of the community into one of the known types described below. If you wish to identify a specimen for your own interest, the assistance of an expert is recommended (the Forest Practices Authority Biodiversity Program can refer you to an appropriate person). Material can be collected and stored in a paper envelope or bag, and allowed to dry. The moss will quickly re-hydrate when immersed in water with no damage to the cell features. If you wish to collect *Sphagnum* from any reserved land you will need appropriate authorisation from the relevant management authority.

Sphagnum peatlands can be dominated by *Sphagnum* moss alone, or other species (trees, shrubs, ferns), can also be prominent. Thirteen different community types have been described in Tasmania. A key to these communities is included on the following page of this technical note.

Sphagnum peatlands can be roughly divided into forest and non-forest floristic communities. Only non-forest floristic communities in which *Sphagnum* has at least 30 % cover fit the TASVEG definition of *Sphagnum* peatland, as listed as threatened under the *Nature Conservation Act 2002*. Some other vegetation communities in which *Sphagnum* is prominent, including forest communities, may also be listed as threatened (e.g. pencil pine open woodland).

Information on the distribution of *Sphagnum* communities identified in the following key is provided in the table in Section 4 of this technical note. Note: Images of the species mentioned in the key can be accessed on the FPA website. Scientific names of species (other than eucalypts) are given at the end of this technical note.

Key to *Sphagnum* peatland communities (based on Whinam et al. 2001)

See Table 1, at the end of this technical note, for botanical names of species mentioned in this key.

1 Trees not prominent in peatland**2 Low altitude peatlands (<400 m)**

3 *Sphagnum* present as a floating mat over liquid peat (associated with aquatic limestone sinkholes).....Aquatic sinkholes in limestone (**Group 12**)

3 Fire-disturbed peatlands with flag iris, twine rush and swamp selaginella presentLow-altitude, fire-disturbed *Sphagnum* moss beds (**Group 13**)

2 Medium to high altitude peatlands (>400 m)**3 Sedges or grasses prominent**

4 Dominated by sedges (buttongrass, cord rush) with occasional cider gum (*E. gunnii*) and heath species *Sphagnum*-sedge peatlands (**Group 2**)

4 Dominated by grasses with sedges and herbs and occasional shrubs (e.g. native pepper)..... Montane grassy *Sphagnum*-moss beds (**Group 4**)

3 Shrubs prominent

4 Dominated by heath (with pencil pine, creeping pine or pandani sometimes present) *Sphagnum*-heath peatlands (**Group 1**)

4 Dominated by riparian vegetation including prickly bottlebrush, heath and herbs Streamside *Sphagnum*-moss beds (**Group 3**)

4 Dominated by daisies and mountain tea-tree with small moss beds interspersed Snowpatch *Sphagnum*-moss beds (**Group 5**)

3 Dominated by herbs with a low shrubby layer of mountain heath-myrtle and Gunn's heath..... Herbaceous *Sphagnum*-moss beds (**Group 6**)

1 Trees prominent in peatland**2 Rainforest trees prominent**

3 Dominated by celery top pine with cheeseberry, bottlebrush or native pepper common. Found in NECelery top pine-*Sphagnum* peatlands (**Group 7**)

3 Dominated by sassafras with straggling trochocarpa, waratah, cheesewood, flag iris or bats wing fern common..... Sassafras-*Sphagnum*-moss beds (**Group 9**)

2 Rainforest trees not prominent

3 Dominated by blackwood with fishbone fern or mother shield fern common.Blackwood-*Sphagnum* moss beds (**Group 8**)

3 Dominated by scented paperbark with bauera or pouched coral fern and square twig rush.....*Melaleuca*-*Sphagnum* swamp (**Group 10**)

3 Dominated by *Eucalyptus perriniana*, *E. tenuiramis*, *E. ovata* or *E. rodwayi* with tea-tree, paperbark, heath or sedges common in understorey. Open-lowland eucalypt forest-*Sphagnum* moss beds (**Group 11**)

4. Typical habitats of Tasmanian *Sphagnum* communities

Asterisks indicate those communities most likely to be encountered in proposed forestry areas.

<i>Sphagnum</i> community type	Typical location and habitats
Group 1: <i>Sphagnum</i> – heath peatlands	Relatively high altitude community (average of 940 m). Sites fairly flat, on sandstone, dolerite and granite.
Group 2: <i>Sphagnum</i> – sedge peatlands	Community of the Central Highlands (average altitude of 940 m). Wet, nutrient-deficient, poorly drained and cold sites on sandstone, dolerite and basalt. Commonly occurs near buttongrass moorland.
Group 3: Streamside <i>Sphagnum</i> -moss beds	Alongside watercourses, often on sandstone. Average altitude of 780 m. Found in Cradle Mountain–Lake St Clair National Park, however, best examples outside reserve system in NW and NE, where the community often forms a boundary between tussock grassland and rainforest.
Group 4: Montane grassy <i>Sphagnum</i> -moss beds	NE and central, on more fertile substrates (often basalt). Average altitude of 780 m. Sites often better drained than those of other <i>Sphagnum</i> communities, occurring along drainage lines associated with <i>Poa</i> tussocks.
Group 5: Snowpatch <i>Sphagnum</i> -moss beds	High altitude community (average of 1360 m). On sheltered, well-drained sandstone subject to snow, i.e. Cradle Mountain – Lake St Clair National Park.
Group 6: Herbaceous <i>Sphagnum</i> -moss beds	Only recorded from within Cradle Mountain–Lake St Clair National Park, at 860 m on sandstone slopes.
Group 7: Celery top pine <i>Sphagnum</i> peatlands	Community associated with shallow watercourses at an average altitude of 820 m. Occurs on relatively flat ground on granite and dolerite in NE.
*Group 8: Blackwood – <i>Sphagnum</i> -moss beds	Community of low altitudes (average of 280 m). Occurs where drainage is impeded under blackwood forest in the NW and SE.
*Group 9: Sassafras – <i>Sphagnum</i> -moss beds	Community of medium altitudes (average of 720 m), occurring on well-drained sandstone or dolerite in generally flat terrain.
Group 10: Melaleuca – <i>Sphagnum</i> swamp	A single site on private land in the NW currently typifies this community. Located on a poorly drained flat site, it is at 180 m altitude.
Group 11: Open-lowland eucalypt forest – <i>Sphagnum</i> -moss beds	Lowland community occurring on flat site, often on sandstone. These moss beds are largely on private land in SE lowlands. Associated with the RFA priority community 'Inland <i>Eucalyptus tenuiramis</i> Forest'.
Group 12: Aquatic sinkholes in limestone	Aquatic limestone sinkholes. Reserved near Mole Creek and on the Gog Range. Occurs at an average altitude of 300 m.
Group 13: Low-altitude, fire-disturbed <i>Sphagnum</i> moss beds	Community of low altitudes (average of 140 m) in the NW and at the Gog Range. The sites are disturbed by fire, differentiating them from other communities.

5. Conservation significance of *Sphagnum* peatlands

***Sphagnum* peatland, as defined in Harris and Kitchener (2005), is listed as a threatened native vegetation community under the Nature Conservation Act 2002.**

Although many of the known *Sphagnum* sites in Tasmania are reserved, non-reserved peatlands remain of high conservation value due to the distinctive habitat they provide, and the fragile nature of their ecology. The importance of such peatlands is heightened by geographical isolation (i.e. occurring within regions where the community type is scarce). They are also integral to ecological processes surrounding soil and hydrology, and help to maintain water quality.

The unique habitats associated with *Sphagnum* peatlands are known to support many flora and fauna species. Some of these species, such as certain invertebrate groups, are *Sphagnum* specialists. It is thought that these peatlands are a refuge for primitive, relictual and rare fauna. The discovery of Tasmania's first Stygocaridae (invertebrate) in a *Sphagnum* community is evidence of this. Some rare or threatened flora species (e.g. *Eucalyptus perriniana*, *E. gunnii* subsp. *divaricata*) are associated with *Sphagnum* peatlands.

The diversity found in many *Sphagnum* peatlands may be partially attributed to the presence of terrestrial, aquatic, and semi-aquatic habitats, which provide a range of ecological niches. Conditions within the *Sphagnum* peatland are also relatively stable, with few large fluctuations in the humid microclimate. In addition to species that live and feed in these peatlands, some invertebrates are known to use *Sphagnum* mires as a breeding habitat. Different *Sphagnum* communities vary greatly in the habitats they provide for invertebrate fauna, and therefore will contain very different faunal assemblages.

Some plant communities associated with *Sphagnum* are of high conservation significance independent of the special values of *Sphagnum* peatlands and bogs. They include *E. rodwayi* forest, *E. perriniana* forest, *E. ovata* forest and tussock grassland.

Finally, in some cases *Sphagnum* peatlands are associated with sites of geomorphological significance (such as sinkholes), and some may be associated with sites of archaeological significance.

6. Threats and management issues

The vast majority of *Sphagnum* sites in Tasmania are less than 5 ha in area. This makes them extremely prone to disturbance. The effect of disturbance on peatlands may include a reduction of moss productivity, introduction of weeds, or death of the moss bed.

The major threats to *Sphagnum* peatlands are moss harvesting, peat mining, burning, grazing forestry operations and other activities that result in changes to hydrology. Illegal harvesting of moss beds for supply to the horticultural industry has resulted in the destruction of a number of sites throughout the state.

Forestry operations can affect *Sphagnum* peatlands directly, through physical disturbance and fire. They can also affect peatlands indirectly by altering site hydrology. Both types of disturbance can dramatically affect the health and persistence of peatlands. These forestry-related threats to *Sphagnum* peatlands are further outlined below.

Disturbance caused by machinery and roading

The use of machinery on peatlands damages moss (and other plants) and often causes rutting in the bog surface. This can result in the formation of drains, which leave some areas too dry for growth as water drains from them, while other areas become too wet, as water ponds into them (Whinam and Buxton, 1997).

Construction of roads over *Sphagnum* bogs can cause substantial direct disturbance to the site. They can also increase sediment and alter the hydrology, causing ongoing deterioration of the remaining areas of peatland. Activities such as roading or alterations to drainage adjacent to *Sphagnum* bogs can cause similar effects.

Effect of Fire

Intense and repeated fire will kill *Sphagnum* moss and its associated fire-sensitive vegetation. Fire can also alter the ecology of a site, producing conditions that favour other species (e.g. buttongrass). Less severe fires can affect the margins of *Sphagnum* bogs resulting in a reduction in the size of the peatland. An indirect effect of fire on these bog sites is increased sediment load in run-off.

Disease and weed invasion

Weeds may invade after disturbance such as rutting or fire, altering the ecology of the site.

Although *Sphagnum* itself is not known to be affected by diseases, some of the species associated with *Sphagnum* peatlands are susceptible to disease.

Myrtle wilt (*Chalara australis*) can kill myrtles if they are disturbed or damaged during operations such as roading or logging. Several Tasmanian *Sphagnum* communities contain myrtle.

The root rot pathogen *Phytophthora cinnamomi* affects a range of lowland species. Many susceptible shrub species occur in moorland, low altitude heathland and open lowland forest communities that contain *Sphagnum*.

7. Recommended management actions

Sphagnum peatlands are often small in area, and likely to occur in localised environments (e.g. swamps) within a forestry operation area. (Note that *Sphagnum* dominated vegetation that has clearly resulted from past disturbance (e.g. logging tracks) does not comprise *Sphagnum* peatland – but check with the FPA Biodiversity Program if in doubt).

Sphagnum peatland (as defined for TASVEG in Harris and Kitchener 2005) is listed as a threatened vegetation community – this means that it cannot be cleared or converted unless exceptional circumstances have been approved by the Forest Practices Authority.

In addition, the *Forest Practices Code* states:

- Disturbance to native vegetation in localised environments (including swamps) should be avoided or minimised (section D 3.1).
- A 10 m machinery exclusion zone applies around swamp and surface drainage areas (section C 4.3).
- Additional upslope protection may be necessary around seepage areas, to prevent sediment entering watercourses (C 4.3).

The Forest Practices Plan biodiversity evaluation sheets require that specialist advice be sought if native non-forest communities could be affected by proposed forestry or other vegetation clearance activities. All sites supporting *Sphagnum* peatlands should be considered potentially significant, irrespective of their size and condition. The FPA Biodiversity Advisory Program and/or Forestry Tasmania conservation planning staff can provide advice on the significance of sites.

Timber harvesting and silvicultural regimes in catchments containing *Sphagnum* peatlands will require careful planning. **The potential impacts of all stages of the proposed operation should be considered in the planning phase. This applies especially to burning.**

The management actions listed below should be considered prior to seeking advice, to ensure that all issues have been addressed. Site visits by FPA specialists will not normally be needed if the patches have been accurately assessed on the ground and management issues (e.g. fire management, roading, etc.) have been discussed with appropriate people. The following prescriptions should be applied to all *Sphagnum* peatlands with an area of greater than 100 m². They should also be applied, where possible, to smaller peatlands. They do not need to be applied to areas of *Sphagnum*-dominated vegetation that have clearly resulted from past disturbance (e.g. logging tracks) – if in doubt contact the FPA Biodiversity Program for advice.

- No machinery should enter or cross *Sphagnum* peatlands (see above).

- No timber should be salvaged from *Sphagnum* areas by cables or other means. A sufficient buffer (see next dot point) should ensure no trees in adjacent production forest areas fall into the *Sphagnum* community.
- A buffer of at least 30 m width should extend around the edge of *Sphagnum* peatlands (the buffer may partially or wholly comprise non-forest communities or non-commercial forest, as it is common for *Sphagnum* peatland to be surrounded by such communities, but should always include a component of woody vegetation). This is equivalent to the minimum buffer for a Class 2 stream. If it cannot be implemented for any reason, the FPA Biodiversity Program should be contacted. In some situations this buffer may need to be increased to maintain current canopy or understorey coverage around sites and to ensure increased sediment associated with burnt areas does not adversely affect *Sphagnum* peatlands. There should be no heaping of vegetation/slash into the buffer area surrounding *Sphagnum* sites during harvesting or burn preparation.
- There should be no hauling of logs through retained *Sphagnum* sites.
- Roads and other ground disturbing activities (dams, borrow pits, etc.) should be located away from *Sphagnum* sites. Roads and other infrastructure can also indirectly impact these peatlands by altering the hydrology of the catchment, and their location will therefore require careful planning. In particular, care should be taken not to construct culverts and drains that divert water away from a site or direct sediment into a site. Planning for roads and infrastructure should be conducted during the wetter seasons where possible because identification of drainage patterns is often difficult during dry weather.
- Snig tracks and access tracks should be located to avoid crossing streams and or drainage lines that feed *Sphagnum* sites or altering downstream drainage. The relevant provisions for snig tracks in the *Forest Practices Code* should be considered the **minimum** level of water-course protection on watercourses associated with *Sphagnum* sites. These prescriptions include:
 - snig tracks will not cross Class 1 or 2 streams
 - the number of crossings of Class 3 and 4 watercourses will be minimised
 - crossing points across any watercourse should be a least 100 metres apart and will not be used while water is flowing over them).
- *Sphagnum* peatlands and their associated buffers should be excluded from all burns. Burn plans should clearly identify the area that fire is to be excluded from. Burning up to *Sphagnum* edges has been identified as a degrading factor and it is therefore important that burns are conducted under conditions which minimise the risk of the *Sphagnum* community and its buffering vegetation being burnt. High intensity regeneration burns in coupes that contain or are adjacent to *Sphagnum* sites will require special consideration during the planning stage.
- Firebreaks should not be established around *Sphagnum* sites managed specifically for conservation because they may lead to increased sediment run-off into the *Sphagnum*. Specialist advice should be sought if firebreaks are proposed around *Sphagnum* sites.
- Burning in and around karst sinkhole areas containing *Sphagnum* should be avoided.
- *Sphagnum* peatlands managed specifically for their conservation values should be identified on planning maps (e.g. Forestry Tasmania's MDC system).

References

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Publication details

This technical note has been prepared by Allison Woolley, Nina Roberts, Fred Duncan and Mark Wapstra, with assistance from Jennie Whinam. It should be cited as:

Forest Practices Authority 2009, '*Sphagnum communities*', *Flora Technical Note No. 6*, Forest Practices Authority, Hobart.

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Document Summary Information

Document name	Flora Technical Note No.6: <i>Sphagnum communities</i>
Version	2.1
Trim record	2009/35295
Owner	Biodiversity Section Staff
Author(s)	Biodiversity Section Staff
Release date	November 2009
Release Approved by	Biodiversity Manager
Release status	For publication on the FPA webpage and other external distribution

Version Control

Version	Date	Author(s)	Summary of changes
2	Nov 2009	Biodiversity Section Staff	Document previously available on FPA website revised. Previous revisions pre-date document control.
2.1	Feb 2011	Nina Roberts	Note: the wording of this document is identical to that approved by the FPA Biodiversity Manager in early 2010, except for the addition of document control information.

Table 1. Scientific names of species mentioned in the key. Images of most of these species can be seen on the Forest Practices Authority's website.

Bats-wing fern	<i>Histiopteris incisa</i>
Bauera	<i>Bauera rubioides</i>
Bottlebrush	<i>Callistemon</i> species (usually <i>C. viridiflorus</i>).
Buttongrass	<i>Gymnoschoenus sphaerocephalus</i>
Celery top pine	<i>Phyllocladus aspleniifolius</i>
Cheeseberry	<i>Cyathodes glauca</i>
Cord rush	<i>Restio</i> species
Creeping pine	<i>Microcachrys tetragona</i>
Fishbone fern	<i>Blechnum nudum</i>
Flag iris	<i>Diplarrena</i> species
Golden rosemary	<i>Oxylobium ellipticum</i>
Gunn's heath	<i>Epacris gunnii</i>
Hooker's everlasting daisy	<i>Olearia hookeri</i>
Mothershield fern	<i>Polystichum proliferum</i>
Mountain heath-myrtle	<i>Baeckea gunniana</i>
Mountain tea-tree	<i>Leptospermum rupestre</i>
Native pepper	<i>Tasmannia lanceolata</i>
Pandani	<i>Richea pandanifolia</i>
Pencil pine	<i>Athrotaxis cupressoides</i>
Pouched coral fern	<i>Gleichenia dicarpa</i>
Prickly bottlebrush	<i>Callistemon viridiflorus</i>
Rodway's everlasting daisy	<i>Ozothamnus rodwayi</i>
Sassafras	<i>Atherosperma moschatum</i>
Scented paperbark	<i>Melaleuca squarrosa</i>
Silver daisy	<i>Celmisia asteliifolia</i>
Slender twine rush	<i>Empodisma minus</i>
Square twig rush	<i>Baumea tetragona</i>
Stragglng trochocarpa	<i>Trochocarpa cunninghamii</i>
Swamp heath	<i>Epacris lanuginosa</i>
Swamp melaleuca	<i>Melaleuca squamea</i>
Swamp selaginella	<i>Selaginella uliginosa</i>
Waratah	<i>Telopea truncata</i>