Indigenous Flora of the

Wombat State Forest

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1.0 STUDY OBJECTIVES

There are several specific objectives for this study:

- Compiling existing information about the indigenous flora of the Wombat State Forest (WSF).
- Gathering additional information to help fill gaps in the existing knowledge base.
- Evaluating and assessing the conservation significance of indigenous flora and fauna.
- Assessing botanical sites of significance and defining appropriate management regimes.
- Proposing prescriptive procedures to conserve significant flora and fauna in the Forest.
- Proposing directions for future research and survey in the forest.

The area assessed and described in this report is limited to the main part of the WSF, excluding the Pyretes Range block to the east and including the Bullarto Block north of the Daylesford-Trentham Road. This is the area of the WSF which is cut for timber and wood chipping.

2.0 RESEARCH METHODS

2.1 Plant Names and Taxonomy

Plant names in this report are based on the *Census of vascular plants of Victoria* (Ross 1993) with updates from *Flora of Victoria. Vol 2* (Walsh and Entwisle 1994).

Many sources of botanical information were accessed for compiling and assessing the flora of the WSF. Beaglehole (1983), Willis (1972), records from the La Trobe University rare plants register and unpublished data from DCNR's Flora Information System were the primary sources. Several local and not so local naturalists were also consulted, being asked about the presence of rare plants and sites of significance (the individuals are detailed in the reference section and the information they contributed is summarised in Appendix 3). Some additional but minimal survey work was undertaken by the author; this survey work consisted of searching for rare species and/or inspecting possible sites of interest or significance, as well as vegetation quadrats placed in riparian environments. The streamside environments were targeted for formal survey because there was minimal information about this community in comparison to the drier areas in the forest.

2.1 Plant Lists

There are two plant lists included in this report. Appendix 1 is the list of plants observed in the specific research undertaken for this report, from naturalists, field study and quadrat data (see below). Appendix 2 is the most recent list provided from the Department of Conservation and Natural Resources Flora Information Service, it is summary list for the WSF.

Appendix 2 lists all of the rare and endangered species, or VROTS in jargon being short for vulnerable, rare or threatened species, in the forest but doesn't give the location of them. Any records of the locations of VROTS are available from the FIS but were not obtained in the limited time available for this study. The FIS has comprehensive records of all species in Victoria and the original survey work in this report will be forwarded to it for inclusion in the database.

2.3 Vegetation Community Assessment and Sampling

Quadrat data was taken to sample vegetation community not necessarily investigated well in existing references. Quadrats are defined areas, usually 100 m^2 in this study, where every vascular plant species present is recorded and their cover and abundance is visually assessed using a modified Braun-Blanquet scale:

+	cover <5%, few individuals
1	cover <5%, any number of individuals
2	cover 5-20%, any number of individuals
3	cover 20-50%, any number of individuals
4	cover 50-75%, any number of individuals
5	cover 75-100%, any number of individuals

These quadrats can provide a clear vision of the structure and composition of the vegetation type that is sampled and have been used in the compilation of the flora list. They are used to compare and describe different vegetation communities. The quadrat data will be used as complementary information to other references about the vegetation communities in the WSF and region.

3.0 INDIGENOUS FLORA

This section will describe the flora of the Wombat State Forest in a general sense. It will describe the conditions that influence different vegetation types and relate an assessment of the conservation significance of individual species and vegetation communities.

3.1 Geomorphology and Soil Types

The local soils in the Wombat Forest region have historically supported a wide variety of vegetation types and have driven the European history of the area. There are two major geological origins and soil types in the region (LCC 1995).The dissected hills of the region have infertile clay soils derived from Ordivician marine sediments (460 myo) supporting the Messmate-Peppermint Forest which intertwines with the Victorian Volcanic Plain with relatively fertile red basalt soils derived from recent Tertiary lava flows (5 myo) that flowed over the ancient landscape forming islands of older rock (Douglas 1993). The geological map is striking in its illustration of history and human settlement influenced by natural conditions, the edges of the basalt soil in the region is usually the edge of the State Forest. Most of the basalt soils in the region are on private land, which is predominantly cleared, while much of the forests living on poorer soils is reserved on public land such as the Wombat State Forest.

This has several implications for conservation. The vegetation types occurring on basalt soils in Western Victoria have been decimated by land clearing in the region. Any of these unique vegetation types growing on public land in the region is uncommon and possibly rare. It is a particularly rare soil type within the WFS and very poorly reserved on other public land in the region. There are a few areas of basalt soils left uncleared in the WFS which will be detailed later.

3.2 Climate and Microclimate

The other all inclusive condition in determining the vegetation occurring in any site is moisture. Soil types may limit the potential vegetation community but climate and moisture affect them further and can be the major determinant of which plants and vegetation communities can grow where. Each soil type in the forest

will support a range of vegetation communities depending on the microclimate which is influenced by topography, aspect and water flow. South facing slopes will retain moisture and streams provide water tables close to the surface for moisture loving species.

3.3 Vegetation Communities

Some definitions must be discussed to make the process of describing the vegetation communities in the WSF clearer. First, vegetation communities, they are defined in the Flora of Victoria Vol. 2 (Walsh and Entwisle 1994) as "an assemblage of plants in nature which characteristically occur together". Communities are groups of plants that have evolved over time together adapting to the same geographic and climatic conditions. The broad levels and structural descriptions of vegetation communities are easily described and recognised, eg. open forest, grasslands or heathland (Specht 1970). They are further classified according to rainfall, plant type and structural dominants, the most common species plants with the most foliage cover in an area of similar conditions. For example, the dominant forest type in the Wombat is called "Damp/wet sclerophyll forest...[dominated by] *Eucalyptus obliqua-E. radiata*"(Foreman and Walsh 1993). The Damp/wet refers to the relative rainfall and sclerophyll refers to the dominant hard-leaved fire-adapted plants, *Eucalyptus* and *Acacia* in particular.

Vegetation communities can be recognised in the field by their dominant, 'characteristic' and/or 'indicator' species. These three terms mean similar but slightly different things. Dominant plants usually form the canopy of a forest, or of a heathland or grassland. Characteristic species are often the same species but do not necessarily dominate any particular layer of vegetation. The dominant species may be used as indicator species, plants that are easily recognised as indicators of increasing or decreasing moisture levels or other variations in conditions and therefore vegetation communities. However, many smaller less common plants may also be clear indicators of relative moisture levels in different areas of the forest. For example, Ivy-leaf Violet (*Viola hederacea*) is very common in wetter areas of the Messmate/Peppermint Forest but is absent in many of the drier areas. The vegetation communities of the WSF are summarised below but comprehensive species list for each community are not included but any sources of more comprehensive lists will be referenced. These comprehensive lists help in locating the habitats of significant species and in recognising the diversity of vegetation.

Once communities are examined beyond the level of dominant species they can be quite complex and of much greater diversity in the groundstorey. For example, the Messmate-Peppermint Forest is the forest canopy but there is a great deal of variety in the understorey because of different microclimates, ranging from a short twisted Messmate forest with a heathy shrub understorey, a more open forest with a open tussock grass groundstorey to a tall forest canopy with understoreys of Wiregrass (*Tetrarrhena juncea*). Candlebark (*E. rubida*) is also common in the forest in different levels in different conditions; it is half or more of the tree canopy in some areas and completely absent in many others. Messmate often grows in pure stands in many areas of the forest as well. All of these forest types gradually intergrade with each other across a landscape according to topography, aspect and soil conditions.

Different management practices may also cause or influence a the variety of vegetation types, or the various conditions possible within one broad vegetation community. For example different fire histories or logging practices may affect the ecology of vegetation in different directions. The species well adapted to disturbance, such as Prickly Moses (*Acacia verticillata*), do well after logging but obligate resprouters such as Grevilleas (*Grevillea* spp.) do not because of the soil disturbance associated with the activity.

The vegetation types of the WSF were mapped by the Land Conservation Council (1985) in the Melbourne Area, District 1 Review. This is the most comprehensive map available and is generally the basis of the descriptions provided in the this report with additional species considered from other references, as listed in the summary table. The LCC map provides the best available information on the distribution of the major

forest types on public land in the region. However, this map has no description of the vegetation types in the many microclimates in the WSF, the riparian vegetation, fern gullies and basalt communities. Additional information about these communities was found in other references and doing fieldwork.

The Vegetation communities are described in the next section of the report in three different ways. They are first described in a general sense, describing the conditions they occur in and their distribution. Table 1 then presents a summary of the soil types of the forest, the spectrum of the possible vegetation communities and some examples of sites where these communities exist. Table 2 then inventories each vegetation community with lists of the most common species in different levels and their conservation significance. Several different perspectives are provided through presentations of the available information.

Vegetation Communities on Ordivician and Alluvial Soils

Damp/wet sclerophyll forest Messmate - Peppermint Forest

This is the dominant forest type in the WSF. It is an open forest with sparse shrub layer and generally a groundstorey of tussock grasses. The LCC (1985) referred to it as Open Forest Messmate and Peppermint are the most common overstorey species, but Candlebark is also very common in some areas as well. The most common grasses in the understorey are Gray Tussock Grass (*Poa sieberiana)* and Silver-top Wallaby Grass (*Chionochloa pallida*). However, this forest type can include three seemingly disparate conditions along a gradient of moisture and topography:

1) Open Forest with shrubby heathy understorey
This condition occurs on the driest north facing slopes and can have very little grass and the groundstorey can be dominated by sclerophyllous shrubs including *Baeckea ramosissima* and *Acacia oxycedrus*. This extreme of the forest type is very abundant in Lerderderg State Park but an excellent example of was found during this study on Nolan Creek Road just north of the Blackwood Ridge.

2) Open Forest with tussock grass understorey and scattered shrubs, usually wattles, peas and heaths. This is probably the most common expression of the forest type.

3) Open Forest with Forest Wire Grass understorey and relatively few shrubs. This condition is more common in more shaded slopes and Yugovic *et al* (1993) theorised that it may be transitional to riparian forests. However, in some places Forest Wire Grass can dominate in areas with very frequent fires so burning regimes might be a factor in the distribution of this condition as well.

The condition of this forest type is the result of 150 years of exploitation, including extensive deforestation and bushfires beginning last century. The species that remain are very well adapted to short fire regimes and extensive disturbance. A comprehensive study on the effects of fire on the flora and fauna that live within this forest was undertaken by the Department of Conservation and Environment in the 1980's (Tolhurst *et al* 1992). It found that no species were lost within the time frame of the study. However, there baseline data was based on the forest after its long history of disturbance and likely indicates a depleted forest.

Swamp Gum Riparian Forests

These are the forests occurring in the sheltered gullies, valleys and flood plains of the forest. These soils are the results of erosion and deposition from the adjacent upland areas and are derived from a variety of sources. Some riparian areas in the WSF have basalt soils and result in different vegetation communities, which will be discussed below.

The most common streamside and flood plain vegetation in the WSF is designated Swamp Gum Riparian Woodland (Yugovic *et al* 1993). Swamp Gum is the most common dominant canopy tree, although Manna

Gum (*E. viminalis*), Black Gum (*E. aggregata*) and Yarra Gum (*E. yarraensis*) also grow in the same habitats. Manna Gum is a common overstorey in many streamside environments in the larger Central Victorian region but is uncommon in the drainage lines in the WSF (Monty Kirby pers. comm.).

The understorey can vary a great deal as well. Many of the northern facing and wider drainage lines in the WSF have an open grassy understorey dominated by Common Tussock Grass (*Poa labillardieri*) and sometimes Tall Sedge (*Carex appressa*) and rushes (*Juncus* sp.); quadrats 1, 2 and 4 are samples of this variation of the community. There are areas that are more waterlogged that have a dense understorey dominated by Tall Sword Sedge (*Lepidosperma elatius*), quadrat 3 is an excellent example of this extreme. A riparian forest, probably more typical of southern-facing and more sheltered gullies, with many medium and low shrubs is described by Conn (1993) near O'Briens Crossing on the Lerderderg River. Many ferns are also in more shaded areas in drainage lines and these riparian forests clearly grade into a "Fern Gully" vegetation type but this will be dealt with below.

Fern Gullies

Several fern gullies were visited and quadrat samples were taken (quadrats 5, 6, 8 and 9). Two areas were investigated in detail, along Chettle Road just north of Lerderderg State Park and west of Blackwood along the Lerderderg River and Paradise Road. Most of the fern gullies visited in the former have an emergent overstorey of Swamp Gums, many large old trees with many hollows as well, while the gullies west of Blackwood have an emergent overstorey of Messmates, very few of which were very large with few if any hollows seen.

In both areas the eucalypts were emergent *above* a lower canopy of Musk Daisy Bush (*Olearia argophylla*) and a groundstorey of ferns. It is a vegetation structure reminiscent of cool temperate rainforest in the Otways and the Central Highlands of Victoria. It does partially fulfil the structural criteria of rainforest as well being "closed broad-leaved forest vegetation [the Musk Daisy Bush] with a more or less continuous rainforest tree canopy of variable height, and with a characteristic composition of species and life forms (CFL 1988)". However, the gullies don't have the definitive rainforest species, such as Myrtle Beach (*Nothofagus cunninghamii*) or Lilly-pilly (*Acmena smithii*) but they still share several species typical of rainforests, and other wet forests, in the Otways and Central Highlands. These species include the Musk Daisy Bush, Shade Nettle (*Australina pusilla*), Austral Mulberry (*Hedycarya angustifolia*), Elderberry Panax (*Polyscias sambucifolius*) and various ferns.

Vegetation Communities on Basalt Soils

The vegetation communities indigenous to basalt soils in Victoria have been decimated by European settlement and very little is known about them. Consequently this section is only a basic discussion of their distribution in the WSF and their composition. Very little field work has been done to investigate the vegetation occurring on these unique soils, both in general and during the research conducted for this report. Lists of the vegetation around waterfalls and swamps on basalt in the Trentham area, all off the WSF, were compiled by Dormouse (1992). Conn (1993) describes an open forest on basalt cones southeast of Ballarat. Carr and Todd (1990) described a degraded Swamp Gum Forest on basalt soils in the WSF on the edge of a property at Lyonville. These three documents are the extent of the information found describing the vegetation on the intertwining margins of the basalt plants and older sediments, around the edges of the WSF. The areas of basalt soils in the WSF are detailed in Table 4.

Swamp Gum Forests

This forest type would have probably been on the waterlogged flats in wide valleys around the older hills. Swamp Gums would have dominated the canopy. This is possibly the type of habitat that *Discaria pubescens* would have occurred in (Lunt 1987).

Open Forest

A tall open forest of Messmate and Candlebark was found on the slopes of Babbington Hill and a very similar vegetation type was described by Conn (1993) from Mt. Warrenheip near Ballarat. This forest type shares many species with the more common Messmate - Peppermint forest on older soils but the newer soils support vegetation characterised by species adapted to deeper soils and more moisture, such as Spiny Mat-rush (*Lomandra longifolia*), Rough Coprosma (*Coprosma hirtella*) and Forest Clematis (*Clematis aristata*).

Gorges/Waterfalls

One known list has been compiled detailing the species occurring around waterfalls and on basalt soils in the Trentham area (Dormouse 1992). This list includes many species unique to basalt soils and will have to be the definitive source on what occurs in such habitats. The largest and most significant area of basalt on the WSF is in the Werribee River and Spargo Creek headwaters and the vegetation there is likely to be very similar to the basalt gorges around Trentham and elsewhere in the region.

Table 1. The relationship between soil types and vegetation communities.

Soil Type: --- **Geomorphological Conditions:**	**Ordivician Sediments**	**Tertiary Basalt**	**Alluvial Soils in Valleys**
Dry, Northern Facing Hillsides	Stunted Messmate Forests with shrubby, heathy understoreys and Open Messmate-Peppermint Forest with grassy Poa dominated understoreys	Messmate-Candlebark Open Forest with unique understorey (Babbington Hill is the best example in the forest, although other basalt cones may be other examples).	Not applicable
Slightly wetter slopes and valley flats	Taller Messmate-Peppermint-Candlebark Forests with Wiregrass understoreys	Swamp Gum-Messmate Forest with open grassy understorey (near Lyonville, south of Blakeville etc). Very rare community in the area.	Not applicable
Flood plains, riparian strips or gorges	Swamp Gum Forests with open *Poa labillardieri* understorey (Bullarto Block gullies and northern edge of main block).	Swamp Gum Forests with open *Poa labillardieri* understorey (Werribee River Gorge at Spargo Creek may be the best example in WSF.)	Swamp Gum Forests with open *Poa labillardieri* understorey (Bullarto Block gullies and northern edge of main block).
Sheltered Gullies	Fern Gullies (south facing gullies west of Blackwood and north of Lerderderg State Park).		Fern Gullies

Table 2. Vegetation communities and their conservation significance.

Vegetation Community	Dominant canopy trees and understorey	Conservation Significance	References
Messmate - Peppermint Forest Damp/Wet Sclerophyll Forest	*Eucalyptus obliqua* *E. radiata* *E. rubida* *Acacia melanoxylon* *Acacia verticillata* *Acacia mucronata* *Dillwynia cinerascens* *Cassinia aculeata* *Epacris impressa* *Chionochloa pallida* *Lomandra filiformis* *Poa sieberiana* *Tetrarrhena juncea* *Dianella revoluta* *Gonocarpus tetragynus* *Goodenia lanata* *Helichrysum scorpioides* *Poranthera microphylla* *Viola hederacea*	This forest type is common and widespread in the Midlands Region and the majority of its pre-European extant is reserved on public land, usually forest reserves. However, any areas with older trees (greater than 80 years) and areas undisturbed by logging are very rare and should be considered State Significant.	LCC 1985, Conn 1993, Yugovic *et al* 1993, Tolhurst and Flinn 1992 (Species lists for this forest type are published in Yugovic *et al* 1993, Tolhurst 1992 and Tolhurst and Oswin 1992. Quadrat 7 of this study is a sample of this community as well.)
Swamp Gum Forest Riparian Forest	*Eucalyptus ovata* *E. viminalis* *Acacia dealbata* *Acacia melanoxylon* *Acacia verticillata* *Leptospermum lanigerum* *Pomaderris aspera* *Carex appressa* *Juncus pauciflorus* *Lepidosperma elatius* *Lomandra longifolia* *Poa labillardieri* *Tetrarrhena juncea* *Acaena novae-zelandiae* *Geranium potentilloides*	Regionally Significant, this forest type formerly occurred widely but large areas on private land have been cleared, settled and degraded. The drainage lines of the WSF contain important habitats that are uncommon and generally degraded in the wider region.	Conn 1993, Yugovic *et al* 1993, Frood and Calder 1987, this study (quadrats 1, 2, 4)

Vegetation Community	Dominant canopy trees and understorey	Conservation Significance	References
Fern Gullies	*Eucalyptus obliqua* *Eucalyptus ovata* *Acacia melanoxylon* *Bedfordia arborescens* *Coprosma quadrifida* *Hedycarya angustifolia* *Olearia argophylla* *Rubus parvifolius* *Lepidosperma elatius* *Tetrarrhena juncea* *Australina muelleri* *Viola hederacea* *Blechnum nudum* *Blechnum minus* *Cyathea australis* *Polystichum proliferum*	Regionally Significant, being an example the extremes of the ranges of flora adapted to wetter areas of Victoria. This flora is common elsewhere in Victoria but only in the most sheltered areas of the Midlands, from the WSF to Mt. Cole.	Conn 1993, CFL 1988, this study
Messmate - Candlebark Forest Open Forest [on basalt soils]	*Eucalyptus obliqua* *E. ovata* *E. radiata* *E. rubida* *Acacia dealbata* *Coprosma* *Olearia myrsinoides* *Pimelea axiflora* *Lepidosperma elatius* *Lomandra longifolia* *Poa labillardieri* *Tetrarrhena juncea* *Stellaria pungens* *Veronica spp.*	Regional Significance, a formerly common but now rare vegetation community; few undisturbed areas are now in the region.	Conn 1993, this study, Frood and Calder 1987, Lunt 1987

Vegetation Community	Dominant canopy trees and understorey	Conservation Significance	References
Riparian Forests [Gorges/Waterfalls on basalt soils]	*Eucalyptus obliqua* *E. radiata* *E. viminalis* *Acacia melanoxylon* *Bursaria spinosa* *Coprosma quadrifida* *Hymenanthera dentata* *Olearia argophylla* *Pimelea axiflora* *Rubus parvifolius* *Sambucus gaudichaudiana* *Lomandra longifolia* *Poa labillarderi* *Tetrarrhena juncea* *Stellaria pungens* *Plantago varia*	Regionally Significant. Most of this vegetation community was on land taken for settlement and cleared. Any remaining areas need protection.	Dormouse 1993, Lunt 1987, Frood and Calder 1987
Swamp Gum Forest [on basalt soils]	*Eucalyptus ovata* *Bossiaea cordigera* *Dillwynia cinerascens* *Leptospermum continentale* *Danthonia semiannularis* *Lomandra longifolia* *Poa sp.* *Tetrarrhena juncea* *Burchardia umbellata* *Gonocarpus tetragynus* *Stylidium graminifolium* *Pteridium esculentum*	Regionally Significant. Most of this vegetation community was on land taken for settlement and cleared. Any remaining areas need protection.	Carr and Todd 1990

3.4 Determining Conservation Significance

Significance in the biological context means very much what it means in common usage, being defined as noteworthy or of considerable importance. Sites of botanical significance are assessed according to defined biological criteria and are independent of any land-use classifications. Significance is an assessment of the qualities and composition of the vegetation in relation to its current distribution, conservation status and integrity.

There are two components to significance - scale and degree. The determination of degree is related to the qualities of the site in relation to overall distribution, condition or importance of other sites possessing such

values, within a range defined by the scale of reference. Scale and degree are generally combined into levels of significance and defined by scale alone. The scale of significance, for the purposes of this study, are within the following areas:

- Local: Wombat State Forest and local environment
- Regional: Most of the WFS falls within the Land Conservation Area Melbourne Area, District 1 (LCC 1985). Any species that are endangered, vulnerable or rare within this area are considered regionally significant.
- State: Victoria
- National: Australia

Several things should be noted in relation to conservation significance. It is not a static condition, the significance of indigenous flora will change over time according to the evolving condition of the flora and the ongoing impacts, positive or negative, on it as well as changes in other similar habitats.

Conservation significance is determined through consideration of references and personal knowledge of the flora, both for specific species and the broad vegetation communities. However, most determinations of significance are based on available references.

3.5 General Conservation Issues in the WSF

3.5.1 Species on the Edge of their Range

The WSF is an island of hills distant from the main mountain ranges of Victoria but it contains many wet forest species that are in the western and northern limits of their range. There are species that are at their easternmost limits as well, such as the Victorian Flat-pea. The WSF is also the home of several rare species endemic to the dry foothill forests of the Great Divide, such as *Grevillea repens* and *Pultenaea weindorferi*. This island is a crossroads for vegetation and there are relatively few extremely rare species but many significant species for the region in general.

3.5.2 Riparian Vegetation

Riparian areas have been extensively cleared in Victoria and grazing has badly degraded many areas of public land along streams that haven't been cleared. It is also very susceptible to weed invasion when disturbed as well (Frood and Calder 1987). A study published by Water Victoria (Mitchell 1990) found that 29% of the length of major streams in Victoria were in poor or very poor condition and that 65% of the streams in clear areas were of poor or very poor quality. These statistics highlight the intense development and degradation that has occurred in the riparian habitats in lowland Victoria. This contrasts with the consistently good or excellent condition of the headwaters of several rivers flowing out of the WSF, including the Loddon, Coliban, Maribyrnong and Werribee. The headwaters of these rivers within the WSF were all in good or excellent condition at the time of sampling (Mitchell 1990).

The large-scale degradation of streams and riparian vegetation outside of the WSF and other public land makes the remaining riparian vegetation in the WSF very valuable from a conservation view as well from a water supply view. All of the sensitive flood plain vegetation needs to be protected from grazing and erosion to ensure the stream's health and the health of the water supplies in the forest.

3.5.3 Vegetation on Basalt Soils

The unique vegetation communities on basalt soils in the WFS clearly have significance beyond the borders of the forest. The vast majority of basalt areas in western Victoria have been cleared for agriculture. The areas of western Victoria covered with recent basalt and the fertile soils produced from these geological origins supported a diverse range of woodlands, wetlands and grasslands in a diverse landscape, including gorges, wide valleys, plains and "stony rises". This fertility made them very desirable for farming and the native vegetation in these environments is reduced to fragmented remnants across the entire region. In fact, most of the boundaries between the WSF and private land in the area corresponds very closely to the transition from basalt soils to the more ancient soils of the high forest land (LCC 1985). The vegetation communities on basalt are very poorly reserved in western Victoria and the presence of any areas on the WSF are significant for the region.

Lunt (1987) assessed the status of the rare (Briggs and Leigh 1988) Australian Anchor Plant (*Discaria pubescens*) west of Melbourne where it is restricted to "stream valleys, on well-drained and usually basaltic soils." Lunt summarised the decline and dismal prospects of the species as a reflection of "the decimation of the flora and fauna of the basaltic plains and valleys of western Victoria". Frood and Calder (1987) also described the grassy woodlands, implicitly including the Riparian Forest and Swamp Gum Woodlands occurring on basalt soils on the WFS, occurring on the edge of a region as "destroyed to the extent that it is often not possible to determine the original importance of particular species in the vegetation, and many species are regionally extinct or nearly so".

For all these reasons the few sites in the forest with basalt soils and any remaining native vegetation is considered Regionally Significant and should be managed with conservation as the highest priority.

The geological data presented in the LCC's Melbourne Area 1 report (1985) was used to identify any areas with basalt soils in the WFS. Some of these areas were subsequently inspected in the course of this study and some quadrat data was taken (presented in Appendix 5). The most important sites are summarised here but many others are listed in Table 3. These will be critical sites for survey before logging occurs.

Werribee River Gorge south of Spargo Creek
This is impressive gorge with a lush character that may be attributable to the fertile nature of the basalt soils.

Babbington Hill
The forest on this hill was sampled with one quadrat (please refer to Appendix 5) and appears quite unique. The dominant trees, Messmate and Candlebark, are tall and straight, unusual on a north west facing slope. Another atypical species occurs in the lower canopy, Silver Wattle (*Acacia dealbata*) is common on the slopes of the hill; it is a tree usually found in riparian areas. Spiny Mat-rush (*Lomandra longifolia*) dominates the groundstorey, again an atypical species above the riparian strips. Three quarters of the hill has been logged but the site should be considered Regionally Significant and spared from further logging.

3.5.4 The Ecological Impacts of Logging

Logging, and associated regeneration and controlled, is not necessarily detrimental to the health of the forest. If done sensitively logging and regeneration burns can vaguely imitate some of the natural processes of fire and regeneration. However, modern logging includes the use of much heavy equipment causing significant soil disturbance compaction. In the course of the field work many coupes were examined and most were incredibly muddy and disturbed with large bark dumps and this disturbance will cause problems for regeneration of trees, shrubs and groundstorey plants. Soil disturbance significantly disadvantages plants that regenerate from root stocks causing a super abundance of plants that regenerate from soil-stored seed.

This process significantly changes the composition of the vegetation. The desired trees may still be regenerating in such a logging regime but the species in the groundstorey of the forest are not being maintained, a key criteria for sustainable forestry.

Logging practices have to respect the integrity of the ground surface and groundstorey species in the forest. Lighter equipment should be used with more care. Rare species, such as *Grevillea repens* must be surveyed before logging so yarding areas can be placed away from populations of such species.

The rate of logging may also be a concern for conservation. The Messmate - Peppermint forests of the WSF need fire for many species to regenerate and to rejuvenate itself. Different species of plants will be more common in distinct stages of succession after fires or other disturbances. A mosaic of ages of vegetation is desirable across a landscape so that animals can recolonise burns and plants will be abundant in distinct patterns across a landscape. For example, many plants, including peas, banksias and orchids, often need fire to regenerate or their populations will decline. So it is desirable to have a mosaic of different ages of stands of such plants across a landscape to have a diversity of ages of plants. It is a type of insurance policy; create a diversity of successional stages in the landscape to create a diversity of habitat for the many different species in the WSF. Many animals need hollows that only occur in older trees so some long-term cycles are needed as well to preserve faunal biodiversity.

3. 6 Rare Flora

Species of special interest are highlighted in this section initially. The species considered in the text are either extinct in the WSF or their populations are depleted in the region. Extinct species are included to highlight historical degradation processes in the WSF region. Species discussed in the text are sometimes considered in detail because important and detailed information can't be included in Table 1, which is simply a summary of the rare species recorded in the forest in other studies or found in the research for this report. The summary table is the most inclusive inventory of rare species found in the forest. All significant species found in field research and references are summarised and referenced.

Ballantinia antipoda Southern Shepherds Purse

This is a small, 2-10 mm, member of the Brassicaceae family. It grows on "basaltic and granitic sites in moss mats in seepage areas" but is now known from only one site in Victoria (SGAP 1993). There are two records of this plant in the region, in Daylesford in 1880 and the Upper Loddon in 1887, according to Beaglehole (1983). It is a plant limited to the habitats most impacted by historical development in Victoria.

Beyeria viscosa Pinkwood

This plant is typical of "Damp sclerophyll forest, along gullies" and usually found in East Gippsland but there is a lone stand in the Dandenong Ranges and recorded from the Lerderderg Ranges in 1902 (Beaglehole 1983). It may still be present in the fern gullies of the WSF north of Lerderderg and it would be in the westernmost extreme of its range and therefore Regionally Significant.

Discaria pubescens Australian Anchor Plant

This plant is considered rare on a national level and vulnerable within Victoria (Gullan *et al* 1990). One centre of population in the Australian Alps is reserved on public land (Briggs and Leigh 1988) but the second centre of population, in basalt valleys in western Victoria west and north of the WSF, is primarily on private land and in drastic decline (Lunt 1987). This western extreme of the species is a significant population within itself.

This plant has not been recorded within the WSF but has been found in the area. In western Victoria it is restricted to basalt valleys and was recorded at Trentham in 1857 (Beaglehole 1983). All recorded sites were investigated by Lunt (1987) and he found 14 plants remaining in the Ballarat area and 38 plants

remaining along the Campaspe River inbetween Kyneton and Redesdale. It was not regenerating on any of the sites and Lunt felt it was possible that the plant may be more extensive in the region but many of the possible sites along the Campaspe and other rivers or gorges with basalt soils were not adequately surveyed at that point. This lack of survey efforts exists to this day.

Any appropriate basalt areas, open valleys and gorges, in the WSF should be surveyed for this species, particularly before any works or logging. If by some chance it is found on any sites they should be managed appropriately. Appropriate sites may also be found in the WSF for the re-establishment of this rare species on public land.

The general ecology of this species was also researched by Hall and Parsons (1987). This article and Lunt's work (1987) would provide important background information for a regional assessment and management of this plant.

Eucalyptus aggregata Black Gum
Eucalyptus yarraensis Yarra Gum

These two species occur on alluvial flats with waterlogged clay soils where the riparian Swamp Gum Forest described above. Black Gum is considered endangered in Victoria and the Yarra Gum is considered Rare on a national level. Both species have naturally fragmented populations and the Yarra Gum is endemic to Victoria. The Yarra Gum is found in Woodend and the Ballarat-Creswick area and is likely to be found somewhere inbetween the two areas in suitable habitat. It is also recorded for the WSF (DCNR 1990). Both trees are in habitats that are usually not logged on public land, because they are not good timber trees and they are often near streams. However, their riparian habitats are easily degraded by weeds and may by affected by clearing and dam construction on private land in the region so stands on public land may be very important for conservation of both species.

Grevillea obtecta Elphinstone Grevillea

This species has an extremely limited distribution, mostly in drier forest to the north of the WSF. However, there is one record of the species in the WSF (Vic Dolby pers. comm.) and it efforts to survey this species are important to understand its distribution. It is endemic to the region and occurs nowhere else.

Grevillea repens Creeping Grevillea

This is the possibly rarest species in the WSF. It is endemic to Victoria and is only known from populations around Healesville and Toolangi, Kinglake National Park and in the WSF. The status of the populations are unknown. Many historical documents were collected in the course of this study, from the "Register of Rare and Endangered Native Plant Species in Victoria". The La Trobe University Botany Department received information from the Forests Commission detailing 11 sites where the species occurred. They subsequently surveyed these sites and could find no plants on eight of the eleven sites they were directed to by the Forest Commission but still found small but regenerating populations on six sites in the WSF. Several areas ~~with~~ have been logged with stands of the species in the last year with little consideration for the plant (Monty Kirby pers. comm.) The assessment by La Trobe University Botany Department recommended that the species be monitored closely to ensure its conservation.

All of this information raises some questions about the species:
1) Is the species in long-term decline, with many sites having lost the species in the early 80's?
2) Has the Department of Conservation undertaken any monitoring work since 1984?
3) Does the Department consider the plant's occurrence when planning logging coupes?

The present distribution and status of this species should be surveyed and assessed as a high priority. It may be considered the symbolic Achilles heel of sustainable management of the WFS: have management practices preserved the populations of this rare species in the WSF? The Department should be requested to

undertake such a survey and assessment. There may even be Commonwealth funds available for such work, since it is a nationally listed species. It may also be a good self-contained for an university student.

Table 3. Rare Flora Summary

Species	Population Status and Vegetation Community	Conservation Status	Location/s	References
Elbow Orchid *Arthrochilus huntianus*	Two small populations known	Regionally Significant	Musk area, Bell's Reef Road and Midland Highway, near Blackwood	Wendy Bone pers. comm., Robert Parsons pers. comm., Geoff Carr pers. comm.
Long-tail Spleen Wort *Asplenium polyodon*	Extinct in WSF	Extinct in WSF	Presently in far East Gippsland.	DCNR 1995, Walsh and Entwisle 1994
Alpine Fescue *Austrofestuca eriopoda*	Rare in Victoria	Extinct in WSF	possibly in Woodend and eastern Victorian Alps	Yugovic *et al* 1993, DCNR 1995, Walsh and Entwisle 1994
Southern Shepherds Purse *Ballantinia antipoda*	Rare in Victoria	Extinct in WSF	Basalt	Beaglehole 1983, LCC 1995
Pinkwood *Beyeria viscosa*	1 historical record, occurs in damp gullies.	Extinct in WSF?	Record in Lerderderg Ranges.	Beaglehole 1983
Mountain Leafless Bossiaea *Bossiaea bracteosa*	One known population in WSF	Regionally Significant	Musk Creek Reference Area, mtns. and sub-alps in eastern Victoria	Beaglehole 1983, Woolcock
Wiry Bossiaea *Bossiaea cordigera*	Uncommon in Messmate Peppermint Forest.	Regionally Significant	WFS, Lyonville, Blackwood, Barkstead	Beaglehole 1983, Carr and Todd 1990, Geoff Carr, pers. comm., This study
Swamp Everlasting *Bracteantha sp. aff. sunundulata*	Unknown	Vulnerable in Victoria	WSF	DCNR 1995
Shiny Everlasting *Bracteantha viscosa*	Unknown	Regionally Significant	WSF and Woodend area	DCNR 1995, Yugovic *et al* 1993
Slender Beard Orchid *Calochilus gracillimus*		Regionally Significant	WSF, Musk area	Wendy Bone pers. comm., this study

Rough Coprosma *Coprosma hirtella*		Regionally Significant	WSF, Squires Track	This study, Vic Dolby, pers. comm.
Species	**Population Status and Vegetation Community**	**Conservation Status**	**Location/s**	**References**
Turquoise Berry *Drymophila cyanocarpa*	Shaded gullies	Regionally Significant	WSF, Squires Track	This study, Vic Dolby pers. comm.
Black Gum *Eucalyptus aggregata*	Alluvial flats in association with Swamp Gum.	Endangered in Victoria	WSF and Woodend Area	DCNR 1995, Yugovic *et al* 1993, Yugovic 1994, LCC 1985
Brooker's Gum *Eucalyptus brookeriana*	Unknown	Rare in Victoria	WSF, Several sites	DCNR 1995, La Trobe University 1987
Yellow Stringybark *Eucalyptus muellerana*		Regionally Significant	WSF near Gisborne	Beaglehole 1983
Yarra Gum *Eucalyptus yarraensis*	Alluvial flats in association with Swamp Gum.	Rare in Australia and rare in Victoria	WSF , Woodend, Ballarat-Creswick Area, Yarra Valley	DCNR 1995, Yugovic *et al* 1993, SGAP 1993
Elphinstone Grevillea *Grevillea obtecta*	One or more records on rocky ridges.	Rare in Australia and rare in Victoria	WSF, Upper Loddon State Forest, Fryers Ridge, Clearwater Creek?	DCNR 1995, La Trobe University 1985, Vic Dolby pers. comm.
Creeping Grevillea *Grevillea repens*	Several populations on dry north-facing ridges	Rare in Australia and rare in Victoria	Kinglake National Park, WSF, private land	La Trobe University 1984, LCC 1985, this study.
Austral Mulberry *Hedycarya angustifolia*	One site known from fern gullies	Regionally Significant	Common in wet forests and gullies elsewhere but rare in WSF	This study, Vic Dolby pers. comm.
Small Pepper-cress *Lepidium hyssopifolium*		Endangered in Australia and endangered in Victoria	WSF, Roadside north of Melbourne	DCNR 1995, LCC 1985
Tortuous Rapier-sedge *Lepidosperma tortuosum*	Heathy forest	Regionally Significant	WSF, western extreme of range	LCC 1985
Hairy Beard-heath *Leucopogon microphyllus*		Rare in Victoria	WSF	DCNR 1995
Oval Woodrush *Luzula ovata*		Regionally Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995

Trailing Shaggy Pea *Oxylobium procumbens*	Unknown	Regionally Significant	WSF, Near Blackwood	Geoff Carr, pers. comm.
Species	**Population Status and Vegetation Community**	**Conservation Status**	**Location/s**	**References**
Dwarf Geebung *Persoonia chamaepeuce*		Regionally Significant	Rocklyn Road and Clearwater Creek	This study, Vic Dolby pers. comm.
Plains Rice-flower *Pimelea spinescens*	Basalt	Vulnerable in Victoria	WSF	DCNR 1995
Victorian Flat-pea *Platylobium alternifolium*	Small populations in Messmate-Peppermint forest on northfacing hillsides	Regionally Significant	Near Blakeville (Appendix 3) and further west in Victoria	Beaglehole 1983, LCC 1985, Tolhurst 1992, Woolcock
Broad-lip Leek-orchid *Prasophyllum patens*		Rare in Victoria	WSF, generally restricted to eastern Victoria	DCNR 1995, Backhouse and Jeanes 1995
Dusky Scurf-pea *Psoralea adscendens*	Western extreme of range	Rare in Victoria	Records at Bullarto and Lyonville, WSF and Eastern Highlands	Beaglehole 1983, LCC 1985, Woolcock
Mueller's Bush-pea *Pultenea muelleri var. reflexifolia*	Large populations	Regionally Significant	Endemic to Victoria, in central and eastern highlands	DCNR 1995, Kemp 1985, LCC 1985,
Swamp Bush- Pea *Pultenea weindorferi*	4 stands in Open Forest.	Vulnerable in Australia and vulnerable in Victoria	Endemic to Victoria, only in Kinglake NP, Bunyip SP, Lerderderg SP and WSF	Latrobe University 1982, Kemp 1985, LCC 1985
River Buttercup *Ranunculus inundatus*	Floodplains	Regionally Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995
Soft Bog-sedge *Schoenus tesquorum*		Regionally Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995
Slender Candles *Stackhousia viminea*		Regionally Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995
Leafy Fireweed *Senecio squarrosus*		State Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995

Naked Bluebell *Wahlenbergia gymnoclada*	One known population	Regionally Significant	Lyonville, WSF	Carr and Todd 1990, DCNR 1995
Species	**Population Status and Vegetation Community**	**Conservation Status**	**Location/s**	**References**
Early Nancy *Wurmbea uniflora*		Regionally Significant	WFS	LCC 1985, Walsh and Entwisle 1994

Key for Table 3:
N.B. These designations and definitions are generally based in information provided by DCNR and in Gullan *et al* 1990, Briggs and Leigh (1988) and ANZECC Endangered Flora Network (1993).

Extinct in WSF: These are species that have been recorded historically in the WSF but are considered extinct in the forest.

Endangered in Australia: At serious risk of disappearing from the wild state if present land use and other causes of decline continue.

Endangered in Victoria: Rare and at risk of disappearing from the wild state within one to two decades if present land use and other causes of decline continue.

Vulnerable in Australia: Rare, not presently endangered but at risk of disappearing from the wild in Australia over a longer period (20 to 50 years) through continued depletion.

Vulnerable in Victoria: Rare, not presently endangered but at risk of disappearing from the wild over a longer period (20 to 50 years) through continued depletion.

Rare in Australia: Rare but overall not considered Endangered or Vulnerable. Such species may be represented by a relatively large population in a very restricted area or by smaller populations spread over a wider range.

Rare in Victoria: Rare but not considered otherwise threatened. This category does not necessarily imply that plants are substantially threatened, but that they are known from few stands.

Regionally Significant: Rare or extremely localised species, this includes many species that may be common elsewhere in Victoria but very uncommon in the WSF

4.0 SITES OF SIGNIFICANCE

In this section the areas in the forest with significant or rare species and unique botanical characteristics will compiled in Table 4. Sites are included here if they contain rare or significant species or other significant conservation values.

Table 4. Summary of Sites of Significance

Site	Values	Location/Extent	Rare Species	Recommendations
Babbington Hill	Unique tall open forest type on basaltic cone, with tree hollows on the way in a few decades.	Northwestern third of hill, just east of Babbington Hill; the remainin unlogged.	Vegetation Communi-ties on Basalt soils.	1) Exclude logging. 2) Preserve landscape views.
Basalt Sites Areas of basalt soil were identified from LCC (1980 and1985) geology maps. Many sites were mapped and most sites were not visited.	1) Severely depleted communities in Victoria. Sites in WSF may be largest areas of such habitats on public land	Bullarto Block: 1) Babbington Hill 2) Currys Hill-Leitches Creek 3) Lowes Hill - Big A Track 4) Kangaroo Creek at Denver Bullarto - Lyonville Area 1) Waterwheel Farm 2) Blue Mtn. - Newbury 3) Mt. Wilson 4) Coghlans Hill - Coliban River - Lyonville Southwestern Part of WSF 1) Leonard's Hill - Kelly Hill 2) Werribee River - Spargo Creek 3) Golden Creek - Greenhills 4) Rocklyn - Molonggip 5) Moorabool River, West Branch	Vegetation Communi-ties on Basalt soils.	1) These areas should be surveyed and assessed before logging as a high priority. Some areas may have significant if not interesting flora present.
Bell's Reef Road south of Midland Highway	Rare orchid species, Black Gums	Narrow strips along both sides of road for 200 m south of Midland Highway	*Arthrochilus huntianus* *Eucalyptus brookeriana* *Dipodium punctatum*	1) Protect from disturbance 2) Survey and Monitor
Musk Creek Reference Area	1) One known significant species. 2) Basalt vegetation community (Open Forest?). 3) Long term ecological monitoring site.	Small area inbetween Musk and Spargo Creek. Mapped by LCC 1985.	*Bossiaea bracteosa*	1) Determine status of Reference Area [These are intended to be long-term monitoring sites in undisturbed condition. This RA does not appear on recent maps but the LCC recommended it as such in 1985.]
Clearwater Creek north of Chettle Road	1) Several rare species on the dry slope. 2) Fern gully with many big Swamp Gums with many tree hollows.	Fern gully and surrounding slopes	*Grevillea obtecta,* *Persoonia chamae-peuce*	1) Exclude logging on slopes above gully. 2) Conduct more surveys for rare species.

Site	Values	Location/Extent	Rare Species	Recommendations
Grevillea repens Sites	Protection for flora Rare in Australia and Victoria	Range of species limited to the triangle inbetween Hepburn Springs to Blakeville to Molingghip.	*Grevillea repens*	1) Re/Conduct comprehensive survey of distribution. 2) Formally assess effects of logging and fire on species.
Nolan Creek Road, south end just off of Blackwood Ridge Road	Characteristic example of shrubby, heathy understorey on dry hill-top.	Approx 10-20 hectares or more.	*Acacia oxycedrus*	1) Exclude logging and other disturbance. 2) Survey vegetation in more detail.
Platylobium alternifolium Sites	Only known stands of rare shrub endemic to central and western hills of Victoria	1) SE of junction of Spargo-Cairn Rd. and McGee 2) Off Blunding Blakeville Rd. (Please see Appendix ???)	*Platylobium alternifolium*	1) Survey and assess the site and species before any more logging.
Pultenea weindorferi Sites	Only known stands of Vulnerable plant in region	1) Fingerpost Rd. 2) Campaspe Rd. 3) O'briens Rd 4) Salt Water Tributory (see La Trobe University 1982)	*Pultenaea weindorferi*	1) Protect from disturbances such as logging, trailbikes etc. 2) Survey and Assess 3) Manage fire regimes to conserve the Swamp Bush-pea
Saltwater Creek along Saltwater Creek Road	1) Fern gully with giant old trees and many hollows.	Northern half of Saltwater Road		1) Exclude logging from gully and surrounding slopes.
Squires Tk. Gully	Two Regionally Significant species in Fern Gully.	Approx.1 km of creek line parallel to Squires Track.	*Drymophila cyanocarpa* *Coprosma hirtella*	1) Protect creekline and corridor from disturbance. 2) Survey for rare species.
Werribee River Gorge south of Spargo Creek	1) Riparian Forest, Mossy Basalt Gorge, one of largest in WSF and region. 2) Bush corridor link to Ballan Daylesford Road.	The immediate corridor of the Werribee River, and 100-200 metres along it where it crosses the WSF	This site requires an extensive survey.	1) Protect river corridor from logging and soil disturbance.

Site	Values	Location/Extent	Rare Species	Recommendations
Wombat Forest Track area	1) Substantial visitors in area with Ashram and Walking Track 2) Rare ferns in railway cuttings 3) *Grevillea repens* sites	Area enclosed by Railway Tk, White Point Tk. and inbetween Wombat Station and the forest boundary.	*Grevillea repens, Persoonia chamae-peuce; Gleichenia dicarpa*	1) Exclude logging to protect walking and nature study opportunities. 2) Protect landscape views along walking trail on rail line.
XL Link and Chettle Road Fern Gullies	1) Two fern with large Swamp Gums with many hollows.	Gullies just north of Chettle Road		1) Exclude logging from gullies and immediate slopes

5.0 GENERAL RECOMMENDATIONS FOR THE CONSERVATION OF FLORA IN THE WSF

In this section general recommendations will be made in a summary form and then necessary explanations or subsidiary recommendations will be detailed.

1) Use the rare species of the forest as indicators of effective forest management for biodiversity by requesting assessments of the status of the rarest species in the forest be carried out by DCNR.

Rare species are the canaries of the forest, the fluctuations in the populations of rare species can be used as a method to monitor the sustainability of the forest management process. If rare species are declining or disappearing critical objectives of sustainability and preserving biodiversity in the WSF are not being met. If the species that are presently rare are disappearing then many other common species may become rare through the same management processes.

Unfortunately, it appears little monitoring of the rare species in the forest is being done by the Department of Conservation and Natural Resources. The distribution of *Grevillea repens* in the forest is a good example of the lack of concrete information. The last general assessment of the distribution and health of the species appears to have been undertaken in 1984 by the La Trobe University. This plant has endemic to Victoria and has two centres of population, around Healesville and Toolangi and in the western half of the WSF. Logging has occurred in areas where at least two stands of the plant occur, on Specimen Hill Road and on Rocklyn Road, without any formal assessment of the impact of logging and the health of the species.

Lunt (1987) undertook a study of the status of the rare Australian Anchor Plant west of Melbourne and published a summary in the Victorian Naturalist. This is a good example of the type of assessment that should be occurring for the rarest species in the WSF, particularly plants of National and State Significance as detailed in Table 3 above. These type of assessments are the obligation of DCNR when assessing logging plans in the WSF but it may be up to the community to initiate such studies, by encouraging botany students from universities or field naturalist groups to do surveys and research in the forest. The species of National Significance, eg. *Grevillea obtecta* and *G. repens*, may attract Commonwealth funds for research into their status.

The summary of rare flora in Table 3 provides a list of rare plants to monitor and survey and use as indicators of forest health. The Wombat Forest Society can contribute to conserving biodiversity in the WSF by using the list as a basis for demands or requests for survey, research and monitoring in the

management process. The Society may also have to contribute by doing some survey work or coordinating and encouraging work on the part of local field naturalist groups or students.

Species of National and State Significance; High Priority Species Requiring Survey and Assessment:
Grevillea obtecta
Grevillea repens
Pultenaea weindorferi

2) Survey, assess and document the sites with basalt soils in the WSF. There may be some rare species in these rare habitats. It may be another good project for a botany student from a university in Ballarat.

3) Initiate further mapping of rare species in the WSF. All of the VROTS listed by DCNR (1995) have records of their locations available. These locations can be acquired from the Flora Information System with a written request. These species should be mapped and appropriate management regimes for the various taxa should be considered and appropriate advice given to DCNR.

4) Protect riparian areas in the forest by demanding that no logging or other disturbances occur near streams or on floodplains. The prescription should require that no logging occurs on the floodpains of streams and that heavy equipment is not allowed into such areas.

6.0 CONCLUSIONS

I have attempted to bring together the existing information about the flora of the WSF and present it n a coherent package. One issue is very clear, there is very little information available about the flora. This report has scraped together disparate sources to make a somewhat coherent picture. However, there are clearly many gaps in the knowledge base. This report hopefully highlights those gaps, provides some advice and support for conservation management in the WSF and provides directions for future research and action in the forest to help preserve the area's biodiversity.

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Personal Communications

Wendy Bone, local resident

Geoff Carr, Consultant Botanist, Ecology Australia Pty. Ltd.

Vic Dolby, local resident

Monty Kirby, resident of Daylesford

Robert Parsons, Botany Department, La Trobe University

APPENDIX 1
Plant Species by Botanical Family
Wombat State Forest
August 1995

Based on records , local naturalists, quadrats taken by Lincoln Kern in August 1995
* indicates introduced species.

FERNS

ADIANTACEAE	
Adiantum aethipoicum	Maidenhair
ASPLENIACEAE	
Asplenium flabellifolium	Necklace fern
BLECHNACEAE	
Blechnum nudum	Soft Water Fern
Blechnum minus	Fishbone Water Fern
Blechnum wattsi	Hard Water Fern
DENNSTAEDTIACEAE	
Pteridium esculentum	Austral Bracken
GLEICHENIACEAE	
Gleichenia dicarpa	Wiry Coral Fern
LINDSAEACEAE	
Lindsaea linearis	Screw Fern

MONOCOTYLEDONS

CYPERACEAE	
Luzula ovata	Oval Woodrush
JUNCACEAE	
Juncus continuus	Rush
LILIACEAE	
Burchardia umbellata	Milkmaids
Dianella tasmanica	Tasmanian Flax Lily
Drymophila cyanocarpa	Turqouise Berry
ORCHIDACEAE	
Arthrochilus huntianus	Elbow Orchid
Caladenia carnea sens. lat.	Pink Fingers
Caladenia clavigera	Plain-lip Spider Orchid
Caladenia gracilis	Musky Caladenia
Caladenia phaeoclavia	Brown-clubbed Spider Orchid
Calochilus gracillimus	Slender Beard Orchid
Calochilus robertsonii	Purple Beard Orchid

Chiloglottis valida	Common Bird Orchid
Dipodium punctatum	Purple Hyacinth Orchid
Dipodium roseum	Rose Hyacinth Orchid
Diuris sulphurea	Tiger Orchid
Gastrodia procera	Tall Potato Orchid
Glossodia major	Wax-lip Orchid
Pterostylis longifolia	Tall Greenhood
Thelymitra aristata	Great Sun Orchid

POACEAE

**Anthoxanthum odoratum*	Sweet Vernal Grass
Danthonia semiannularis	Wallaby Grass
Microlaena stipoides	Weeping Grass
Poa sp.	Tussock
Poa labillardieri	Common Tussock Grass
Poa tenera	
Tetrarrhena junceum	Forest Wire Grass

XANTORRHOEACEAE

Lomandra filiformis	Wattle Mat-rush
Lomandra longifolia	Spiny Mat-rush
Xanthorrhoea australis	Grass Tree

DICOTYLEDONS

ASTERACEAE

**Hypochoeris radicata*	Cat's Ears
Olearia erubescens	

CAPRIFOLEACEAE

Sambucus gaudichaudiana	White Elderberry

CAMPANULACEAE

Wahlenbergia gymnoclada	Bluebell

DROSERACEAE

Drosera peltata ssp. *auriculata*	Yellow Tall Sundew

EPACRIDACEAE

Acrotriche prostrata	Trailing Ground Berry

EUPHORBIACEAE

Poranthera microphylla	Small-leafed Poranthera

FABACEAE

Bossiaea cordigera	Wiry Bossiaea*
Dillwynia cinerascens	Grey Parrot Pea
Indigofera australis	Austral Indigo
Oxylobium procumbens	Trailing Shaggy Pea

HALORAGACEAE	
Gonocarpus tetragynus	Common Raspwort
Gonocarpos micranthus	Trailing Raspwort
LAMIACEAE	
Prosthanthera melissifolia	Balm Mint-bush
MIMOSACEAE	
Acacia melanoxylon	Blackwood
MONIMIACEAE	
Hedycarya angustifolia	Austral Mulberry*
MYRTACEAE	
Eucalyptus ovata	Swamp Gum
Leptospermum continentale	Prickly Tea Tree
PROTEACEAE	
Banksia marginata	Silver Banksia
Grevillea obtecta	Grevillea
Grevillea repens	Grevillea
Persoonia chamaepeuce	Dwarf Geebung
ROSACEAE	
**Rubus ulmifolius*	Elm-leaf Blackberry
RUBIACEAE	
Coprosma hirtella	Rough Coprosma
Coprosma quadrifida	Prickly Currant Bush
RUTACEAE	
Phebalium squameum	Satinwood (one or two plants)
SANTALACEAE	
Exocarpos strictus	Pale-fruit Ballart
STYLIDIACEAE	
Stylidium graminifolium	Grass-leaf Trigger Plant
VIOLACEAE	
Viola hederacea	Ivy-leaf Violet —

APPENDIX 2

Alphabetical Species List for Wombat State Forest Area as at August 1995

APPENDIX 3
Plants Found by Local Naturalists and through the research for this report.

1) Wendy Bone is a resident of Musk and walks within 1 or 2 kilometres of her home in the Wombat

Arthrochilus huntianus	Elbow Orchid
Caladenia carnea sens. lat.	Pink Fingers
Caladenia clavigera	Plain-lip Spider Orchid
Caladenia gracilis	Musky Caladenia
Caladenia phaeoclavia	Brown-clubbed Spider Orchid
Calochilus gracillimus	Slender Beard Orchid
Calochilus robertsonii	Purple Beard Orchid
Chiloglottis valida	Common Bird Orchid
Dipodium punctatum	Purple Hyacinth Orchid
Dipodium roseum	Rose Hyacinth Orchid
Diuris sulphurea	Tiger Orchid
Gastrodia procera	Tall Potato Orchid
Glossodia major	Wax-lip Orchid
Pterostylis longifolia	Tall Greenhood
Thelymitra aristata	Great Sun Orchid

2) Vic Dolby lives in the western end of the forest north of Barkstead and has searched his local area extensively for all indigenous plants. He mentioned several areas and several rare species for the Wombat State Forest.

Creek Along Squires Track

Drymophila cyanocarpa	Turqouise Berry
Coprosma hirtella	Rough Coprosma

(one plant, the only specimen he has found in the found in the area

Valley Flat southeast of Barkstead (This area is on the western of a pine plantation on a side ride just 1/2 kilometre south of the Korunggibe??? Road. It is adjacent to small flat with Swamp Gum forest with an understorey of *Lepidosperma elatius*.)

Banksia marginata	Silver Banksia*
Exocarpos strictus	Pale-fruit Ballart
Bossiaea cordigera	Wiry Bossiaea*

Confirmed by Lincoln Kern on 9 August 1995

Pinchgut Road (corner)

Indigofera australis	Austral Indigo

Clear Water Creek Valley North of Chettle Road (in eastern end of forest)

Grevillea obtecta	Grevillea
Hedycarya angustifolia	Austral Mulberry*
Persoonia chamaepeuce	Dwarf Geebung*
Sambucus gaudichaudiana	White Elderberry*
Xanthorrhoea australis	Grass Tree

Confirmed by Lincoln Kern on 12 August 1995

Also found by Vic Dolby in western area of forest around Barkstead but exact locations unknown:

Phebalium squameum	Satinwood (one or two plants)
Prosthanthera melissifolia	Balm Mint-bush (one or two plants)

3) Recorded in the forest near Blackwood by Geoff Carr 1995

Arthrochilus huntianus	Elbow Orchid
Bossiaea cordigera	Wiry Bossiaea
Oxylobium procumbens	Trailing Shaggy Pea

4) Found on corner of Bell's Reef Road and Midland Highway by Robert Parsons, La Trobe University Botany Department. The plants were in "large populations" found scattered on both sides of Bell's Reef Road for 200 metres south of the Midland Highway.

Arthrochilus huntianus	Elbow Orchid
Dipodium punctatum	Purple Hyacinth Orchid

5) Two sites with small populations of Victorian Flat-pea (*Platylobium alternifolium*) were found in the WSF on 8 August 1995. The first one was in a small area of dry north facing forest just southeast of the junction of Spargo-Blakeville Road and McGee Road. The second was in a recently burned area inbetween the Bunding-Blakeville Road and McGee Road; this sight is part of one of the Fire Effects Study Area investigated by Tolhurst *et al* (1992).

APPENDIX 5
Quadrat Data

Quadrat 1
On tributary of Upper Loddon River, across the floodplain just below junction of Wickham Track and Loddon River Road.
Data taken on 9/8/95

57	*Acacia melanoxylon*	+
105	*Acaena novae-zelandiae*	1
278	*Asperula conferta*1	
408	*Blechnum nudum*	1
782	**Cirsium vulgare*	+
922	*Cyperus gunni*	+
1036	*Dichondra repens*	1
1307	*Eucalyptus ovata*	4
1315	*Eucalyptus rubida*	2
1402	**Galium aparine*	1
1434	*Geranium solanderi*	1
	Gnaphalium sp.	1
1741	*Hypericum gramineum*	+
1748	**Hypochoeris radicata*	1
	Juncus sp.	1
1919	*Lepidosperma elatius*	+
2179	*Microlaena stipoides*	1
2386	*Oxalis perennans*	1
2600	*Poa labillardieri*	4
2645	*Polystichum proliferum*	+
2757	*Prunella vulgaris*	1
2777	*Pteridium esculentum*	1
	Ranunculus sp.	1
2952	**Rubus fruticosus*	+
	Senecio sp.	1
3255	*Stellaria pungens*	1
3528	*Viola hederacea*	1

Quadrat 2
On the floodplain and steep bank next to the Loddon River where Bridge Road crosses it.
Data taken on 9/8/95

25	*Acacia dealbata*	2
57	*Acacia melanoxylon*	3
105	*Acaena novae-zelandiae*	1
408	*Blechnum nudum*	1
788	*Clematis aristata*	1
922	*Cyperus gunni*	1
1036	*Dichondra repens*	1
1304	*Eucalyptus obliqua*	4
1307	*Eucalyptus ovata*	4
1315	*Eucalyptus rubida*	2
1434	*Geranium solanderi*	1
2299	*Olearia argophylla*	+
1616	*Ozothamnus ferrugineus*	+
2600	*Poa labillardieri*	4
2645	*Polystichum proliferum*	3
2650	*Pomaderris aspera*	1
2757	*Prunella vulgaris*	1
2777	*Pteridium esculentum*	1
2952	**Rubus fruticosus*	1
	Senecio sp.	1
3255	*Stellaria pungens*	1
3348	*Tetrarrhena juncea*	1

Quadrat 3
A waterlogged flat on the upper Loddon River just off Bridge Road, 1.7 km east of junction of Bridge Road and Noname Track.
Data taken on 9/8/95

25	*Acacia dealbata*	+
100	*Acacia verticillata*	+
105	*Acaena novae-zelandiae*	1
408	*Blechnum nudum*	+
	Carex sp.	1
922	*Cyperus gunnii*	+
1036	*Dichondra repens*	1
1307	*Eucalyptus ovata*	4
	Galium sp.	1
1434	*Geranium solanderi*	1
1455	*Glycine clandestina*	1
1524	*Gratiola peruviana*	1
1748	**Hypochoeris radicata*	1
	Juncus sp.	1
1919	*Lepidosperma elatius*	4
2046	*Lomandra longifolia*	+
2179	*Microlaena stipoides*	1
2386	*Oxalis perennans*	1
2610	*Poa tenera*	1
2777	*Pteridium esculentum*	1
	Senecio sp.	1
3528	*Viola hederacea*	1

Quadrat 4
On narrow floodplain in a small tributory of Salt Water Creek in the eastern end of the WSF, just 100 metres downstream of crossing with Fitzgerald Road.
Data taken on12/8/95

57	*Acacia melanoxylon*	2
100	*Acacia verticillata*	1
105	*Acaena novae-zelandiae*	2
623	*Carex appressa*	2
782	**Cirsium vulgare*	1

788	*Clematis aristata*	1
1165	*Epacris impressa*	1
1304	*Eucalyptus obliqua*	1
1307	*Eucalyptus ovata*	2
1315	*Eucalyptus rubida*	2
1434	*Geranium solanderi*	1
1692	**Holcus lanatus*	1
	Juncus sp.	1
1748	**Hypochoeris radicata*	1
1919	*Lepidosperma elatius*	2
2600	*Poa labillardieri*	2
2952	**Rubus fruticosus*	1
3255	*Stellaria pungens*	1
3348	*Tetrarrhena juncea*	1
3528	*Viola hederacea*	1

Quadrat 5
In eastern end of WSF in fern gully off of Salt Water Road just north .5 km north of junction with Lloyd Track. In a gully with very clear stream, many large old Swamp Gums with many hollows visible in trees all along the creek line west of the northern half of Saltwater Road. This quadrat id directly below a huge old burnt out Swamp Gum inbetween the creek and road.
Data taken 12/8/95

100	*Acacia verticillata*	1
382	*Bedfordia arborescens*	2
408	*Blechnum nudum*	1
822	*Coprosma quadrifida*	1
1307	*Eucalyptus ovata*	2
1395	*Gahnia sieberiana*	1
1919	*Lepidosperma elatius*	1
2299	*Olearia argophylla*	3
2650	*Pomaderris aspera*	2
2645	*Polystichum proliferum*	2
3348	*Tetrarrhena juncea*	2

Quadrat 6
In deep fern gully north of Chettle Road just west XL Link Road. It is along a creek with large several old Swamp Gums with hollows. The quadrat include a Swamp Gum approx. 2m at the base.
Data taken on 12/8/95

57	*Acacia melanoxylon*	3
100	*Acacia verticillata*	3
408	*Blechnum nudum*	1
788	*Clematis aristata*	1
822	*Coprosma quadrifida*	1
1030	*Dianella tasmanica*	1
1304	*Eucalyptus obliqua*	2
1307	*Eucalyptus ovata*	4
1507	*Goodenia ovata*	+
1919	*Lepidosperma elatius*	+
	Senecio sp.	1
3348	*Tetrarrhena juncea*	2

Quadrat 7
In on dry west facing slope above Clear Water Creek above Chettle Road. This quadrat covers approximately 3 hectares on the lower slopes.
Data taken on 12/8/95

91	*Acacia stricta*	+
100	*Acacia verticillata*	1
122	*Acrotriche prostrata*	1
123	*Acrotriche serrulata*	1
363	*Banksia marginata*	1
508	*Brunonia australis*	1
666	*Cassinia aculeata*	1
973	*Chionochloa pallida*	2
999	*Daviesia ulicifolia*	1
1029	*Dianella revoluta*	1
1030	*Dianella tasmanica*	1
1165	*Epacris impressa*	1
1304	*Eucalyptus obliqua*	2
1313	*Eucalyptus radiata*	3
1350	*Exocarpos cupressifolia*	+
1489	*Gonocarpus tetragynus*	1
1507	*Goodenia ovata*	1
1571	*Hakea sericea*	1
1919	*Lepidosperma elatius*	1
2042	*Lomandra filiformis*	1
2046	*Lomandra longifolia*	1
2220	*Monotoca scoparia*	1
2608	*Poa sieberiana*	2
	Persoonia chamaepeuce	1
2777	*Pteridium esculentum*	1
3351	*Tetratheca ciliata*	1
3512	*Veronica plebeia*	1
3348	*Tetrarrhena juncea*	1
3528	*Viola hederacea*	1

Quadrat 8
This quadrat straddles the appropriately named Clear Water Creek in a deep fern gully. There's a few big trees with hollows with many more large trees likely to develop hollows within a few decades.
Data taken 12/8/95

57	*Acacia melanoxylon*	3
100	*Acacia verticillata*	1

105	*Acaena novae-zelandiae*	2
129	*Adiantum aethiopocum*	1
337	*Australina muelleri*	1
382	*Bedfordia arborescens*	+
407	*Blechnum minus*	1
408	*Blechnum nudum*	1
623	*Carex appressa*	1
788	*Clematis aristata*	1
822	*Coprosma quadrifida*	1
895	*Cyathea australis*	2
1030	*Dianella tasmanica*	1
1098	*Doodia caudata*	1
1304	*Eucalyptus obliqua*	2
1307	*Eucalyptus ovata*	3
1434	*Geranium solanderi*	1
1600	*Hedycarya angustifolia*	1
1748	**Hypochoeris radicata*	1
1761	*Indigofera australis*	+
1919	*Lepidosperma elatius*	1
2046	*Lomandra longifolia*	1
2179	*Microlaena stipoides*	1
2299	*Olearia argophylla*	3
2316	*Olearia myrsinoides*	+
2650	*Pomaderris aspera*	2
2386	*Oxalis perennans*	1
2600	*Poa labillardieri*	1
2645	*Polystichum proliferum*	1
2650	*Pomaderris aspera*	+
2743	*Prostanthera lasianthos*	2
2757	*Prunella vulgaris*	1
2777	*Pteridium esculentum*	1
2956	*Rubus parvifolius*	1
3348	*Tetrarrhena juncea*	2
3528	*Viola hederacea*	1

Quadrat 9

This quadrat was taken in a fern gully off of Paradise Track west of Blackwood. There were emergent Messmate over a dense lower canopy of *Olearia argophylla* with a thick understorey of ferns.

Data taken on 12/8/95

57	*Acacia melanoxylon*	3
100	*Acacia verticillata*	1
408	*Blechnum nudum*	3
822	*Coprosma quadrifida*	1
1036	*Dichondra repens*	1
1304	*Eucalyptus obliqua*	3
2299	*Olearia argophylla*	5
2643	*Polyscias sambucifolius*	+
2645	*Polystichum proliferum*	3
3348	*Tetrarrhena juncea*	1
3528	*Viola hederacea*	1

Quadrat 10

On the west slope of Babbington Hill in the Bullarto Block. This quadrat was taken to highlight the vegetation on this hill of Tertiary basalt. The trees were taller and straighter compared with other nearby areas facing the west and northwest.

Data taken 12/8/95

25	*Acacia dealbata*	3
100	*Acacia verticillata*	2
122	*Acrotriche prostrata*	1
278	*Asperula conferta*	1
989	*Daucus glochidiatus*	1
999	*Daviesia ulicifolia*	1
1036	*Dichondra repens*	1
1304	*Eucalyptus obliqua*	3
1307	*Eucalyptus ovata*	2
1313	*Eucalyptus radiata*	2
1315	*Eucalyptus rubida*	3
1402	*Galium australe*	+
1434	*Geranium solanderi*	1
1455	*Glycine clandestina*	1
1489	*Gonocarpus tetragynus*	1
1626	*Helichrysum scorpioides*	1
1748	**Hypochoeris radicata*	1
1919	*Lepidosperma elatius*	1
2042	*Lomandra filiformis*	1
2046	*Lomandra longifolia*	4
2179	*Microlaena stipoides*	1
2316	*Olearia myrsinoides*	1
2600	*Poa labillardieri*	1
2608	*Poa sieberiana*	2
2777	*Pteridium esculentum*	1
3503	*Veronica calycina*	1
3512	*Veronica plebeia*	1
	Senecio sp.	1
3255	*Stellaria pungens*	1
3348	*Tetrarrhena juncea*	1
3528	*Viola hederacea*	1