



ANGAHOOK-OTWAY INVESTIGATION DISCUSSION PAPER

VICTORIAN
ENVIRONMENTAL
ASSESSMENT
COUNCIL



SEPTEMBER 2003



WHAT IS VEAC?

The Victorian Environmental Assessment Council was established in 2002 – under the *Victorian Environmental Assessment Council Act 2001* – to replace the Environment Conservation Council (ECC) as the body providing the State Government with independent advice on strategic public land-use planning.

The five members of VEAC are:

(Chair) Dr Brian Robinson, AM, FTSE, B.Sc., Ph.D. – The former chair of the Environment Protection Authority; a wealth of experience in sustainable development and natural resources management.

Dr Sarah Ewing, B.Sc (Hons), M.Sc., Ph.D., Grad. Dip. Ed. – Currently a member of the Victorian Catchment Management Council and formerly a deputy member of the Australian Landcare Council; many years experience in catchment and natural resource management issues.

Mr Duncan Malcolm – Currently the Chairman of the Gippsland Coastal Board and Watermark Inc.; immediate past Chairman of Lakes and Wilderness Tourism Association, immediate past chair and current board member of Irrigation Association of Australia and member of Victorian Coastal Council.

Dr David Mercer, BA (Hons), Ph.D., Dip.Ed. – Fellow of The Environment Institute of Australia and New Zealand; broad expertise in natural resource management, recreation and tourism and also highly regarded academic experience.

Mrs Eda Ritchie, Grad. Dip. Bus. – Formerly a member of the Environment Conservation Council, Trust for Nature Board and the Chairperson of the Western Region Coastal Board; has a strong background in farming in Western Victoria.

SUBMISSIONS INVITED

Submissions are now invited from interested groups and individuals for consideration for the Draft Proposals Paper to be published early in 2004. Submissions should be addressed to the Executive Officer at the address below or by fax or e-mail. If submissions are sent by fax or e-mail, please include a postal address if you wish to receive progress reports on the investigation.

The submission period closes on **FRIDAY, 5 DECEMBER 2003.**

NOTE THAT ONLY SUBMISSIONS SENT DIRECTLY TO VEAC CAN BE TREATED AS SUBMISSIONS

There will be further opportunities for submissions following publication of the Draft Proposals Paper.

Unless specifically requested otherwise, all submissions to VEAC become public documents. If you wish your submission to be considered confidential, a written request must accompany the submission. If the confidentiality request is not accepted, your submission will be returned to you.

Information contained in all submissions may also be stored and used by VEAC or the Department of Sustainability and Environment, for purposes relating to the Angahook-Otway Investigation and subsequent government consideration of matters related to the investigation.

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Land Victoria	Back Cover

MESSAGE FROM THE COUNCIL

The Otways region is one of Victoria's most treasured areas. Many people live and work in the region, many others retire there and, of course, many holiday there. It is one of the State's major tourist areas with attractions ranging from the famous Great Ocean Road and some of the world's finest beaches to the beautiful hinterland with its waterfalls, magnificent tall forests and ancient rainforest gullies. The green and undulating farmlands, cleared with often heroic endeavour by the early settlers, are some of the richest and most picturesque agricultural lands in Australia.

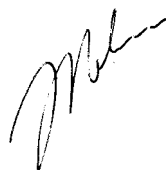
In September 2002, the State Government first gave the Victorian Environmental Assessment Council (VEAC) the task of making recommendations on whether the existing Angahook-Lorne State Park should be upgraded to a national park. Following commitments made during the election campaign in late 2002, the Government amended the Terms of Reference and in February 2003, the Council was asked to make boundary recommendations for a new national park including the existing Otway National Park and the Angahook-Lorne State Park. The Council was also required to look at a number of other matters detailed in the Terms of Reference, particularly to recommend whether other parcels of land within the study area should be added to the park and reserve system.

This Discussion Paper is the result of the work Council has done to date and will be followed by a Draft Proposals Paper in early 2004 and a Final Report to the Minister for the Environment in September 2004. Over 470 submissions were received by Council from members of the public and interest groups during the preparation of this Discussion Paper. These submissions contain a great deal of valuable information and represent the full range of community views on the future of public land use in the Otways.

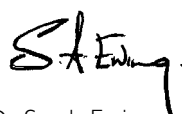
Many other Government agencies are also involved in future planning for the Otways. The development of the Great Ocean Road Region Strategy, the regional Catchment Management Strategy and strategies to manage tourist development in the area all rely heavily on community input and leadership. The Council is keenly aware of these strategic planning developments and work being done by local government and other bodies. Council will continue to work closely with these groups.

The needs of people who live and work in the Otways and the possible effects of any proposed changes on their lives are of central concern to the Council. However, Council is also aware that all Victorians have an interest in and responsibility for the area. It is our task, with the assistance of both the local and broader communities, to consider all views and seek to develop recommendations that reflect the optimum combination of environmental, social and economic objectives for the area.

The Council expects that this Paper will provoke discussion and interest in the future of the region. It contains much information gleaned from many sources and covers many issues which will interest stakeholders. We look forward to further input from interested individuals and groups as we prepare our Draft Proposals Paper and the Final Report to go to the Minister:



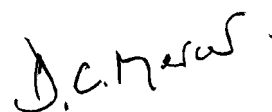
Dr Brian Robinson (Chairman)



Dr Sarah Ewing



Mr Duncan Malcolm



Dr David Mercer



Mrs Eda Ritchie

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THIS DISCUSSION PAPER

This Discussion Paper is the first report published in VEAC's Angahook-Otway Investigation. The discussion this paper is intended to generate discussion that will inform later stages of the investigation process. VEAC will be receiving submissions in response to this Paper until 5 December 2003 (details inside front cover), and will be consulting with the community in the study area up until that time.

There are 6 chapters in this Paper:

Chapter 1 introduces the Council and its operation, and the Angahook-Otway Investigation.

Chapter 2 outlines the system of public land use categories in Victoria and describes those of the Angahook-Otway study area.

Chapter 3 documents the values, uses and resources of public land in the study area.

Over 470 submissions have been received to date by VEAC and the views and information contained in these submissions are summarised in **Chapter 4**.

Chapter 5 discusses issues raised in submissions and from other information collected by VEAC.

Finally **Chapter 6** discusses some draft approaches to resolving issues associated with public land-use planning in the Otways, with a view to developing the Draft Proposals Paper (the next document in the Angahook-Otway Investigation process).

Additional detailed and background material related to the investigation is contained in the Appendices. Maps showing relevant information are interspersed throughout the Paper and additional large scale maps are inside the back cover.

SUBMISSIONS ON THE DISCUSSION PAPER

The primary purpose of this Discussion Paper is to inform and initiate submissions from interested people and organisations. All stakeholders are encouraged to make a submission to VEAC – these submissions will be considered in detail by VEAC when developing specific proposals for public land in the study area for the Draft Proposals Paper, scheduled for publication in the first half of 2004. The community will then have further opportunity to provide feedback through formal submissions and community consultation. These views will be taken into account when VEAC prepares recommendations for its Final Report to the Minister for the Environment by 3 September 2004.

To assist those making submissions, Chapter 6 of this Paper explores approaches that Council expects to consider in developing draft recommendations. Stakeholders making submissions should not however feel constrained by these options.

Note that only submissions sent directly to VEAC can be treated as submissions. The address for submissions is inside the front cover of this Paper.

The closing date for written submissions on this Discussion Paper is 5 December 2003



Figure 1. Terms of Reference for Angahook-Otway Investigation

Victorian Environmental Assessment Council Act 2001

On 8 September 2002 the former Minister for Environment and Conservation requested the Victorian Environmental Assessment Council to carry out an investigation relating to Angahook-Lorne State Park to determine the potential for designation as a national park. The request is now amended as specified below.

Amendment to request to carry out an investigation

Pursuant to section 15 of the *Victorian Environmental Assessment Council Act 2001* (the VEAC Act), the Minister for Environment hereby amends the request to the Victorian Environmental Assessment Council made by the former Minister for Environment and Conservation concerning the Angahook-Lorne State Park dated 8 September 2002.

The Victorian Environmental Assessment Council is now requested to carry out an investigation of the public land landward of low watermark within the Otway Ranges area shown on the accompanying plan [see Map 1].

The purpose of the investigation is to determine the boundaries of:

- (a) a single national park in the Otway Ranges including public land extending from Anglesea to Cape Otway, specifying whether or not the Great Ocean Road should be included in the park; and
- (b) any other public land currently managed as State Forest which would be suitable for addition to existing State Parks or nature conservation reserves, or for inclusion in new conservation reserves once native forest logging ceases in the Otways.

The Council is required to prepare a discussion paper and draft proposals paper and to submit a written report on the results of its investigation by 3 September 2004.

In addition to the considerations specified in section 18 of the VEAC Act, the Council must also take into consideration the following matters:

- Victorian Government's policies with regard to logging and woodchipping in the Otways;
- definition of 'national park' used by the former Land Conservation Council and the former Environment Conservation Council;
- objects of the National Parks Act with respect to national parks;
- Victorian Coastal Strategy 2002;
- Victorian Government's Great Ocean Road Region Strategy;
- Great Ocean Road Regional Tourism Development Plan;
- Anglesea Heathland Agreement between the Secretary to the Department of Natural Resources and Environment and Alcoa Australia Limited;
- relevant regional catchment strategies.



CHAPTER I INTRODUCTION

BACKGROUND TO THE ANGAHOOK-OTWAY INVESTIGATION

In many ways, Victoria is the most diverse state in Australia, and the Otways is perhaps the most naturally diverse region in Victoria. In little over 3,000 square kilometres, residents and visitors can experience ancient rainforests, tranquil estuaries, numerous rivers and waterfalls, some of the world's tallest trees, the beautiful, naturally occurring Lake Elizabeth, and one of the world's most famous scenic coastlines. The natural riches of the region underpin a broad range of human activities, including broad-acre and intensive agriculture, water supply catchments, timber plantations, stone and gravel quarries, and many different types of recreation, such as fishing, horse riding, nature study, sightseeing, bushwalking, surfing and other beach activities. This range of activities generates, and is supported by, a substantial tourism industry in a landscape of lush, fertile farmland with picturesque coastal and inland towns.

It is not surprising, then, that the Otways occupy a special place in the hearts of many people, from new residents, international and local visitors, to those with a long family history in the region, particularly the indigenous Wathaurong and Gunditjmara people. It is also not surprising that the number of people who appreciate and spend time in the Otways is increasing, placing pressure on the region's natural resources and infrastructure.

About half of the land in the Otways region is public land including one relatively small national park (Otway National Park), three state parks (Angahook-Lorne, Carlisle and Melba Gully), large areas of state forest, and a variety of other public land categories. There are also two marine national parks off the Otway coast. Given its extent in the region public land is clearly critical for planning in the Otways, and plays a central role in defining the character of the whole region. There has, however, been no systematic review of public land use in the Otways since the Land Conservation Council's Corangamite Final Recommendations in 1978 and, in recent years, there has been vigorous public debate about the appropriate uses for public land in the area. The pressures on the Otways have changed markedly since 1978 — one only needs to see a photograph of Lorne at that time to see how much has changed!


In this setting, the Government of Victoria has now requested the Victorian Environmental Assessment Council (VEAC) to investigate and make recommendations on public land use in the Otways, and specifically to determine the boundaries of a single national park from Anglesea to Cape Otway.

What is the Victorian Environmental Assessment Council?

The *Victorian Environmental Assessment Council Act 2001* (VEAC Act) came into effect on 31 December 2001. This Act repealed the *Environment Conservation Council Act 1997* and established the five-member Victorian Environmental Assessment Council to conduct investigations and make recommendations relating to the protection and ecologically sustainable management of the environment and natural resources of public land. The five inaugural members appointed to VEAC by the then Minister for Environment and Conservation are Dr Brian Robinson (chair), Dr Sarah Ewing, Mr Duncan Malcolm, Dr David Mercer, and Mrs Eda Ritchie. A brief biography of each of the Council members is provided on the inside front cover of this Discussion Paper.

The Council conducts its affairs in accordance with the VEAC Act. In particular, Section 18 specifies that "Council must have regard to the following considerations in carrying out an investigation and in making recommendations to the Minister—

- (a) the principles of ecologically sustainable development;
- (b) the need to conserve and protect biological diversity;
- (c) the need to conserve and protect any areas which have ecological, natural, landscape or cultural interest or significance, recreational value or geological or geomorphological significance;
- (d) the need to provide for the creation and preservation of a comprehensive, adequate and representative system of parks and reserves within Victoria;
- (e) the existence of any international treaty ratified by the Commonwealth of Australia which is relevant to the investigation;
- (f) any agreement at a national, interstate or local government level into which the Government of Victoria has entered, or under which the Government of Victoria has undertaken any obligation in conjunction with the Commonwealth, a state, territory or municipal council, which relates to the subject matter of the investigation;
- (g) the potential environmental, social and economic consequences of implementing the proposed recommendations;
- (h) any existing or proposed use of the environment or natural resources."



In carrying out its investigations, Council has the difficult task of considering all the complex issues and views involved and providing fully integrated recommendations that can form a basis for the future management of the public land in the area. In particular, Council is required to take into account the protection of biodiversity and other environmental values along with the competing demands on the land and its resources while also taking into account the full range of social and economic considerations.

Terms of Reference for the Angahook-Otway Investigation

On 17 February 2003, the Minister for Environment requested VEAC to expand its (then) current investigation (called the Angahook-Lorne Investigation) in line with amended Terms of Reference provided with that request. The Terms of Reference were amended to reflect commitments made in the Government's 'Forests and National Parks' 2002 election policy. The amended Terms of Reference and accompanying map are reproduced in Figure 1 and Map 1. They circumscribe a study area of 343,295 ha, of which some 158,985 ha is public land included in the investigation.

The Terms of Reference specify eight matters that VEAC must take into consideration and each of these matters is briefly summarised and referenced in Appendix 1.

Matters not Within the Terms of Reference

The Council is an independent body that reports directly to the Minister for the Environment. Its role is prescribed by the *VEAC Act* under which it was established and confirmed by the Terms of Reference for individual investigations. Accordingly there are matters in most investigations that VEAC does not address because of either requirements in the Act or directions in the Terms of Reference. In the Angahook-Otway Investigation the following matters will not be considered:

- privately owned land (the *VEAC Act* specifies that VEAC can only consider public land);
- the continuation of native forest timber harvesting (the Government has already decided that it will phase-out native forest timber harvesting on public land by 2008);
- the process to phase-out timber harvesting (the Department of Sustainability and Environment is managing this process);
- land leased or licensed for plantations and that part of the Anglesea Heathland covered by the Alcoa lease area (these areas are specifically excluded in the map accompanying the Terms of Reference); and

- whether or not there will be a national park (the Terms of Reference specify that there will be "a single National Park in the Otways including public land extending from Anglesea to Cape Otway").

Although the Council will not make recommendations related to the above matters they may remain relevant to the Council's consideration of issues. For example, the Terms of Reference specifically require the Council to take into account the Anglesea Heathland Agreement between the Government and Alcoa. Similarly the impact of any recommendations on private land will be taken into account by the Council.

The Investigation Process

The process for the Angahook-Otway Investigation (summarised in Figure 2) is formally specified in the *VEAC Act* and the Terms of Reference for the investigation. There are three submission periods (each a minimum of 60 days) and the investigation is scheduled to be completed by 3 September 2004 when the Final Report is given to the Minister for the Environment. VEAC has established a Government Contact Group and a Community Reference Group for the investigation as per Sections 12 and 13 of the *VEAC Act*. The Government Contact Group provides technical expertise and liaison assistance between VEAC and Government Agencies. The Community Reference Group includes representatives of groups covering a broad range of interests relevant to the investigation (Appendix 2 lists all group members and affiliations). The Community Reference Group will meet regularly throughout the investigation and will provide advice and input to Council on relevant issues.

Over 470 submissions were received in response to the Notice of Investigation, including 21 submissions received in September-November 2002 on the Notice of Investigation for what was then the Angahook-Lorne Investigation. These submissions contain an enormous amount of valuable information and perspectives on the investigation, and have contributed substantially to this Discussion Paper and the investigation as a whole. VEAC is very grateful for the huge amount of time and effort that members of the community have put into their submissions, and looks forward to receiving further submissions in response to this Discussion Paper – details for making submissions are provided on the inside front cover of this Paper.

Map 1: Plan of Angahook-Otway Study Area accompanying the Terms of Reference for the Investigation .

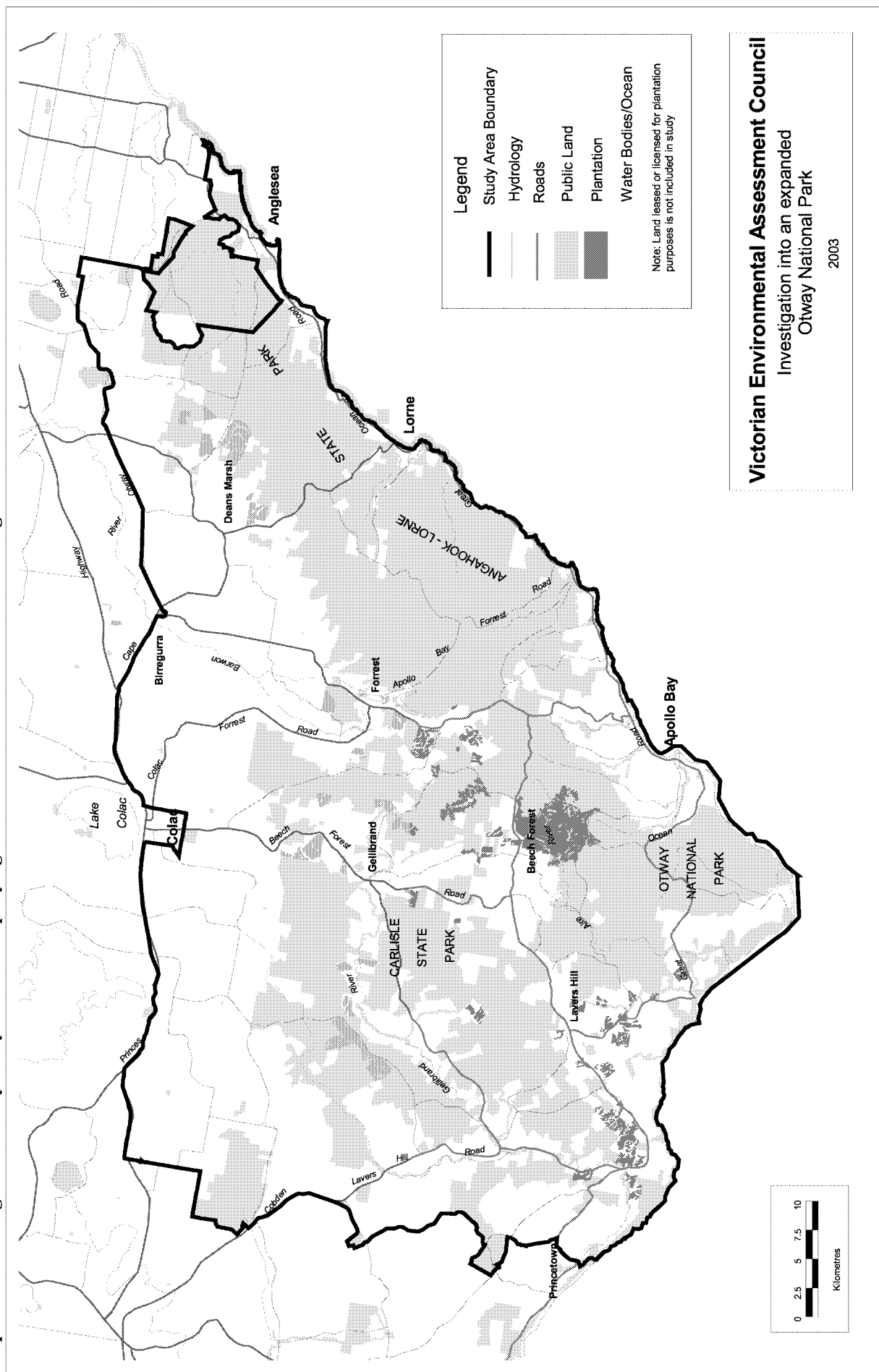
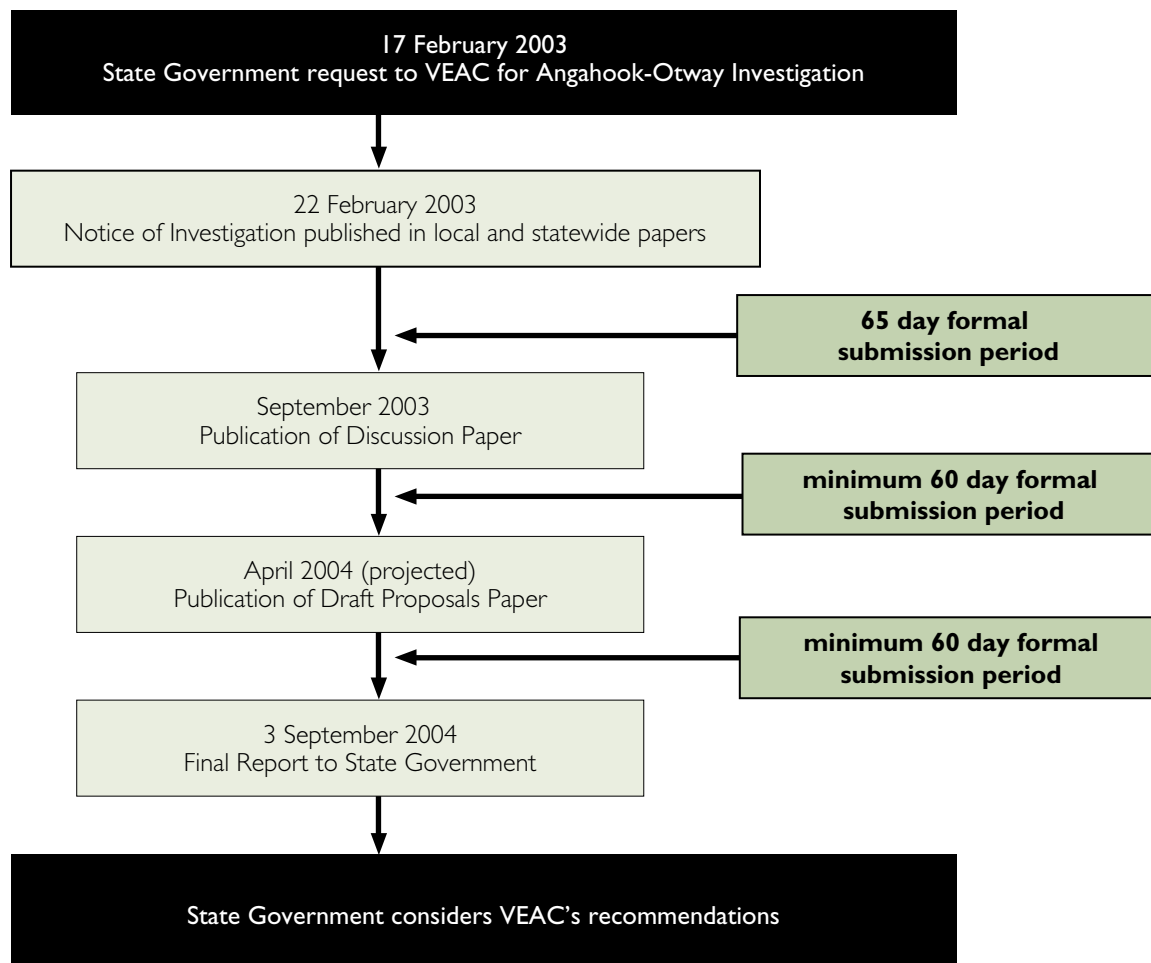


Figure 2: VEAC's public consultation process for the Angahook-Otway Investigation



OBJECTIVES OF THE INVESTIGATION

After considering the Terms of Reference, inspecting the study area, talking to stakeholders, and considering submissions, the Council has developed a set of objectives for the investigation. These will help the Council identify and focus on the key issues, guide the consultation process and ensure the Council has adequate information on which to base and justify its recommendations to Government.

The overall aim of the investigation is to recommend a sustainable and balanced pattern for public land use within the context of all land use in and adjacent to the study area.



In achieving this aim the Council will develop recommendations that will reflect the following objectives:

- Protection of natural values, specifically
 - Adequate representation of all Ecological Vegetation Classes (EVCs) of the study area in the park and reserve system
 - Protection of biodiversity including rare and threatened flora and fauna
- Protection of catchments and water quality
- Protection of landscape values and cultural heritage
- A high level of community involvement in the investigation and the ongoing management of public land, including
 - Local residents
 - Indigenous people
 - Commercial and industry interests
 - Conservation and recreation groups
- Consideration of community views on the area
- Maintenance of options for possible future infrastructure development such as:
 - Increased water harvesting
 - New roads and other public facilities
 - Tourism development
- Integration of opportunities for a diversity of activities within the area including
 - Provision for appropriate recreation and resource use in the various categories of public land
 - Development of a culture of integrated conservation and land management involving farmers, resource users, tourism operators and the public
 - Accessible and well-managed natural areas for public recreation and enjoyment
- Consideration of the management demands in the different public land-use categories, including:
 - Control of weeds and vermin
 - Fire management
 - Access, interpretation and education for visitors

General community acceptance of the Council's recommendations is particularly important to ensure that, as far as possible, public land in the area meets the needs and aspirations of both the local communities and the larger Victorian community, now and into the future. In reaching its conclusions the Council will need to weigh up competing views and may not be able to accommodate all views to the extent their advocates would like. In recognition of this, the Council will ensure that its processes are transparent and its assessment of views and information are fair, reasonable and supportable.

CHAPTER 2 CURRENT PUBLIC LAND USE

Land use results from an interaction between the nature of the land and the needs and aspirations of the community. Land use changes over time as needs and aspirations change and as the condition of the land changes. Current public land use thus reflects, and is constrained by, its own history.

In undertaking the current investigation, VEAC is mindful that it is not starting with a 'clean sheet'. Consideration of possible changes to current land use is best undertaken with an understanding of past land-use decisions and a knowledge of the available land-use category 'tools'.

This chapter outlines the range of land-use categories in place within the study area. This outline will assist in the consideration of matters related to additional areas for the national park land-use category as well as the possible inclusion of state forest areas into other parks and reserves.



PUBLIC LAND-USE HISTORY

Since European settlement, the formal allocation of land use has been the prerogative of government and three major processes have influenced current land use in the study area.

Alienation of Crown Lands

In the 1830s and 1840s much of Victoria was licensed to pastoralists. In contrast, by the 1860s the imperative was to settle the land more densely and establish cultivated farmlands. The alienation (that is, transfer to freehold) of Crown land mostly took place after surveyors, who acted as de facto town planners, laid out and surveyed townships and farm allotments which were then put up for sale. Land was sold by way of selection, auction or ballot.

Such settlement inevitably involved the clearing of the land, indeed, selectors were required to clear their land. Trees were typically ringbarked or burnt. As land clearance spread, the loss of timber resources became a concern. Loss of timber was exacerbated by the opening up of the forests for selection after the best agricultural land had been sold (or leased with a view to sale) by the 1880s. Moreover, the taking of timber from unalienated Crown lands

(permitted under licence) was poorly controlled, placing even greater pressure on timber resources.

Some Crown lands were set aside as timber reserves and state forest (notably in 1873), however these reserves were revoked by a subsequent Government resulting in virtually all remaining Crown lands of the Otway forests being available for selection by 1892.

Protection of Forest Resources

In 1899, a Royal Commission found that the manner in which settlement in the Otways was permitted and encouraged was a 'great administrative blunder' and that most of the timbered areas of the Otways should be reserved for water supply and timber milling.¹ The Government responded by proclaiming 64,000 ha as reserved forest. By 1907, the Government had enacted forestry legislation and established new public service bodies to supervise and manage forest resources. Remaining Crown lands were assessed and those with timber resources were proclaimed as reserved forest, protected from alienation, and controlled by the new agencies.

The boundary of the public land in the study area had largely been established at the turn of the previous century, with timber protection and timber production being the primary land use of the remaining public lands covering the majority of the Otway Ranges. Areas of abandoned farmland were later purchased by the Forests Commission to plant pines and by the State Rivers and Water Supply Commission for water supply. In areas where there were no timber resources, the alienation of Crown land continued intermittently on a small scale, with the only major agricultural development of unreserved Crown lands occurring in the west of the study area (the Heytesbury Land Settlement Scheme initiated by the then Soldier Settlement Commission in 1956).

After World War 2, the forests came under increased pressure. This pressure arose from the development of technology such as chain-saws, bull-dozer and mechanised transport which, allied with increased post-war demand for timber products, led to significant increases in the road network and the annual volume of timber cut. In addition, demand for new areas to develop pine plantations was strong and the harvesting of hardwood trees for pulpwood began.

During earlier periods when timber production and associated infrastructure occupied small areas, land uses such as nature conservation and water production could be readily provided for in the reserved forest areas. By the 1970s there was concern that such values were being diminished. In addition, the nature conservation and landscape values of smaller blocks of Crown land were also being recognised and increasingly considered to be under threat, despite areas of bushland still being sold.

Similar issues were becoming apparent throughout the State. In 1970 the Government established the Land Conservation Council (LCC), charged with systematically assessing and recommending the most appropriate use of all public lands.

Planning for Balanced Land Use

The LCC divided Victoria into study areas, undertook regional investigations of these study areas and recommended that public lands be allocated to a balance of specified land-use categories. The LCC's recommendations were made after the collection of scientific resource data and an extensive process of consultation.

The Angahook-Otway study area was partly covered in the LCC's Melbourne Study Area Investigation (Aireys Inlet and Anglesea areas) completed in 1977,² and a subsequent review of that area (completed in 1987³). Most of the Angahook-Otway study area was covered by the Corangamite Area Investigation which was completed in 1978.⁴

The Corangamite Area Final Recommendations allocated public lands to the major land-use categories in the following proportion:

- a) hardwood production areas – 36%;
- b) lake reserves – 18% (all outside the Angahook-Otway study area);
- c) national and state parks – 17%;
- d) uncommitted land – 7%;
- e) softwood plantations and associated 'forest areas' – 5%;
- f) flora reserves, flora and fauna reserves and wildlife reserves – 4% (many of which lie outside the current study area);
- g) bushland reserves, scenic reserves – 2%; and
- h) regional parks and recreation reserves – 1%.

The investigation also identified some five percent of public land as suitable for sale for agricultural or forestry purposes, mostly in the Heytesbury Land Settlement Scheme.

The LCC's recommendations were subsequently adopted by the Government and have largely been implemented. A scheduled ten-year review of the Corangamite region never commenced. Since the 1978 study, there have only been a few changes to the land-use allocations, mostly arising from subsequent special investigations undertaken by the LCC and ECC (see Table 2.1). The boundaries of the relevant LCC and ECC investigations are shown in Figure 2.1.



Table 2.1: Land Conservation Council and Environment Conservation Council Investigations

NAME OF INVESTIGATION	DATE OF FINAL RECOMMENDATIONS	KEY IMPLICATIONS FOR STUDY AREA
Regional Investigations		
Melbourne Study Area	January 1977	Led to creation of the first state park in the study area.
Corangamite Area	September 1978	First comprehensive review for most of the public lands. Led to, amongst other things, the creation of the first national park as well as three state parks.
Melbourne Area District 1 Review	June 1987	Minor changes only.
Special Investigations		
Rivers and Streams Special Investigation	June 1991	A statewide study that, amongst other things, led to the designation of heritage rivers.
Historic Places Special Investigation – South-Western Victoria	January 1997	Led to the creation of additional historic and cultural features reserves.
Marine Coastal and Estuarine Investigation	August 2000	Mostly covered areas below low water mark. Amongst other things, led to the creation of two marine national parks on the edge of the study area.

Present Needs and Expectations

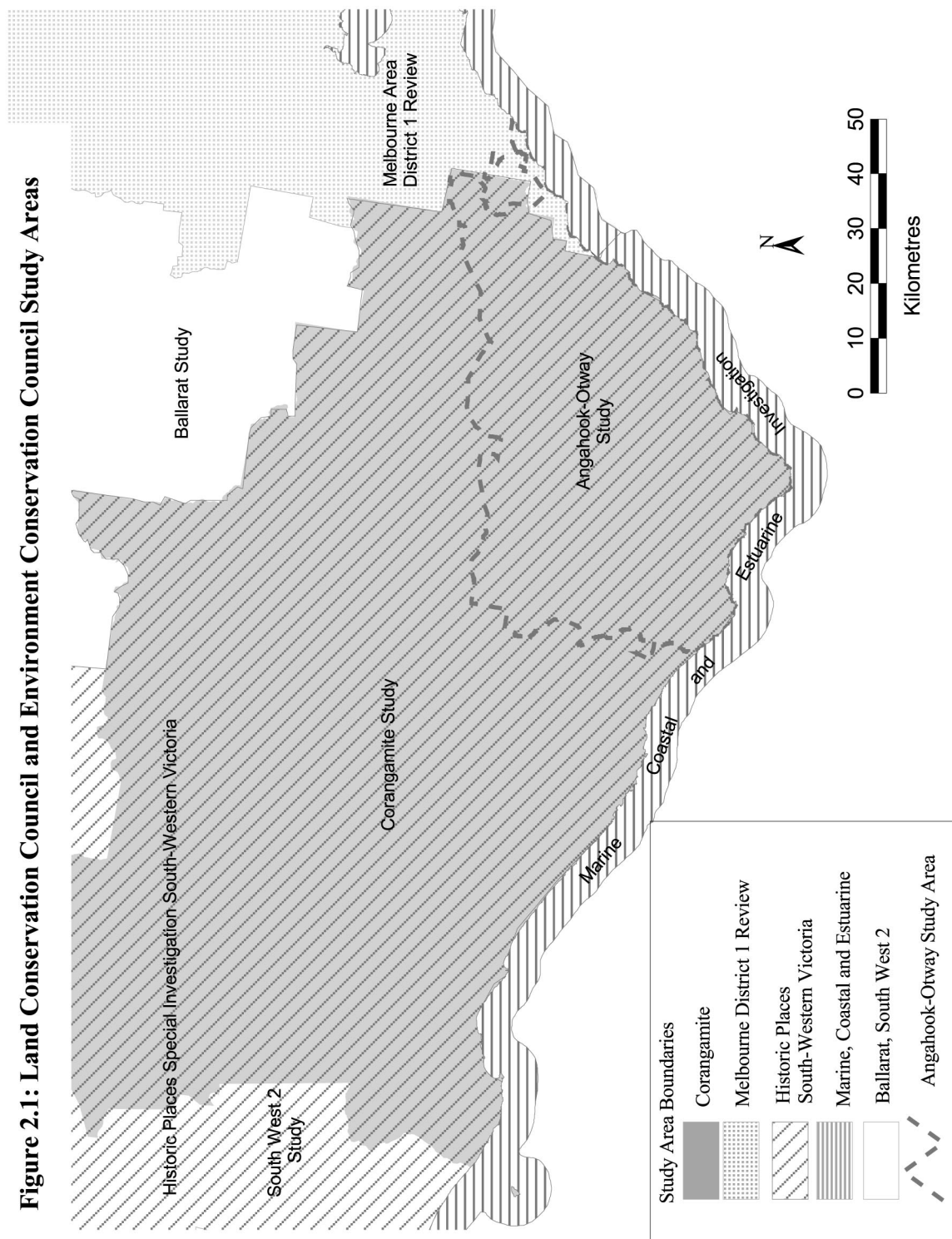
In recent years, the community has become aware of the major contribution that public land makes to the protection of biodiversity. Land managers have undertaken increasingly sophisticated management planning exercises to promote sustainability. Park and forest management plans now provide for multiple uses and protect an array of values over and above the primary land-use objective of the land.

Key Points

Current public land use is based on freehold land boundaries largely defined by the extent of agriculturally productive land, the presence of timber resources, and the results of an assessment and land-use allocation process undertaken twenty-five years ago.



Figure 2.1: Land Conservation Council and Environment Conservation Council Study Areas



PUBLIC LAND-USE CATEGORIES

Public lands are now classified into the following major land-use categories:

- a) Parks—national, state, regional and marine national parks (there are no wilderness parks in the study area);
- b) Nature conservation reserves—flora reserves, flora and fauna reserves, non-hunting wildlife reserves and marine sanctuaries;
- c) Historic and cultural features reserves;
- d) Natural features reserves—including bushland reserves, water frontages, streamside reserves and scenic reserves;
- e) State forest—including forest areas previously allocated specifically as hardwood production areas, forest areas, and uncommitted lands (with no defined primary use);
- f) Coastal waters and coastal reserves;

g) Community use areas—education areas, recreation reserves, parklands and gardens, schools, public halls and so forth;

h) Water production areas—storages and distribution facilities;

i) Plantations - Softwood plantations (those that are leased or licensed are not included in the study), and hardwood plantations (none in the study area);

j) Other categories – including earth resources (stone reserves and coal production areas) and services and utilities reserves.

Each land-use category in essence defines the primary purpose of the public land. For many of the land-use categories a range of additional purposes is also defined. Each land-use category is generally subject to particular legislation and management arrangements (see Table 2.2).

Table 2.2: Summary of Land-use Categories, Legislation and Management Arrangements

LAND USE CATEGORY	LEGISLATION	MANAGER
National and state parks	<i>National Parks Act 1975</i>	Parks Victoria
Regional parks	<i>National Parks Act 1975 or Crown Land (Reserves) Act 1978</i>	Parks Victoria
Nature conservation reserves	<i>Crown Land (Reserves) Act 1978</i>	Parks Victoria
Historic and cultural features reserves	<i>Crown Land (Reserves) Act 1978, Forests Act 1958</i>	Mostly Parks Victoria
Natural features reserves	<i>Crown Land (Reserves) Act 1978</i>	Parks Victoria
State forest	<i>Forests Act 1958</i>	Forests Service
Coastal reserves	<i>Crown Land (Reserves) Act 1978</i>	Committees of management (under Land Victoria)
Community use areas	<i>Crown Land (Reserves) Act 1978</i>	Committees of management (under Land Victoria)
Water production areas	Various	Water authorities
Softwood production	<i>Victorian Plantations Corporation Act 1993</i>	Private company as licensee.
Other reserves (e.g. services and utilities, stone reserves, coal production areas, etc.)	Various	Various (under Land Victoria)

Note: This table is a summary only. Any given park or reserve may be subject to additional legislation or alternative management arrangement.

Victoria's conservation reserve system comprises national, state and wilderness parks, nature conservation reserves, and reference areas. Other special features may be protected by specific reserves, such as historic and cultural feature reserves and natural features reserves.

Special values of public land may also be given legal protection by a variety of mechanisms that overlie the main land-use category of an area. Such overlays include:

- a) reference areas;
- b) wilderness zones (none in the study area);
- c) remote and natural areas (none in the study area);
- d) heritage rivers;
- e) representative rivers (Gellibrand River and Kennedy Creek in the Angahook-Otway study area);

- f) historic and cultural features zones (a number within a variety of land-use categories);
- g) marine special management areas (such as Dinosaur Cove, a 20 ha area abutting the Otway National Park west of Glenaire);
- h) coastal protection and coastal recreation zones of coastal reserves;
- i) scenic coast (a designation given by the LCC in 1978 to the coastline between Warrnambool and Lorne in recognition of its "outstanding natural landscape qualities"); and
- j) declared water supply catchments.

Special values of public land can also be specifically protected by zoning and prescriptions as defined in management plans, codes of practice and other management planning documents.

The formal assignment of a public land use category to an area is undertaken in a number of ways. Between 1970 and 1997 it was mostly undertaken through an Order in Council

process, which directed government departments and public authorities to give effect to government-approved land-use recommendations. The *Victorian Environmental Assessment Council Act 2001* retains the legal standing of such Orders in Council to still define the approved public land use for an area unless specifically amended or revoked by the Governor in Council (see s.28, *Victorian Environmental Assessment Council Act 2001*). Orders in Council may be implemented by amending legislation (for example, the *National Parks Act 1975*), by changing the reservation of the land, or by administrative process.

CURRENT PUBLIC LAND USE – BY CATEGORY

Table 2.3 documents the extent of each of the major public land categories in the study area. Note that the study area covers some 343,295 ha, which includes 158,985 ha of public land included in the study, and 5715 ha that are leased or licensed for plantations and therefore – under the Terms of Reference – are not included in the study.

Table 2.3: The Extent of Major Public Land Categories in the Angahook-Otway study area

Category	Area (ha)
National Park	11,880
State Park	26,930
Regional Park	665
Nature Conservation Reserve	6570
Coastal Reserve	4100
Natural Features Reserve	7170
Water Production	905
Historic and Cultural Features Reserve	1230
Community Use Area	1170
State Forest	91,020
Plantation	100
Earth Resources	445
Services and Utilities	415
Uncategorised Public Land	3595
Land not required for public purposes	2780
Total Extent of Public Land included in the Investigation	158,975
Public Land Leased or Licensed for Plantations – not included in the Investigation	5715
Freehold	172,810
Total Extent of Study Area	337,500
Overlays (areas included in the totals above)	
Reference Area (in various categories above)	2170
Heritage River (in various categories above)	820
Special Protection Zone (in state forest)	25,410

Note: The areas in this table are rounded-off to the nearest five hectares. The areas are mostly derived from GIS analysis of 1:25,000 or 1:100,000 mapping, and therefore may differ from other (generally less precise) area statements. For example, the area of Otway National Park according to Schedule 2 of the *National Parks Act 1975* is "129 square kilometres [12,900 ha], more or less", whereas the GIS area is 11,800ha". As a result, the areas in this table may not concur with those in other tables in this Chapter which use the area statements from the official scheduling, proclamation, or reservation (whichever is appropriate) of lands in the various public land-use categories (e.g. 12,900 ha for Otway National Park).

Parks

Until 1970 there were no areas set aside for parks within the study area. In the early 1970s the Forests Commission of Victoria established two 'forest parks', the 2915 ha Angahook Forest Park near Anglesea area and the 3680 ha Lorne and Mount Defiance Forest Park near Lorne. The first national and state parks were created following the 1978 recommendations of the LCC, although it was not until some ten years later that all of these areas were scheduled under the *National Parks Act 1975*. In 1975 a significant rainforest area was donated to the Victorian Conservation Trust (now Trust for Nature). This area

formed the heart of the Melba Gully State Park which was declared a park in 1978. In addition, two marine national parks were declared, offshore from the study area in 2002 (as shown in Map A).

Details of the study area's national park and the three state parks are provided in Table 2.4. Together, these parks form a complementary group protecting a range of environments found in the study area and offering a variety of opportunities for recreation in natural environments. While all parks include relatively undisturbed areas, they also include areas with past disturbance, mostly by timber harvesting. Parks are multi-objective land-use categories



providing for nature conservation, recreation, water supply and other uses. Park management plans generally apply a zoning scheme which indicates which management direction has priority in different parts of the park (see Table 2.4).

National Parks

National parks are generally substantial tracts of public land of national significance for their outstanding natural features and diverse land types. They are primarily set aside to conserve and protect natural ecosystems and provide for public enjoyment, education and inspiration in natural environments.

The only existing national park in the study area, the Otway National Park, comprises about eight percent of the public land of the study area. It contains extensive wet forest, significant areas of cool temperate rainforest, as well as heathland and coastal complex. The park includes geomorphological sites of international significance, pristine streams and catchments, old-growth forest, rare and threatened flora and fauna, Aboriginal archaeological sites, and historic features. Spectacular landscapes, proximity to the Great Ocean Road, walking tracks and campsites provide extensive opportunities for recreation and enjoyment.

This Otway National Park comprises two very distinct sectors – a comparatively narrow coastal strip extending between Princetown and Cape Otway and a large consolidated block of approximately 10,000 ha lying between Cape Otway and Apollo Bay including parts of the southern slopes of the Otway Ranges.

State Parks

State parks are generally not as extensive as national parks and their natural features are usually less outstanding, but they are an important contributor to Victoria's park system and enjoy a similar level of protection as national parks. Like national parks, they are primarily set aside to conserve and protect natural ecosystems and provide for public enjoyment, education and inspiration in natural environments.

The Angahook-Lorne State Park is a very large and diverse state park. It encompasses a major part of the coastal side of the eastern Otway Ranges. The forests, woodlands and heaths, dissected terrain, waterfalls and water catchments are of high nature conservation value and also offer an array of recreational opportunities. The park is particularly popular with day visitors who appreciate its ease of access from major tourist towns and network of walking and vehicle tracks. The landscape of the park is spectacular in places, with geomorphic and historic sites of significance, and the park is especially important for the protection of flora and fauna.

The Carlisle State Park is located on the north-western flanks of the Otway Ranges and is the most important conservation area on the inland side of the Ranges. It protects rare examples of low open forest and extensive areas of wet heath and heathy woodland, which provide habitat for threatened flora and fauna. The park contains perched freshwater lakes, historic sites and pristine streams. It also offers scenic vistas and, being comparatively remote from major tourist routes, offers different opportunities for passive recreation compared with the other parks in the study area.

The Melba Gully State Park is very much smaller than most state parks but protects a small but high-quality stand of wet forest and cool temperate rainforest, which is home to a number of rare and threatened plant and fauna species. The park offers opportunities for tourism, recreation and enjoyment within a protected natural environment.

Regional Parks

The only regional park in the study area, the Kewarren Regional Park, allows more intensive use for informal recreation in fairly natural surroundings. Like most regional parks, it is close to a major regional centre (Colac) and offers opportunities for activities such as picnicking and walking in a forest environment.

Table 2.4: Parks

Name of Park	Area (ha)	LCC Rec (1978)	Current Legal Status	Date of Creation	Primary Historic Land Use ⁵	Manager	Management Plan	Comments
Otway National Park	12,900	A1 and part of A2 ^a	National Parks Act 1975 – Schedule 2	1981, minor amendments and additions in 1990s.	Extensive forestry (ceased 1985).	Parks Victoria	Yes – 1996	Includes three reference areas and part of the Aire Heritage River.
Angahook-Lorne State Park	21,359	A4, also Melbourne District 1 Review (1987) ³ – A4	National Parks Act 1975 – Schedule 2B	1987, minor additions in 1995 & 1997.	Moderate forestry (ceased 1960s). Part formed the Angahook Forest Park (created 1970) and another part the Lorne and Mount Defiance Forest Park (declared in 1972) declared under s. 50 of the Forests Act 1958.	Parks Victoria	Yes – 1999	Part (10.3%) is within a 'Special Water Supply Catchment Area'. The park was previously managed by the Forests Commission. Breakfast Creek No. 2, Distillery Creek and Bambra Roads to be kept open; and the Bambra Road stone quarry be permitted to continue operation.
Carlisle State Park	5600	A5	National Parks Act 1975 – Schedule 2B	1988	Moderate grazing (ceased 1960s).	Parks Victoria	Yes – 1998	Within a 'Special Water Supply Catchment Area'. It was previously managed by the Forests Commission.
Melba Gully State Park	73	Nil	National Parks Act 1975 – Schedule 2B	1978, minor addition in 1986.	Extensive forestry (ceased 1920s).	Parks Victoria	Yes – 1996	Original area was donated to the Crown.
Kawarren Regional Park	662.5	A6	Mostly reserved forest under the Forests Act 1958	Not formally implemented. ^b	Timber production. Also partly gravel reserve.	Parks Victoria	No	The park was previously managed by the Forests Commission.


Notes: a. The LCC recommendation A2 was for a Western Entrance / Port Campbell National Park. The park established under legislation did not include lands east of Princetown which were added to the 'A1'—Cape Otway National Park.

b. The government-approved LCC recommendation was that it be permanently reserved as a regional park under section 14 of the Land Act 1958 (this provision is now in the Crown Land (Reserves) Act 1978).

Table 2.5: Management Plan Emphases and Zoning of Parks

Name of Park	Reference Area	Conservation	Conservation and Recreation	Recreation Development	Overlays
Otway National Park	6%	79%	21%	0.2%	Yes
Angahook-Lorne State Park	Nil	87%	13%	Nil	Yes
Carlisle State Park	Nil	>99%	<1%	Nil	Yes
Melba Gully State Park	Nil	75%	22%	3%	No

Note: Kawarren Regional Park is not currently subject to a management plan. Overlays include special protection areas, fossicking zones, heritage river areas, water catchments special management areas.



One of the major issues considered by the LCC when recommending the original boundaries of these parks was the balance between nature conservation and timber production. As some areas had high capability for both nature conservation and timber production, this meant that some areas with park values were not included within the recommended parks system (and vice versa). Information on the flora and fauna distribution and values of the Otway Ranges is now significantly greater than it was in 1978 when most of the existing parks were defined. Usage of the parks has also increased significantly since their creation, although in recent years it has levelled off.

Key Point

The Angahook-Lorne State Park is actually larger than the Otway National Park and contains more vegetation types. It also includes sites of national geomorphic significance, several relatively undisturbed catchments and nationally significant heathlands. Arguably, the Angahook-Lorne State Park could be considered as meeting national park criteria in its own right.

Discussion Point

The focus of the Angahook-Otway investigation is to consider possible new parks and additions to parks. VEAC is seeking information on the presence and distribution of features that are worthy of inclusion in parks as well as submissions on park boundaries.

(Chapter 6 includes further discussion of possible approaches to new parks and park additions.)

National parks provide protection for conservation values and opportunities for nature-based recreation.

Nature Conservation Reserves

Nature conservation reserves, together with national and state parks, make up the core of the State's protected area system. Nature conservation reserves (many previously recommended as flora reserves and flora and fauna reserves) are set aside to conserve rare or threatened species, and significant plant associations or communities. The primary land-use objective is nature conservation, although education, scientific study and passive recreation are permitted subject to the maintenance of the values of the particular reserve.

There are 16 nature conservation reserves in the study area (see Table 2.6), including one wildlife reserve which has been designated as a game refuge where hunting is not permitted—such areas are effectively nature conservation reserves and are managed as such. Also, two small marine sanctuaries have been declared offshore from the study area on the coast at Aireys Inlet (Split Rock) and Marengo. Two of the largest flora and fauna reserves include relatively undisturbed areas that have been proclaimed as reference areas. Many other such reserves are small, although four are greater than 900 ha in size. Five of the reserves abut or are surrounded by state forest. Unlike most national or state parks, the small size of nature conservation reserves means that they are particularly sensitive to other uses undertaken within them or on adjoining land.

Key Point

Information on flora and fauna distribution and values is greater than it was in 1978 when many of these reserves were identified, albeit the information is still not comprehensive. The boundaries of nature conservation reserves that abut state forest may reflect the LCC's intention to prioritise timber extraction in adjoining areas, rather than reflect an absence of nature conservation values outside the reserves.

Discussion Points

Are there any existing nature conservation reserves that VEAC should consider as additions to new or existing parks?

Which, if any, boundaries of existing nature conservation reserves should be reviewed?

VEAC is also seeking information on the presence and location of features that may be worthy of inclusion in new nature conservation reserves.



Nature conservation reserves are an important element in the State's conservation reserve system.

Historic and Cultural Features Reserves

Historic and cultural features reserves are established primarily to protect places with highly significant historical values, including remnant historical features such as buildings, structures, relics or other artefacts. There are currently seven historic and cultural features reserves within the study area (see Table 2.7). Most were created after a comprehensive special investigation of historic places across south-western Victoria by the LCC (completed in 1997).⁶

The LCC's 1997 special investigation also identified a range of other significant and notable historic places throughout the public land of the Otway Ranges. These have been, or are to be, protected by a range of mechanisms, such as zoning, listing on heritage registers, and identification in planning schemes, but without changing the underlying land tenure or land-use category.

Table 2.6: Nature Conservation Reserves

Name of Reserve	Area (ha)	LCC rec (1978)	Current Legal Status	Date of creation	Manager	Comments
Barongarook West Flora and Fauna Reserve	0.4	Nil	Reserved for the preservation of native flora and fauna.	1960		A small reserve not considered by the LCC.
Carpenters Flora and Fauna Reserve	1242	H10	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1982	Parks Victoria	Includes a reference area. Abuts state forest (hardwood production area). Also known as the Jancourt Flora and Fauna Reserve.
Edna Bowman Nature Conservation Reserve	0.79	Melb IR (1997) – part VI	Native plants and garden reserve.	1971		A small reserve at Anglesea. Not considered in detail by the LCC.
Eumeralla Flora Reserve	286	Melb IR (1997) – part G14	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1992	Parks Victoria	Three blocks. Parts have been a flora reserve since 1956.
Forest Road Flora Reserve	569	Melb IR (1997) – part G14	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1992	Parks Victoria	Abuts Alcoa leasehold. Also known as the Anglesea Flora Reserve.
Marengo Flora Reserve	16.5	H3	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1987	Parks Victoria	Isolated block, mostly surrounded by private lands. An old racecourse reserve.
Mount Ingoldsby Flora Reserve	48	Melb IR (1997) – G13	"Native plants reserve" under the <i>Crown Land (Reserves) Act 1978</i> .		Parks Victoria	Abuts Alcoa leasehold. A flora reserve since the late 1970s.
Mt McKenzie/ Crinoline Creek Flora and Fauna Reserve	2159	H11	Unreserved Crown land.	Not formally implemented.	Parks Victoria	Includes a reference area. Abuts state forest (hardwood production area).
Olangolah Flora and Fauna Reserve	1694	H13	Part reserved for water supply purposes under the <i>Crown Land (Reserves) Act 1978</i> , part reserved forest under the <i>Forests Act 1958</i> , and part lands owned by Barwon Water.	Not formally implemented.	Parks Victoria	Managed as the Olangolah Reservoir catchment since the late 1940s. Includes mountain ash stands dating from 1850, 1919 and 1939 fires. Includes a reference area. Abuts state forest (hardwood production area).
Prinetown Nature Conservation Reserve	68.5	Nil	Reserved for the management of wildlife under the <i>Crown Land (Reserves) Act 1978</i> .	1985	Parks Victoria	Hunting is not permitted. Most of this reserve was previously freehold land.
Redwater Creek Flora and Fauna Reserve	370	H14	Reserved forest under the <i>Forests Act 1958</i> .	Not formally implemented.	Parks Victoria	Surrounded by state forest (hardwood production area). Also known as Calder Ridge Flora and Fauna Reserve.
Smythes Creek Flora Reserve	78	H4	Mostly reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Abuts state forest (hardwood production area).
Stoney Rises Flora and Fauna Reserve	13.5	H7	Reserved for management of wildlife under the <i>Crown Land (Reserves) Act 1978</i> .	1980	Parks Victoria	A wildlife reserve. Hunting is not permitted.
West Barham Big Trees Flora Reserve	220	E4	Section 50 reserve. <i>Forests Act 1958</i> .	1984	Forests Service	An area of undisturbed mountain ash, surrounded by state forest (hardwood production area).
Yan Yan Gurt Flora and Fauna Reserve	16	H9	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1980	Parks Victoria	A timbered area, formerly a sanctuary.
Yaughter Flora and Fauna Reserve	121.5	H12	Reserved for the preservation of species of native plants under the <i>Crown Land (Reserves) Act 1978</i> .	1980	Parks Victoria	A flora and fauna reserve since 1960. Is well timbered and abuts state forest (hardwood production area).

Note: Although some of these areas are not formally reserved, all are managed as if they were so reserved.

Table 2.7: Historic and Cultural Features Reserves

Name of Reserve	Area (ha)	LCC Rec (1997)	Current Legal Status	Manager	Comments
Hayden's Sawmills Historic Area	305	B13	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service	
Henry and Sandersons Sawmills Historic Area	565	A10	Reserved forest under the <i>Forests Act 1958</i> .	Parks Victoria	Site includes tramways, mill settlement and tunnels.
Henry's Nettle and Carisbrook Sawmills Historic Area	72	B15	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service	Includes tramways and mill settlement.
Knotts No.3 Sawmill Historic Area	12.5	A9	Reserved forest under the <i>Forests Act 1958</i> .	Parks Victoria	Site includes tramways.
Marchbank Sawmill and Tramway Historic Area	132	A8	Reserved forest under the <i>Forests Act 1958</i> .	Parks Victoria	Includes tramways and mill settlement
Marengo Tramway Historic Area	0.5	Nil	Natural interest and historic reserve under the <i>Crown Land (Reserves) Act 1978</i> .	Parks Victoria	Located within the township of Marengo.
St. George Sawmills Historic Area	173	B14	Part reserved forest, part state park	Parks Victoria Forests Service	

Note: Although some of these areas are not formally reserved, all are managed as if they were so reserved.

Key Point

Most of the Historic and Cultural Features Reserves are surrounded by land managed as state forest.

Natural Features Reserves

Natural features reserve is a general public land-use grouping that includes several categories of land that have broadly similar land-use objectives. The category includes:

- a) bushland reserves;
- b) wildlife reserves (those that permit hunting);
- c) lake reserves;
- d) scenic reserves;
- e) streamside reserves; and
- f) water frontage reserves.

While the conservation values of such reserves are not generally as significant as the values of parks and nature conservation reserves, these areas nonetheless protect remnant vegetation, habitat and landscape character. They often include natural and scenic features and provide opportunities for education and passive recreation. Details of the natural feature reserves of the study area are provided in Appendix 3.

Most of the bushland reserves in the study area are small isolated blocks of remnant vegetation to the north and west of the Otway Ranges. However, the Wiridjil and Tomahawk Creek Bushland Reserves—in the west of the study area—are both greater than 1000 ha in area. Furthermore, a reference area has been proclaimed over relatively undisturbed land amounting to 17.2 percent of Tomahawk Creek Bushland Reserve.

The wildlife reserves, lake reserves and water frontage reserves are mostly surrounded by cleared agricultural lands. Streamside reserves generally include lands of nature conservation and recreation value along water frontages. Additional values of water frontage reserves were identified during the LCC's Rivers and Streams Special Investigation of 1991.⁷

All of the scenic reserves are small. They encompass areas of particular visitor interest such as waterfalls and lookouts mostly within or abutting larger areas of public land that are now managed as state forest.

Key Points

Information on flora and fauna distribution and values is greater than it was in 1978 when many of these reserves were identified, albeit the information is still not comprehensive.

Many of the scenic reserves established to provide protection of features of special value lie within or abut state forest.

Discussion Point

Are there any existing natural features reserves that VEAC should consider as additions to new or existing parks or reclassify as nature conservation reserves?

State Forest

State forests are extensive areas of land supporting native forests and other vegetation set aside to produce hardwood timber; conserve native plants and animals, supply water and protect catchments and streams, provide opportunities for open-space recreation and education, protect historic sites and Aboriginal cultural sites and places and to produce minerals, honey, gravel, sand, road-making materials, and other forest products. It is thus, like parks, a multi-objective land-use category. The land use category 'state forest' defined and used by the LCC differs from the meaning of 'state forest' used in the *Forests Act 1958*. Under the *Forests Act 1958*, the term 'state forest' describes reserved forest for the production of timber and other forest produce, and protected forest which brings the management of forest produce in unoccupied Crown land, unused roads and water frontages under the jurisdiction of the *Forests Act 1958*.

State forest encompasses well over half the public lands in the Angahook-Otway study area. These areas include a wide range of vegetation types and natural features (such as waterfalls, cliffs, and dissected ranges) as well as many roads and facilities used by visitors. In addition to the harvesting of hardwood sawlogs and the associated production of residual wood, minor forest products such as firewood and posts and poles are also procured from areas of state forest in the study area. Details of each state forest area are provided in Table 2.8.



While primarily set aside to provide timber, state forests also provide other forest products and encompass areas used for recreation and nature conservation.

Table 2.8: State Forest Areas

Name of Forest	Area (ha)	LCC Rec (1978)	Current Legal Status	Manager
Aire State Forest ^a	9800	E5	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Anglesea River headwaters		U1 (part)	Unreserved Crown land.	Forests Service
Arkins Creek catchment		U2 (part)	Part reserved for water supply purposes and part lands owned by Barwon Water.	South West Water
Barongarook State Forest ^b	1200+	E10, U1 (part)	Part reserved forest under the <i>Forests Act 1958</i> and part unreserved Crown land.	Forests Service
Jancourt State Forest	1900	E8	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Kennedys Creek State Forest	2500	E7	Mostly reserved forest under the <i>Forests Act 1958</i> and some unreserved Crown land.	Forests Service
Lardner Creek State Forest ^{a, c}	4000+	E11, G1 (part), F4 (part), F5.	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Otway State Forest – Boonah	14,000+	E1, G1 (part)	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Otway State Forest – Barwon	11,700+	E2, U1 (part)	Mostly reserved forest under the <i>Forests Act 1958</i> , with some unreserved Crown land.	Forests Service
Otway State Forest – South-eastern	13,300	E3	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Otway State Forest – Barham	7,800	E4	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Pennyroyal forest		U1 (part)	Unreserved Crown land.	Forests Service
Sheepyard Creek State Forest	1700	E6	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Tomahawk Creek forest		G1 (part), U1 (part)	Unreserved Crown land.	Forests Service
West Gellibrand catchment		U2 (part)	Part reserved for water supply purposes, part reserved for public purposes and part lands owned by Barwon Water.	Barwon Water
Western Otways State Forest ^a	8200	E12	Part reserved forest under the <i>Forests Act 1958</i> , part unreserved Crown land.	Forests Service
Wonga State Forest	4200+	E9, U1 (part)	Reserved forest under the <i>Forests Act 1958</i> and unreserved Crown land.	Forests Service
Wormbete State Forest ^c		G1 (part), F6	Reserved forest under the <i>Forests Act 1958</i> .	Forests Service
Yaugher forest		U1 (part)	Mostly unreserved Crown land, also part cemetery reserve.	Forests Service

Notes: a. These three forests are often included in references to the 'Otway State Forest'.

b. Southern part is also referred to as the Upper Gellibrand Forest.

c. These areas include softwood plantation lands that were never planted and have reverted to reserved forest.



Management of these state forest areas is driven by government-accepted recommendations of the LCC, forest management plans, forest agreements and the Government's recent policy to phase-out logging. Each of these aspects is summarised in Figure 2.2 and discussed below.

Figure 2.2: State Forest Land-use Categories and Management Zones.

GOVERNMENT ACCEPTED LCC RECOMMENDATION (1978)	Hardwood Production Area	Forest Area	Uncommitted Land
LAND-USE CATEGORY CURRENTLY USED FOR MANAGEMENT PURPOSES	State Forest		
FOREST MANAGEMENT AREA MANAGEMENT PLAN ZONING (1992)	Production Zone	Conservation Zone	
FOREST MANAGEMENT AREA MANAGEMENT PLAN SUB-ZONES (1992)	Hardwood Sawlog Production Domestic Water Supply A (sawlog harvesting) Domestic Water Supply B (no sawlog harvesting) Softwood Production Minor Forest Produce Green Firewood Production Zones	Rainforest Conservation Area Rainforest community and buffers Significant Floristic Area Wildlife Corridor and Native Fish Stream Reserve Geological Conservation Areas Water Supply Areas	
REGIONAL FOREST AGREEMENT ZONES (2002)	General Management Zone	Special Management Zone	Special Protection Zone

Land Conservation Council Recommendations

Most of the areas currently managed as state forest within the study area arise from three different land-use categories applied by the LCC in their regional investigation of 1978.⁴ These land-use categories are:


- hardwood production areas – where timber production is the primary land-use objective;
- forest areas – land set aside as buffer areas to pine plantations; and
- uncommitted land – land without a primary land use managed to maintain future options.

The uncommitted land category was created by the LCC during its first regional investigation in 1973, with the intention of keeping future primary land use options open where an immediate allocation was not required. The category maintained "the capability of the land to meet future demands" and could be used to produce goods and services provided that did not seriously reduce the long-term ability of the land to meet future demands. During LCC reviews conducted between 1983 and 1997, areas classed as uncommitted in earlier investigations were typically reallocated to other land-use categories or placed in the then new category 'state forest' created to encompass hardwood production areas, 'forest areas' and much of the former uncommitted land. However, as the

LCC's Corangamite study area was never reviewed, such re-allocation never occurred in this area. These three land-use categories still apply in the study area because the original government-approved recommendations have not been reviewed since their acceptance in the late 1970s. However, all such lands within the study area are managed as if they were state forest.

The majority of the area now considered as state forest was land designated as 'hardwood production areas'. While the primary objective was to produce hardwood timber, the LCC also defined conservation of flora and fauna, recreation, and the protection of water production and landscape values, as major additional uses. The LCC also recognised that some parts of these areas were unsuitable for timber production because of low productivity and the need to protect other values. Such parts were included "for ease of management".

'Forest areas' were designated to provide a buffer area to softwood plantations. In the 1970s the LCC was still recommending clearance of some native forest for softwood plantations. Adjoining forest areas were to be managed for the conservation of flora and fauna, preservation of scenic values, protection of adjacent softwood production areas and water supply and catchment protection. These areas could also be used, for low-intensity hardwood production and recreation



provided this did not conflict with the conservation of fauna, flora and scenic values. Forest areas were also considered important for fire protection. Six such areas were designated, encompassing a total area of 2440 ha (or 2.5 percent of the area now managed as state forest).

The 1978 LCC study also included some 17,100 ha of 'uncommitted land' (17.2 percent of the area now managed as state forest). Two of the areas included as uncommitted land (in the catchments of Arkins Creek and West Gellibrand River) were to be generally protected and "remain under present tenure and management until reviewed by the [Land Conservation] Council."⁴

Regional Forest Management Plan

Given that state forest is a multi-objective land-use category, management plans are used for detailed planning and apply a zoning scheme to indicate which management direction has priority in different parts of the state forest. Within the study area, this planning was undertaken in the 1992 Forest Management Plan for the Otway FMA (Forest Management Area).⁸

The management planning process had access to considerable new information on flora distribution and values that was collected between 1982 and 1988. Two main zones were applied – a production zone and a conservation zone, with fire protection overlays. The majority of land was included in production zones, mostly for hardwood sawlog production. Less extensive areas, generally on the northern and western margins of the Otways, were identified as green fuelwood production zones and for minor forest produce. The conservation zones encompass a range of identified special values such as rainforest, significant flora, wildlife corridor value, native fish streams, geological features and two water supply areas. Recreation was considered to be generally appropriate in all zones, although subject to more restrictions in the conservation zones.

Regional Forest Agreement

In March 2000, the West Victoria Regional Forest Agreement was signed by the State of Victoria and the Commonwealth of Australia.⁹ The agreement established a framework for the management of the forests of western Victoria both within the study area and for extensive areas of state forest to the north, including the Pyrenees State Forest and Wombat State Forest. The Agreement identified special protection zones ('informal reserves') to complement the existing parks and nature conservation reserves ('dedicated reserves') and implemented a reserve system consistent with the national CAR Reserve System and associated JANIS criteria for the region (see Map A, and Chapters 3 and 5 for details). The areas mapped as special protection zones are based on the conservation zones of the Otway Forest Management Plan, but include additional areas.

Under the Agreement, the zones adopted supersede those of the earlier forest management plan, although the more detailed 'sub-zones' of the management plan are still relevant (where not otherwise inconsistent with the more recent zoning). The scheduled review of the Otway Forest

Management Plan (to be undertaken by 2005) is required to reflect the outcomes of the Agreement.

The regional forest agreement also designates a number of special management zones where additional controls apply to timber harvesting operations, for example, to ensure retention of habitat for the endangered spot-tailed quoll.

Government Policy on Logging and Woodchipping in the Otways

In November 2002, the Government announced that it 'will immediately reduce wood chipping and logging in the Otways by 25 percent' and 'complete the exit from native forests in the Otways by 2008' (see Appendix 1).¹⁰ That is, timber harvesting will be phased out by 2008.

Details of special values within the hardwood production areas as identified by previous planning processes are summarised in Appendix 4.

Key Points

While now managed as state forest, most of these areas were set aside in 1978 principally for their hardwood production values. Information on flora and fauna distribution and values is now significantly greater and hardwood production is to be phased out. Consequently, it is appropriate for these areas to be reviewed and considered for inclusion in "a single national park in the Otway Ranges extending from Anglesea to Cape Otway", specifically allocated to state forest or re-allocated to alternative land-use categories.

It is also appropriate to review the areas designated in 1978 principally to maintain future land-use options ('uncommitted land') and to protect conservation and scenic values ('forest areas'), and consider these areas for inclusion in "a single national park" or to specifically allocate them to State forest or re-allocate them to alternative land-use categories.

Extensive areas of State Forest are within special protection zones and special management zones.

Discussion Point

Which if any, areas of state forest should be re-categorised as national park, State park or nature conservation zone – and which areas should be specifically retained as state forest?

Coastal Reserves

Coastal reserve is a multi-use land-use category set aside primarily to provide informal recreation, including fishing and boating, in a natural coastal environment for large numbers of people as well as protection of natural coastal landscapes, ecosystems, and flora and fauna. Most coastal reserves are the legacy of public purpose reserves set aside in 1879 which, unlike many other places throughout the world, have ensured that virtually all of Victoria's coastline is accessible to all. Since the late 1980s most coastline has been permanently reserved for 'the protection of the coastline' under the *Crown Land (Reserves) Act 1978* and extends to the low water mark or, in places, to 600 metres offshore. The seaward boundaries of

the Otway National Park and the Angahook-Lorne State Park also extend to the low water mark.

It should be noted that the coastline reserves were created between 1981 and 1984. Small areas of land reserved for public purposes, unreserved Crown land and miscellaneous other reserves also occur in most sectors managed as coastal reserve. The protection of the coastline reserve also extends seaward of the Angahook-Lorne State Park between Cape Patton and Wye River and between Cumberland River and Lorne. Some sectors of protection of the coastline reserves extending offshore have been superseded by the proclamation of the Point Addis Marine National Park.

In 2000, the ECC mapped a coastal protection zone (to the low water mark) and a coastal recreation zone (to 600 metres offshore) as established by the Government in its Victorian Coastal Strategy.^{11,12} In essence the latter zone encompasses the more developed and heavily used foreshores (such as in and around Apollo Bay, Kennett River,

Wye River, Lorne, Aireys Inlet and Anglesea), with remaining parts of the coastal reserve included in coastal protection zones. The zones indicate areas with different management emphases, rather than areas where particular activities are necessarily restricted. Most of these reserves are managed by public committees of management.

The ECC's 2000 recommendations also introduced a coastal waters reserve which encompassed all territorial waters not otherwise included within a park or reserve.¹² The coastal waters reserve is also a multi-use category, with wide ranging objectives including conservation of natural and cultural features, provision for recreation, education and tourism, the sustainable harvesting of natural resources, exploration and extraction of earth resources and provision for shipping and pipelines. It extends from the shoreline to 5.5 km offshore.

Further details of the coastal reserves in the study area are provided in Table 2.9.

Table 2.9: Coastal Reserves

Sector	Length (km)	LCC Rec (1978)	Current Legal Status ^a	Manager	Comments
Coastal Reserves					
Apollo Bay (Marengo to Cape Patton)	19.5	J1 (part)	Mostly public purposes reserve, part unreserved Crown land, part protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> (to 600 metres offshore).	Committee of management.	Includes a designated 'local port' at Apollo Bay (managed by the Colac-Otway Shire Council). Part coastal protection zone and part coastal recreation zone. Mostly not formally implemented.
Kennett River	1.5	J1 (part), O4 (part).	Reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> (to 600 metres offshore).	As above.	Entirely within a coastal recreation zone.
Wye River	1	J1 (part)	Part reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> (to 600 metres offshore), part public purposes reserve and part unreserved.	Committee of management.	Entirely within a coastal recreation zone. Only implemented in part.
Lorne (Cumberland River to Cathedral Rock)		J1 (part); Melb IR – J1 (part)	Mostly reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> - extends seaward to 600 metres offshore.	Committee of Management	Includes a designated 'local port' at Lorne (managed by the Lorne Foreshore Committee of Management). Part coastal protection zone and part coastal recreation zone.
Big Hill (Cathedral Rock to Grassy Creek)		Melb IR – J1 (part)	Part reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> and part unreserved Crown land.	Land Victoria	Much of this area was developed by the Great Ocean Road Trust. Coastal protection zone.
Fairhaven/ Aireys Inlet/ Anglesea - Point Addis (Grassy Creek to Southside Beach)		Melb IR – J1 (part), J3, J4.	Part (east of Anglesea) reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> (to 600 metres offshore), ^b part public purposes reserve, and part unreserved.	Several Committees of Management	Part coastal protection zone and part coastal recreation zone. Only implemented in part.
Bells Beach		Melb IR – J1	Part reserved for the protection of the coastline under the <i>Crown Land (Reserves) Act 1978</i> (to 600 metres offshore), ^b and part recreation reserve.	Committee of Management	Part coastal protection zone and part coastal recreation zone.
Coastal Waters Reserves					
Moonlight Head to Point Addis	---	ECC (2000) – R12	Unreserved Crown land.	Department of Sustainability and Environment	Not formally implemented.

Key Point

The whole of the coastline between Apollo Bay and Anglesea is within a coastal reserve, except for three steep sectors of coastline between Cape Patton and Lorne (where the Angahook-Lorne State Park extends across the Great Ocean Road to the shoreline). In some sectors, unreserved Crown lands occur between the coastal reserve and the Angahook-Lorne State Park.

Discussion Point

Would it be appropriate to add parts of the coastal reserve and/or unreserved coastal Crown lands into "a single national park in the Otway Ranges extending from Anglesea to Cape Otway"?

Community Use Areas

Community use areas are primarily used for education, recreation or other specific community purposes. Many smaller blocks of public land have been set aside in the study area for particular community uses. The management of these reserves is often delegated to a locally-based committee of management. Although some of these reserves contain small areas of remnant vegetation that contribute to local habitat and landscape values, generally they do not abut larger areas of public land or incorporate areas of nature conservation value. They include:

- a) recreation reserves – mostly small reserves close to townships with facilities for organised sports and informal recreation;
- b) parklands and gardens – small intensively-used community parklands, playgrounds and ornamental gardens; and
- c) buildings in public use – such as schools and public halls.

Education Areas

Education areas form a subcategory of community use areas. Most public land is available for educational use, however, such educational use is usually restricted to passive activities such as observation. Education areas are specifically set aside as reserves where students can study the nature and functioning of natural ecosystems, observe and practice methods of environmental analysis and field techniques, and conduct simple long-term experiments. Appropriate facilities, including accommodation, may be established on-site or be located nearby. Environmental education is the long-term primary land use. The statewide network of education areas is intended to encompass examples of Victoria's major land systems and environments.

Three education areas have been designated within the study area. Details of these are included in Table 2.10. Each is accessible from a main road and together they encompass a range of the natural environments found in the Otway Ranges. While all appear to be used to some extent for environmental education, at least two of the education areas are not subject to any specific management arrangements to facilitate such use.



Table 2.10: Education Areas

Name of Education Area	Area (ha)	LCC Rec (1978)	Current Legal Status	Date of creation	Manager	Comments
Barramunga Creek	135	M3	Part reserved forest under the <i>Forests Act 1958</i> and part unreserved Crown land.	Not formally implemented	Parks Victoria	Mountain ash forest abutting state forest (hardwood production area).
Bambra	217	M4	Reserved for the study of the natural environment under the <i>Crown Land (Reserves) Act 1978</i> .	1988	Parks Victoria	An isolated block of foothill forest. A school camp adjoins the reserve.
Eumeralla	291	Melb IR (1987) – M1	Reserved for the study of the natural environment and public purposes under the <i>Crown Land (Reserves) Act 1978</i> .	1992	Scout Association (under lease and licence)	Coastal scrub abutting a flora reserve. On-site facilities include accommodation.

Discussion Points

Can the education areas be made more effective? Could they be managed more actively to complement education programs that may be offered within "a single national park in the Otway Ranges"?

Water Production

Water production includes harvesting, storage and distribution. The water production land-use category encompasses the actual water storage areas, diversion weirs, pump intakes and associated buffer areas. Separate land-use provisions apply to the harvesting areas (see text on declared water supply catchments below), and distribution facilities are usually within service and utility reserves.

A large number of water production areas were recognised by the LCC in 1978, including the three largest storage facilities – the 2,000 ML West Gellibrand Reservoir, the 20,900 ML West Barwon Reservoir, and (just beyond the northern boundary of the study area) the 38,000 ML Wurdee Boluc Reservoir. A variety of pumping stations, diversions, dams, weirs, off-takes, reservoirs, service basins, storage tanks and associated buffer strips were also included. These facilities may be located on isolated blocks, with a number also occurring within or on the edge of larger public land areas such as parks and state forest. An additional water production area was identified in the LCC's Melbourne District I Review of 1987 (D99 on Painkalac Creek).⁴

The precise boundaries of the water production areas and, in particular, the buffer strips surrounding the defined facilities, are normally defined through detailed plans called special area plans (or pre-existing 'land use determinations'). These plans are prepared for water catchments declared as 'special water supply catchment areas' under the *Catchment and Land Protection Act 1994*.

From time to time, new facilities are required and old facilities decommissioned. Consequently areas allocated to water production will occasionally require amendment. There have been many changes in the administration of water services since 1978. All former water authorities have been restructured and the total number significantly reduced. Currently, two water authorities maintain facilities for the storage and distribution of water (and management of sewage disposal) within the study area – Barwon Water and South West Water. In addition, Southern Rural Water regulates the extraction of groundwater and works on waterways.

Key Point

The land from which water is harvested, that is the catchments, is not included in the defined water production areas. Within the study area, catchments are generally a mix of freehold land, state forest, parks and reserves.

Plantations

Public land is used for both softwood (pine) and hardwood (eucalypt) plantations. While areas of the Otway Ranges have been logged or cleared and subsequently re-afforested, there are no hardwood plantations on public land within the study area. Extensive softwood plantations occur on public land, and have also been planted on private land. Four school plantations have also been developed on small blocks of public land within the study area.

Softwood Plantations

Softwood plantations have been established on both public land (mostly on land that was reserved forest under the *Forests Act 1958*) and private land. These plantation areas were established on areas of native forest as well as on reclaimed farmland, and may include remnant native forest forming small inliers, buffers, filter strips and landscape areas. Most are located on the edge of the forested areas of the Otway Ranges.

The LCC's 1978 recommendations covered existing and proposed plantations.⁴ By 1982, when the State Government made a policy decision to prohibit the further clearing of native forest on public land for softwood plantations, some of the proposed plantation areas had been cleared and planted but other areas had not. Lands formerly vested in the Rural Finance Commission (now known as the Irrewillipe Plantation (LCC Corangamite recommendation F2), McDevitt Plantation (LCC Corangamite recommendation F3) and part of what is now known as Meehan's Plantation (LCC Corangamite recommendation F4)) were planted with pines.⁴ Lands adjoining the Irrewillipe Plantation (that part of LCC Rec F2 which was revoked in 1989), lands at Barramunga (LCC Rec F5) and Wormbete (LCC Rec F6) were not planted with pines. The public land areas allocated for plantations by the LCC that were never planted to softwoods remain reserved forest under the *Forests Act 1958*.

The great majority of the public lands planted to pine were vested in the Victorian Plantations Corporation (under the provisions of the *Victorian Plantations Corporation Act 1993*) in 1993, with perpetual licences over the timber resources granted to a private company in 1998. Under Section 27G, *Victorian Plantations Corporation Act 1993* (as inserted by the *Victorian Plantations Corporation (Amendment) Act 1998*), the vested lands legally remain unreserved Crown land, although the Act provides for the possible sale of the land. The Terms of Reference for the Angahook-Otway Investigation specify that land leased or licensed for plantations (shown on Map A) is not included in the study.

Key Point

Some areas of native forest previously allocated for plantations were never actually used for this purpose and were not included in land vested in the Victorian Plantation Corporation. They are now mostly managed as state forest.

Other Land-use Categories

Other reserves occurring in the study area include a variety of earth resources, and service and utilities reserves. These cover land uses such as quarries, cemeteries, municipal buildings, lighthouses, water towers and service basins, and water and sewage treatment facilities. There is also an aerodrome reserve (the Apollo Bay Aerodrome). Such reserves are mostly small isolated blocks although some lie within larger areas of public land. Services and utilities occurring on broad-acre public lands are more generally under lease or licence. In addition, an area of Crown land (7350 ha) on the eastern edge of the study area has been leased to Alcoa Australia Limited under the provisions of the *Mines (Aluminium Agreement) Act 1961*, although the bulk of this leasehold lies outside the study area boundary. The lease provides a conditional right to remove coal. Alcoa has constructed and operates a power station within the lease area on what is now freehold land to supply power to its Point Henry facility at Geelong.

Some public land previously defined as 'land not required for public purposes' is still public land. This is mostly land forming part of the Rural Finance Corporation's Heytesbury Land Development Scheme. Most such land has been developed as farmland by holders of land settlement 'purchase leases' who, if they meet the obligations of their lease under the *Rural Finance Act 1988*, are entitled to a Crown grant of the land.

In addition, some public land has been defined as 'uncategorised public land'. The uncategorised public land shown on Map A includes several areas not subject to previous LCC recommendations, notably:

- Some former freehold land adjacent to Angahook-Lorne State Park has been purchased by the Government for addition to the park.
- Victree Forests Pty Ltd purchased extensive areas in the 1970s and 1980s for softwood plantations. Much of that land was not planted and, in 2002, the Government purchased 13 landholdings from Victree. Three of these blocks adjoin existing parks or reserves, two blocks are partly planted with pines and are privately licensed until the pines are harvested, and the remaining blocks are within more extensive state forest areas.
- Land owned by Barwon Water adjacent to its water storages, channels, and offtakes did not previously have LCC recommendations.

The remaining uncategorised public land comprises small parcels previously designated 'other reserves and public land' and areas in townships.

Road Reserves

Road reserves are a type of service and utility reserve. The primary purpose of road reserves is to provide for communication, transport and access. However, vegetation along the road verges can have particularly high conservation, recreation and landscape values, especially in agricultural districts where most of the native vegetation has been cleared. Geological features exposed in roadside cuttings are a useful adjunct to more detailed work involved in mapping the geology of an area and are often used as an educational resource. Management guidelines to protect roadside landscape, recreation and conservation values were developed by the LCC and adopted by Government, as were guidelines for unused road reserves.

Key Point

A number of roads cross other land-use categories, including parks and nature conservation reserves. Such roads may or may not lie within a designated road reserve and many road reserves do not contain formed roads – thus creating potential for uncertainty about regulations, protection of remnant vegetation and possible future development.

CURRENT PUBLIC LAND-USE OVERLAYS

Three categories of land-use overlay defined by legislation occur in the study area. These are reference areas, heritage rivers, and declared water supply catchments.

A number of special values identified in land-use investigations of the LCC and ECC and recommended for specific protection have also been given legal standing through Orders in Council which require land managers to give effect to such recommendations.

Reference Areas

Reference areas are relatively small areas of public land containing viable samples of one or more land types that are relatively undisturbed and are reserved in perpetuity. Such areas are set aside to maintain natural systems as a scientific reference to enable comparative study of modified and unmodified lands.

Seven reference areas occur within the study area, all of which have been proclaimed under the *Reference Areas Act 1978*. Three of the reference areas are located in the Otway National Park, comprising six percent of the park area. Each reference area is surrounded by a buffer, as generally defined by the relevant management plan, restricting uses that may detrimentally affect the reference area. Further details of these reference areas are provided in Table 2.11.

Table 2.1: Reference Areas

Name	Area (ha)	LCC Rec (1978) ⁴	Date of Proclamation	Manager	Land Use of Surrounding Land
Calder River	155	B3	1996	Parks Victoria	Otway National Park
Carpentait	415	B7	1990	Parks Victoria	Carpentait Flora and Fauna Reserve
Crinoline Creek	340	B5	1998	Parks Victoria	Mt McKenzie/Crinoline Creek Flora and Fauna Reserve
Olangolah Creek	120	B4	1984	Parks Victoria	Olangolah Creek Flora and Fauna Reserve
Parker River	205	B1	1996	Parks Victoria	Otway National Park
Stony Creek (Otways)	370	B2	1996	Parks Victoria	Otway National Park
Tomahawk Creek	300	B6	1990	Parks Victoria	Tomahawk Creek Bushland Reserve

Ministerial management directives for reference areas made under the Act include the exclusion of entry by all persons (other than management personnel or those with ministerial approval), provision for approved research work and the prohibition of grazing, mineral exploration, mining, harvesting of forest produce, quarrying, bee-keeping, educational use, recreational activities and all forms of harvesting (except water harvesting). The management directive also requires that approved departmental management guidelines be complied with. Amongst other things, the guidelines provide for three-yearly assessments and define recommended buffer widths in which restrictions on activities apply outside the reference area. Depending on the activity, the buffer may extend from

around 60 metres (timber production) to 2 km (bee sites) or more. The *Mineral Resources Development Act 1992* provides additional statutory protection from mineral exploration and mining in reference areas.

Key Point

A complete land systems map of Victoria was not available when the reference areas of the study area were defined. In order to ensure that all the major land types of the study area occurring on public land are included in reference areas, additional reference areas may be required (especially in the eastern Otway Ranges) and, if so, they could form part of "a single national park in the Otway Ranges".



Heritage Rivers

Victoria's heritage river system was established to identify and protect those rivers with outstanding values for current and future generations.

The Aire River is the only designated heritage river in the study area (see Table 2.12) listed on Schedule 1 of the *Heritage Rivers Act 1992*. A draft management plan was released for comment in 1997. The LCC recommendations specified that the Aire River corridor be retained free from

impoundments or other barriers to the passage of in-stream fauna and that new diversions of water only be permitted if they do not significantly impair fish habitat or reduce scenic landscape value. The recommendations were accepted by the Government, with the enabling legislation also prescribing that there was to be no timber harvesting in the heritage river corridor. When recommending this heritage river, the LCC commented that it had reduced the corridor width in parts to avoid impact on productive hardwood forest areas.

Table 2.12: Heritage Rivers

Name	Area (ha)	LCC Rec (1991) ⁷	Date of Creation	Manager	Special Values to be Protected (LCC 1991) and Restricted Land and Water Uses (<i>Heritage Rivers Act 1992</i> – Schedule 3)
Aire River Heritage River	820	A16	1992	Parks Victoria, Forests Service, Victorian Plantations Corporation, Catchment Management Authority	Scenic landscapes, rainforest, fish habitat and diversity, geomorphic sites. No impoundments, artificial barriers or structures to be constructed, new water diversions not to significantly impair attributes and no timber harvesting.

Key Point

Given that timber production is to be phased out of the Otway Ranges, consideration could be given to widening parts of the heritage river corridor where it traverses state forest.

Declared Water Supply Catchments



Much of the Otway Ranges is within declared water supply catchments. Some of these are managed as 'closed catchments' to ensure the highest possible water quality with minimum treatment; most provide for multiple use.

Currently all declared water supply catchments (previously known as 'proclaimed water supply catchments') are listed on Schedule 5 of the *Catchment and Land Protection Act 1994*. Additional water supply catchment areas can be declared by Order of the Governor in Council. Declared water supply catchments are legislatively defined as a type of 'special area'. Declaration does not, in itself, directly affect existing land use, rather the 'declared water supply catchment' land-use overlay alerts planners, landowners, managers, and the wider community to the importance of the area for water supply.

More than 60 percent of the public land in the study area is within declared water supply catchments. Most of the declared water supply catchments in the study area, which cover 106,550 ha, also encompass various areas of private land.

Currently water supply authorities do not have direct management responsibility for all land within catchments although parts of the catchment areas around the Arkins Creek diversions and the West Gellibrand Dam are lands owned by a water authority. Generally, only the storage and distribution areas have been included in water production areas. The catchment from which the water is harvested has generally been allocated to other primary land uses, with water production specified as an additional land use. Nonetheless, it has always been acknowledged that

catchment land managers, water authorities and catchment management authorities coordinate action to protect water quality and quantity in all domestic and, as appropriate, other water supply catchments.

Provision for detailed planning is made under the *Catchment and Land Protection Act 1994*, by way of 'special area plans' (or a pre-existing 'land use determination'). They are binding on public land managers and may recommend that planning schemes be amended, the effects of which would be binding on private landholders. An appropriate use in one catchment may not be appropriate in another due to differences in climate, geology, soils, topography, and vegetation, as well as the level of water treatment provided. In the end, appropriate use is a balance between desired

activities and the cost of treatment to ensure that harvested water meets accepted community standards.

Key aspects of harvesting involve water yield and quality. Approaches to the management of water supply catchments vary widely. They range from 'closed' catchments (like most of those supplying water to Melbourne's water supply system) to multi-use catchments. In recent years some sources of town water have provided relatively poor water quality and supplies are now piped from higher quality sources.

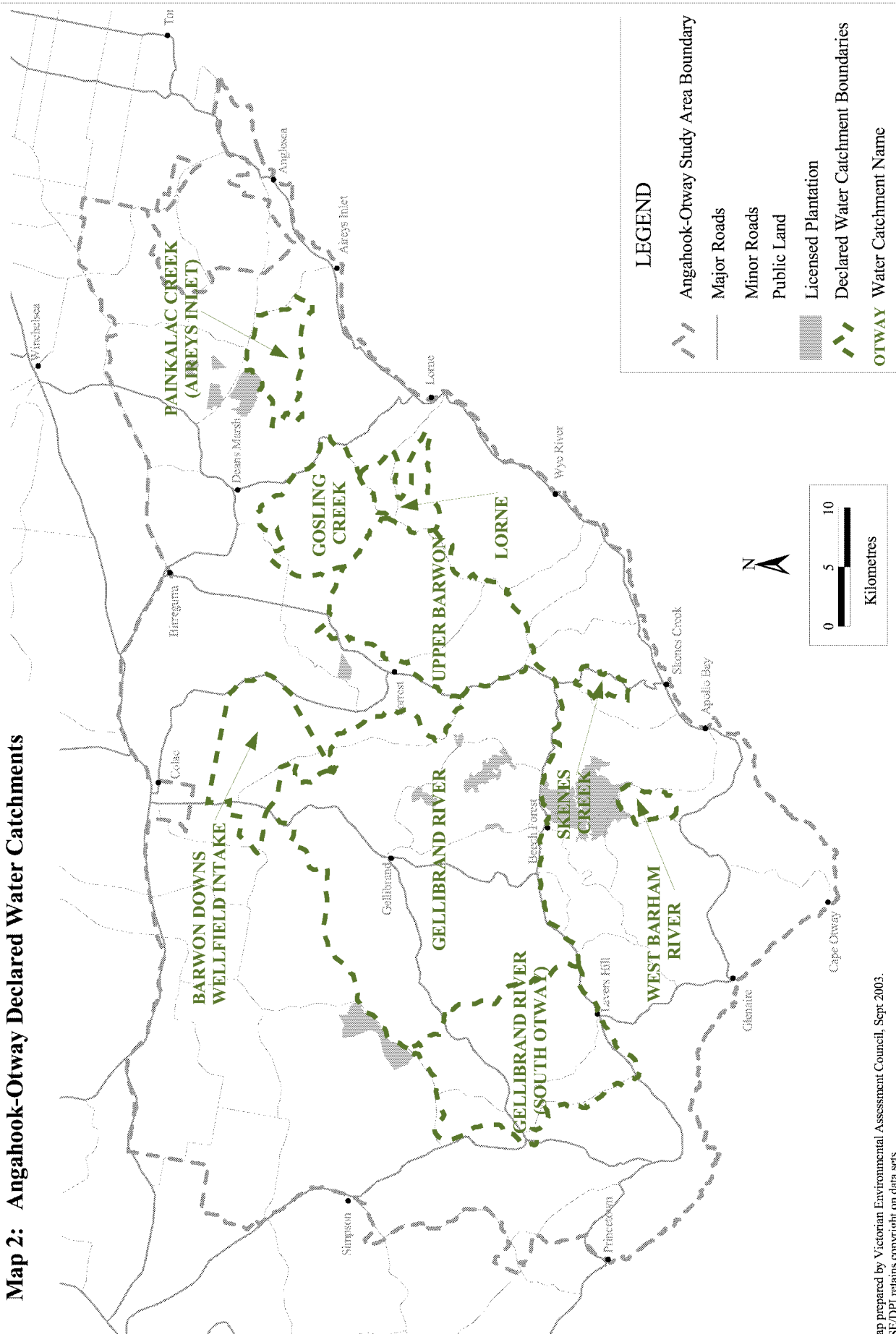
Further details of the declared water supply catchments are provided in Table 2.13. Their boundaries are shown in Map 2.

Table 2.13: Declared Water Supply Catchments

Catchment (sub-catchments)	Area (ha)	Date of Gazettal	Special Area Plan	Water Production Facility	Relevant Water Authority	Extent of Public Land (%)⁸
Barwon Downs Wellfield Intake Area	7783	1989	No	Ground water intakes	Barwon Water (supplies Geelong)	29.3
Gellibrand River – South Otway (Sheepyard Creek, Skinners Creek, Crinoline Creek)	16,708	1983	Yes	Warmambool offtakes and pumping stations (x2)	South West Water (supplies Warmambool and surrounding districts)	65.4
Gellibrand River (Carlisle River, Boggy Creek, Gum Gully Creek, Loves Creek, Charles Creek, Lardners Creek, Asplin Creek, West Gellibrand, Olangolah Creek, Upper Gellibrand)	49,853	1983	Yes - parts managed as a 'closed' catchment.	Lardners Creek Pumping station, West Gellibrand reservoir, Olangolah Reservoir, Colac No.4 Basin.	Barwon Water (supplies Colac, Gellibrand, Forrest, etc.)	54.0
Lorne (Erskine River and St George River)	2754	1964	No	Erskine River Weir, Allen Reservoir	Barwon Water (supplies Lorne)	91.4
Painkalac Creek	3466	1981	Yes	Painkalac Reservoir	Barwon Water (supplies Aireys Inlet, Fairhaven)	94.4
Pennyroyal, Matthews & Gosling Creeks	7192	1980	No	Pennyroyal Creek Diversion, Matthews Creek Diversion.	Barwon Water (supplies mainly Geelong)	52.7
Skenes Creek	803	1984	Yes	Facility no longer in service.	Barwon Water	7.3
Upper Barwon (Barwon West, Barwon East, Callahan Creek, Dewing Creek)	15,547	1963	Yes	Callahan Creek Diversion Weir, East Barwon River diversion weir, West Barwon Reservoir.	Barwon Water (supplies mainly Geelong; also Bellarine peninsula, Anglesea, etc.)	85.8
West Barham River ^b	1051	1981	Yes	West Barham Weir	Barwon Water (supplies Marengo, Apollo Bay, Skenes Creek)	100

Note: The relocation of the Barham River offtake has been proposed to enable capture of the waters of the east branch of the river. Consequently it is also proposed to enlarge the Barham River Declared Water Supply catchment to include the east branch of the river.¹³

Map 2: Angahook-Otway Declared Water Catchments



Map prepared by Victorian Environmental Assessment Council, Sept 2003.
DSE/DPI retains copyright on data sets.

Key Points

Expanding populations in the areas supplied by the catchments of the Otways are likely to create greater demand for water.

Many land-use activities (on private and public land) can affect water quality and yield, and environmental flows. Activities that affect water quality and yield are of particular concern where water supply is sourced by offtakes and small weirs (relying on the 'run of the river') rather than where collected in larger storages.

Most declared water supply catchments are subject to multiple-use, with water production being one of a number of land uses for which provision must be made. Where they have been prepared, special area plans made under the Catchment and Land Protection Act 1994, may place restrictions on such land-use activities. However, such restrictions do not necessarily (or always) guarantee desired water quality and yields.

Under the Catchment and Land Protection Act 1994, special areas can be declared, and special area plans prepared, not only for protecting water supply but also over any area where "the existing or potential use of the area may adversely affect the quality and condition of land, water quality or aquatic habitats or aquifer recharge areas or aquifer discharge areas". In the past they have been mainly used to protect potable (drinking) water supplies.

Discussion Point

Can the declared water supply catchment overlay be made more effective? What would be the advantages or disadvantages of including such declared catchments as parts of "a single national park in the Otway Ranges"?

Information Sources (see 'References' section for full citations)

¹ Brinkman and Farrell (1990)

² LCC (1977)

³ LCC (1987)

⁴ LCC (1978)

⁵ Parks Victoria (2000)

⁶ LCC (1997)

⁷ LCC (1991)

⁸ DCE (1992)

⁹ Commonwealth of Australia and State of Victoria (2000)

¹⁰ ALP (2002)

¹¹ VCC (1997)

¹² ECC (2000)

¹³ Barwon Water (2003)



CHAPTER 3 VALUES, USES AND RESOURCES

This chapter documents the values, uses and resources of the Angahook-Otway study area which, together with further information and views provided in the public consultation process, will form the basis of VEAC's recommendations to the Government. The first section of the chapter details the biophysical characteristics and natural values of the study area. The second section presents a brief history of human occupation and lists sites and places of cultural heritage significance. The next section summarises the socio-economic characteristics of the study area, and the final section documents resources and uses.

NATURAL HERITAGE OF THE ANGAHOOK-OTWAY STUDY AREA

The Angahook-Otway study area covers approximately 343,000 ha, of which approximately 159,000 ha is public land included in the investigation. The remaining land is either public land leased or licensed for plantations (approximately 6000 ha) or freehold land that is outside VEAC's scope.



Physiography

Land system mapping is a method of characterising land to assist in understanding its capability for various uses, its limitations, and its management requirements. It also serves very well in providing a physiographic overview of an area. The mapping process uses an ecological approach integrating geology, landform, climate, soils, and indigenous vegetation. The result is quite detailed – statewide, around 750 land systems have been identified and mapped. For simplicity, land systems are grouped into geomorphic units, based on geology and landform. There are 29 geomorphic units across Victoria.¹

The land systems, soils and geomorphology of the Otways have been studied in considerable detail^{2,3} but, in summary, three geomorphic units occur in the Angahook-Otway study area: the South Victorian Uplands (Otway Ranges), South Victorian Coastal Plains, and West Victorian Volcanic Plains. There are two distinct divisions within the South Victorian Coastal Plains: the Barrier Complexes along the coast, and the Dissected Plains further inland. These geomorphic units are briefly described below and their distribution is shown in Map 3.

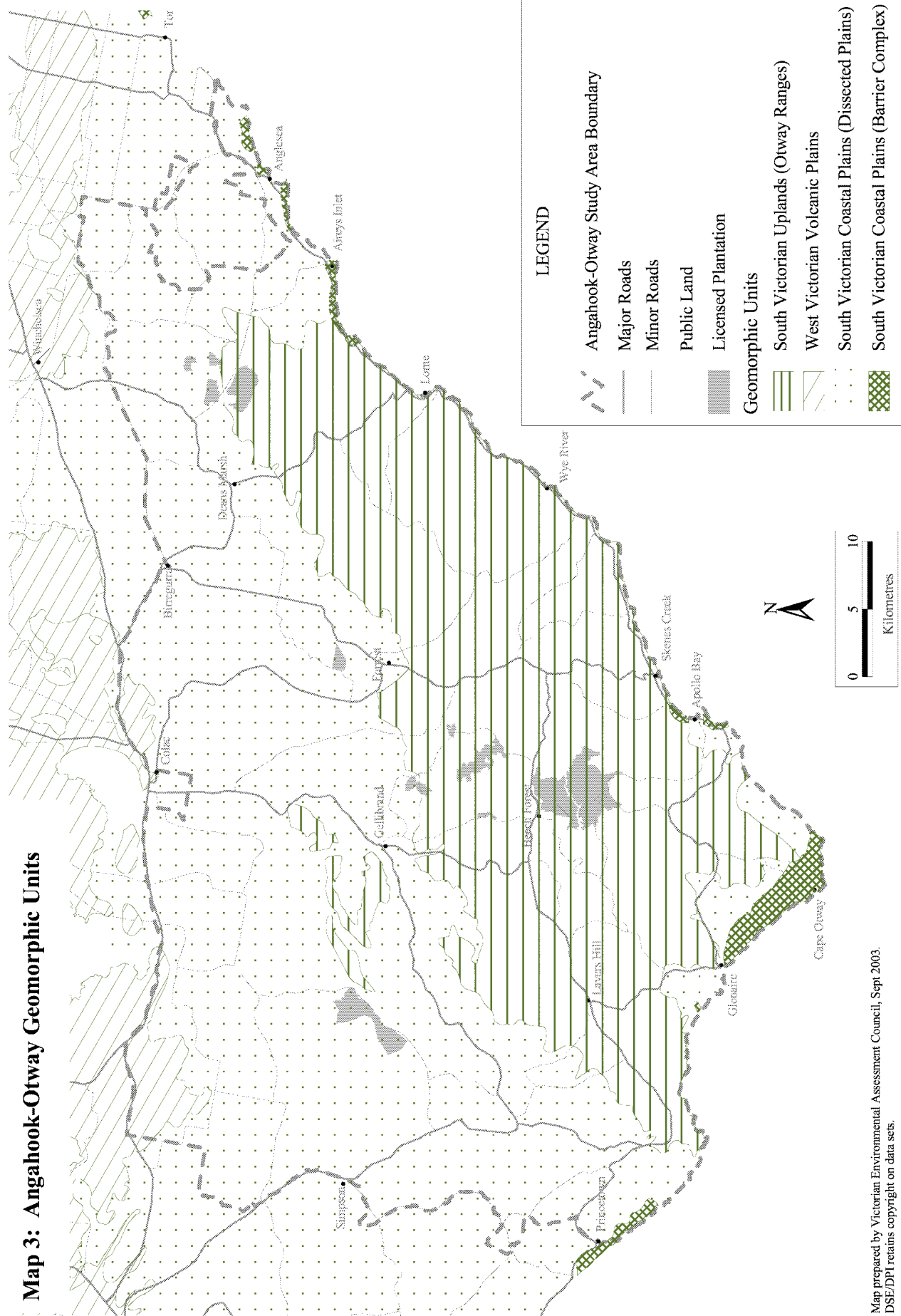
South Victorian Uplands (Otway Ranges)

The steep slopes of the Otway Ranges (which form part of the Southern Uplands) are found in the south of the study area and are composed mostly of Lower Cretaceous (96 to 145 million year old) non-marine sedimentary rock – geologically, the oldest in the study area. In the intervening millions of years, these sediments have been buried and then uplifted at intervals.⁴ Present day elevations range from sea level to 675 metres at Mt Cowley near Lorne. The top of the main range has a general elevation of about 500 metres above sea level. The major drainage dissections in the ranges have produced steep, rugged terrain where landslips are common. The south-east slopes of the main range descend rapidly to the sea, producing coastal scenery that is unlike any other in Victoria and world-famous for its beauty. The streams on these slopes are short, fast-flowing and steep, with an abundance of waterfalls that are a special feature of the Otway coast. Average annual rainfall varies from 600 mm to 2000 mm.


South Victorian Coastal Plains (Dissected Plains)

To the west of the study area and extending around to the north of the Otway Ranges are the Coastal Plains, which consist of undulating country on sediments from an ancient sea floor created during various marine inundations – at which time the ranges were an island – in the Tertiary period (1.8 to 65 million years ago). One of the most notable features of this geomorphic unit is the striking trellis pattern of parallel drainage lines in many areas – south of Jancourt Forest, for instance. Elevations are generally

Map 3: Angahook-Otway Geomorphic Units



Map prepared by Victorian Environmental Assessment Council, Sept 2003.
DSE/DPI retains copyright on data sets.



between 100 metres and 200 metres above sea level, but up to 300 metres south of Colac. Where they meet the coast, the plains typically end in magnificent vertical sea cliffs 30 to 60 metres high – such as those visible from The Gable, west of Moonlight Head. The average annual rainfall ranges from 700 mm to 1000 mm.

South Victorian Coastal Plains (Barrier Complexes)

In several small areas – never more than five kilometres from the coast (e.g. Princetown, Cape Otway, Eastern View) – there are elevated plains of coastal dunes, from sea level to about 150 metres elevation. The dunes are of recent, wind-blown origin (they represent the youngest geological element in the study area) and are composed of sand and shell grit on a calcarenite base. Average rainfall is between 900 mm and 1000 mm annually. Similar (often more extensive) Barrier Complexes are the typical near-coastal geomorphic unit along much of Victoria's open-ocean coasts.

West Victorian Volcanic Plains

Only a small part of the Angahook-Otway study area (in the north-west corner) overlaps with the West Victorian Volcanic Plains. These plains lie to the north of the Coastal Plains and are composed of newer volcanics basalts with the most recent originating from volcanoes that erupted less than 10,000 years ago. The plains are very gently undulating, at an elevation of 150 metres to 200 metres above sea level, with only a slight decline to the south. Average annual rainfall ranges from 500 mm to 700 mm, increasing from east to west. Stony Undulating Plains (a separate sub-unit also known as Stony Rises) are characterised by irregular low ridges and depressions of later basalt flows, perhaps only 6000 years old, that are typically closely associated with scoria cones.

Climate

The study area has a mostly temperate climate with weather patterns largely determined by the easterly movement of pressure systems across the Australian continent. These weather patterns produce relatively settled weather from November to April but produce very wet and cold periods between May and October as cold air moves north from the Southern Ocean. Climatic variations within the study area are mostly associated with changes in elevation and distance from the sea.

Rainfall

The main ridge of the Otways receives an average annual rainfall of 1750 to 2000 mm, with the highest annual total being 2760 mm at Weeaprounah in 1952. By contrast, in the drought year of 1967, Weeaprounah received only 1230 mm. In most winters, light snowfalls occur on the highest parts of the ranges. Winchelsea lies in a marked rain shadow north-east of the range and receives less than 600 mm per year on average. Even areas on the range east of Lorne – and especially towards Aireys Inlet and Anglesea – are in the rain shadow of the main range.

Most rain falls between May and September with August being the wettest month and January the driest. During intense storms over the Otway Ranges in March 1983 and April 1985, as much as 400 mm of rainfall was recorded in 48 hours.

Temperature

Temperatures are affected by both elevation and distance from the sea: at higher altitudes the maximum daily temperatures are reduced, and the range in monthly average and daily temperatures increases as distance inland increases and frosts become more frequent. The warmest months are January and February, when the average daily maximum temperature ranges from about 20°C on the coast to 27°C inland. The average mid-winter daily minimum temperatures on the range are generally 3°C to 4°C.

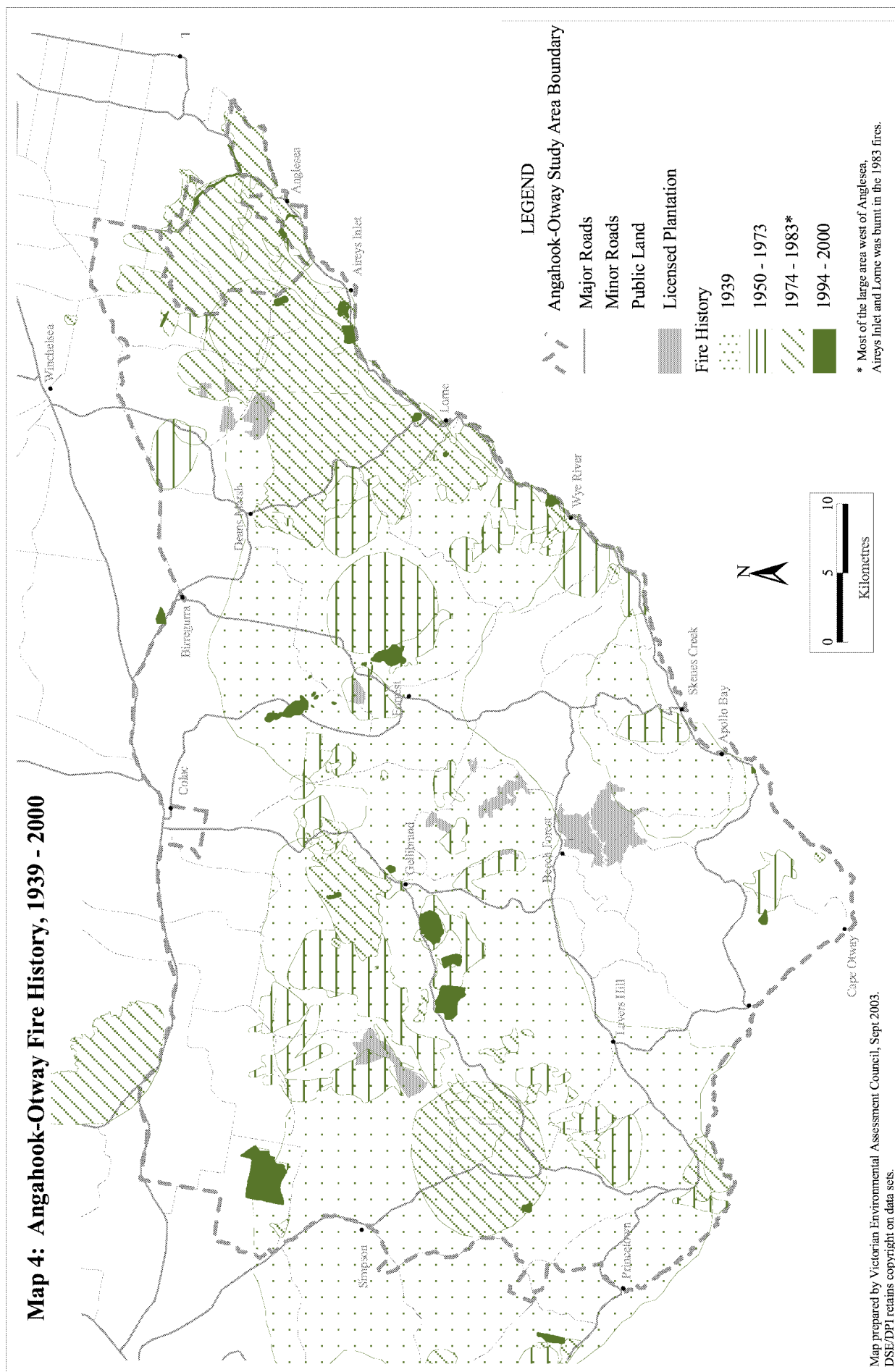
Fire

Fire in the region is a product of climate and vegetation type and the fire history in turn also has a profound influence on the ecosystems of the Otways. In many cases, the boundaries of vegetation types are determined to a large degree by fire frequency and intensity.

Most notably, the rainforests of the Otways have been little touched by fire for at least several centuries. When burnt, the rainforests will be replaced by more fire-tolerant vegetation types and may take hundreds of years to fully re-establish. The wet forests, mostly dominated by mountain ash (see Appendices 5 and 6 for common and scientific names of all species in the Angahook-Otway study area), have a natural fire frequency of between 50 and 400 years and depend on these relatively infrequent but (to human eyes) catastrophic fires for regeneration. The drier eucalypt forests, mostly to the north and east of the main range, are subject to more frequent fires and are dominated by species that are relatively fire-tolerant. The coastal and inland heaths and heathy woodlands typically require relatively frequent and patchy fires to maintain ecological diversity, with many species favouring a particular period (e.g. five to ten years) post-fire.

The inter-dependence of ecosystems and fire operates on many scales of time and space, from the thousands of years of Aboriginal burning to the current annual program of burning by land managers to manage fuel loads. These fires are generally of low intensity and cover relatively small areas – they have little impact on human settlements in the study area. Wild fires, on the other hand, have had a major impact on human communities with major fires in the ranges in 1851, 1886, 1898, 1919 (48,480 ha), 1926, 1939 (87,000 ha), 1951 (45,320 ha), and most recently in the 1983 Ash Wednesday fires (41,200 ha) when 800 homes were destroyed and three lives lost along the coastal strip.⁵ Map 4 shows the recorded spread of major fires in the study area.

Map 4: Angahook-Otway Fire History, 1939 - 2000



Map prepared by Victorian Environmental Assessment Council, Sept 2003.
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Bioregions

The distribution of plant and animal species across the landscape varies according to environmental variables such as landform, rainfall, fire frequency, soil fertility, and the occurrence of other species. Species with similar requirements tend to co-occur, leading to distinctive associations in particular areas. For example, the flora and fauna occurring in the sand dunes along the coast have more in common with other coastal dunes (including those several hundreds of kilometres away), than with the flora and fauna of the much closer volcanic plains. Biogeographers have identified and mapped bioregions to reflect and characterise these patterns.⁶ Not surprisingly, given the similar nature of their origins, bioregions often share some characteristics of geomorphic units.

The study area encompasses all or part of eight bioregions: Otway Ranges, Otway Plain, Warrnambool Plain, Victorian Volcanic Plain, Otway Coast, Central Victorian Coast, Rivers and Streams, and Wetlands. Map 5 shows the extent and location of the first six of these bioregions within the study area (the other two bioregions occur as scattered sites that cannot be mapped comprehensively at the scale of Map 5). A brief description of each bioregion follows, with more details on the conservation status of each bioregion provided under 'Natural Heritage of the Angahook-Otway study area', below.

Otway Ranges

The Otway Ranges Bioregion is entirely contained within the study area, although it includes some areas now licensed for plantations and therefore not included in the investigation. It encompasses the mountain forests along the spine of the range, from the rainforests of the gullies (mostly between Lavers Hill and Kennett River) and the surrounding wet forests dominated by mountain ash, to the drier forests of the foothills characterised by a number of eucalypts such as messmate, mountain grey gum, blue gum, and narrow-leaved peppermint.



The Otway Ranges are an outlier of the main belt of the Victorian Highlands along the Great Dividing Range east of Melbourne, and the bioregion shares most of its flora and fauna with the forests of that area. The plants and animals typical of both regions include familiar species such as the eucalypts mentioned above, rough and soft tree-ferns, mountain pepper, mountain correa, broad-toothed rat, grey goshawk, pink robin, satin bowerbird, and Victorian smooth froglet. In the Otways, many of these species are at the south-western end of a distribution that extends, to varying degrees, along the east coast of Australia. However, it is the differences, as much as the similarities, between the plants and animals of the two areas that are of interest to biogeographers attempting to explain these patterns of occurrence. For example, why are species such as southern sassafras, greater glider, sooty owl, superb lyrebird, and eastern whipbird not found in the Otways, when the habitat seems suitable? While the common wombat has disappeared from the region since European settlement, the other species have never been recorded here. Have these species been unable to survive because of the isolation and relatively small total area of suitable habitat in the Otways (compared to the main area of the Southern Highlands) and, if so, what are the implications of this fragmentation for those species that do occur in the Otways, particularly those currently reduced in distribution or numbers?

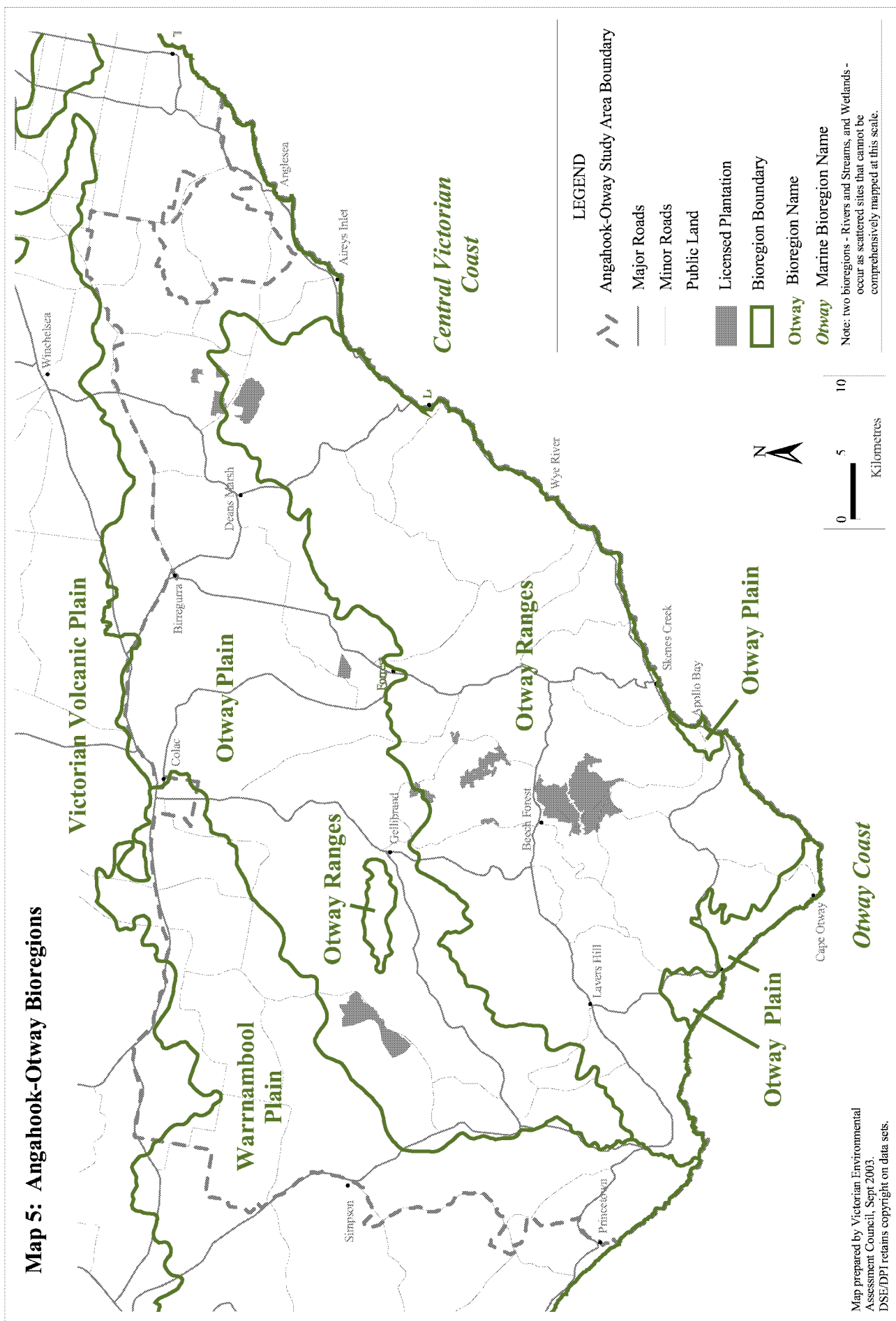
Another association of interest to biogeographers is that between the Otway Ranges and the wetter forests of western Tasmania. This affinity is apparent in the occurrence of species such as slender fork-fern, beech finger-fern, myrtle beech, grey goshawk, masked owl, pink robin and forest raven. Some of these species – such as the ferns and forest raven – are found only in Tasmania and nearby areas of the mainland (particularly the Otways). Others are more widespread on the mainland, but the Otway Ranges are a stronghold for them in Victoria.

Otway Plain

The plains, river valleys and foothills between the ranges and the volcanic plains, and along the coast east of Eastern View and in patches west of Cape Otway, form the Otway Plains Bioregion. The bioregion extends east beyond the study area to parts of Geelong and the Bellarine Peninsula. The Otway Plain is one of three similar bioregions that form the Coastal Plains of southern Victoria, the other two being the Warrnambool Plain (see below) and the Gippsland Plain.

The natural vegetation of the Otway Plain changes from forests with mountain grey gum and messmate on the higher foothills (with red ironbark in the eastern foothills rainshadow near Aireys Inlet), to more open brown stringybark and messmate forests with heath understoreys, and then heathy woodlands (usually with brown stringybark as the main tree species) and heathlands on the lower hills and valleys. The main natural vegetation types on the inland plains are grassy woodlands but these have been almost completely cleared.

Map 5: Angahook-Otway Bioregions



The characteristic species of this bioregion are mostly shared with the Warrnambool and Gippsland Plain Bioregions, and other bioregions with coastal plains and foothills in Tasmania and further east and west on the mainland. Characteristic plant species include many in the heath, banksia, orchid, myrtle (eucalypt, tea-tree) and pea families: including the pink swamp-heath, southern and large white spider-orchids, smooth tea-tree, scented paperbark, and showy bossiaea. Characteristic animal species include swamp antechinus, white-footed dunnart, New Holland mouse, ground parrot, rufous bristlebird, beautiful firetail, and swamp skink. As with the Otway Ranges Bioregion, there are many interesting details within this general pattern – for instance, swamp antechinus is a predominantly Tasmanian species that otherwise occurs only in a few places in southern Victoria and South Australia.

An area of particular note in the Otway Plain Bioregion is that around Aireys Inlet, Bambra and Anglesea, which supports four species found nowhere else in the world (wrinkled buttons, Anglesea grevillea, Anglesea sun-orchid, and Anglesea mountain dragon), as well as an extraordinary abundance of other threatened species, especially orchids. The area is well-known for its wildflowers which are featured in the annual Angair Spring Wildflower Show.

Warrnambool Plain

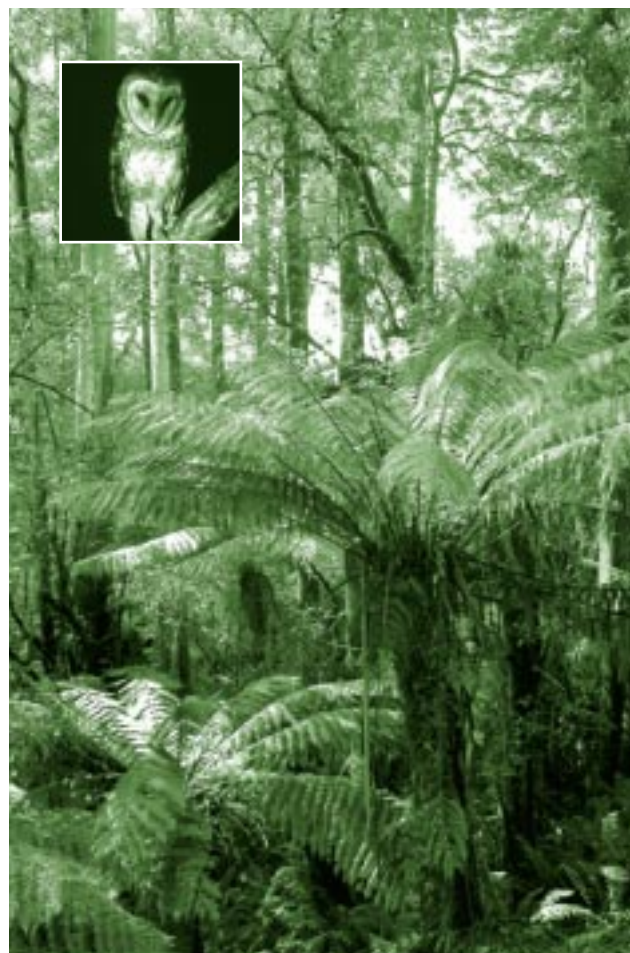
West and north of Kennedys Creek, the Otway Plain is replaced by the Warrnambool Plain Bioregion, which continues further west beyond the study area almost to Portland. Within the study area, the main vegetation types in the Warrnambool Plain Bioregion are foothill forests and inland plains that closely resemble those in the Otway Plain Bioregion.

Characteristic species and other salient features are also largely shared with the Otway Plain, although with a limited extent of other vegetation types – notably heathy woodlands and heathlands – in the study area, the Warrnambool Plain Bioregion is less diverse. That said, the rich diversity of the Otway Plain has attracted great interest and study from biologists, and may have artificially inflated the apparent difference. Further biological surveys in the west and north-west of the study area are likely to redress this imbalance.

Victorian Volcanic Plain

The Victorian Volcanic Plain Bioregion covers around two million ha of south-west Victoria, from near Portland to the northern suburbs of Melbourne, and from Colac north to around Ararat. However, only 3000 ha of the bioregion occurs in the north-west corner of the study area.

The natural vegetation of the Victorian Volcanic Plain was predominantly tussock grasslands with few or no trees, interspersed with shallow lakes and small patches of grassy woodlands, including on the stony rises formed by the most recent lava flows. Characteristic species, often shared with other grassland and grassy woodland areas in Gippsland and northern Victoria, include fat-tailed dunnart, brolga, singing bushlark, kangaroo grass, kneed spear-grass, common wallaby-grass, yam daisy, blue devil, and lemon beauty-heads, with blackwood, river red gum and manna gum being the predominant trees. However, because of the suitability of the bioregion for agriculture, the flora and fauna of the Victorian Volcanic Plain has a long history of severe depletion and is now characterised by a high proportion of both threatened species and pest species.



What makes Rainforests so Special?

One hundred and thirty million years ago, Australia – along with Antarctica, South America, Africa and India – was part of the great southern supercontinent Gondwana. Dinosaurs wandered through relatively open forests of southern conifers (ancient relatives of Norfolk Island and Huon pines), ginkgoes (now found only in China), cycads, club-mosses and ferns. Although Australia was then well south of its current location, the climate was considerably warmer than it is now at those latitudes. This generally warmer climate more or less persisted for around 80 million years, during which time the first rainforests appeared (around 100 million years ago) and then spread to cover most of Australia. These rainforests were dominated by southern conifers (of more types than in the earlier forests), but also included relatives of myrtle beech which eventually largely replaced the conifers. Rainforest ancestors of such distinctive groups as the eucalypts and sheoaks also first appeared in this period.

As Gondwana broke up (Australia broke away from Antarctica about 50 million years ago) the Southern Ocean and south polar ice cap were created, and – even though Australia was drifting north into warmer and wetter latitudes – a long period of cooling and drying began, albeit with numerous (sometimes significant) fluctuations. The tropical, subtropical and temperate rainforests of Victoria (and the rest of Australia) contracted and, in some cases, changed in response to the new conditions. Drier vegetation types rose to prominence and eventually rainforest was restricted to relatively small relict patches where favourable conditions remained, typically high rainfall and/or sheltered sites along the Great Dividing Range and in coastal regions of the tropics. The drier conditions were also more conducive to fire, leading to the replacement of rainforest with less fire-sensitive vegetation types, a process that was exacerbated when people first arrived in Australia, and then again when Europeans arrived. Europeans have also cleared around 75 percent of the comparatively small area of rainforest that remained 250 years ago. Fire, weeds and disease are the main threats to rainforest today.

Four types of rainforest now occur in Victoria:

- dry rainforest (small areas in lowland East Gippsland – the southernmost outliers of more extensive and numerous patches in eastern New South Wales and northern Australia)
- gallery rainforest (riparian areas in lowland East Gippsland – again, more extensive further north)
- warm temperate rainforest (sheltered lowland sites from Wilsons Promontory to north Queensland – generally relatively small patches in Victoria)
- cool temperate rainforest (spanning a range of altitudes in the Otways (sheltered sites) and Tasmania (relatively large areas), and then in increasingly elevated and smaller patches along the east coast from the Central Highlands of Victoria to south-east Queensland). Also, botanists have identified cool temperate mixed forest which is essentially secondary cool temperate rainforest that is prevented from maturing by relatively frequent fires, leading to a mixture of rainforest and eucalypt forest species. It is found in eastern Victoria and Tasmania.

In many areas, Australia's record of prehistoric environmental change can only be assumed as local evidence is limited. In the Otways, however, sites at Dinosaur Cove near Glenaire and in the coal deposits of Alcoa's Anglesea mine have made an important contribution to our understanding of prehistoric Australia, and have confirmed the applicability of the general patterns.

The role of rainforests in the evolution of Australia's landscapes and flora and fauna makes them particularly special for many people. They are the cradle of our distinctive modern flora. They are also a time capsule that has allowed us to understand the evolution of Australia's vegetation, with its links to the other southern continents as well as insights for the future. At the same time rainforests are ongoing, living ecosystems – both the venerable elder of Australia's vegetation types (a distinction entirely in keeping with the dark, damp and mossy rainforest interior) and a living reservoir of biodiversity: for example, rainforests cover only 0.14 percent of Victoria but contain four percent of its higher plants – many of them occurring nowhere else.

The 100 million year story of rainforests in Australia is a major factor bringing significant weight to consideration of any course of action to ensure that the continuation of that story is not compromised.

Otway Coast

As well as bioregions on land, biologists have identified marine and coastal bioregions.⁸ These bioregions are somewhat peripheral to the Angahook-Otway study area and only brief descriptions are given here.

The Otway Coast extends from Cape Jaffa in South Australia to just south of Apollo Bay (see Map 5). The coast is predominantly south-west facing and exposed to influences from the Southern Ocean, leading to high energy waves and cold water temperate waters with nutrient-rich upwellings.

Central Victorian Coast

The Central Victorian Coast Bioregion extends from just south of Apollo Bay to west of Wilsons Promontory. Compared to the Otway Coast, it is more sheltered with moderate wave energy and warmer sea surface temperatures representative of Bass Strait waters.

Rivers and Streams

This bioregion brings together all the permanent and temporary flowing waterways of Victoria, scattered across the other discrete bioregions such as those listed above.

The rivers and streams of the Angahook-Otway study area fall into two distinct divisions – the short, generally fast-flowing streams of the coastal side of the main range, and the longer, more meandering waterways that (initially, at least) flow inland from the main range. The latter category is dominated by the Barwon River (with an east and a west branch), the Gellibrand River (with major tributaries being the Carlisle River and Lardner, Kennedys and Chapple Creeks), and the Aire River (with the Ford and Calder Rivers being the major tributaries). There are numerous coastal streams, with a greater abundance of waterfalls than any other part of Victoria, but among the more prominent are the Barham, Kennett, Wye, Cumberland, St George, Erskine and Anglesea Rivers.

The physical differences between the inland and coastal rivers and streams are reflected in a number of other differences. For example, fish species with entirely freshwater life-cycles (such as river blackfish and southern pigmy perch) are common in the inland waterways, but all native species in the coastal streams have marine phases in their life-cycles (Australian grayling and broadfin galaxias, for example). More broadly, though, the flora and fauna of the rivers and streams in the Otways have affinities with other waterways in south-eastern Australia, including those in Tasmania. As with the terrestrial bioregions, several aquatic species reinforce the biogeographic affinity of the Otways with Tasmania: southern pigmy perch, river blackfish, dwarf galaxias, and Australian mudfish, for example.⁹

Wetlands

As with the Rivers and Streams Bioregion, the Wetlands Bioregion encompasses a large number of sites scattered across Victoria, in this case, all natural aquatic habitats other than rivers and streams, including floodplain billabongs, coastal tea-tree swamps, large open lakes, and intertidal

areas (including estuaries). Apart from intertidal areas, wetlands are not a significant habitat type in the Otways. The only major natural wetlands are Lake Elizabeth near Forrest and the swamps on the lower floodplains of the Aire and Gellibrand Rivers. These wetlands support similar ecosystems to other such wetlands in south-eastern Australia.

Sites of Geological and Geomorphological Significance

Some 120 sites of geological and geomorphological significance have been identified in the study area, including two sites of international significance, and six of national significance (Appendix 7).^{10,11,12} A short description of some sites of interest and important geological significance is provided below.

Port Campbell National Park (National)

Although called 'Port Campbell National Park' this site extends well beyond that park in a strip of approximately 60 kilometres of coastline from Peterborough to Cape Otway that is considered one of the most spectacular in Australia. The coastal exposures of Cretaceous, Tertiary and Quaternary sediments form vertical cliffs, rock stacks and islands, headlands and sandy beaches that attract thousands of visitors each year. The area contains some 33 individual sites of geological and geomorphological significance. Of these, 19 are within the study area including the internationally significant Dinosaur Cove, and national significant sites Pebble Point, Lion Headland-Slippery Point and the Sentinel Rock fossil locality. The diversity and spectacular scenic nature of the geology along the coast makes the overall Port Campbell National Park site of national significance.

Lion Headland to Slippery Point (National)

At Lion Headland, Lower Cretaceous Otway Group sediments outcrop in high cliffs and display a number of structural and depositional features. Landslips, boulder beaches and narrow shore platforms occur along the coast as well as some small sea caves that have formed as a result of the wave removal of thin siltstone layers within the sea cliff. To the east of Lion Headland a dinosaur footprint over 10 cm long has been found. The extensive list of specific features also includes plunging folds, joints and faults, overhanging cliffs, massive landslips, sea caves, and extensive and varied rock exposures.

Dinosaur Cove (International)

Dinosaur Cove near Glenaire is a world-renowned dinosaur fossil site, and has added important knowledge to the scientific understanding of the dinosaurs in the Australian part of Gondwana during the Cretaceous period. Indeed, even the existence of dinosaurs in the area at approximately 106 million years ago, when Victoria was attached to Antarctica and near the South Pole, challenges the supposition that all dinosaurs were cold-blooded. Although the climatic conditions were milder than those at the south pole today, both the plants and animals would

have experienced months of darkness every winter. While of great scientific interest, Dinosaur Cove displays little to attract the general public – the fossils are either unrecognisable or buried deep in hard rock, requiring specialised excavation by mining and drilling experts to access them for study.

Lake Elizabeth and landslide (Regional)

Lake Elizabeth was formed by a landslide blocking the flow of the eastern branch of the Barwon River in 1952. The site was later modified after heavy rains in 1953 and the dam wall was breached creating a new channel. A smaller lake and swamp have formed on a portion of the remaining original landslide surface. The site is an excellent example of drainage adjustment as a result of a landslide blockage of a river channel and is a good model for studying relevant geological, hydrological and meteorological processes. DSE's Forest Service have recently provided visitor facilities, including a walking track, to enhance public enjoyment of Lake Elizabeth.

Cape Patton, Ramsdens Cave (National)

At Cape Patton high cliffs have formed in landward dipping Lower Cretaceous Otway Group sandstones. Within the cliff face is the entrance to Ramsdens Cave which is elevated some 12 metres above sea level. The site is unusual for a number of reasons. Firstly, large caves are uncommon in Cretaceous rocks in Victoria, especially along the coast. Secondly, this is one of few locations where Cretaceous rocks dip landward along the coast and lastly, the presence of dinosaur bone fragments within the rocks on the shore platform at Cape Patton make this an important site for palaeontologists.



Artillery Rocks (Regional)

At Artillery Rocks, on the coast north of Wye River, various types of concretions have formed in Lower Cretaceous Otway Group Sandstones. The site is named for the large round concretions that look like cannonballs, although shapes range from spherical to columnar, pillow and platy forms. The concretions consist of quartz, feldspar and shale fragments cemented by calcium or iron carbonates. Weathering and erosion around the more resistant concretions has left coastal rock platforms, often as cappings on pedestals of honeycomb weathered sandstone.

Erskine Falls (Regional)

Erskine Falls are an easily accessible site that clearly displays the relationship between geology and landform development. The Erskine River flows across the sandstone beds of the Otway Group at near right angles and plunges into a pool. This is one of the best known waterfalls in the Otway Ranges as a result of its scenic values and accessibility.

Torquay to Aireys Inlet (International)

This section of coastline characterised by steep cliffs is used for sequence stratigraphic analysis of sedimentary rocks and is often investigated by visiting international geologists. The sequence is used to examine the differences in sedimentary rocks deposited as Tertiary sea levels fluctuated and because of the excellent exposure, these variations can be easily traced along the shoreline and shallow marine environment that existed at that time. The cliff sections at Point Addis expose the marginal marine Anglesea Member of the Demons Bluff Formation which is overlain by the non-marine Angahook member. A subsequent sea level rise changed deposition to the richly fossiliferous Point Addis Limestone which, further north-east (especially Rocky Point to Fishermans Steps near Torquay), can be seen inter-tonguing with the deeper water marl (marine mudstone) of the Jan Juc Formation. Both the limestone and the marl are overlain by calcareous silt and clay of the Puebla Formation.

Flora

Approximately 1500 plant species have been recorded in the Angahook-Otway study area (Appendix 5), including 270 non-indigenous species. Most of these species are vascular plants (that is, woody species such as trees, shrubs and grasses), although around 130 mosses have been recorded (but no fungi or lower plants such as algae and liverworts are listed). Of the indigenous plants, some 120 species are classified as threatened nationally or in Victoria. Among the threatened species are four that are endemic to the study area (not found anywhere else in the world): wrinkled buttons, Anglesea grevillea, Anglesea sun-orchid, and Otway grey-gum. There are several other species that are found elsewhere in Victoria, but the Otways contains a major part of the Victorian population: slender fork-fern, beech finger-fern, slender tree-fern, tall astelia, Otway bush-pea and, of course, myrtle beech.

Vegetation Types

In Victoria, botanists have developed a system of classifying vegetation types which identifies *vegetation communities* – composed of species of plants that tend to co-occur – and then groups ecologically similar vegetation communities into *Ecological Vegetation Classes* (EVCs). This system is described more fully in Appendix 8, which also describes the main 31 EVCs – out of a total of 38 EVCs – identified in the study area.

One of the key factors when considering changes to public land use is the selection of areas for the conservation reserve system. In recent years, this process has been guided by the JANIS criteria¹³ – a set of criteria agreed to by the Commonwealth and all State and Territory Governments, to develop a national system of conservation reserves that is comprehensive, adequate and representative (CAR). The criteria are discussed more fully in Chapters 5 and 6, but essentially comprehensive means that all regions and ecosystems should be included, adequate refers to the need for reserves to be of sufficient size to conserve the values they are intended to protect, and representative means that an appropriate amount of each ecosystem should be included. In Victoria, EVCs are used as the best approximation of 'ecosystems'.

Appendix 9 shows the current reservation status (representation in conservation reserves) of EVCs in the study area. The key figures are in columns 9 and 10 of the table in Appendix 9. These columns show the percentage of the pre-European extent of each EVC in conservation reserves. Column 9 shows those percentages for the dedicated reserve system (those reserves set aside by parliament – national, state and regional parks, reference areas, nature conservation and some natural features reserves), and Column 10 shows the percentages for all reserves (dedicated reserves and informal reserves – the Special Protection Zone (SPZs) in state forest, established as a result of the West RFA¹⁴).

The JANIS¹³ 'targets' for EVC representation are 100 percent of remaining extent for rare or endangered EVCS, 60 per cent of remaining extent for vulnerable EVCs, and 15 percent of pre-European extent for all others. Appendix 9 shows that all widespread EVCs satisfy the JANIS targets in the dedicated and informal reserve system, but several do not or barely reach the targets in the dedicated reserve system: cool temperate rainforest, herb-rich foothill forest, riparian forest, and shrubby wet forest.

Old-Growth Forest

There are many definitions of old-growth forest but the most widely-applied in Australia is that in the JANIS criteria¹³ which defines old-growth forest as *ecologically mature forest where the effects of disturbance are now negligible*. Disturbance can have a variety of forms, but logging, roading, clearing and fire predominate. The effects of disturbance and, therefore, the identification of old-growth can vary between vegetation types. For example, the fire causes much less disturbance to a fire prone environment (such as heathy woodlands) than it does in a fire-sensitive

environment such as rainforest. The flora and fauna in most fire-prone environments have generally adapted to relatively frequent fires and recover well. However, most rainforest species are killed by fire because, over the millennia, they have not experienced fire with sufficient frequency to adapt to it. As a result, old-growth rainforest will generally be older than old-growth heathy woodland.

Most forms of disturbance have become much more frequent and widespread with European occupation of Australia and, as a result, old-growth forests and the species that have adapted to live in them have become rarer.

The value of old-growth forest can be viewed at a number of levels. From an ecological perspective these forests often contain key habitat resources, such as large aging trees with numerous hollows. These forests are important repositories of flora and fauna species, the inter-relationships of which provide important insights into the function of the natural system. This not only provides an important window into historic times pre-dating settlement, but also enables the development of management and future use decisions pertaining to the forest system. From an anthropocentric viewpoint, the antiquity and intactness of these forests may generate spiritual and emotional appeal in people. These forests are generally perceived to display high aesthetic values and indeed, visitors often look upon large old trees in awe.

The need to adequately protect old-growth forest is now widely accepted. As briefly described above, old-growth represents a critically important stage of forest development that needs to be protected accordingly. Under the JANIS criteria¹³, the reservation of old-growth forest is separate to the criteria for reserving biologically representative areas of forest. The old-growth criteria are:

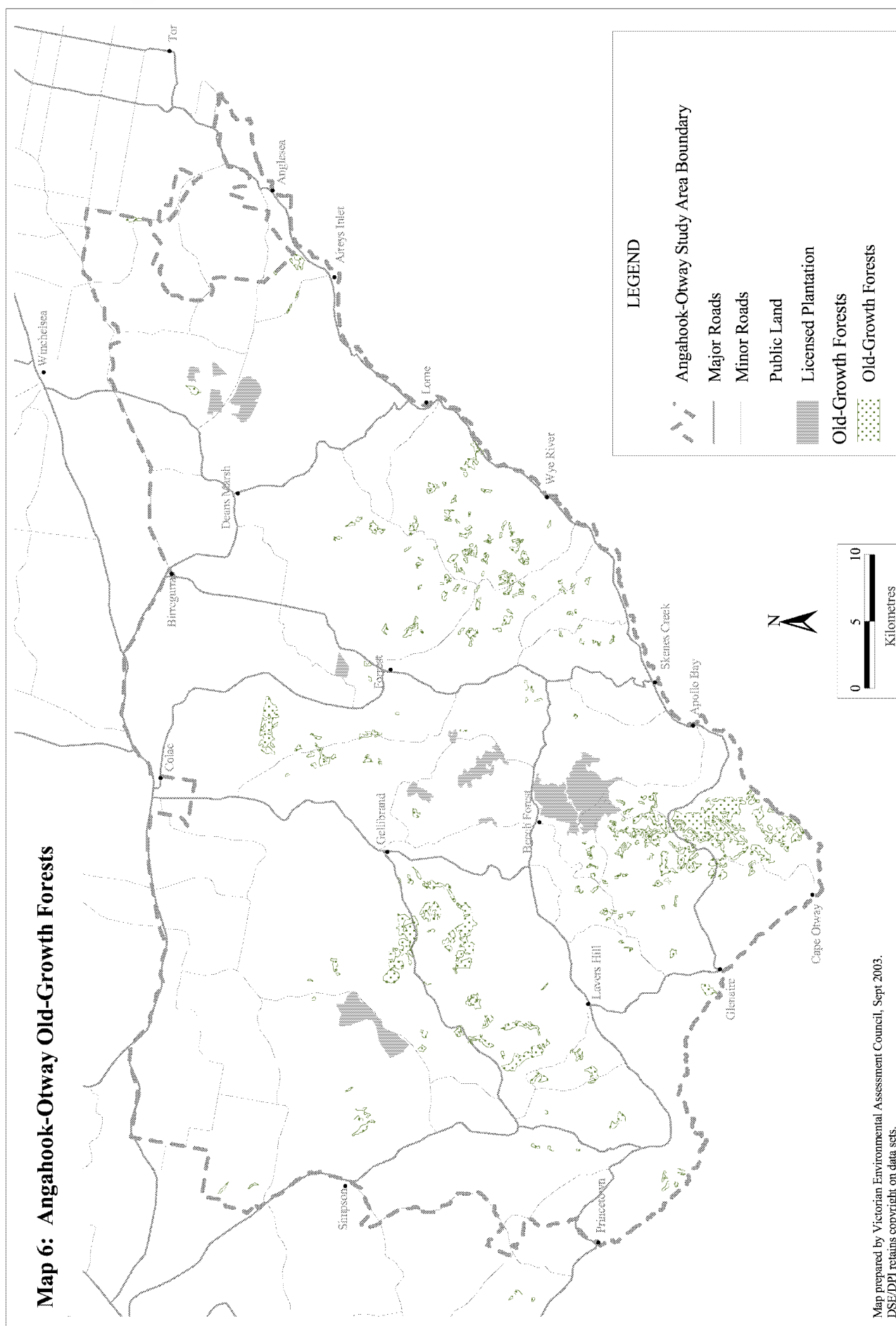
- Where old-growth is rare or depleted (generally less than 10 percent of the current extent of a vegetation type (EVC)) then all of the old-growth should be reserved.
- Where it is not rare or depleted then 60% of the existing old-growth should be reserved.

Given the time-scale applicable to old-growth forest (it generally takes hundreds of years for old-growth to develop), the desirability of giving the longer-term protection of dedicated reserve status (as opposed to informal reserve status) to old-growth forests is significantly greater than for more ephemeral values.

The distribution of the 8500 ha of old-growth forest in the study area is shown in Map 6. All reasonably widespread (greater than 500 ha in current extent) old-growth types have more than 90 percent of their current extent in the reserve system, with the exception of old-growth cool temperate rainforest (88.5 percent) and shrubby wet forest (79.5 percent).

Old-growth representation in the dedicated reserve system is much poorer though: cool temperate rainforest (63.9 percent), heathy woodland (51.7 percent), lowland forest (83.6 percent), shrubby foothill forest (84.6 percent), and shrubby wet forest (16.5 percent).

Map 6: Angahook-Otway Old-Growth Forests



Fauna

Appendix 6 lists 381 fauna species, including 30 introduced species, recorded in the Angahook-Otway study area. The list includes ten invertebrate species, but invertebrates are very poorly known and limited data have been collected. It is likely that several hundred, if not thousands, of species inhabit the study area, even though only ten have been recorded. It would be wrong to conclude from the list that no leeches, flies, mosquitoes, ants, bees, or wasps occur in the study area!

The fauna list includes 44 threatened species: eight mammals, 24 birds, three reptiles, one amphibian, five fishes and three invertebrates. A further two species, Tasmanian pademelon and eastern bettong, are likely to have occurred in the study area at the time of European settlement but are now extinct on the mainland. Several of the threatened species listed in Appendix 7 are also known to be, or likely to be now effectively extinct in the study area: eastern quoll, eastern barred bandicoot, common wombat, dingo, plains-wanderer, bush stone-curlew, and regent honeyeater. The few recent records of these species are likely to be dispersing vagrants.

Five species have not been recorded outside the study area – that is, they may be completely dependent on the study area for their survival: mountain dragon (Anglesea form), Otway caddisfly, Otway stonefly, Otway burrowing cray, and Otway black snail. In addition, the study area is a Victorian stronghold for several species: spot-tailed quoll, swamp antechinus, smoky mouse, New Holland mouse, grey goshawk, masked owl, rufous bristlebird, forest raven, swamp skink, Australian mudfish, and Glenelg freshwater mussel. Some of these populations (and those of several other species) are at the edge of more extensive distributions on the mainland or in Tasmania.

Finally, records of migratory birds travelling through the study area en route between Tasmania and the mainland¹⁵ indicate that the study area's importance for fauna extends well beyond its boundaries.



CULTURAL HERITAGE OF THE ANGAHOOK-OTWAY STUDY AREA

History of Human Occupation in the Otways

Aboriginal people, primarily from the Gadubanud language group, occupied the Otways for many thousands of years. Little is recorded of the culture, economy and movements of the Gadubanud although some conclusions can be drawn from the 250 or so known archaeological sites along the main range and adjoining areas.¹⁶ The density of these sites – of a wide variety but mostly middens and artefact scatters – is lowest along the main range itself and greatest along the north-western periphery of the range, and in a five kilometre wide band along the coast and hinterland. This pattern, together with some site characteristics, has been interpreted as indicative of a mobile society, using coastal and estuarine resources, and food sources provided by inland rivers and wetlands according to the seasons.

The coastal strip may have been occupied year-round, with residential moves along the coast, and with or without seasonal moves into and possibly over the ranges. The northern peripheral strip is less likely to have been occupied year-round, with people moving seasonally into the ranges and the more open, lightly timbered areas in the west, north, and east of the study area where they would have met people in the adjoining Girai Wurrung, Djargurd Wurrung, Gulidjan, and Watha Wurrung language groups (from west to east). The fertile volcanic plains were among the most densely populated areas of Aboriginal Australia, and the lakes and rivers of the plains near the northern boundary of the study area (e.g. Lakes Colac and Corangamite, and the Barwon River and its floodplain) are likely to have been important sites for seasonal visits.¹⁶

European colonisation, with first contact predominantly between Aboriginal people and European pastoralists in most areas, led to the destruction of the indigenous way of life and Aboriginal society as it was at that time. Various proximate causes such as disease and displacement have been postulated for this devastating upheaval, largely without evidence pertaining directly to the study area. However, two incidents of frontier violence – near Blanket Bay and Gerangamete, in which a total of at least eight Aborigines and two Europeans were killed – are on the official record for the study area, with several other such incidents recorded in nearby areas.¹⁷

Today, people in the Gunditjmara and Wathaurong communities maintain the ancient connection of indigenous people with country in the Otways.

The first recorded sightings of the Otway coast by Europeans were in the very early 1800s. While sealers and whalers formed temporary settlements at various points on the coast it was not until the late 1830s that there was any exploration further inland. While the population of western Victoria increased markedly as a result of the gold rush of 1851 to 1861 it was not until the 1880s that settlement really began in the Otway Ranges.

The delay in settlement resulted from the extreme practical difficulties of access and moving timber and agricultural products through the steep, wet ranges. Many early selections were abandoned, and resumed by the Crown for forestry. Today the landscape reflects the settlement difficulties, with farms along the gently sloping ridges, but on the slopes a patchwork of semi-cleared or regrowth blocks, interspersed with forest and public and private pine plantations.

Early timber harvesting in the 1850s and 1860s was located along the coast (particularly around Apollo Bay with over 1000 timber cutters in this area in 1862) but it was not until surveyors and others made their way inland in the 1870s that the true timber wealth in the Otways was fully appreciated. In 1886 the first relatively large mill was established inland (at Forrest). Access was facilitated with the coming of the narrow gauge railways to Forrest in 1891 and to Beech Forest in 1902. These brought a boom in the timber industry. Numerous mills were set up in the forests, linked to the main railways by timber tramways.

The history of human association with the study area is now apparent in a large number of places exhibiting a fascinating and diverse range of cultural heritage values. These values are summarised in the section on 'Cultural Heritage of the Angahook-Otway study area', below. Current human activities in the Otways public lands are detailed under 'Resources and Uses of the Angahook-Otway study area', below.

Sites and Places of Cultural Heritage Significance

The activities of humans in the Otways have left a wealth of historical associations and features, providing a record of

Aboriginal use and insights into agricultural, forest and coastal uses.

The association of Aboriginal people with their land is much more profound than just interest in particular sites or places. The cultural heritage of Aboriginal people is enmeshed with their spiritual, ecological, and economic connection with the land and water. To a certain extent, this relationship is what is meant when Aboriginal people talk about 'country', and forms the basis of the strong connection which Aboriginal people maintain with the Otways.

At the same time, it is also important to ensure that archaeological sites are adequately protected. Analysis of 250 or so known Aboriginal archaeological sites in the Otways,¹⁶ identified three sensitivity zones: zone 1 along the coast and immediate hinterland (to five kilometres), zone 2 along the northern foothills of the ranges and the adjoining plains, and zone 3 along the ranges themselves. Zones 1 and 2 are of high archaeological sensitivity, meaning that any land-altering activities should be subject to archaeological impact assessment prior to commencement of ground disturbance. Sites in zone 3 are less likely to be impacted by land-altering activities, although large scale disturbance such as clearfell logging or clearing of native vegetation still pose a considerable threat particularly on ridgetops, where sites in this zone tend to be concentrated.

Aboriginal archaeological sites are given statutory protection under the *Archaeological and Aboriginal Relics Preservation Act 1972*, and the *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984* which provide substantial penalties for unauthorised disturbance of Aboriginal sites.


Table 3.1: Numbers of Historic Places by Protection Status and Level of Significance

Historic Places	Historic and Cultural Features Reserves	Register Listings	Number of Places
Highly Significant Places	3	9	12
Significant Places	3	26	29
Notable Places	n.a.	n.a.	62
Total Number of Places			103

Note: 'Register Listings' refers to the total number of places on either the Register of the National Estate or the Victorian Heritage Register.

Table 3.2: Numbers of Historic Places by Type

Type of Historic Place	Number of Places
Sawmills & Tramways	36
Coastal Sites	19
Buildings & Other Township Sites	11
Water Supply Sites	5
Other Site Types	32



Many sites in the historical record illustrate the difficulties inherent in utilising this high rainfall, steeply dissected area. The Beech Forest historical display photos capture this sweat and effort in the mud.

Transport was a key historical theme from the early days of European settlement in the study area. The Birregurra – Forrest railway was opened in 1891, the terminus named after local MLA Charles Forrest who supported its construction. Until closure in the 1950s, it supported sawmilling and agriculture. The narrow gauge ‘Beechy Line’ from Colac to Beech Forest opened in 1901, was extended to Crowes in 1911, and closed in 1962. Sawmillers located in the forest built numerous timber-railed tramways linking to these railways – for example the extensive Henry No. 1 mill system. Some sawmills, for example Hays’ at Wye River, were built along the coast with tramways and jetties to load logs for transport by ship.

In the west the Heytesbury land development scheme is a rare example of settlement history continuing to the present, with numerous ‘new’ farms in the process of alienation. Simpson Historical Park interprets the extensive clearing of native forest under this scheme.

Victoria’s premier scenic and tourist route, the Great Ocean Road, was constructed principally by repatriated World War I soldiers from 1918 to 1932, and is an outstanding engineering feat as well as a memorial to the Great War. Another scenic route – Turttons Track – was built in 1927 and upgraded by unemployment relief workers in the 1930s.

Several water supply systems are historically significant. Workers used picks, shovels and explosives to build the Olangolah Weir and pipeline to Colac in 1909-1911. The Wurdee Boluc Channel and associated offtakes supplying Geelong were constructed in the 1920s, while Warrnambool’s Arkins Creek Weirs and pipeline were built using sustenance labour in the late 1930s.

Cape Otway’s historical lighthouse symbolizes efforts to prevent further shipwrecks along this treacherous coast. Other historical buildings on public land range from humble local schools to the grand Erskine House at Lorne, long used for beach holidays.

Coal resources of the Otways were recognised early. The Great Western Colliery Company worked its mine at Benwerrin from the 1890s to the late 1940s, carting coal via a tramway to Deans Marsh. The later Wensley Bray coalmine moved coal by aerial ropeway 7 km to Wensleydale. Alcoa continues to mine this coal resource.

CURRENT SOCIAL AND ECONOMIC SETTING

The following summary of the social and economic characteristics of the Angahook-Otway study area draws on 2001 census data collected and processed by the Australian Bureau of Statistics (ABS). The ABS presents data according to Statistical Local Areas (SLAs) that are subdivisions of municipalities. As shown in Map 7, the Angahook-Otway study area encompasses three shires – major parts of Colac Otway and Surf Coast Shires and a small area of Corangamite Shire. There are several SLAs within these municipalities – those that best approximate the Angahook-Otway study area are:

- Colac Otway – North
- Colac Otway – South
- Colac Otway – Colac
- Surf Coast – West

In the following account, statistics for the study area as a whole are based on totals for these SLAs. Other statistical divisions in the municipalities have little overlap with the study area, but are noted below as indicated where they enhance interpretation.

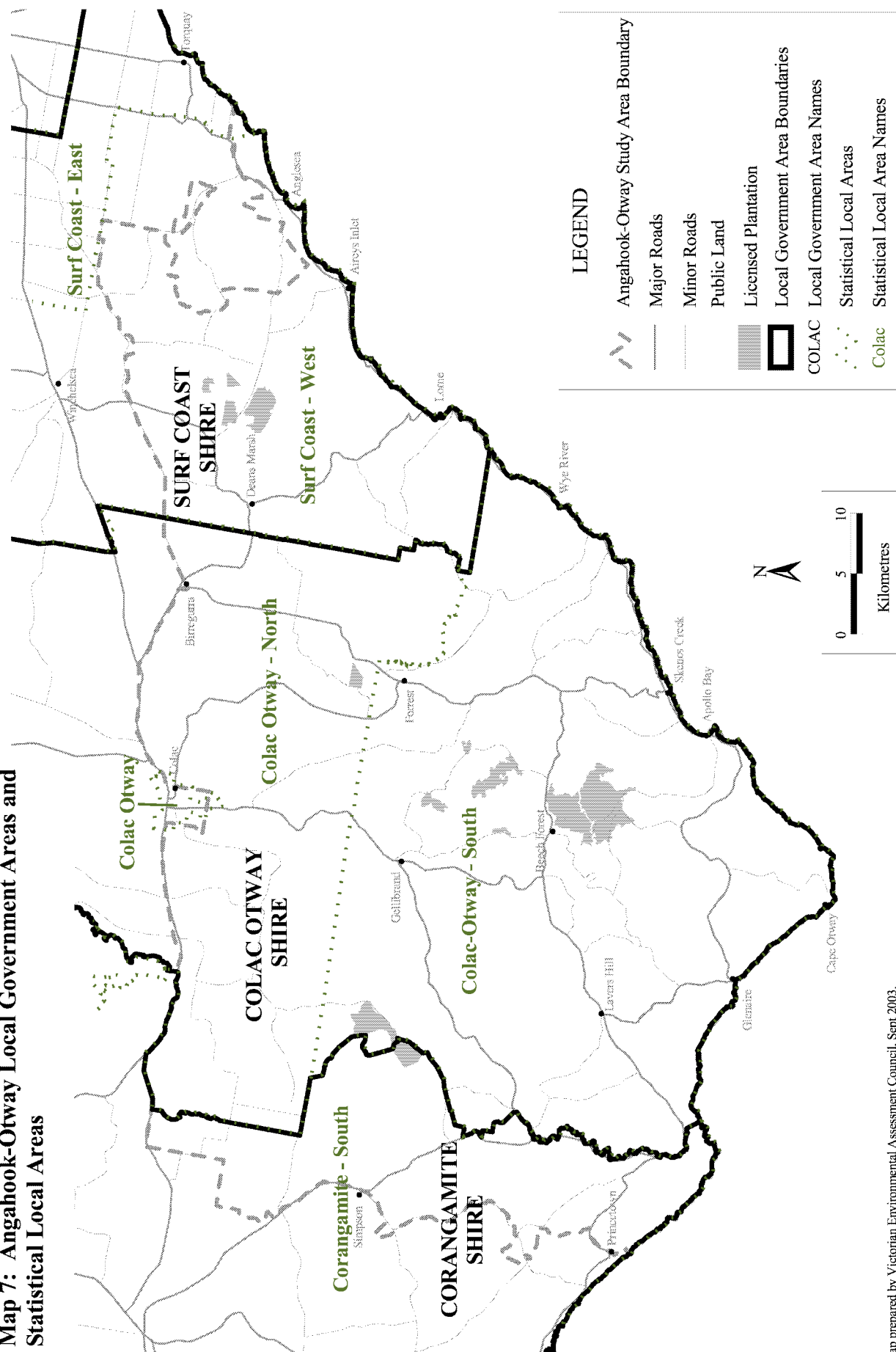
Population

In 2001, approximately 28,600 people lived in the study area – a 4.5 percent increase on the population of the study area in 1996. However, the changes have varied substantially between SLAs in the study area, with a decrease of 0.7 percent in Colac Otway – North and increases of 0.9 percent in Colac itself, 8.8 percent in the coastal area of Colac Otway – South, and 11.9 percent in Surf Coast – West. The trend of decreasing inland rural population and increasing coastal population is also apparent in the Corangamite SLAs that are predominantly outside the study area. The overall population increase in Surf Coast Shire, where around half the residences are not permanently occupied, was 17 percent. In summary, inland rural populations are decreasing slightly and coastal populations are increasing significantly, particularly in the eastern parts of the study area nearest to Geelong and Melbourne.

A north-south comparison in Surf Coast Shire (where the SLAs provide an east-west comparison) would be useful to test the commonly held notion that inland populations are also increasing there. That is, that the strength of the overall increase in the eastern part of the study area is overwhelming the inland rural decline as the reduced availability and affordability of coastal land pushes new residents to inland rural areas.

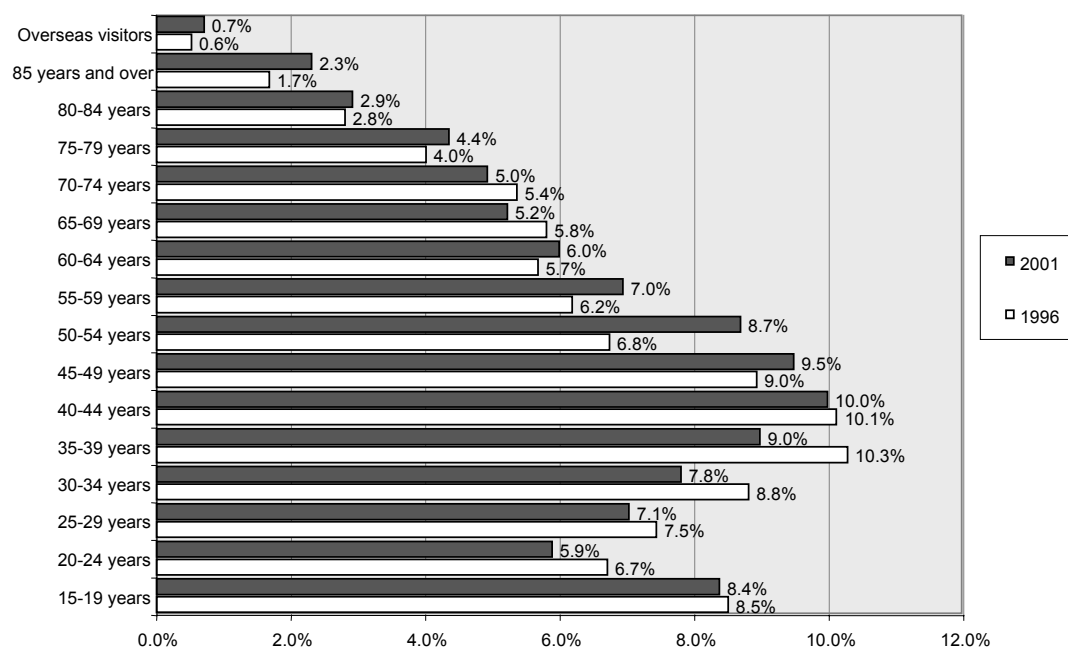
Another notable detail in the population changes in the study area is the variation in age distribution, which has shifted into older age groups, with a substantial increase in the proportion of those people in the 50-54 years age bracket (Figure 3.1).

Map 7: Angahook-Otway Local Government Areas and Statistical Local Areas



Map prepared by Victorian Environmental Assessment Council, Sept 2003.
DSE/DPI retains copyright on data sets.

Figure 3.1: Angahook-Otway Study Area - Age Distribution (ABS 1996 and 2001 Census)



Population projections for the three shires within the study area for the years 2006 to 2021 are shown in Table 3.3. Surf Coast figures include Surf Coast – East SLA which lies outside the study area and inflates that shire's increase slightly, and most of Corangamite Shire also lies outside the study area. The projections largely reflect the trends described above for 1996-2001, with continuing large increases for Surf Coast Shire.

Table 3.3: Population Projections for the Angahook-Otway study area¹⁹

Shire/City	2006	2011	2016	2021	15 yr Change	Percentage Change
Colac Otway	20,631	20,643	20,794	20,836	205	+1.0
Corangamite	13,218	12,594	12,043	11,578	-1,640	-12.4
Surf Coast	20,879	22,210	23,446	24,947	4,068	+19.5
Regional Victoria	1,342,141	1,367,751	1,394,933	1,424,238	82,097	+6.1
Victoria Total	4,946,688	5,099,070	5,235,983	5,359,116	412,428	+8.3

Employment

Table 3.4 shows that employment in the Angahook-Otway study area has increased steadily between 1996 and 2001, despite increases in the number of people in the workforce. Table 3.5 shows that the corresponding decrease in unemployment has been spread across the study area and that, although generally higher than the statewide average in the late 1990s, unemployment rates in recent years have been below the average for Victoria. SLAs showing comparatively high levels of unemployment include Colac Otway – South (6.1 percent), and Colac Otway – Colac (5.8 percent). The SLAs recording the lowest levels of unemployment are Colac Otway – North (1.6 percent) and Corangamite – South (2.3 percent).

Figure 3.2 shows that the bulk of employment in the study area is in:

- agriculture, forestry and fishing;
- retail trade;
- manufacturing;
- health and community services,
- accommodation, cafes and restaurants;
- construction; and
- education.

However, while employment has increased slightly in the retail trade and in health and community services, it has decreased substantially in manufacturing and in agriculture, forestry and fishing. Agriculture, forestry and fishing are the main industries of employment only in the Corangamite and Colac Otway Shires. This comes as no surprise considering the high proportion of land allocated to agricultural activity in these shires: 82 percent in Corangamite and 50 percent in Colac Otway. The employment categories in Figure 3.2 may obscure some pertinent information. For example, tourism, a major industry in the study area (see below), is not listed as a category, and many of the people employed in the 'Retail Trade', 'Accommodation, Cafes and Restaurants', 'Transport and Storage', and 'Cultural and Recreational Services' would consider themselves to work in the tourism industry.

Figure 3.3 shows that weekly household income in the study area has shifted substantially into higher income brackets between 1996 and 2001. There has been a large fall in the proportion of households with income of less than \$300 and a large increase in the proportion earning \$1000 to \$1499 per week. The extent of this shift clearly implicates the influence of factors other than inflation alone – presumably new residents generally have higher incomes than longer-term residents. It is unclear how much of the change reflects incomes of permanent rather than part-time residents.

Table 3.4: Employment in the Angahook-Otway study area, 1996-2001

Employment Status	1996	2001
Unemployed	983	731
Employed (full and part time)	10,812	12,385
In the labour force	11,795	13,116
Not in the labour force	8407	8203
Total	20,202	21,319
Unemployment rate (percent)	8.33	5.57

Note: includes persons 15 years and over

Table 3.5: Unemployment rates by region²⁰

Statistical Local Area (SLA)	Unemployment Rate (percent)					
	Dec 97	Dec 98	Dec 99	Dec 00	Dec 01	Mar 02
Colac Otway – Colac	10.5	8.3	9.6	8.2	5.4	5.8
Colac Otway – North	4.8	3.0	3.5	3.1	1.9	1.6
Colac Otway – South	8.9	6.8	8.7	8.5	5.5	6.1
Corangamite – North	7.2	6.1	6.5	5.5	4.1	3.8
Corangamite – South	4.3	3.7	4.0	3.6	2.3	2.3
Surf Coast – East	9.0	7.1	8.0	6.6	4.2	4.5
Surf Coast – West	8.9	7.9	7.8	6.9	4.7	4.8
Victoria	7.9	7.1	6.6	5.8	6.4	6.2

Figure 3.2: Total Employment (full and part time) in the Angahook-Otway study area according to Industry (ABS 1996 and 2001 Census)

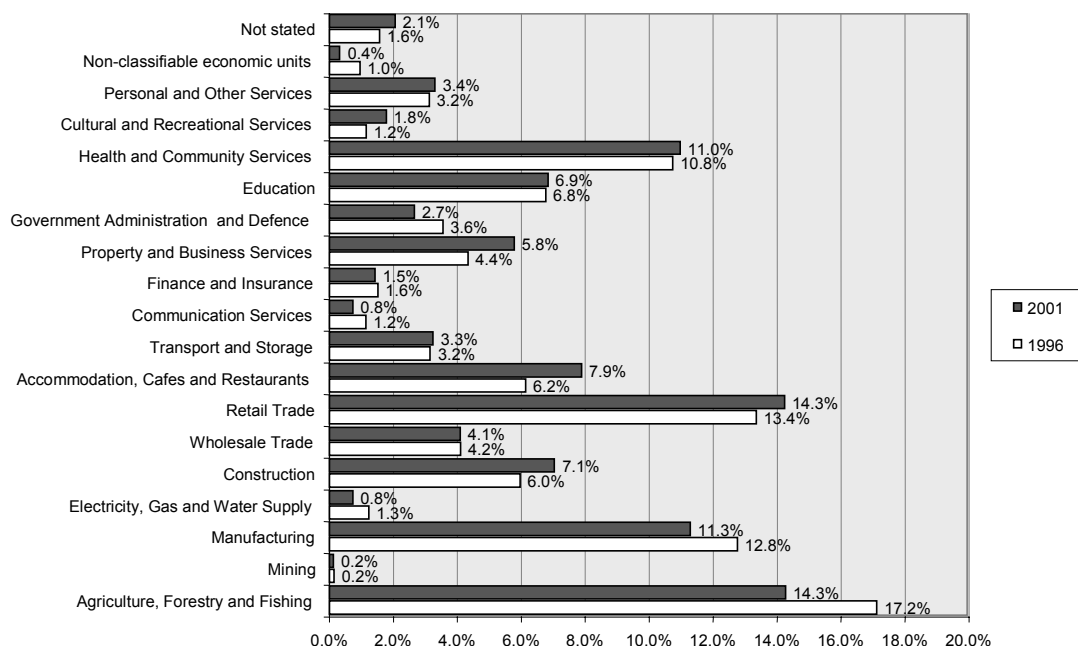
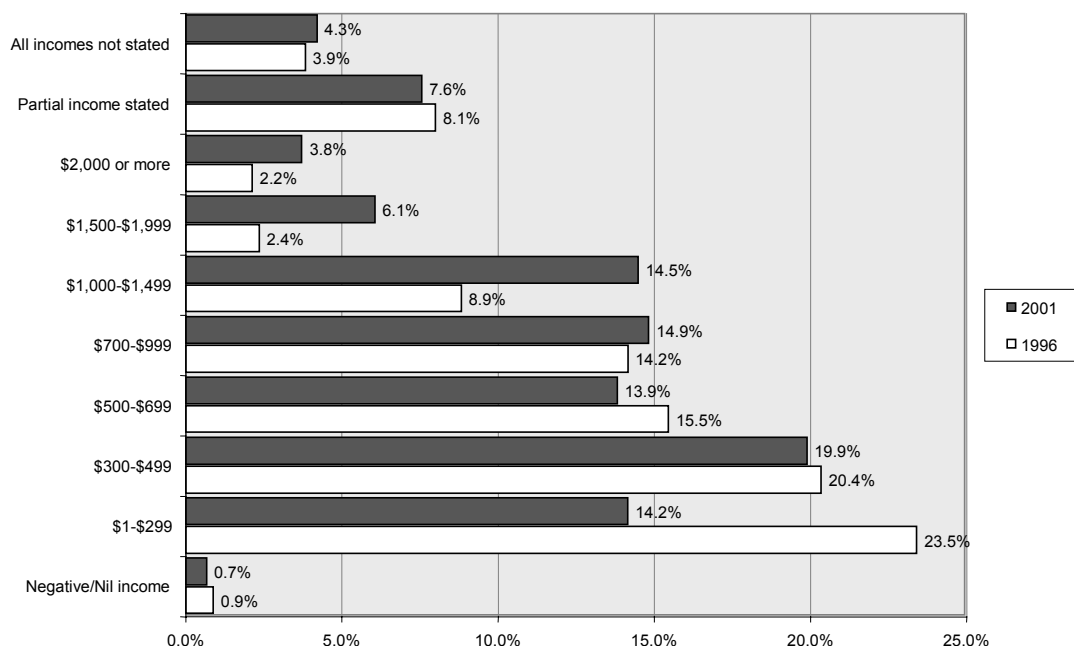


Figure 3.3: Weekly Household Income in the Angahook-Otway Study Area (ABS 1996 and 2001 Census)



RESOURCES AND USES OF THE ANGAHOOK-OTWAY STUDY AREA

Tourism

The region offers a combination of natural and developed tourism attractions for visitors to experience, and public land in the study area provides the basis for a diverse range of activities for tourists including bushwalking, picnicking, fishing, surfing, diving, forest drives, camping and four-wheel driving.

Tourism plays an important part in the economies of the shires within the study area and is currently a viable and fast growing industry. The Surf Coast Shire is the gateway to the Great Ocean Road, a favourite destination for families (28 percent of visitors) and younger solos (23 percent of visitors). Over two million people visit the Great Ocean Road annually, and the Twelve Apostles (just to the west of the study area) is the most popular Victorian tourist attraction outside Melbourne.²⁰ Apart from being a significant destination for international and domestic visitors,

the study area also accommodates a regular influx of visitors to holiday houses.

In 1995, a total of over 2.42 million people visited attractions along the Great Ocean Road. In 2000, Surf Coast Shire received 685,000 overnight visitor trips. Seventy five percent of these overnight trips were made in the Surf Coast – West SLA. Colac Otway Shire received 355,000 overnight visitor trips in the same year. There are approximately 190 tourist accommodation businesses in the Otways. They are mainly located in Anglesea, Apollo Bay, Lorne, and Colac²¹.

Reliable estimates of the numbers of people visiting public land are notoriously difficult to obtain. This problem is particularly acute in blocks that have many access points and especially when a major road, such as the Great Ocean Road, abuts or passes through a block. These are common problems in the Angahook-Otway study area. Accordingly, any data that is available should be treated as no more than indicative. Proceeding on that basis, Parks Victoria statistics indicate that Angahook-Lorne State Park was the most visited park in the study area in 2000/2001 (696,700 visit days), while Carlisle State Park was the least visited (1500 visit days). The estimates for Otway National Park and Cape Otway Lighthouse in 2000/2001 were 219,200 visit days and 51,400 visit days respectively.

The number of visit days to Melba Gully State Park is surprisingly high (183,400) given that the park is small and is not immediately adjacent to the Great Ocean Road but this figure is in line with the perceptions of local Parks Victoria staff and, given that there is effectively a single access point, is likely to be more reliable than most figures.

Timber Production

Native Forest Production – Public Land

The nature of timber production on public lands has changed significantly over the last twenty years in the

Otways. In 1980, 80,000 cubic metres of sawlogs were extracted; today, there is a licence for 27,000 cubic metres per annum of sawlogs. Residual logs are also harvested from the region with around 60,000 cubic metres to 70,000 cubic metres per annum typically harvested in recent years. Such logs are mostly used to create pulpwood and woodchips for the production of paper products.

Relevant Victorian government policies relating to public native forests include the "Our Forests Our Future" policy statement of forest management reform, released in February 2002, which, amongst other things, aimed to reduce the volume of hardwood production to sustainable levels across the state and reform some departmental management practices – including the creation of Vic Forests and a new licensing and pricing system. More recently the Government has announced that there would be an immediate reduction of woodchipping and logging in the Otways by 25 percent (following the surrender of a major timber licence), additional reductions as further licences are surrendered or expire, with a complete exit from native forests by 2008. Unless surrendered or bought out, existing licence commitments remain in place until 2008.

In addition to the production of eucalypt sawlogs and woodchips, the public land forests are an important source of specialty timber, firewood, timber for fencing, poles and spars, hobby wood, logs for competitive wood chopping, and tea-tree stakes. Firewood is harvested by commercial firewood cutters as well as by individuals – and mostly supplies local markets including Geelong and Colac. Specialty timbers, predominantly blackwood, are mostly sourced during eucalypt logging programs, with the other forms of forest product mostly harvested from the foothill forests on the northern flank of the Otways.

Recent production figures for wood products other than sawlogs and woodchips are presented in Table 3.6.

Table 3.6: Production Figures for Wood Products other than Sawlogs and Woodchips

PRODUCT	UNIT	QUANTITY			
		1999/2000	2000/01	2001/02	2002/03
Bush sawn/split timbers	pieces	340	125	0	0
Round timbers	pieces	151	15	110	not available
Craftwood	cubic metres	12.75	6.5	not available	6.14
Chopping logs	cubic metres	0	0	0	50
Firewood – commercial	cubic metres	2239	2392	2359	3986
Firewood – domestic	cubic metres	1425.5	819.5		
Poles	lineal metre	20	0	0	36
Posts	lineal metre	not available	not available	not available	345
Tea-tree	lineal metre	39,692	25,509	not available	23,790
Xanthorrhoea fronds/heads	bunches/number	1100	not available	700	400
Total Value	\$	21,966	20,736	16,897	29,144

Source: Department of Sustainability and Environment

Native Forest Production – Private Land

It is estimated that in 2001/02 around 14,000 cubic metres of sawlogs came from private native forests in the Colac Otway region including some small volumes from plantation trees, such as sugar gum on private land. This volume may vary from year to year. It is not known how sustainable this volume of resource is.

Plantations on Private Lands and Agroforestry

Softwood plantation forestry on private land is made up of sawlog plantations (around 6000 ha), but increasingly plantations, created under various investment and leasing arrangements, are being developed for blue gum wood chip production. Sugar gum plantations and shelterbelts on the volcanic plains area are a legacy from the 1890s onwards and have traditionally been used for firewood. They are now being recognised as a potential sawlog resource (by the Corangamite Farm Forestry Project, for instance). Christmas trees are also produced.

Agroforestry is the integration of farming and forestry to create sawlogs, veneer logs, high quality furniture timbers and fibre or pulpwood. This activity is currently expanding with strong promotion through the Otway Agroforestry network and the Corangamite Farm Forestry network. The Government has identified that substantial areas of land are suitable for agroforestry within the region.

The West RFA Private Sawlog Farming Project is seeking to invest state funds in either establishing hardwood sawlog plantations or changing management regimes on current blue gum plantations – with a view to replacing dependence on native forests.

Public land issues of particular relevance for plantation managers include the need for active fire prevention and adequate resources for suppression, control of noxious weeds, maintenance of access, and honouring of existing public land licences and leases.

Processing Plants

Wood harvested from the study area is generally processed locally. Hardwood processing plants for sawn timber are located at Colac and Geelong (2 mills), with softwood processing plants for sawn timber located at Cobden, Colac (two mills), Barongarook, Forrest, Lorne, Geelong, Buninyong and Ballarat (3 mills). Plants at Ballarat also produce particle board and treated timber; the Geelong plants also produce woodchips and pulp/paper; and treated timber and woodchips for pulp/paper is produced at Colac. Local timber resources are particularly important to the mills at Colac, Forrest and Barongarook. Downstream businesses include the manufacture of furniture from specialty timbers, such as at Otway Blackwood Furniture in Lavers Hill, which has operated since 1976.

Economic Contribution

Together all of these sectors of the timber industry contribute approximately \$82 million in value of production and employ 390 people in the Colac Otway Shire (which includes the town of Colac which is technically just outside

the study area). Industry within Corangamite and Surf Coast Shires is much smaller. In addition to mills at Colac, Forrest and Barongarook, approximately 16 local businesses – at Colac, Barongarook, Forrest, Kwarren and Barwon Downs – are involved in native sawlog harvesting, transportation and forest roading.

Key Points

Timber production in the study area consists of a number of sectors, with the regional industry less dependent on native forests than in the past. Logging and woodchipping are to be phased out of the Otway forests by 2008.

Public land native forests are also used for the production of forest products such as specialty timbers, firewood, timber for fencing, poles and spars, hobby wood, logs for competitive wood chopping and tea-tree stakes.

Discussion Point

Which areas of public land forests are particularly important for forest products such as specialty timbers, firewood, timber for fencing, poles and spars, hobby wood, logs for competitive wood chopping and tea-tree stakes?

Extractive Industry

The extractive industry produces crushed rock, sand, gravel and clay, mostly for building, construction and road-making, as well as stone blocks and slabs for decorative use in buildings, paving and monuments. The industry is of significant economic importance as a provider of essential materials as well as being of high monetary value. In general, stone resources are sought close to where they will be used to reduce transport costs.

Hard Rock Construction Materials

Crushed rock products are used for an array of purposes including aggregates for road surfacing, crushed rock for road base construction, bedding materials for dam construction and pipe laying, and armour stone for embankments. Each such application requires stone of defined size and properties, with basalts the most widely used material. Extensive reserves exist across most of Victoria.

Within the study area the widely distributed Otway Group sandstones produce rock that is well suited for crushing. It is cheaper than crushed basalt and is used for road-making. Extensive sources of scoria (which is the cheapest source of crushed rock) occur on private land and are used in the west of the study area. Extensive sources of basalt also occur on private land to the north of the study area, and are used to produce the high quality sealing aggregate preferred by VicRoads for finishing main roads and highways.

Limestone is also used for road-making material and for agricultural purposes, with small pits located at Princetown, the mouth of the Aire River and Cape Otway.²² Extensive, high quality resources are found to the west of the study area between Princetown and Warrnambool.

Soft Rock Construction Materials

Gravels and sand of colluvial (down-slope deposits), alluvial (deposited by water action), and aeolian (wind blown) sources are cheap to extract and are suitable in relatively unprocessed form for low-grade road-making applications and for track use on dairy farms and as filling materials for construction. Sand with appropriate properties and processing is used for cement manufacture, mortar, and paving.

Sand and gravel deposits are widespread within the study area, especially in Wangerrip Group sediments which outcrop along the western flank of the Otway Ranges. Very large reserves of sand and gravel are also known on the east of the study area in the Alcoa lease area,²³ with significant dune sands occurring at a number of localities including at Cape Otway.

Sand and gravel from the Eastern View Formation is quarried extensively for concrete and road construction materials in the Gherang area.²⁴ Sand from Benwerrin and Wensleydale is used for sub-base road material. Sand and gravel from near Carlisle River is used for road-making and concrete production, and sand has been commercially extracted from the beach at Skenes Creek.²²

Clays are used in the manufacture of bricks, pavers, pipes and roofing tiles. In the past, several small clay pits near Elliminyt and Yeo supplied a brick factory in nearby Colac.²² While no clay is presently quarried in the study area, both Wangerrip Group and Otway Group sediments are considered to have large potential clay resources.²⁵

The sand and gravel resources of the study area have considerable potential to continue to produce large quantities of material.

Dimension Stone

Dimension stone is natural stone cut to specific proportions for use in the building (especially, for cladding), construction (paving) and monumental industries. Stone is also increasingly used for the manufacture of bench-tops and other furniture. Within Victoria, basalt, granite, sandstone, limestone and marble have been quarried as dimension stone, with a major expansion of the industry in the 1980s responding to local demand for natural stone (mostly granite and basalt) for building and paving. A significant proportion of dimension stone currently used in Victoria is sourced from interstate or overseas.

Barrabool sandstone, a widely used construction stone (although of highly variable durability), is quarried west of Geelong from sandstones of the Otway Group.²⁶ Similar sandstones occur throughout the study area. Sandstone was quarried from Parker River (now in the Otway National Park) for use in the construction of the Otway lighthouse.²⁶ Sandstone dimension stone was also produced from quarries at Wongarra,²² and high quality sandstone has been extracted for the past 40 years from a small quarry to the north of Aireys Inlet at Lookout Hill on the Bambra Road. This quarry is within but pre-dates Angahook-Lorne State Park. It has government approval to

continue operating and is subject to a work permit application under the Extractive Industries Development Act 1995. Potential for locating additional sources of dimension stone is considered high.²²

Public Land Tenements

Stone resources are owned by the landowner and extraction requires, with some exemptions, a work authority under the Extractive Industries Development Act 1995. A key exemption (under Section 5 (1) of the Act as gazetted on 16 April 1998) is the extraction or removal of stone from land to a depth of two metres and area less than 2000 square metres. As a consequence, no location or production data are available for such extractive activity.

Under the *Extractive Industries Development Act 1995*, the following areas are not available for production of stone (which includes all extractives):

- land in a reference area (under the *Reference Areas Act 1978*);
- land in a national park, wilderness park, state park (under the *National Parks Act 1975*) – although stone production may be allowed to continue if a pre-existing extractive tenement is current at the time of park establishment;
- land that is an Aboriginal place (under the *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984*); and
- land that is an archaeological area or contains registered relics (under the *Archaeological and Aboriginal Relics Preservation Act 1972*).

The *Extractive Industries Development Act 1995* also specifies areas for which the consent of the Minister for the Environment is required for stone production: mostly areas subject to the *Crown Land (Reserves) Act 1978* (such as nature conservation reserves and natural features reserves), the *Heritage Rivers Act 1992*, and the *Water Act 1989*.

Currently there are seven work authorities substantially covering public land. These include four privately-held tenements, with the Surf Coast Shire holding two tenements and DSE holding one. Of these, five tenement holders extract sand and gravel resources from the Gherang Gherang Stone Reserve, north of Anglesea (see Map A). These seven tenements cover an area of 137.5 ha. An additional privately-held work authority for the extraction of sand and gravel lies within the Alcoa lease area.

Government agencies, such as VicRoads and municipal councils are major users of public land stone resources. As well as gravel resources, DSE's Forests Service makes use of Otway Group sandstones for the maintenance of forest roads and tracks.

There are eight stone reserves in the study area, which are used mainly to produce crushed rock and gravel for road-making. They are located on the western and northern flanks of the Otway Ranges. Such road-making material is also sourced from roadside borrow pits or as a by-product of road works. The eight stone reserves cover an area of 188 ha.

Key Points

Extensive stone resources occur throughout the Otway Ranges as well as on its northern flanks. These resources are a key source of local road-making material.

The potential for locating additional sources of dimension stone within the Otway Ranges is considered high.

Discussion Point

In response to concerns that conflicting land-uses were adversely affecting the ability to develop earth resources in and around Melbourne, 'Extractive Industry Interest Areas' were identified and included in planning schemes as a matter to be taken into consideration. Should 'Extractive Industry Interest Areas' be defined within the study area, and, if so, where?

Mining (Production of Minerals and Petroleum)

The supply of minerals is essential for many facets of our lives. Moreover, the export of minerals is a significant producer of wealth for Australia. Within Victoria the production of gold, brown coal and petroleum has long been a vital part of the economy, with mineral sands production likely to also become important. Few mineral deposits have, however, been identified in the study area. The closest large-scale mining activity is at Anglesea where extensive deposits of brown coal are being mined. All minerals belong to the Crown until transferred under the authority of a miner's right, or mining licence or petroleum production licence.

Map 8 shows the boundaries of all current mineral and petroleum tenements within the study area. There are no active mining licences or petroleum production licences over public land in the study area, nor any current exploration licences for minerals over public land. Three petroleum exploration permits currently encompass public land areas.

The administrative framework for mining in Victoria is set out in the *Mineral Resources Development Act 1990* which, in terms of access to public land, specifies similar terms to those for the extractive industry. That is, reference areas, Aboriginal places, national, wilderness, and state parks, archaeological areas, and registered relic sites are 'exempt' from exploration and mining except under approved pre-existing tenements. In addition, the consent of the Minister for the Environment is required for exploration or mining in many areas subject to the *Crown Land (Reserves) Act 1978* (such as nature conservation reserves and natural features reserves), and the *Heritage Rivers Act 1992*.

Metallic Minerals

No known deposits of metallic minerals (such as gold) occur in the study area and recent mineral exploration has been largely unsuccessful.²²



Map 8: Angahook-Otway Extractive Industry, Mining and Petroleum Tenements

LEGEND

- Angahook-Otway Study Area Boundary
- Major Roads
- Minor Roads
- Public Land
- Licensed Plantation
- Work Authorities and applications (Extractive Industry)
- Mining Lease (Alcoa)
- Mining Licence
- Petroleum Exploration Permit

Note: The majority of the study area, apart from 'exempt areas' is covered by current exploration licences for minerals or applications for such licences.

0 5 10 Kilometres

Map prepared by Victorian Environmental Assessment Council, Sept 2003.
DSE/DPI retains copyright on data sets.

Non-metallic Minerals (Industrial Minerals and Gemstones)

Bentonite occurs in the study area. It is a high-value clay with a number of specialty uses including as a bonding agent in foundries and in drilling muds. The major bentonite deposit in the study area is located south of Gellibrand (on Charleys Creek), with reserves of about 71,000 tonnes proven.²⁵ Bentonite has also been reported at Kavarren and Anglesea (at Soapy Rocks) and may occur elsewhere in the Otway Ranges.^{22,27} Extensive resources of higher economic potential occur elsewhere in Victoria and none of the deposits in the study area have been exploited commercially.

While phosphate has been found in geological formations at the mouths of the Aire and Gellibrand Rivers and near Birregurra,²⁵ the economic potential of phosphate in the study area is low – extensive exploration for phosphate was undertaken in the 1960s and while many phosphatic horizons were located, none were of any economic significance.²⁷ Small zones of phosphate mineralisation also occur – for example, phosphate nodules (which may contain phosphate mineralisation) have been recorded at Point Addis, Anglesea and Princetown.²⁸

Tertiary deposits of quartz rich sands, such as those on the north-western flank of the Otway Ranges and in the Aire district, have excellent potential for the production of high-grade silica.²² Largely untapped resources of quartz sand also occur in the brown coal overburden at Anglesea.²⁷ Beach sand at Anglesea is reported to contain the heavy metals zircon and rutile, but they are insignificant compared to the resources of the southern Murray basin.²⁷ Potential mineral sands resources are being sought under current exploration licences in the west of the study area.

Limestone occurs in the Kavarren – Gellibrand area, the Aire District, and the Aireys Inlet and Torquay areas, with the outcrop north of Kavarren the only resource quarried commercially.²⁷ In the past, the limestone here was burnt in kilns to produce building lime and later agricultural lime. Extensive high quality limestone deposits occur to the west of the study area and at Geelong.

Jarosite (which is used as a paint pigment) was mined near Point Addis in 1871 and later between 1926-1927,²⁹ and may also occur in suitable sediments at Wensleydale and around Yan Yan Gurt Creek.²²

Exploration for uranium was undertaken in the 1970s but no signs were found.²²

There are no commercial gem stone deposits in the study area, although agates (notably agates known as 'moonies') and other semi-precious stones (including jasper; topaz, garnet, tourmaline and zircon) are found in beds of conglomerate material and beach gravel in and around Moonlight Head.²⁸ Sapphires were recorded last century from a tributary of the Gellibrand River near Cape Otway.²⁸

Zeolite specimens have been recorded from Otway Formation sediments at Point Castries (near Eastern View) and at Cape Lewis (between Blanket Bay and Cape Otway) – and the Otway Formation sandstones are considered to be worthy of further investigation.³⁰ Zeolites are used in a range of agricultural and pollution control applications.²⁷ Peat is mined to the south of Pirron Yallock under authority of a mining licence.

Fossil Fuel Minerals

The study area lies within the Otway basin – an area with proven oil and gas reserves. Oil and gas is currently being produced from fields to the west of the study area around Port Campbell and exploration for hydrocarbons is continuing. Prospects to the east of the Otway Ranges (the Torquay sub-basin) offer less potential.²⁹ There are a number of current petroleum exploration permits covering much of the study area outside the Otway Ranges themselves.

According to a 1902 report, coal seams were mined from adits in the Skenes Creek and Wild Dog Creek valleys north of Apollo Bay,²² and thin black coal seams have been located near Wangarrup. No economic seams have been located here or elsewhere in the study area, despite considerable exploration.

Reserves of high quality brown coal are present in early Tertiary sediments (Wangarrup Group) outcropping round the Otway Ranges between Gellibrand and Anglesea. While a number of mines have been worked in the past, a mine on the eastern edge of the study area at Anglesea, first mined in 1959 by Roche Bros Pty Ltd, is the only current operation.²⁴ The coal is now extracted from the Anglesea mine by Alcoa of Australia Ltd (Alcoa) and since 1969 has been used in the adjoining power station to generate power for its aluminium smelter at Point Henry, Geelong. This 160 megawatt power station generates about 41 percent of the total electricity needs of the smelter and rolling business at Point Henry. Surplus power is transferred into the state grid. This coal field is the highest-grade large brown coal deposit in Victoria.²⁹ Alcoa operates the mine under the site-specific *Mines (Aluminium Agreement) Act 1961*, which provides Alcoa with a 50-year lease (from 1961) over the resource with a right of renewal for a further 50 years. The legislation also allows for the extraction of sand and gravel from overburden material prior to the extraction of coal. The power station and coal mine activities cover about seven percent of the lease area. While coal reserves extend throughout the lease area, not all of the reserves are economically mineable. In the late 1970s and early 1980s exploration found large sources of brown coal to the north east of Anglesea, but these are considered uneconomic due to their depth (30–140m).³¹ As brown coal tends to spontaneously catch fire, it is usually used near the mine and mostly burnt for the production of electricity.

An overview of known brown coal reserves and mines are shown in Table 3.7.

Table 3.7: Known brown coal reserves and mines^{25,22,32}

Locality	Known Reserves (tonnes)	Past and Present Use
Anglesea (most of these reserves are just outside the study area)	100,000,000 plus	Generally around a million tonnes per annum is produced (Alcoa of Australia Ltd) – 1,069,000 tonnes in 2001/02. This represents 1.6 percent of the total Victorian production in 2001/02. At an estimated value of \$8/tonne, production is worth about \$8.5 million per annum.
Benwerrin	75,000	An underground mine was worked at the turn of the century with 6715 tonnes of brown coal produced and later from 1943 to 1948 (4620 tonnes produced).
Deans Marsh – Bambra	1,000,000	Underground mine operated between 1901-1905 and 1950-1952 and in total produced 11,235 tonnes of brown coal.
Gellibrand	Unknown	
Kawarren	Unknown	
Wensleydale (Wombete Creek valley)	1,000,000 plus	An open cut mine operated in the 1920s (17,000t produced) and later from 1943 to 1959 (2,945,200t produced).

Coal Bed Methane

A number of companies are investigating the potential of extracting coal bed methane (the major component of natural gas) from coal in Victoria. The study area has been identified as having potential for coal bed methane and three companies hold exploration licences over parts of the study area.

It should be noted that coal bed methane is a mineral, and approvals for exploration and extraction come under the *Mineral Resources Development Act 1990*.

Key Points

There are no active mining operations in the study area (although a major brown coal field on public land on the eastern edge of the study area at Anglesea is mined).

Together with the Anglesea lease area, the study area contains extensive brown coal deposits (although small in comparison to the extensive, and readily accessible, deposits in the Latrobe valley). The extensive areas of Tertiary sands found in the study area have potential as a source of silica that could be used industrially, such as for the manufacture of glass products.

The study area may have a high potential for coal bed methane reserves.

Discussion Point

Should provision be made for additional exploration to be undertaken to explore sediments identified as potentially prospective for high value minerals prior to committing any such areas to land use categories that would preclude such exploration in the future?

Agriculture

Agriculture is one of the most significant industries in the study area – with forestry and fishing it accounts for 14 percent of the employment in the study area (Figure 3.2). Beef, dairy, sheep and cereals are the main agricultural products from the study area, with cereals mostly produced in the north-east part of the study area, and beef and dairying predominating in the west.

Of course, most of this production comes from private land which is outside VEAC's scope. While issues such as the management of fire, and pest plants and animals on public land clearly have the potential to impact upon adjoining farming enterprises, these issues are discussed in Chapter 5. The main relevance of public land to agriculture is in the licensing of various public land areas for grazing by domestic stock, generally cattle and sheep.

Public Land Grazing

There are 540 current licences for grazing domestic stock on public land in the Angahook-Otway study area, held by around 400 licensees (many people hold several licences). The licences cover 2040 ha in total, although not all areas or all licences are necessarily used for grazing – some are held for convenience, or to reduce the need for fencing, for instance. The largest grazing licence covers 56 ha, but 90 percent of licences are for areas of less than 10 ha, and most less than 3 ha.

Grazing licences mostly occur along public land water frontages and unused roads. Not surprisingly, the licences are concentrated along the water frontages and unused roads that are most accessible to farmland and generally held by the abutting private landholder. There are no grazing licences in any of the more extensive public land blocks,

which are less accessible to farms and have generally low grazing capability. Grazing licences in the Angahook-Otway study area are administered by Land Victoria within DSE.

Although grazing licences only occupy small areas, both in the context of individual farms and the whole study area, they are often important to farm operations as they can reduce the need for boundary fencing, provide additional grazing lands and enable a degree of control over lands that abut or cross farm holdings. However, grazing by domestic stock, particularly water frontage grazing, can have negative impacts on water quality and yields, and terrestrial and aquatic biodiversity, and can actually compromise agricultural production as a result of stock drinking fouled stream water³³.

Commercial Fisheries

The eel fishery is the only commercial wild harvest fishery that operates within the study area, although a number of important fisheries operate offshore and rely on the use of port facilities in the study area. There are also a number of land-based aquaculture operations within the study area boundaries.

Eel Fishing

The commercial harvesting of eel populations is a relatively small industry, despite this it is renowned for its international exports. The eel fishery across the state comprises three sectors – wild harvest, stock-enhanced and cultured-product (aquaculture). The harvest sector operates over rivers and lakes throughout the state, and is reliant on both artificially-stocked and natural populations. Controlled under the Fisheries Act 1995, the fishery operates under the *Victorian Eel Fishery Management Plan (2002)*.³⁴ Commercial eel fishers must be a holder of an Eel Fishery Access Licence.

Within the study area, waters have been allocated to two licensees. One has been allocated the lower reaches of the Aire River (downstream of the Great Ocean Road) and the other the Gellibrand River (also downstream of the Great Ocean Road). This represents about seven percent of the total stream length of the coastal waterways in the study area. The wild harvest fishery targets the short-finned eel, which is the only naturally occurring eel found in the study area.

The wild fishery is vulnerable to ocean-climate effects, habitat modification, instream barriers to migration, water extraction, pollution and poor water quality and the translocation of exotic organisms. Potential threats to natural values from wild harvesting of eels predominantly relate to bycatch, however, this has been mitigated by net design. In addition, sections of streams open to commercial eel fishing are generally restricted to estuarine reaches where populations of platypus (which may be harmed by harvesting equipment) do not usually occur.

As it has proved difficult to breed eels in artificial conditions, expansion of the industry relies on glass (young) eels being harvested and ongrown. To date, no permits have been granted in the study area for the collection of glass eels, no natural water-bodies are stock enhanced (for ongrowing

under natural conditions), and there are no licensed aquaculture operations. Some water bodies in the study area may be sought for the stocking and subsequent harvesting of eels. The current management plan proposes that eel fishery access licences be based on river basins rather than specific water courses. Within the study area only the Barham River is currently specifically closed to eel fishing.

Aquaculture

Several yabby farms have been established under aquaculture licence. All are located on private land. Possible future aquaculture of other species may seek the establishment of facilities on or across land adjoining the water although the operations themselves are likely to be on private land.

Offshore Commercial Fisheries

The waters offshore from the study area support abalone, giant crab, rock lobster and scale fisheries. The ports between Port Campbell and Barwon Heads landed approximately 14.5 percent of the landed catch of all Victorian managed fisheries in 2001/02.³⁵ Other than abalone divers (who operate from trailerable boats), most licensed commercial fishers based in the study area operate out of the Apollo Bay harbour or off the Lorne Pier.

The Commonwealth-managed South East Fishery, Southern Shark and ocean squid fisheries involve Victorian-based fishers and much of this catch is landed at Victorian ports including Apollo Bay.

Key Point

The eel fishery is the only wild harvest fishery that operates within the study area.



Apiculture

Much of the public lands of the study area are available for apiculture. In the past, bee keepers have used sites in the Otway National Park, throughout the State forests, and on other public land. Many of the sites previously used have fallen into disuse. Currently there are five designated apiary sites, of which two temporary apiary right sites at Anglesea (one is within the Eumeralla Flora Reserve and the other within the Eumeralla Education Area) are currently unoccupied. Of the three currently occupied public land apiary rights, two are held over land in the Alcoa lease area, and one in the Eumeralla Flora Reserve.

Bees from hives located on private land may make use of honey flows and nectar resources located within adjoining public land and the eucalypt species of the foothill forests have been identified as an important source of honey.³⁶

Recreation

The coastline of the study area has long attracted large numbers of people seeking beach-based recreation. Such use is highly seasonal, with a major influx over summer. The great majority of these people are visitors from outside the study area, predominantly from Melbourne. The forested areas of the hinterland are also increasingly used for recreation. Both the coast and accessible forest areas

attract those seeking more passive forms of recreation such as sightseeing and car touring.

Beach Activities (Surfing, Swimming, Wind Surfing)

Swimming and surfing are the most popular recreational activities undertaken in the study area. Large numbers of people also use the beach for beachcombing, walking, and sunbaking. Other water sports include wind surfing.

Most swimmers use sheltered sandy beaches (which generally coincide with coastal settlements), whereas those surfing generally target the lee side of headlands and reefs during periods of suitable swell. Some, such as those with young families, prefer to swim in the shallow, sheltered water found in estuaries at river mouths. Although beach activities attract many thousands of people, they are undertaken at a comparatively small number of localities – as most of the coastline is rocky and subject to strong swell, currents and rips and thus unsuitable for swimming. Few inland water bodies are particularly suitable for swimming. The presence of beaches patrolled by the volunteer members of surf life saving clubs is important to many swimmers. These clubs are affiliated with Surf Life Saving Victoria which also employs professional lifeguards. The organisation currently has 41 affiliated clubs and over 14,000 members (see Table 3.8 for clubs within the study area). The professional lifeguard service operates within the study area at Point Roadknight.

Table 3.8: Surf Clubs Affiliated with Surf Life Saving Victoria

Name of Club	Date Established	Average Annual Number of Rescues
Anglesea (surf life saving patrols are also provided at Point Roadknight)	1952	12
Fairhaven	1957	10
Lorne	1948	50
Wye River	1958	33 (2002/03)
Kennett River	1963	5
Apollo Bay	1952	8

Source: Surf Life Saving Victoria.

While swimming is largely confined to warm weather months, surfing occurs throughout the year. Bells Beach is one of the premier surfing localities in Australia and attracts international visitors as well as visitors from all round Australia and is regularly used as a venue for state and national competitions. The Torquay Board Riders Club, one of Australia's oldest surf clubs, stages club events at Bells and Winki Pop Beaches. Many reefs and headlands between Skenes Creek and Bells Beach offer conditions suitable for surfing, with the southern end of the Lorne beach and Fairhaven popular surfing beaches. To the west of Cape Otway, Johanna Beach is an important site and has been used for national surfing competitions.

A section of beach between Point Addis and Bells Beach has been prescribed as an 'optional dress area' under authority of the *Nudity (Prescribed Areas) Act 1983*.

Boating

Most boating activity occurs near the coast. Some of the more sheltered coastal bays, such as at Apollo Bay, Lorne, and Anglesea, are popular for off-the-beach sailing. The Apollo Bay Sailing Club offers competition sailing for off-the-beach and keel-boat classes. Boat ramps at Princetown, the Aire River estuary, Apollo Bay (in the harbour), and at Anglesea provide water access for trailerable sailing and power boats, which are used for sailing, fishing, diving, water skiing or cruising.

The study area is mostly unsuited for canoeing (the Barwon River is mainly canoed downstream of Winchelsea and the Gellibrand River is considered mostly uncanoeable).³⁷ However, the estuaries of larger coastal rivers are canoed, including the estuaries of the Gellibrand River (at Princetown), the Aire River, Painkalac Creek (Aireys Inlet) and the Anglesea River (at Anglesea). Sea kayaking is increasing in popularity.

Power boats and yachts with engines must be registered and operators of such vessels must be licensed. Club facilities on public land include those of the Anglesea Motor Yacht Club at Point Roadknight and the Lorne Aquatic and Angling Club at Point Grey. There is one licensed private boatshed and workshop located on the Aire River.

Bushwalking

Walking routes abound throughout the Otways. For example, the Geelong Bushwalking Club has published track notes for 55 walks around Anglesea and Aireys Inlet, Lorne, Kennett and Wye Rivers, Apollo Bay, Beech Forest and Forrest, Cape Otway and the Western Otways.³⁸ Walking is one of the most popular recreation activities in the Angahook-Lorne State Park, with over 90km of formed walking tracks. There are few designated walking tracks in state forest areas (total length of 12 km). Designated walking tracks generally offer short walks, as well as half day and day trips, along ridges and watercourses to features such as lookouts and waterfalls.

Walking is undertaken by residents and visitors, individuals, family groups and walking clubs, and participants in youth camps, although VEAC has been informed that overnight walks into parks and reserves for youth camps have been curtailed because of track closures (due to vehicle damage) and a lack of camping sites. A number of commercial operators also lead walks.

Walking groups do not consider that horse trails or vehicular tracks are particularly suitable for walking, and management plans for public land generally aim to provide separate designated walking tracks. In particular, the management plans for the Otway National Park and Angahook-Lorne State Park envisage the construction or formalisation of a number of walking tracks. In contrast, there are no designated walking tracks within Carlisle State Park. Walkers may be given priority of use over some former logging trails and fire protection tracks.

Opportunities for longer walks and, in particular, overnight walks are currently limited. However, since the mooted of a long distance walking track between Anglesea and Portland in 1989,³⁹ the 'Great Ocean Walk' has been developed along the

coast to the west of Apollo Bay and the 'Surf Coast Walk' developed (by Surf Coast Shire) between Torquay and Moggs Creek. A proposed route for a 'Trans Otway Walk' has been surveyed between Lorne and Apollo Bay. This latter route has been surveyed and promoted by the Otway Walking Track Association. A proposed route had been marked since mid 1998 and is designed to feature waterfalls and gorges (in total 20 waterfalls), mountain forests and streams, coastal views, and timber mill sites and former tramways. It is approximately 70 km in length and its supporters envisaged it becoming an 'icon walk' attracting visitors from around Australia and overseas who will choose to walk the track in sections or in its entirety (a 4 to 5 day walk). Such long distance walking tracks will require designated campsites.

The standard of existing walking tracks is highly variable – some tracks are considered of a high standard, others poor. Bushwalking groups have sought the improvement of walking tracks and the creation of new walking tracks. For example, the Otway Ranges Walking Track Association proposes 24 new walks and the Geelong Bushwalking Club Inc has also sought additional tracks.

Camping

Parts of the foreshore at a number of coastal townships have been developed as camping grounds. Such facilities are located at Marengo, Apollo Bay, Skenes Creek, Kennett River, Wye River, Cumberland River, Lorne and Anglesea. Usage is highly seasonal with the camping grounds often booked out over summer. These facilities permit large numbers of people to holiday in close proximity to the sea.

There are far fewer inland camping grounds. They generally offer a limited number of campsites and attract smaller numbers of people. Camping grounds are generally accessible by vehicle, although a number of 'walk-in' camping areas have been established to service bushwalkers. A summary of current inland public land campsites is given in Table 3.9. In addition, dispersed camping is permitted in the Otway National Park and State forest areas – no facilities are provided and campers are required to provide for all their needs. Many people and groups prefer dispersed camping to using formal camping grounds.

Table 3.9: Designated Camping Grounds on Public Land – Inland Localities

Location	Vehicle-based camping grounds	Walk-in camping grounds
Angahook-Lorne State Park	64	2
Beauchamp Falls Scenic Reserve	1	Nil
Otway National Park	4	1
Otway State Forest	2	Nil
Stevenson Falls Scenic Reserve	1	Nil

Note: Both figures for Angahook-Lorne State Park include the Allervale Mill Site Camping Ground which is located on Crown land adjoining the park and managed by Parks Victoria.

A full range of accommodation is available in the larger towns of the study area, including camping grounds and cabin parks at both coastal and inland localities.

A number of youth camps operate at Anglesea and elsewhere in the study area. Most were established on public land but are now freehold. Youth camps remaining on public land are Eumeralla Scout Camp (Anglesea), Belmont High School Camp (Tanbryn, north of Skenes Creek), Tallawalla Girl Guides Camp (Moggs Creek), and Patanga Park Scout Camp (Barongarook). Sport and Recreation Victoria's Anglesea Recreation Camp is also on public land. Youth camps offer educational, recreational and environmental programs.

Diving (Snorkelling, SCUBA Diving)

The eastern coastline provides protection from south-westerly winds and swells and attracts SCUBA divers and snorkellers seeking ship wrecks, underwater scenery and marine life. Divers may also take fish. Localities of interest include reefs off Cape Otway and Point Franklin, Blanket Bay, Hayley Reef (at Marengo), Cumberland River, Split Point and Eagle Nest (Aireys Inlet), Point Roadknight (Anglesea) and Point Addis. To the west of Cape Otway, the reefs at Moonlight Head and Rotten Point diving are utilised by divers. Snorkelling is mainly undertaken in the summer months, with both snorkelling and SCUBA highly weather-dependent.

Fishing

A range of fishing opportunities can be found within the study area, on inland waters as well as along the coastline. Spearfishing is undertaken where conditions are suitable.

Inland fish sought include native species, such as river blackfish and short-finned eel, and introduced species, such as brown trout and redfin. Inland water fishing localities include the Aire River, Carlisle River, Gellibrand River and tributaries (such as Love Creek), Barham River and Barwon River. No public waters within the study are currently stocked with fish.

Estuarine fish sought include eastern Australian salmon, black bream, estuary perch, and mullet. Localities fished include the of the Gellibrand, Kennett, Wye, Cumberland, Erskine, Painkalac and Anglesea estuaries.



Off the beach surf fishing and rock fishing is undertaken extensively along most of the coastline between Apollo Bay and Anglesea. To the west of Apollo Bay, access is more limiting but nonetheless good fishing is obtained. Fishing localities in this sector include Johanna, Glenaire (Castle Cove), the mouth of the Aire River, and Blanket Bay. Species such as mullet, eastern Australian salmon, black bream, flathead, King George whiting, snapper, sweep, mackerel, shark and silver trevally are targeted, with many other species also taken, including crayfish, abalone, barracouta, pike, garfish, leather jackets, rock cod, and parrot fish. Coastal fishing may also be undertaken from boats, piers and breakwaters. Indeed, the pier at Lorne is said to be "one of the best places in Victoria to fish from".⁴⁰

Fishers between the ages of 18 and 70 require a recreational fishing licence (with some exemptions as specified in the Fisheries Regulations 1998), and must comply with fishing regulations covering fishing equipment, bag and possession limits, size, closed seasons and localities.

Four Wheel Driving, Trail Bike Riding and Mountain Bike Riding

Many old logging tracks and fire protection tracks are available for public use. These tracks and the varied terrain of the Otways have particular appeal for four wheel driving and trail bike riding. Most such use is undertaken in an unstructured manner; with drivers and riders seeking challenging driving and riding, as well as access to places of interest (such as forests, waterfalls and scenic views) to visit and camp. Four wheel drive vehicles are also used to enable families and children to gain access into the forests – areas that they may not otherwise visit – to experience the flora, landscapes and history. Access to many tracks is restricted in wetter periods (to avoid track damage), with other tracks available and used all year round.

Clubs, including the locally-based Otway Trial Riders, the Otway Four Wheel Drive Club and the Geelong Four Wheel Drive Club, use the Otways for organised activities and trips. Clubs may assist the Department of Sustainability and Environment with revegetation, track clearing, reporting and rubbish removal.

Within the public lands of the Otways, four wheel driving and trail bike riding is restricted to formed vehicle tracks, although some trail bike riders would like to see areas designated for off road riding.

The vehicular tracks of the Otways offer an array of opportunities for mountain bike riding, with the Kewarren Regional Park an area of special interest.

A number of four-wheel drive tour routes have been promoted, including routes in the northern Otways, the Otway Ranges, in the Aire Valley, around Carlisle and through the northern foothills. These routes traverse park and state forest areas.

Horse-riding

Horse-riding is a popular activity undertaken by individuals or as part of club activities or commercial tour operations. Most horse-riding is undertaken by residents, and is particularly popular in the Aireys Inlet and Anglesea areas. The Angahook-Lorne State Park attracts local children as well as adult riders, with forest tracks and trails used on weekends and through the week. Some former bridle trails through the park have been closed because of unacceptable environmental impacts. Horse-riding occurs on tracks and trails elsewhere in the Otways, and is permitted on a number of beaches within the Otway National Park, as well as at Lorne, Aireys Inlet and Anglesea.

A number of commercial businesses such as, Sea Mist Horse Riding based at Winchelsea South, Blazing Saddles based at Aireys Inlet and Bimbi Park Trail Rides based at Cape Otway, offer trail rides through the Otways. Such operations attract school groups, international visitors, children with special needs and family groups.

Local horse-riding clubs and a horse carriage driving club based at Colac, also use the region, as do members of clubs based elsewhere in Victoria. When trail riding, clubs use designated tracks identified by markers tied to trees. The Anglesea District Riding Club operates on licensed Crown land on the Anglesea River on the edge of the Alcoa leasehold.

Hunting

Parts of the study area are used by recreational hunters who are required to hold both game and firearms licences and meet the requirements of regulations under the *Wildlife Act 1975*. Both pest animals and game species are targeted. Hunters use private land (with the owners permission) as well as public lands such as state forest. Three freshwater lakes on the Aire River floodplain comprise a designated state game reserve (the Aire River Wildlife Reserve) and used by duck hunters during duck season. Other game reserves just outside the study area include the Princetown Wildlife Reserve, Lake Thurrumbong (near Colac), Lake Dubban, Lake Gherang Gherang and Browns Swamp near Winchelsea. Hunters also shoot ducks along other rivers, such as the Gellibrand River.

A number of species of duck are declared game, with the pacific black duck, grey teal, Australian wood duck, Australian shelduck, chestnut teal and Australasian shoveler targeted by hunters. Commonly hunted pest species include rabbits and foxes. Red, fallow, and sambar deer are found in the study area and, according to the South West Victoria Deer Advisory Group, are valued by deer enthusiasts for their hunting and aesthetic values.





Nature Study (Bird Watching, Wildflower Study)

The heathlands, woodlands, forests and wetlands of the Otways offer many opportunities for nature study, and many local field guides and natural history books are available to assist in plant and bird identification and other aspects of natural history^{41,42,43,44,45}. The Angahook-Lorne State Park is of special interest to birdwatchers. Coastal heaths at Anglesea are of particular appeal for wildflower enthusiasts, with the impressive wildflower displays found in the Carlisle State Park also of great interest. Over a weekend in late September every year, Angair Inc holds its famous Annual Spring Wildflower Show in Aireys Inlet. Hundreds of visitors attend the wildlife art exhibition and the wildflower and other displays in the auditoriums, as well as enjoying guided walks to the most spectacular sites for wildflowers in the surrounding bush.

A number of nature trails have been developed including trails in the Otway National Park (at Maits Rest, Tall Trees, and Blanket Bay), Angahook-Lorne State Park (at Sheoak Creek and Distillery Creek), Melba Gully State Park (Madsens Track) and at Lake Elizabeth (Otway State Forest). These provide interpretative material and appeal to a wider range of visitors. A bird hide has been established in the Angahook-Lorne State Park near Aireys Inlet.

A number of friends groups have been established and undertake surveys and assist in other ways with the management of parks and reserves.

Sightseeing, Car and Bicycle Touring, Picnicking

Informal recreational activities such as sightseeing, car and bicycle touring and picnicking have wide appeal and are well catered for within the study area. Most visitors choose to visit during summer and autumn, although increasingly visitors arrive throughout the year.

The Great Ocean Road remains the focus of access for most visitors to the region and is popular in its own right for tourists, sightseers, photographers and cycling groups. Breathtaking views of the rugged coastline and Southern Ocean and lush forest landscapes are the main drawcards, but the cafes, shops and facilities of the Great Ocean Road coastal settlements complement the experience. The Shipwreck Trail – a designated route that follows the Great Ocean Road between Lavers Hill and Port Fairy – features 25 sites marked by road signs and information plaques featuring shipwrecks and is of interest for many.

Increasingly the inland forests and settlements draw sightseers. While craft shops, tearooms, markets, nurseries and a range of cottage industries all attract visitors, a number of local tourist drives specifically promote forest views, waterfalls and rainforest. Most are day-trip circuits commencing at Lorne or Apollo Bay, with the Great Ocean Road providing vital access to the roads into the Otway forests. Picnic grounds and associated short walks through fern gullies and towering trees are very popular with those seeking a rich range of experiences from their visit.

There is also an array of short walking tracks providing access to waterfalls, cascades and lookouts which often commence at picnic grounds. They are a focus of day visitor use. Some walks – for example to Erskine Falls, Kalimna Falls and Sheoak Falls (Angahook-Lorne State Park), the Maits Rest Rainforest Walk (Otway National Park) and the Triplet Falls Heritage Trail (Aire State Forest) – are particularly aimed at tourists. Recent initiatives are likely to encourage more visitors to the hinterland, most notably new walking tracks and other visitor facilities at Lake Elizabeth near Forrest, and the Otway Fly – a 600 metre long, elevated canopy walkway with associated facilities on freehold forest near Triplet Falls. Nonetheless, for the moment at least, most walks undertaken by sightseers (and residents) are still along the coastline and in and around the coastal settlements.

Picnicking is often undertaken in association with other activities. While natural features and views are sought out by visitors, the presence of facilities, such as picnic tables, car parking and toilet blocks, and easy access are also important determinants of usage. An overview of visitor facilities provided on public land at inland sites is provided in Table 3.10.

Many picnic areas and lookouts are located along the Great Ocean Road, with more remote parts of the coastline, such as the secluded coves and unspoilt sandy beaches of the Otway National Park, offering a contrast to the intensively used beaches and foreshores of the main coastal towns.

Other forms of recreation

Hang gliding and paragliding are undertaken at a limited number of coastal sites, including Johanna Beach, Moggs Creek and Demons Bluff (Anglesea). Some rock climbing and abseiling is also undertaken but there are limited suitable sites available. Small caves at Cape Patton, She-Oak Creek and Cumberland River offer limited opportunities for caving. Orienteering and rogaining events are held on occasion. Water skiing is undertaken at Point Roadknight (Anglesea) and Apollo Bay.

Agates and other semi-precious stones can be found along the beaches and bays near Moonlight Head, and designated fossicking area at Wreck Beach (within the Otway National Park) is of ongoing interest to gem collectors.

Sports requiring specific facilities are provided for in a number of coastal and inland towns. Such facilities are mostly located on public land and provide for golf, bowling, tennis, football, cricket, basketball and swimming. Many of these facilities are managed by local clubs and are used predominantly by residents. The Barongarook Shooting Ground (operated by the Victorian Field and Game Association – Colac Inc) and Barongarook Archery Range (operated by the Colac Otway Archers Inc) operate on licensed public land within the Barongarook forest, and another archery range operated by the Geelong Trophy Bowhunters Inc is located in the Wombete forest. A rifle range is also operated by the Geelong Rifle Range Association on the edge of the study area adjoining the Anglesea Flora Reserve within the Alcoa lease area. Finally, a speedway is operated by the Simpson Car Club on a leased block of public land south of Bungador, and a motor-cross track has been established on licensed public land in the Barongarook forest.

Table 3.10: Inland Visitor Facilities

Location	Picnic area with toilets (number)	Other formal day-visitor sites (number)
Angahook-Lorne State Park	5	4
Kawarren Regional Park	1	Nil
Melba Gully State Park	1	Nil
Otway National Park	5	5
Scenic reserves and other reserves	3	3
State Forest	3	1
West Barwon Reservoir Reserve	1	Nil

Key Points

Swimming and surfing are the most popular form of recreational activities, with most use occurring in a comparatively small number of locations.

Walkers, horse-riders and four-wheel drivers all seek the creation and/or maintenance of designated tracks for their use.

An array of recreational activity is undertaken – some areas are intensively used, other areas are valued for their remoteness.

Most existing public-land recreational facilities have been provided within the boundaries of existing parks and reserves.

Discussion Point

Are there specific areas of special importance or potential for particular forms of recreation?



Information Sources

(see 'References' section for full citations)

- ¹ Rowan (1990)
- ² Pitt (1981)
- ³ Ransome (1983)
- ⁴ Sandiford (2003)
- ⁵ Rawson et al. (1985)
- ⁶ Government of Victoria (1997)
- ⁷ Peel (1999)
- ⁸ Interim Marine and Coastal Regionalisation for Australia Technical Group (1998)
- ⁹ Koehn and O'Connor (1990)
- ¹⁰ Buckley (1993)
- ¹¹ Mitchell and King (in prep.)
- ¹² Rooney et al. (1992)
- ¹³ JANIS (1997)
- ¹⁴ Commonwealth of Australia and State of Victoria (2000)
- ¹⁵ Marchant and Higgins (1993)
- ¹⁶ Richards (1998)
- ¹⁷ Clark (1995)
- ¹⁸ LCC (1997)
- ¹⁹ Department of Infrastructure (2000)
- ²⁰ URS Australia and AgInsight (2002)
- ²¹ CCMA (2002)
- ²² Edwards et al. (1996)
- ²³ Cooney (1986)
- ²⁴ Abele (1977)
- ²⁵ LCC (1976)
- ²⁶ King and Weston (1997)
- ²⁷ McHaffie and Buckley (1995)
- ²⁸ Birch and Henry (1993)
- ²⁹ Douglas and Ferguson (1988)
- ³⁰ Birch (1989)
- ³¹ LCC (1985)
- ³² Anon (2003)
- ³³ LWRDRC (1996)
- ³⁴ Fisheries Victoria (2002)
- ³⁵ NRE (2002)
- ³⁶ DCE (1992)
- ³⁷ Jones (1988)
- ³⁸ Rose (2001)
- ³⁹ O'Shea and Byrne (1989)
- ⁴⁰ Knox (1977)
- ⁴¹ Pescott (1998)
- ⁴² Landy (1993)
- ⁴³ White (1989)
- ⁴⁴ White (1995)
- ⁴⁵ Foster and MacDonald (1999)

CHAPTER 4 COMMUNITY VIEWS

– AN OVERVIEW OF SUBMISSIONS

SUBMISSIONS

VEAC received over 470 submissions following publication of the Notice of Investigation, including 21 submissions received in September–November 2002 in response to the original Notice of Investigation for what was then the Angahook-Lorne Investigation. Such a large number of submissions at this early stage in the investigation clearly indicates a widespread depth of feeling for public land in the Otways and its future. Appendix 10 lists submission details.

Submissions came from as far away as Brisbane and Adelaide but most were from Victoria, with about a third from within or near the study area and the rest from other parts of Victoria. A wide range of matters and views were covered in the submissions, and there is a great deal of very useful information from people with intimate knowledge of the study area or particular public land areas within it. Collectively the submissions are an enormously valuable resource for VEAC, and the Council is extremely grateful to all who took the trouble to contribute to the investigation and make a submission.

This chapter summarises the issues and proposals presented in submissions, under several broad headings. While many submissions included specific proposals concerning particular public land areas or land uses, others were much more general in expressing their views.



Irrespective of the detail apparent in the following summaries, all submissions have been read by VEAC members and all relevant information and views in submissions will be taken into account in the development of Draft Proposals for the Angahook-Otway Investigation.

INVESTIGATION PROCESS

A significant number of submissions referred to the process for the investigation and VEAC's role more generally. A considerable number suggested that VEAC increase awareness of the investigation, particularly within the study area through public meetings, advertisements and letter-drops or mail-outs to all residents. Some flagged the importance of Warrnambool which, although quite a distance from the study area, draws much of its water supply from the Gellibrand catchment.

Public consultation forms an integral part of the VEAC's investigations and there will be three formal consultation and submission periods during the Angahook-Otway Investigation (see Chapter 1 for full details of the process for the investigation). The Notice of Investigation was published in statewide daily and weekly newspapers, and all local newspapers. This coverage will be repeated for the remaining stages of the investigation and will be extended to Warrnambool. In the order of 3000 newsletters were distributed to publicise the Notice of Investigation, including a mail-out to all contacts on VEAC's register of interest for the investigation. People who made submissions have been added to the register of interest, which now has approximately 2000 contacts, and each of these people will receive future mailouts. If you wish to be added to the register of interest, contact VEAC via the details inside the front cover of this Discussion Paper. A mail-out to all residents of the study area would not justify the enormous cost. Finally, VEAC will hold widely-advertised public forums and meet with stakeholder groups as the investigation progresses.

Many submissions proposed that the Community Reference Group established for the investigation reflect the broadest range of interest groups utilising public land in the study area. In particular, some submissions proposed that local interest groups be well-represented on the Reference Group. Establishment of a Community Reference Group requires a balance between achieving broad representation without ending up with large, unworkable meetings. The Community Reference Group which has been established for the Angahook-Otway Investigation (see Appendix 2) represents a balance between representativeness and workability, and Council is grateful for the involvement of the Group's members and the expertise and insights that they bring to the investigation. It should be understood that the Community Reference Group makes an important contribution to the investigation but ultimately, it is the Council which makes

decisions and develops the recommendations.

Several submissions proposed that VEAC specify any environmental, economic and social impacts that may result from its recommendations, and this will be done for both the Draft Proposals Paper and Final Report.

Several submissions commented that the Angahook-Otway Terms of Reference should be amended or that amendments to the Terms of Reference should be subjected to public consultation. This is to misunderstand the VEAC process. The process for a VEAC investigation starts with the State Government providing Terms of Reference to VEAC, then VEAC developing recommendations in response to those Terms of Reference (and in accordance with the VEAC Act), and then finally the Government either accepting, modifying or rejecting those recommendations. In each of these stages, the Government and the Council operate independently of each other, although they may keep each other informed of progress. That is, VEAC has no role in the development of Terms of Reference.

Key Points

The investigation Terms of Reference are outside the control of VEAC.

VEAC will ensure that opportunities for public consultation and involvement continue to be widely advertised.

INDUSTRIES

Timber Harvesting

One of the matters which VEAC must consider in the Angahook-Otway Investigation is the State Government's policies on logging and woodchipping in the Otways. Amongst other things, these policies have determined that logging and woodchipping will be phased-out of public land native forests (as opposed to leased and licensed plantations or freehold land) by 2008. The Terms of Reference also specify that one of the purposes of the investigation is to identify current state forest areas which would be suitable additions to the conservation reserve system 'once native forest logging ceases in the Otways'.

In other words, the phasing out of logging and woodchipping in the Otways, and the details of that phase-out, are essentially outside the scope of the Angahook-Otway Investigation. Nonetheless, this issue attracted much comment, with many submissions proposing either an end to timber harvesting on one hand, or continued timber production from public native forests on the other.

Tourism

The Otway region, and particularly the Great Ocean Road and associated attractions, is one of Victoria's major tourist destinations, drawing hundreds of thousands of visitors annually and supporting a major part of the region's economy.

Given the significance of tourism to the region's economy, a relatively small number of submissions mentioned the issue. Those that did mention tourism considered the promotion of tourism, particularly ecotourism, to be an important priority for the Otways and some submissions proposed the establishment of visitor interpretation centres at specific sites, including Otway National Park. Many submissions believed or implied that expanded parks would enhance tourism development, and nature-based tourism in particular. However, others argued that new parks would restrict some recreational opportunities and therefore discourage tourism.

Mining and Extractive Industries

Some proposals advocated that current access be generally maintained for extractive (that is, quarrying) and mining operations and exploration within the study area. Specifically, these submissions were concerned that creation of new national parks would decrease the area available for mining interests.

Other Industries

A small number of submissions considered other industries, including proposals for the promotion of bee-keeping within any recommended national parks.

Key Points

The Government's policy decision to phase-out logging and woodchipping cannot be altered by the VEAC investigation.


VEAC will take into account submissions received about the use of public land by industry in developing its draft proposals.

NATURE CONSERVATION

There were many submissions supporting recommendations to increase the protection of biodiversity and other natural values throughout the study area however, there were diverging views on the best method to achieve this protection. While most submissions considered reserve system additions to be the key means, others believed controls on existing uses were equally or more important.

Those who supported reserve system additions made proposals ranging from the protection of all public land areas in national or other parks to detailed suggestions for particular parcels. Other submissions called for the protection of specific areas (e.g. Aire River Valley, foreshores or intertidal zones), specific sites (e.g. Triplet Falls) or specific features (e.g. Cumberland River; rainforests), frequently without defining a particular public land category to achieve this protection.

The creation of a large, consolidated national park received significant support. Many considered this to be best achieved by linking the existing Otway National Park and Angahook-Lorne State Park, with or without additional areas added.



Although VEAC cannot consider private land, a few submissions proposed that strategic purchase of freehold lands around reserve boundaries should be undertaken to increase biodiversity conservation. Similarly, the establishment of wildlife corridors on public land (and private land for that matter, even though it is outside VEAC's scope) to address issues of fragmentation was a focus of several submissions. Areas flagged included Aire River valley and Rileys Ridge.

There was considerable support for the protection of old-growth forest in the study area. Many submissions proposed an immediate termination of logging of such forest, while others suggested that all old-growth forest sites be included in the reserve system, particularly within national parks. Similarly, there was considerable support for the protection of rainforest in the study area. Some submissions were particularly concerned about the potential impact that the fungal disease myrtle wilt could have on rainforest communities, including the role that timber harvesting could have in aiding its spread. A number of submissions sought the incorporation of rainforest sites into a national park. There was also concern that the Flora and Fauna Guarantee Action Statement for cool temperate rainforest has not been completed yet.

There was also a common focus on the protection of water catchments within the study area. The majority of submissions related to water catchments proposed that declared water supply catchment areas should be protected within a national park. A few submissions sought the protection of specific catchments, including Cumberland River catchment and Arkins Creek water catchment.

Other features identified as requiring protection included landscape values, Aboriginal cultural values and historic features, including timber industry relics.

A range of submissions suggested that current public land use should continue throughout the study area. Many of these proposed that current land use boundaries and conditions should remain. In particular, a number of these opposed any additions to the reserve system in general, with some specifically related to Otway National Park and Angahook-Lorne State Park. Opposition to new parks and reserves tended to be the position taken by those who would prefer that current land uses and permitted activities remain. It was perceived that the transfer of lands from state forest to the reserve system, particularly national parks, would severely restrict the range of uses permitted. Many of these submissions also referred to potential impacts that changes in land use recommendations could have on industries and recreational users.

Key Point

VEAC will take into account submissions received about ways of providing for nature conservation in the public lands of the study area as it develops its draft proposals.

PUBLIC LAND MANAGEMENT

Many otherwise dissimilar submissions believed greater resources and expenditure were needed to improve public land management. Several emphasised the importance of adequate funding and other resources for the successful implementation of any recommendations. Some sections of the community regarded increases in resourcing for public land management as a higher priority than additions to the park and reserve system, while others saw them going hand-in-hand. A few submissions were particularly concerned about a perceived lack of resources available to address fire and pest plant and animal issues on public land.

A few submissions presented proposals regarding specific aspects of public land management, particularly management of parks and reserves. These were mainly general suggestions to improve current management, such as increased involvement of indigenous people, greater community consultation in management or (as above) better resourcing.

The issue of adequate resourcing for recommendations is discussed further in Chapter 5.

RECREATIONAL ACCESS

A large number of submissions focused on recreational access issues. It was evident that a wide diversity of recreational pursuits are undertaken on public lands in the study area, including bush walking, fishing, four-wheel driving, nature study, horse-riding and hunting. Numerous submissions proposed that access be maintained for recreational users in general with no specific reference to land use categories. Several submissions were concerned with the potential threats posed by some recreational pursuits to natural and landscape values. One submission proposed that zones for gemstone fossicking be established in any national parks recommended.

Issues associated with recreational access, including four-wheel driving, are discussed more extensively in Chapter 5. Some points made in submissions that are not dealt with in Chapter 5 are discussed below.

Bush Walking

Bush walking is a significant recreational use of public land and substantial opportunities exist for walks of varying length and difficulty in the study area. Bush walkers proposed the development of several new walking tracks, including a Trans-Otway walking track connecting Lorne and Apollo Bay and other walks in the Apollo Bay and Gellibrand areas to augment the existing well-developed network of tracks providing visitors with opportunities to experience the beauty of the Otways' waterfalls, rainforests and scenic viewpoints. When they specifically mentioned public land categories, bush walkers supported expansion of the park and reserve system, and especially national parks.

Hunting

Recreational hunters and hunting groups are interested in maintaining current access to public lands in the study area for the purposes of hunting, particularly to state forest areas. One group proposed that access to current areas available for hunting should be maintained as a means of controlling pest animal species.

Fishing

Recreational fishing is generally permitted on public land and waters, including within terrestrial parks and reserves. Many waterways in the study area are popular with fishermen, and a small number of submissions proposed that those areas currently available for fishing should be maintained.

Horse-Riding

Horse-riding is a popular activity in the Otways and several submissions were related to this activity. It was proposed that public land managers, in conjunction with horse-riding groups, should be responsible for the development of a horse-riders' code of practice for the study area. Generally, riders are keen to continue being permitted to ride along public access routes in all public land use categories.

Key Points

Detailed day-to-day management issues of public land do not fall within VEAC's Terms of Reference.

VEAC will take into account submissions received about the best means of providing for desired forms of recreation as it develops its draft proposals.

THE GREAT OCEAN ROAD

The incorporation or otherwise of the Great Ocean Road into the 'single national park' generated a mixed response. Those in favour of its inclusion believed its tourism appeal and landmark status warranted its inclusion in a national park, or that incorporation in the park would increase protection of natural values adjacent to the road particularly when threatened by road works. Proposals opposing the incorporation of the Great Ocean Road into the national park expressed concerns regarding the possibility of a toll on road users, conflicts arising from the passage of the road through towns and limitations on road maintenance and upgrade activities.

This issue is discussed in detail in Chapter 5.



CHAPTER 5 STRATEGIC ISSUES

When undertaking an investigation, VEAC is required to consider a number of defined matters as well as issues raised in submissions. Some of these matters are issues of detail; others are of wider strategic importance. This chapter addresses some of the strategic issues relevant to the Angahook-Otway Investigation, with a focus on the role of public land-use planning. They are not in order of priority.



ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Section 18 (a) of the VEAC Act obliges VEAC to have regard to "the principles of ecologically sustainable development" (ESD) when making recommendations. ESD offers an integration of economic and environmental perspectives in decision-making. While support for ESD seems almost universal, its practical implementation is often difficult.

International and National Concepts of ESD

The concept of 'Ecologically Sustainable Development' (ESD) has developed over the past twenty or so years. A report of the United Nations World Commission on Environment and Development, the Brundtland Report, made it clear that the world's pattern of economic growth was not sustainable in ecological terms and advocated 'sustainable development', defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The concept was further refined in 1992 with the United Nations sponsored Agenda 21 Agreement and the associated Rio Declaration. The concept continues to be developed through bodies such as the United Nations' Commission on Sustainable Development.

Ecologically sustainable development was adopted in an Australian context when the principles of ESD were endorsed in a formal Inter-Governmental Agreement on the Environment approved in 1992. This Agreement commits all parties to pursue "the effective integration of economic and environmental considerations in decision-making processes, in order to improve community well-being and to benefit future generations".¹

By the end of 1992 all Australian governments had agreed to a National Strategy for Ecologically Sustainable Development specifying ESD as "development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations" (see Figure 5.1).¹

Figure 5.1: The Key Elements of the National Strategy for Ecologically Sustainable Development ¹

Goal

Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

Core Objectives

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life support systems.

Guiding Principles

1. Decision-making processes should effectively integrate both long- and short-term economic, environmental, social and equity considerations.
2. Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
3. The global dimension of environmental impacts of actions and policies should be recognised and considered.
4. The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised.
5. The need to maintain and enhance international competitiveness in environmentally sound manner should be recognised.
6. Cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.
7. Decisions and actions should provide for broad community involvement on issues which affect them.

The strategy envisages that these core objectives and guiding principles are part of a package and that "no objective or principle should predominate over the others".¹ Explicit reference to the ESD principles and objectives has subsequently been made in some Commonwealth legislation (such as the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*) as well as in some Victorian legislation. For example, a 2001 amendment to the *Environment Protection Act 1970* incorporated a series of 'principles of environment protection' which are closely allied to ESD objectives and principles. Similarly, the objectives of the *Fisheries Act 1995* include a provision for "the management, development and use of Victorian fisheries ... in an efficient, effective and ecologically sustainable manner", and the *Planning and Environment Act 1987* includes a planning objective which provides for the "sustainable use and development of land".

Application of ESD Principles

The application of ESD principles involves processes where decision-makers consider alternative ways of achieving their objectives that will best achieve ESD objectives – that is, pursue processes that will ensure that decisions improve welfare and well-being, increase equity, and protect and

maintain biodiversity and ecological processes. Of course, this is not to say that the best ongoing community outcomes may result in some individuals being disadvantaged in the short term.

The objectives of VEAC's current investigation are clear: to determine the boundaries of "a single national park in the Otway Ranges" and the boundaries of other public land suitable for state parks or nature conservation reserves. The challenge for VEAC is to determine boundaries that will indeed improve well-being, increase equity and better protect biodiversity.

While many endorse and support the application of ESD principles, implementation mechanisms vary between sectors and are still evolving. One technique recently developed by the Victorian Parliamentary Environment and Natural Resources Committee during its inquiry into the Utilisation of Victorian Native Flora and Fauna appears particularly relevant to VEAC's investigation. This technique applies a question set to generate information on existing and possible alternative scenarios directly relevant to ecologically sustainable development outcomes. A possible question set that may assist VEAC in its current investigation is outlined in Figure 5.2. As VEAC develops different

proposals for parks and reserves, each could be tested against the question set to help determine the combination of parks and reserves most likely to deliver the best ESD outcomes. While it is not a matter of passing or failing, some park and reserve scenarios may well better respond to ESD principles than others.

Figure 5.2: Suggested Question Set To Improve the ESD Outcomes of Investigation Proposals

Questions related to the status quo

1. What is the current status of parks and reserves in the study area?

Questions relating to the welfare and well-being of the community

2. What benefits do current parks and reserves contribute to the community?
3. Will these benefits be available to the community in the longer term?
4. Would additional parks and reserves improve the benefits for the community?
5. What alternatives are there to create equivalent benefits for welfare and well-being?

Questions relating to equity

6. How are the benefits from existing parks and reserves distributed between individual people, and between individual people and communities over time?
7. What flexibility is there to change who receives value (and what values they receive) in 5, 10 and 50 years time?
8. How do the benefits match the benefits needed by communities?
9. What factors could alter the fairness of this utilisation?
10. What alternatives exist that would create equivalent or improved equity?

Questions related to biodiversity and ecological processes

11. How do the current parks and reserves benefit the protection of biodiversity and maintenance of ecological processes?
12. Would additional parks and reserves improve the maintenance of ecological processes and the protection of biodiversity?
13. What research and scientific knowledge is available about the management of parks and reserves that is aimed at improving ecological processes and protection of biodiversity?
14. What alternatives exist that would create equivalent or improved maintenance of biodiversity or ecological processes?

Questions related to the integration of welfare, equity and biodiversity maintenance

15. Of the potential alternatives, which offers the greatest opportunity in terms of their capacity to maintain or improve well-being and equity and biodiversity and ecological processes?

Source: Based on a question set developed by the Environment and Natural Resources Committee.²

Key Points

ESD seeks not only improved ecological outcomes, but outcomes that provide equity and enhancement to community welfare and well-being.

ESD is not an objective measure that can be summarily assessed and met. Rather it is a process of integrated decision-making.

Discussion Point

Is the application of a question set a useful way for VEAC to ensure that regard is given to the principles of ESD and that the best ESD outcomes are obtained?

PROTECTION OF ENVIRONMENTAL VALUES

Many submissions supported an increase in the size and number of protected areas in the Angahook-Otway study area. Such submissions predominantly proposed the establishment of new national parks and/or the consolidation of areas to create larger national parks, mostly to protect biodiversity or particular natural values such as old-growth forests, rainforests, and habitat links. However, many submissions opposed the establishment of further parks, mostly on the basis that additional parks could overly restrict currently allowed activities. Some background to the protection of environmental values on public land is provided below.

Biodiversity Conservation

Biodiversity conservation is now a consistent and significant priority in land use planning and management. In particular, the maintenance of biodiversity is a major focus of local, State and Commonwealth governments. Biodiversity encompasses the full variety of nature, incorporating all life forms from communities to the individual genetic level, and includes ecological and evolutionary processes that relate organisms with each other and to their environment.

The Angahook-Otway study area contains a highly distinctive and valued environmental area within Victoria. It includes noted outliers of wet forest types and rainforest typically associated with the Great Dividing Range of central and east Victoria and extending into NSW. There are also many significant ecological affinities with Tasmania. The gradation of vegetation types with drier foothill forests inland and coastal vegetation types generates a region of rich variety, both in biodiversity and landscape values, and is of considerable biogeographical interest.

Rainforest

Cool temperate rainforest occurs throughout the Otway Ranges – in large stands as well as in isolated pockets. It contains a number of threatened species. One of the key tree species of this vegetation community, myrtle beech, is particularly susceptible to the myrtle wilt fungus caused by unnatural disturbance to its habitat.

The protection of all rainforest sites was proposed in a number of submissions, as was the provision of enhanced protection from logging impacts through increased buffers. It was also argued that an imbalance exists in that cool temperate rainforest (as well as areas of the wet forest EVC) occurs largely outside the dedicated reserve system. Certainly much rainforest occurs outside dedicated reserves, but all existing rainforest sites are, in fact, protected from timber harvesting either in dedicated reserves, in informal reserves or by prescription.

Habitat Fragmentation

Habitat fragmentation was frequently raised in submissions. Fragmentation refers to the patchwork pattern of vegetation on the landscape that is often created as a result of vegetation clearance. Fragmentation results in sharp boundaries between land-use types (e.g. forest versus farmland) and results in ecological communities being isolated. Patches may then be exposed to alterations in environmental conditions associated with edge effects (e.g. weed invasion from surrounding cleared land) and changes to ecological processes, such as when flowering plants are isolated from potential pollinators. Species in habitat fragments may be less able to cope with climatic change. Biologists generally accept that fragmentation is a risk factor in conservation and the reservation of large, consolidated areas is preferable.

At a landscape scale, much of the remaining public land, particularly in the north-west of the study area, is highly fragmented compared to the more consolidated areas of comparable vegetation types in the Great Dividing Range and eastern Victoria.

Old-growth Forest

Old-growth forest protection is now a recognised high priority for land managers, reflecting both its significance and general scarcity. Old-growth forest occurs in stands of similarly aged trees, with emergent old-growth trees also dispersed within younger forests. The main stands of old-growth forest are currently protected from timber harvesting in dedicated reserves, by designated special protection zones or by prescriptions.



Rare and Threatened Species

As detailed in Chapter 3, the Otway Ranges is a stronghold for several threatened species that occur more widely in Victoria, including the spiral sun-orchid, tall astelia (a lily), spot-tailed quoll, masked owl, and grey goshawk. Many other threatened species, such as the Anglesea grevillea, wrinkled buttons, Anglesea sun-orchid, rufous bristlebird and Anglesea mountain dragon, are largely or, in some cases, completely restricted to the Otways. Parks and nature conservation reserves may provide a vital core for such species and their habitat, but currently do not encompass all such sites, nor necessarily include the complete home ranges of more mobile species. Additional protection is, however, provided in management zones and by prescriptions.

Anglesea Heath

The (former) Department of Natural Resources and Environment and Alcoa of Australia Limited have signed a land management co-operative agreement that encompasses a large part of Alcoa's leasehold on the eastern edge of the study area. The aim of the agreement is to ensure that the Anglesea Heath is managed "in a like manner to the Angahook-Lorne State Park".

Key Points

The use of dedicated parks and reserves is one of the primary instruments for biodiversity protection. The creation of such reserves, however, is not always compatible with other objectives. Alternative mechanisms (such as management zones and prescriptions and land-use category overlays) can, and have been, applied.

Figure 5.3: Examples of Conservation Reserves

NATIONAL CAR RESERVE SYSTEM			
VICTORIAN CONSERVATION RESERVE SYSTEM	Dedicated Reserves	Informal Reserves	Protection by Prescription
	National Parks State Parks Nature Conservation Reserves Reference Areas Wilderness Parks Regional Parks (some) Natural Features Reserves (some)	Special Protection Zones of State Forest	Stream buffers as defined in the Timber Harvesting Code of Practice

Conservation Reserve System

An important aspect of the conservation of biodiversity is the development of a system of protected reserves. In Victoria, the existing conservation reserves system is largely a product of the work of the LCC and ECC who sought to represent all different vegetation types and land systems in permanently protected reserves (that is, reference areas, national, state, wilderness and some regional parks; nature conservation reserves; and some natural features reserves). More recently, as part of joint government forest management arrangements, the Commonwealth and all State and Territory Governments have adopted a 'comprehensive, adequate and representative' (CAR) reserve system. This system incorporates three different public land components:

- dedicated reserves* – conservation reserves with legislative protection;
- informal reserves* – areas under other secure tenure or management arrangement; and
- protection by prescription*.

Examples of parks and reserves included in the conservation reserve systems are shown in Figure 5.3.

The CAR reserve system is based on the application of defined criteria (the 'JANIS criteria').³ Amongst other things, the criteria set a target of 15 percent of the pre-1750 distribution of each vegetation type to be protected in the reserve system (see Chapter 6 for a summary of all JANIS criteria). The JANIS criteria were applied in the *West Victoria Regional Forest Agreement (RFA)*,⁴ which covered the entire Angahook-Otway study area (and beyond). As a result significant additional areas were given protection (through the establishment of a number of special protection zones and special protection zones in state forest), although no new permanently protected (dedicated) reserves were created. The representation of vegetation types in the current reserve system in the study area is tabled in Appendix 9, and discussed briefly in Chapter 3.

Key Point

All Australian governments have accepted the CAR reserve system approach and the associated criteria. The CAR reserve system targets on public land are ordinarily met by dedicated, permanent reserves, although where this is not practical they may be met by the creation of informal reserves.

National Park Selection and Design Criteria

In determining the boundaries of a "single national park in the Otway Ranges", VEAC is obliged under the Terms of Reference to consider the definition of 'national park' used by the former LCC and its successor, the ECC, as well as the objects of the *National Parks Act 1975* with respect to national parks.

The concept of national parks is now well established, not only within the Victorian community but Australia-wide and internationally. This is the legacy of many years of largely bipartisan political support, park-specific management agencies and legislation and, of course, the use and enjoyment of national parks, as they are currently defined and managed, by the wider community.

Since the 1970s most national (and state) parks in Victoria have been created in response to recommendations made by

the LCC and ECC. The definitions of national parks used by these bodies are "a substantial tract of nation-wide significance because of its outstanding natural environments and features, scenic landscapes, and diverse land types"⁵ and "an extensive area of public land containing highly significant natural values, and land and vegetation types"⁶. Appendix 1 provides additional detail on the definitions, objectives and criteria used by the LCC, the ECC and in the *National Parks Act 1975*.

Criteria

The LCC and ECC made consistent use of a number of park selection and design criteria. Table 5.1 outlines some of these criteria. As is noted in the next chapter, the application of any such theoretical criteria needs to be tempered by local circumstances.

Table 5.1: National Park Selection and Design Criteria Used in the Past

ELEMENT	CRITERIA
Boundaries	In general, boundaries follow major geographic features such as catchment boundaries or other easily identifiable features such as Crown land/freehold land boundaries or roads.
Contiguity	In general, a national park would comprise a large contiguous block of public land. Other approaches have, however, also been applied. A number of national parks consist of separate blocks of public land (for example, the Little Desert National Park consists of distinct blocks of land separated by cleared lands and roadways, as does the Greater Bendigo National Park). Other national parks consist of distinct large blocks connected by narrow corridors of land (such as the Alpine National Park and the Yarra Ranges National Park).
Ecological Integrity	Ideally the natural environments of a national park will be comparatively little modified, other than areas required to facilitate management or visitor access and related needs. However, most land in Victoria is the result of a history of human-induced change and modification, particularly in the last 180 years. While some relatively small or comparatively remote national parks (such as Burrowa-Pine Mountain National Park – 18,400 ha, or Coopracambra National Park – 38,800 ha) are relatively little modified, some of Victoria's larger parks (such as the Grampians National Park – 167,219 ha, and the Alpine National Park – 660,550 ha) encompass areas that have been heavily disturbed in the past.
Features and Values	Inclusion of native flora, fauna, natural features, archaeological and historical sites of significance, water supply catchments (where relevant), and associated features of recreational, tourist and educational interest and/or capability.
Permanency	An integral part of the internationally accepted definitions of national parks is that they be securely reserved and actively managed.
Representation	Collectively, national parks should contribute to the protection of the range of land and vegetation types across Victoria, and individually represent several land systems or ecological vegetation classes.
Size and Shape	Parks recommended by the LCC and ECC (and accepted by the Parliament), are mostly larger than 10,000 ha, with high area-to-boundary ratios. They generally avoid fragmented or linear shapes.

Key Point

The definitions of national parks currently used in Victoria are consistent with the definition of national parks used across Australia and that used by the World Conservation Union ("a protected area managed mainly for ecosystem protection and recreation").⁷

Discussion Point

Should the current criteria for national park selection and design criteria be used by VEAC in this investigation or be revised or changed?

Water Catchment Protection

The highest rainfall areas in Victoria are in the Otways, sustaining designated water supply catchments for major regional centres including Geelong, Colac and Warrnambool, as well as regional towns such as Apollo Bay, Lorne and Aireys Inlet. As a result, issues of water supply quality and yields, and catchment protection are especially important. In particular, there has been debate over the potential effects that forestry operations in catchment areas may have on the quality and quantity of water yields from the region.⁸ Many submissions proposed the protection of all water catchments, particularly in national parks or other conservation reserves. Some proposed that timber harvesting should cease immediately or have greater controls applied to protect water quality and yields.

Much of the system of water supply harvesting from the Otways is unusual in that it is not collected in large water reservoirs constructed across water courses, but instead draws water sourced directly from the natural flow of the river – a ‘run of river’ system. The available yield is therefore closely tuned to processes currently operating within the catchment.

The majority of the designated water catchments of the study area occur in state forest, where timber harvesting is currently permitted (although, as previously noted, this will be phased out over the next few years in accordance with government policy), and general public access is allowed. This contrasts with the closed water catchments designated for most of Melbourne’s water supply areas, where timber harvesting has not been permitted for many years and all public access is highly restricted. Within the study area there are, however, three upper catchment areas managed in a similar manner to closed catchments – Arkins Creek, Olangolah and West Gellibrand catchments. Where timber harvesting is permitted, its impact on water yields is mitigated by restricting harvesting to a small percentage of the catchment area in any year, increasing the duration of harvesting rotations, and the use of more frequent thinning regimes.

Mature forests, such as those dominated by wet forests of mountain ash have been shown to have higher water yield than younger forests, but their maintenance is reliant on the absence of fire. Closed catchments thus require a high-level fire response capability, including networks of well maintained roads, 24 hour surveillance systems and ready access to personnel and equipment, as well as management of fuel loads in adjacent areas.

Recreational activities can disturb soils and vegetation. Together with human waste and other waste products being deposited, such use can reduce water quality and increase the risk of unnatural sources of fire ignition.

Key Points

The highest quality raw water comes from catchments with mature forests where public access is restricted. Such catchments also deliver high water yields.

Catchments where intensive recreational use and extractive activities are not restricted still provide good sources of water but the water collected generally requires higher order treatment, such as the construction of settling reservoirs and chemical treatment, and may produce lower water yields.

Discussion Points

Should some forms of recreational use be restricted in domestic water supply catchments?

Should domestic water supply catchments be allocated to a specific land-use category where the production of water is the primary management objective?

Would national park status assist in delivering higher yields and quality of water?



MANAGEMENT OF THREATENING PROCESSES

All public lands require active management, whether within a park or not. Such management may involve dealing with resource conservation, visitor activity or consumptive uses (such as gravel extraction and timber harvesting). The management of threatening processes is an increasingly vital part of land management. Fire, infestation by weeds and pest species, and erosion can all have a detrimental effect on natural features and on assets located on public land. Relevant information on the environmental condition of Victoria's parks was published in 2000.⁹

The response to a threatening process will depend on the management objectives of the area. For example, in a pine plantation, pines are assets that need to be protected from fire. Whereas in a national park, pines are considered a pest species and would not be protected but actively controlled or removed.

A number of strategies are available for dealing with risk. Risk can be removed, reduced or managed.

Fire

Fires are a natural part of the Victorian landscape and have been for several million years. However, the forests of the Otway Ranges have been subject to altered fire regimes, the vegetation communities have been modified and many assets, including settlements, have been established through and adjoining the forests. Nonetheless there is no possibility of totally preventing wildfires in our eucalypt-dominated forests and woodlands.

The Role of Fire in Natural Systems

Some habitats need fire to retain their natural biodiversity, and for others fire is a severe threat. At one extreme, rainforests will generally require the long-term absence of fire. Mature forests dominated by mountain ash generally exist because intense fires created the conditions necessary to re-establish them 100 to 300 years ago; while younger ash regrowth has resulted from more recent fires. To maintain species composition in heathlands, plains grasslands or some other plant communities, more frequent

fire is needed. A mixture of fire intensity, extent, seasonality and interval is required to maintain biodiversity, the appropriate mixture varying with vegetation types. Furthermore, within vegetation types, different species may be dependent on different fire regimes: often a mosaic of burning patterns will maximise biodiversity.

Many plants have adapted to wildfire over millions of years and have various survival mechanisms. Some trees with thick bark may lose their canopy but survive the fire and grow new shoots from buds on the surface of the trunk and branches. Individual plants in other species may die but produce prolific seed, which take advantage of post-fire light, moisture and nutrients.

Native animals may survive fire through mobility, shelter, and survival in unburnt areas. Although many individual animals are killed, populations survive and generally recolonise burnt areas as they recover. Sometimes, species in isolated small populations occupying a narrow ecological niche, such as the tall astelia (lily) which occurs in only one place in the Otways, may be at risk in a major fire. On the other hand, wrinkled buttons (a species of daisy) was thought to be extinct, having not been recorded for over 60 years until several populations were found in the Lorne-Anglesea area in the years after the 1983 bushfires.

The fire regime of any given area is defined by the interplay of three factors – fire intensity, fire frequency and the seasonality of the fire.


Wildfires

On average over 600 wildfires start each year in Victoria's state forests, parks and reserves. About a quarter of these are started by lightning; human activities cause the remainder. Some fires are deliberately lit. Each year around 30,000 fires are responded to by the Country Fire Authority on freehold land on the urban fringe, in country towns and farmland. Grass-fires are common around settled areas and many accidental and deliberate fires start around settlements or on farms spread into adjoining public land and may spread onto adjoining public land.

Statewide figures for fire causes and relative area burnt from 1976 to 1996 on public land are shown in Table 5.2.

Table 5.2: Areas Burnt by Fire Causal Agency – Statewide Percentage Figures¹⁰

FIRE CAUSE GROUP	PERCENTAGE OF FIRES	PERCENTAGE OF AREA BURNT
Lightning strike	25.9	46.0
Deliberate lighting	21.4	13.5
Escapes – burning off	18.0	6.8
Escapes – campfire, BBQ	9.5	1.3
Cigarette, pipe, match	7.8	0.4
Other	17.4	32.0



People who live in areas adjoining, or close to, forests often fear wildfires from within the forest. A number of major wildfires have been recorded in the forests of the study area since European settlement, mostly when the forests were largely managed for timber production (the first national park was not created in the Otways until 1981), including fires in 1851, 1886, 1919, 1926, 1939, 1951, 1965 and 1983.

Fire Protection on Public Land in Victoria

The Department of Sustainability and Environment's Fire Management Branch is responsible for wildfire protection and fire fighting in state forest, national, state or other parks, reserves or other Crown land. Other bodies, such as the Country Fire Authority, Parks Victoria and plantation managers, assist in both fire prevention and fire suppression activities.

The published code of practice for fire management on public land states that all wildfires on or threatening public land will be brought under control, with the first priority given to restricting the spread of fire and protecting human life and property.¹¹ Detailed fire protection planning is set out in regional fire protection plans prepared by DSE. These plans outline strategies for wildfire prevention, wildfire preparedness, wildfire suppression and wildfire recovery.

An integral part of most fire protection plans is the maintenance of tracks for fire protection purposes. The Otway Forest Management Area Plan indicates that over 230 km of the Otway permanent road network is maintained primarily for fire protection purposes. Temporary tracks and firelines are constructed to aid suppression of wildfires and control regeneration and fuel reduction burns. These temporary tracks are generally closed and rehabilitated when the particular operation is completed.

Another integral part of most fire protection plans is the use of fuel reduction burning. The amount of fine fuel is one of the few factors controlling fire behaviour that can be regulated and can provide an effective way of reducing the rate of fire spread. Fine fuel is defined as burnable material less than 2 mm thick, and is a major factor in overall fuel hazard. This fuel largely comprises loose or shed bark, dead leaves, twigs and dry grass. The distribution of fine fuel is also important with elevated and loose fuel having a strong effect on the flame height and rate of spread of a fire. This fine material can also be carried by wind as burning embers, setting spotfires ahead of the main fire. Larger material such as logs and fallen branches may ignite as a fire passes and may burn for some time, but they generally do not contribute to behaviour of the fire front nor to the difficulty of controlling the fire.

Fuel Reduction Burning

Public land managers undertake fuel reduction burning (FRB) programs each year according to strategies set out in the regional fire protection plans, with specific fuel management burning targets specified for defined zones. Burns are conducted in a strategic manner to protect assets such as private and community property and vegetation such as rainforest or regenerating forest, or where such burns will assist with future firefighting operations. Fuel reduction burning does not remove all the fine fuel but does reduce the fuel load. On-ground fire

protection works are carried out by DSE with assistance from Parks Victoria and the Department of Primary Industries (DPI).

The right combination of fuel moisture, wind, relative humidity and temperature as well as weather stability are required for safe fuel reduction burns and these conditions only occur on a limited number of days each year. There are also other matters which limit opportunities for burning, including pollution (and hence health) issues particularly near population centres, issues related to peak tourist visitation times (especially high visitation numbers at festivals) and the fact that resources will always be limited.

According to wildfire researchers, "weather influences become more important than fuel conditions at higher levels of fire danger ... as overall fire danger increases, the benefits of FRB start to reduce [in relation to wildfire suppression operations]."¹² If weather conditions favour wildfire, fuel reduction burning will not prevent fire. The effects of fuel reduction burning also have a limited duration. Surface fine fuels can, in some forest types, re-accumulate to pre-burn levels within four years of a fuel reduction burn or wildfire.

Other Management Uses of Fire

Burning is also carried out for ecological reasons on public land (for example, in heathlands, some of which require regular burning for their survival). Fire is also used as a management tool to foster regeneration of forests following harvesting, and back-burning (where fuels are burnt ahead of the main fire front) is used as a fire-fighting tool.

Fire Hazard

Some parts of the study area are of particularly high hazard and other parts less so. Areas of myrtle beech forest and fern gullies on brown loamy soils are of much lower fire hazard than open forests and woodlands of stringybark and peppermint on soils that readily dry out (for example, sandy loams). Vegetation on north facing ridges may be especially fire-prone in dry years.

Key Points

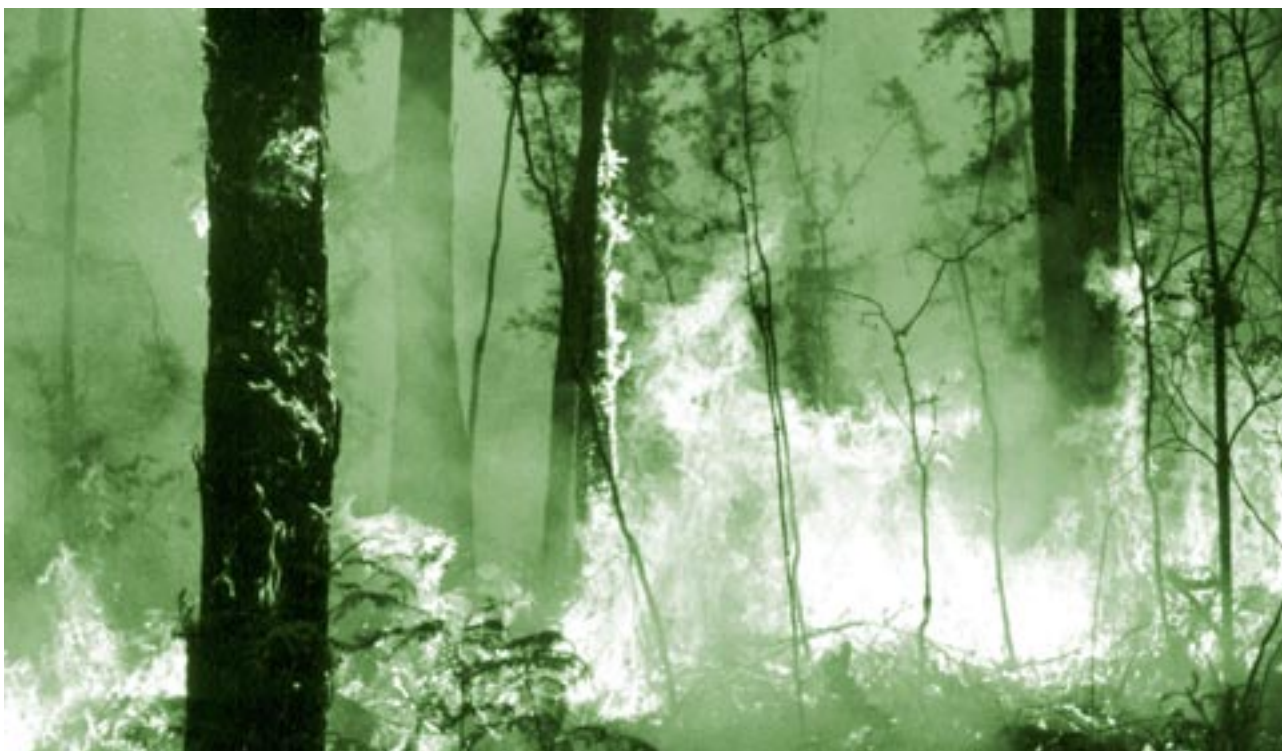
Fuel reduction burning can assist in fire protection but it is not a panacea. In the 2003 fires some areas with very little fuel (including heavily grazed paddocks) still burned and well-protected areas (surrounded by land recently subject to fuel reduction burning) were still destroyed (e.g. the Mount Stromlo Observatory in Canberra).

Some have claimed that fuel reduction burning is not carried out or is greatly reduced in national and other parks, contrary to advice received from the Fire Management Branch in DSE.

The protection of boundary assets and the management of vegetation buffers are important issues for landowners adjoining public lands.

Discussion Point

Equipment used in timber harvesting programs and located in forest areas, such as bulldozers, is often used as part of fire fighting efforts. With the phasing-out of timber harvesting from the Otway Ranges, will there be adequate equipment and skills available to assist in fire fighting efforts?



Regional fire protection plans cover all public land and apply equally to national parks and state forest.

Pest Plants and Animals

Most people recognise that the spread of pest plants and animals is a serious issue that should be tackled with as much urgency and management effort as possible. However, there is much less agreement on the role of strategic public land planning in pest plant and animal control, which is the aspect of the debate most relevant to the VEAC. Essentially, some people believe that plant and animal pests are more abundant in parks and reserves than in other land categories and tenures, while others believe that there is less of a problem in parks and reserves.

Those who claim that pest species are more abundant in parks and reserves argue that:

- a) bans on recreational shooting in parks and reserves reduces control of feral cats, foxes and rabbits;
- b) the dominant philosophy of park and reserve management is to minimise intervention to avoid unnecessary disturbance to the natural ecology but that, without intervention, pest plant and animal numbers tend to increase; and
- c) parks generally have more visitors than other public land categories which, together with increased track networks to accommodate visitors, can lead to more weed seeds and undesirable fungal spores being brought in and an increase in the spread of pest plants and animals.

On the other hand, the following arguments are used to claim that pest plants and animals are less of a problem in parks and reserves:

- a) the ecology of nearly all pest species is very closely linked to disturbance and many species favour disturbed areas. Additions to the reserve system generally target areas of least disturbance to maximise protection of natural values and, major disturbing agents, such as open cut mining, timber harvesting and grazing are generally not permitted in parks and reserves;
- b) more money is allocated for pest plant and animal management in parks and reserves across the state than in state forest and other public land use categories;
- c) volunteer 'Friends' groups associated with parks and reserves (such as, Friends of Angahook-Lorne State Park and Friends of Otway National Park) often make a major contribution in the management of pest species, particularly weeds. Few such groups work in other public land categories;
- d) the emphasis of park interpretation programs is to create an awareness of the need to appreciate and protect the land; and
- e) in forested environments, such as most of the study area, ad hoc recreational shooting (as opposed to systematic and integrated professional control programs) is unlikely to significantly reduce pest animal numbers.¹³

Key Point

Pest plants and animals occur on public land of all land-use categories. VEAC would be interested to receive any evidence that shows that pest species are a greater problem in areas included in national parks than in other public land areas such as state forest or vice versa.

Soil Erosion and Landslides

The earth's surface constantly changes. Sometimes these changes are imperceptible, at other times they are rapid. The removal of vegetation, modification of water runoff and earthworks can all lead to soil erosion.

Erosion hazards were mapped for much of the study area as part of a land capability assessment carried out in the mid 1980s.¹⁴ Most of the deeply dissected hills of the Otway Ranges were classified as being of high erosion hazard and are susceptible to slope failure, sheet erosion, rill erosion and gully erosion. Areas classified as being of moderate erosion hazard were generally undulating hills near the townships of Gellibrand, Forrest, and Carlisle River as well as around Johanna Heights, Hordern Vale, Fergusons Hill, Tomahawk Creek and Blanket Bay. Some areas were also classified as being of low erosion hazard, specifically on the main ridges of Beech Forest and Mount Sabine and to the north east of Gellibrand. Many coastal land systems also have high erosion hazard, with the development of car parks and picnic areas creating runoff and drainage problems leading to rill erosion and gully erosion.

Numerous landslips have been recorded in many parts of the Otway Ranges and relate to the underlying geology and slope, with prolonged high rainfall a major factor in slope failure. A number of assessments of geological hazards were undertaken in the early 1980s. Detailed study of the area between Cape Otway and Cape Patton found that most of this area was of "possible to high landslide risk". In particular, slopes exceeding 35 percent were found to have high landslide risk. Massive landslips also occur at Torquay and Lorne, with a major landslip forming Lake Elizabeth in 1952. Sections of the Great Ocean Road, which in places cuts across the toe of steeply dipping slopes, have been particularly prone to rock falls and landslips.

Key Point

Much of the Otway Ranges is of high erosion hazard and prone to landslides. Without careful siting and design, utilisation activity and the development of facilities for visitors and installation of other infrastructure may lead to ongoing land degradation and high maintenance costs.

Successful management of pest species requires a co-operative partnership between public and private landowners – and ideally a blend of local knowledge with scientific research.

ACCESS

The level of access permitted for, or provided to, public land is an issue of concern to many. It is an issue of particular relevance to the allocation of land to particular land-use categories, as the level and nature of access will vary according to the objectives of each land-use category.

Like many issues of public land-use policy, access covers a range of aspects. Some relevant principles include:

- a) different forms of access may have different levels of compatibility with each other;
- b) different forms of access will either conflict with the objectives of the land-use category, not affect the objectives either way or help achieve the objectives;
- c) the physical capability of land may not be suitable for the provision of some forms of access;
- d) both appropriate and inappropriate forms of access may need active management, control and regulation in some or all areas;
- e) different forms of access may require different levels of infrastructure;
- f) current infrastructure or usage may reflect historical circumstance rather than desirable outcomes; and
- g) provision of access places costs (and responsibilities) on land managers that need to be balanced with other costs of management and the availability of resources.

Vehicular Access

Most significant areas of public land have vehicle track networks and in many cases (including within the Otway Ranges) these networks can be quite extensive. Roads and tracks are created for a variety of reasons. Some, such as Turtons Track, were constructed or upgraded as part of Government relief schemes. Such road networks have developed over many years and now provide a valuable resource for both managers and users alike. However, current use of vehicular roads and tracks may not reflect the original rationale for their creation and their design and construction may no longer be adequate, leading to high maintenance costs and/or damage.

The roads and track network is not static and changes in response to new needs and requirements. Such changes may be reactive (for example, responding to erosion) or proactive (for example, responding to new needs). New roads can be created and old ones closed, rerouted, upgraded or downgraded. Temporary, seasonal or permanent restrictions may be used, with such restrictions applying to some or all users.

The road or track network can be classified in various ways. For instance, by way of:

- a) legal status or tenure – for example, whether formally declared or gazetted;
- b) management responsibility;
- c) development / type of construction – for example, whether sealed, surfaced, or earth and single or two lanes;
- d) useability – all weather, dry weather only and so forth;
- e) status – for example, management vehicles only, 4WD vehicles only;

f) level of use – low, medium, high usage; and

g) function – for example, for tourist access, recreation, timber haulage, or fire protection.

From a public land-use perspective, land primarily used for communication, transport and access, is considered a service and utility reserve. Where roads lie within and mainly service a block of public land, they are normally included within the land-use category applying to that surrounding block.

A summary of the main types of roads and tracks is provided in Table 5.3.

Table 5.3: Summary of the Main Types of Public Roads and Tracks

CATEGORY	DESCRIPTION	TENURE	RESPONSIBILITY
Declared State Highway	Only one on edge of the study area – the Princes Highway.	Gazetted road reserve.	VicRoads
Declared Forest Road	None in the study area.		VicRoads
Declared Tourist Road	Great Ocean Road (sealed), Otway Lighthouse Road (unsealed) and Beech Forest Road (Turtons Track) (sealed/unsealed).	Part within road reserve, part outside the road reserve, and part no road reserve.	VicRoads
Declared Main Road	Within the study area virtually all are sealed. Provide for through access between townships and access to private property.	Mostly in gazetted road reserves.	Funded by VicRoads, with works mostly undertaken by local government.
Major road / local road (generic terms)	These provide through access to private property and areas or features of particular interest. Sealed or surfaced and usually suitable for all vehicles in all weather.	Gazetted road reserve, government road, and subdivision roads.	Mostly local government; also public land manager.
Minor road (generic term)	Generally of a lower standard and provide general access to an area. Formed and usually surfaced. May be dry weather only or 4WD.	Mostly underlying land-use reservation, but also government road or gazetted road reserve.	Local government or public land manager.
Vehicular tracks (generic term)	Generally 4WD standard tracks constructed or formed for specific reasons. May be dry weather only. May have restricted use.	Mostly the underlying land-use reservation.	Public land manager and/or service provider.
Temporary tracks	Created for short-term purposes - such as a timber harvesting operations or for fire fighting – or formed by use.	Mostly the underlying land-use reservation.	Public land manager and/or service provider.

Off-Road Driving

Some visitors to public land seek opportunities for challenging off-road driving or for access to 'off-the-beaten track' locations. Such use is subject to legislative control that applies irrespective of whether the public land is national park, state forest or within any other public land-use category.

The relevant legislation, the *Land Conservation (Vehicle Control) Act 1972*, prohibits vehicle use off-road on any Crown land unless special exemptions apply. Exemptions are for current operations (such as for mining or timber harvesting) or for specially set aside free-access areas (such as a dune buggy area or motor cycle competition track). The effect of the Act is to prohibit any vehicles (including motorbikes) travelling on tracks other than those formed for the passage of a vehicle with four or more wheels. That

is, irrespective of the public land-use category, off-road vehicle use is prohibited.

In addition, normal traffic and vehicle legislation, such as the *Transport Act 1983*, applies. For example, vehicles operating on Crown land must be road-registered. Recreational registration (as distinct from normal registration) is not adequate for Crown land except in free access areas (of which there are none in the study area). Speed and parking restrictions may apply to roads on public land outside declared roads and formal road reserves. All such legislative provisions apply equally to all types of motor vehicles (2WD, 4WD or motorcycles of any sort) and to all types of public land. There are no differences in law applying to vehicle use between an area of national park and an area of state forest.

Track Closures

As noted above, both forest and park managers have inherited extensive road and track networks. Many of these track systems were established over forty years ago for timber harvesting or fire protection. In many cases, these tracks were built to engineering and environmental standards that would not be acceptable today. Many of the tracks were also built when very few members of the public owned 4WDs or trail bikes and were designed to handle occasional use by mainly management vehicles. More than one track may provide access to the same destination.

Environmental factors that lead to track closure include:

- a) safety – for example because of flood damage, land slips, or general condition;
- b) unacceptable erosion or damage to vegetation;
- c) protection of particular species – which may be rare or particularly vulnerable to indirect road impact such as dust, noise or runoff; and

d) reduction of the potential spread of disease – for example, where tracks adjoin plant communities or species susceptible to cinnamon fungus.

As a result of all of these issues, the network of vehicular tracks that had developed across the state, in both state forests and parks, has been rationalised over the past 20 years. Tracks may also be downgraded, rather than closed. For example, a road constructed for logging haulage may be retained but maintained at a lower standard when it is no longer required for haulage.

Generally track closures are undertaken as part of the development of a park management plan, a process that is required to include public consultation. The land managers of parks (Parks Victoria) and state forest (DSE) also have a well-established system of consulting with 4WD groups regarding seasonal track closures. This system appears to work fairly well. Forms of closure are summarised in Table 5.4.

Table 5.4: Forms of Track Closure

FORM OF CLOSURE	COMMENT
Permanent closure	Closure by physical barriers and/or revegetation. May be retained as defined 'route' for fire response activities or be completely rehabilitated.
Temporary closure	Generally closed for safety reasons arising from, for example, flood damage.
Seasonal closure	Tracks may be closed over winter because of concerns about damage to the track surface and safety of users. This regularly occurs across the state, particularly in high rainfall areas such as the Otways, with some variation year to year to reflect the season and condition. May remain open for restricted use by management vehicles.
Closure by neglect	A track is simply not maintained and if not used it grows over and in time becomes impassable.
Management vehicles only	A track is closed to vehicular access by the public but remains open to management vehicles. This can be an ongoing or seasonal arrangement. Most such tracks remain open to the public for walking and, in places, horse riding.

The proposition put in some submissions that park creation leads to all or almost all tracks being closed, does not appear to be supported by the evidence available to Council. In summary, tracks appear to be closed for specific, legitimate reasons, and not simply just because they have been included in a park or reserve. However, many of the reasons for closures may tend to apply more frequently in parks and reserves because they encompass more features that require protection and the objectives of management is for the protection (and enjoyment) of such features. For instance, threatened species occur more commonly in parks. Nonetheless, threatened species, and all the other potential reasons for track closures, occur commonly within other public land categories.

Key Points

A number of submissions proposed that park creation lead to significant track closures. Others suggested that park creation lead to tracks being created or upgraded to cater for increased visitor use.

Surfaced roads require periodic re-surfacing and consequently access to a supply of road making material. In general, gravel is sought from nearby sources including those located on public land. The more extensive the road network, the greater the need for such quarries.

Much of the road network is currently funded through timber harvesting revenue as they are used as haulage roads. If this road network is to remain open, another funding source will be required.

Discussion Points

Given the practicalities (including costs) of constructing and maintaining tracks, what are the needs for vehicular tracks on public lands and how can they be met at minimal cost and in a manner consistent with the relevant land-use objectives?

Some submissions claimed that closure of tracks would hinder fire fighting and other emergency operations. However, it is known that many wild fires are started by humans using such track networks to gain access into the forests. Is the current track network necessarily the ideal size? And is there any difference in the fire protection track requirements of a national park in comparison with those of state forest?

Road Status and Responsibility

When is a road a road? The answer to this question is not as clear as it might seem. Roads are defined by different processes. For example:

- a) by legislative process – such as declared highways and gazettal of road reserves;
- b) by subordinate instruments – such as the certification of plans of subdivision or adoption of planning schemes delineating roads; and
- c) by common law – such as showing 'government road' access to Crown allotments on parish plans or by usage.

Moreover, local government may manage roads declared as roads by the State Government. The body responsible for creating road laws and regulations may be different to the authority responsible for road maintenance. In addition, the road formation may not actually lie within the designated road reserve and many road reserves do not contain a road at all. Where a road reserve passes through a block of public land, it is not always clear whether the responsibility for the road lies with the local council or the public land manager.

These issues are not just matters of semantics. A High Court judgement in May 2001 means that road authorities are no longer immune from liability for failure to maintain or repair roads and that road authorities are responsible for

hazards placed by others and open to claims for negligence on roads even where there may be no constructed road at all. Even where a road has been created or used without the specific consent of the local council or public land manager, that body is considered liable for any arising claims.

A discussion paper published by the Department of Infrastructure in 2002 raises many of the issues arising from the judgement and sought comment on proposals to enact legislation to create a formal classification of roads, more clearly define responsibilities for roads and appropriate standards, and provide a statutory basis for the development and implementation of road management plans.¹⁵

Key Points

A number of roads which pass through public land primarily provide through access rather than access to public land. Some are not on defined road reserves.

Road reserves may encompass lands that have never contained roads or contain areas of remnant vegetation adjoining the road formation. Within otherwise cleared freehold lands, they may be important as wildlife corridors between larger blocks of public land.

If the body responsible for a road cannot afford to maintain a road to a high level, it may feel compelled to close the road for safety or fears of litigation.



Many older vehicular tracks in the Otways were constructed for occasional use and do not meet current standards.



Horse-Riding Access

Horse-riding – whether by individuals, organised groups or with commercial tour operators – is a popular activity in the Otways, and several submissions were received from people supporting horse-riding on public land, as well as from people supporting prudent management of such a popular activity. Many horse-riding supporters opposed the creation of, or addition of areas to, national parks on the basis that horse-riding is not allowed or is heavily restricted in national parks.

As noted in chapter 3, horse-riding is popular in a number of localities within the study area. Like most uses, the riding of horses through natural areas has a variety of potential impacts. Potential impacts of horse-riding include:

- a) soil erosion and damage to walking tracks;
- b) fouling of waterways, tracks, picnic grounds and campsites;
- c) possible weed invasion from feed or droppings;
- d) disturbance to threatened fauna (such as the beach-nesting hooded plover)¹⁶ and trampling or grazing threatened flora;
- e) disturbing or frightening other users.¹⁷

Unlike motor vehicles or trail bikes, there are no laws that apply to how and where horses can be ridden. Consequently, managers of parks and state forest generally manage such potential impacts by an array of mechanisms. Mechanisms used include the restriction of horse-riding to defined vehicular or multi-use tracks, creating new tracks or defining pre-existing tracks or areas principally for horse-riding, or generally restricting horse-riding from some or all of the park or reserve.

The potential for adverse impact arising from horse-riding is probably greater in parks and reserves because such areas encompass more features that require protection. For example, in the Otway National Park there are restrictions on horse-riding on beaches where hooded plovers breed, and at the very popular Maits Rest Rainforest Walk where the walking track is narrow. Such restrictions may, however, also apply in state forest areas. For instance, horses are excluded from tracks to and near popular and sensitive features such as waterfalls (e.g. Beauchamps, Triplet, Stevenson, Sabine, and Hopetoun Falls), water bodies (such as Lake Elizabeth) and particular vegetation communities (such as the Youngs Creek Rainforest Walk). Provision for horse-riding is largely dealt with in management plans, which are required to be prepared with public consultation.

Council also notes that horse-riding is permitted in all or part of 29 of Victoria's 39 national parks including the Otway National Park. In fact, Parks Victoria's website lists horse-riding as a suggested activity for nine national parks, again including Otway National Park.

Key Points

A number of submissions expressed concern that horse-riding could be heavily restricted if additional areas became national parks – perhaps because of concerns that the closure of tracks would reduce access for horse-riders as well as fears of general prohibition. The Council is interested in receiving evidence of previously used tracks that have been closed.

Developed facilities for horse-riding and areas of intensive or off track horse-riding can and are provided on freehold lands. Opportunities for longer distance trail rides are more difficult to provide on freehold lands and some riders may particularly seek the experience of riding through forested areas.

Where the level of desired use is likely to create conflict with other values or users, the desires of horse-riders could be accommodated by specifying areas within the park or reserve where horse-riding is to be provided for, or by excluding such areas from proposed parks or reserves.

Access for Walking of Domestic Dogs

Several submissions were received from people wanting access to public land in the study area to be maintained for domestic dogs. Some submissions opposed the creation of or additions to parks on the grounds that dog-walking would be excluded. Dog-walking is a popular activity undertaken in many areas, including accessible areas of public land near towns, picnic grounds and beaches. The presence of dogs, however, may conflict with public land values and other public land users, with domestic dogs generally not permitted in national and state parks and subject to varying levels of restriction in other areas of public land.

Potential adverse impacts of dogs include:

- a) threat to wildlife susceptible to disturbance or predation by dogs – for example, the New Holland mouse;¹⁸
- b) fouling of tracks, picnic grounds and the environs of water bodies – creating health hazards and reduction in amenity, especially at popular visitor sites; and
- c) disturbing or frightening other users; and
- d) reduction in the enjoyment of park visitors who seek an appreciation of the naturalness of the environment - by making wildlife more difficult to observe and/or by the presence of exotic animals.

Nonetheless, dogs are permitted in all or part of six of Victoria's 39 national parks (including sections of Johanna Beach in the Otway National Park) and in eight of 30 state parks. Dogs may only be permitted if on a lead. Detailed management of dogs on public land is part of the parks management planning and forest management planning processes, which both involve extensive public consultation.

Key Point

The desires of dog owners to access natural areas could be accommodated by including popular dog-walking areas within special management zones within a park or reserve, or by excluding such areas from proposed parks or reserves.

THE GREAT OCEAN ROAD

The Council is required by the Terms of Reference for the investigation to recommend whether or not the Great Ocean Road should be included in the proposed park. Council received a number of submissions that specifically mentioned the inclusion or otherwise of the road in the park although few submissions made detailed comment.

Current Situation

Scenic Amenity

The Great Ocean Road is widely regarded as one of the finest ocean drives in the world and is a feature visited by significant number of overseas visitors to Victoria.

The Great Ocean Road officially extends from Torquay to Allansford (just to the east of Warrnambool). It provides access to national parks, waterfalls, beaches, forests and coastal villages. It offers magnificent vistas of rugged seascapes, dense forests and coastal plains. In parts the road hugs the coast, in other parts it veers inland. Perhaps the most spectacular sections lie to the south of Eastern View and to the south of Lorne, where the road was literally blasted from the plunging slopes of the Otway Ranges.

A Great Ocean Road Trust was formed in March 1918, with construction commencing in August 1918. It was built as a soldiers' memorial and used the labour of returned servicemen. It was officially opened to traffic in November 1932, with a number of tolling points in place until 1936. It has been continually realigned, rebuilt and upgraded. While officially declared a 'tourist road', the road also acts as a major access route for the general public and the commercial sector who live and work in the coastal towns connected by the road. Indeed parts, especially in the vicinity of the larger towns, function as a normal suburban thoroughfare.

Road Safety and Carrying Capacity

The Great Ocean Road, according to VicRoads, is currently at or over maximum carrying capacity with long traffic delays frequent at peak times and a very high accident rate compared to most other roads in Victoria.

It is unlikely that the demands on the road will decrease, unless there is very active management to reduce use by, for example, the provision of viable alternative routes.

Incremental improvements, such as turning lanes for scenic viewing spots, improvements at intersections, provision of alternative routes or lanes for pedestrians and cyclists, and better turn-out areas will improve safety and provide better traffic flow but are unlikely to have a significant effect on the carrying capacity of the road.

Improving the carrying capacity of the road significantly would require major construction work that would be very difficult due to environmental and cost factors.

Management Responsibility

The Great Ocean Road has been declared a 'Tourist Road' under the *Transport Act 1983*. Consequently VicRoads is responsible for works and maintenance of the road and regulations made under the Transport Act apply. The greater part of the road is within a permanent gazetted

road reserve. In these sectors the road reserve was surveyed as Crown allotments were being created. However, there are sections of the road that are on other forms of Crown land such as coastal reserve or park without a defined road reserve. In such areas VicRoads ordinarily has agreements in place with land managers, such as Parks Victoria, which cover the management of roads and the road environs. An overview of road tenure is shown in Table 5.5.

Table 5.5: Description of Great Ocean Road Sectors (from west to east)

Sector	Description	Existing tenure
Allansford to Peterborough	Mostly follows boundaries of adjoining freehold allotments.	Road reserve.
Peterborough to Princetown	Mostly follows a natural alignment through cliff top heathlands.	Within road reserves, including sectors where it traverses the Port Campbell National Park.
Princetown to Hordern Vale	Mostly follows boundaries of adjoining freehold allotments.	Road reserve.
Hordern Vale to Marengo	Part follows boundaries of adjoining freehold allotments, mostly follows natural alignment through forest.	Part on road reserves, mostly unalienated Crown land (areas traversing the Otway National Park but "10 metres either side of the [road] formation centre line" excluded from the park.
Marengo to Cape Patton	Mostly follows boundaries of adjoining freehold allotments and the coastal reserve – through townships and rural lands.	Road reserve.
Cape Patton to Eastern View	Mostly follows a natural alignment, including sectors on the edge of the Otway Ranges.	Mostly road reserve, including through townships and some sectors of public land and much of the Angahook-Lorne State Park (other sectors within this park are excluded by description), part unalienated Crown land.
Eastern View to Anglesea	Mostly follows a natural alignment, traversing cleared and uncleared freehold and public lands.	Mostly road reserve.



Future Plans for the Road

The Great Ocean Road Region Strategy

A major strategic review entitled "Great Ocean Road Region Strategy" is currently in progress, with the draft strategy expected to be released in October 2003. Development of the strategy is being led by the Department of Sustainability and Environment (DSE), and carried out with a number of other state and local agencies, including the Department of Innovation, Industry and Regional Development, the Department of Primary Industries, VicRoads, Tourism Victoria, the Victorian Coastal Council, Parks Victoria, and the shires of Surf Coast, Colac Otway, Corangamite, Moyne and Warrnambool City.

While the strategy deals with much more than the road itself, its emphasis is on issues related to the road. It is not expected that the strategy will make a recommendation as to whether or not the road will be included in the park (largely on the basis that VEAC will recommend on this issue).

Models Suggested by Others

In the next few years, the community will be required to make a decision as to the future of the road. Most of the suggestions being made to date are variations on three broad models:

- a) the status quo with incremental improvements being carried out both on the Great Ocean Road and alternative hinterland routes;
- b) major improvements to the Great Ocean Road – would increase capacity and safety but come with high financial, environmental and scenic amenity costs; and
- c) a new approach to the road focussing on enhancing the value of the road as a primary tourist route and encouraging regular traffic to use alternative routes as far as practicable.

Some have suggested that the last of these models could include measures such as:

- a) incremental improvements to the Great Ocean Road itself;
- b) major upgrades to alternative existing hinterland routes (and possible new routes) with associated environmental and financial costs;
- c) reduced speed limits on the Great Ocean Road; and
- d) the possibility of tolls on the Great Ocean Road.

The Park and the Road

As to whether or not the Great Ocean Road should be included in a proposed park, there are many factors that need to be taken into account. For example:

- a) the road forms one of the major access routes into the existing Otway National Park and the Angahook-Lorne State Park as well a major access route used by those visiting parts of the Otway Ranges lying between these two existing parks;
- b) park regulations could be enforced on those entering the park via the Great Ocean Road;
- c) the declared Great Ocean Road currently passes through townships and rural lands, and may be bounded on one or both sides by freehold lands;
- d) the road forms the legal road access to many private allotments;
- e) the on-ground resources of VicRoads are likely to be required to manage the road either directly or on contract;
- f) irrespective of the tenure of the road, the scenic and tourism attractions of at least significant sections of the road will continue to be important aspects of its management;
- g) irrespective of the tenure of the road, its value as an access route between towns by resident and commercial traffic will continue to be an important aspect of its management; and
- h) the creation of formal road reserves, especially when requiring excision from areas under the *National Parks Act 1975*, can be a complicated process.

Declared 'tourist roads' pass through other national parks. For example the Mount Buffalo Tourist Road is managed by VicRoads but included as part of the national park meaning that park regulations apply. The status of the Wilsons Promontory Road is identical. However some declared 'tourist roads', such as the Donna Buang Road in the Yarra Ranges National Park, pass through the park but are not actually part of the park. Other through-roads, such as declared 'highways' and declared 'main roads', which pass through parks are ordinarily not included within the park itself and their alignment or relevant road reserve is specifically excluded. For example, the Maroondah Highway passes through the Yarra Ranges National Park within a road reserve that is specifically excluded from the park.

In the context of the three main models for the future management of the Great Ocean Road outlined in the previous section, each could operate with the Great Ocean Road actually in the park or on a road reserve (in whole or part) – see Table 5.6.

Table 5.6: Comment on Great Ocean Road Alternatives

ROAD MODEL	GREAT OCEAN ROAD IN PARK	GREAT OCEAN ROAD NOT IN PARK
STATUS QUO with incremental improvements to Great Ocean Road and alternative hinterland routes	If sections of road within the park were not upgraded, the road would not diminish park values. Extensive sections of the road do not traverse public land and appropriately remain outside of the park.	Would ensure a consistent approach (i.e. the entire Great Ocean Road would be excluded from the park). To achieve this combination by the creation of formal road reserves would require survey of road within the park.
MAJOR IMPROVEMENTS to the Great Ocean Road	Probably not an appropriate combination, as the road would be effectively become a through road rather than primarily a tourist and/or park access road.	Would reflect the main purpose of the road and ensure a consistent approach – but the creation of formal road reserves would require survey. In places, road widening may require excision from existing parks.
REDEFINE AS A TOURIST/PARK ACCESS ROAD , with major traffic access diverted to upgraded hinterland routes	Park objectives would guide road management and park regulations would apply. VicRoads could continue to maintain the road under agreement with the park manager. Would rely on non-park funding to upgrade hinterland routes. Extensive sections of the road not traversing public land would remain outside the park.	May not best reflect the intent of the road as primarily a tourist road or park access road.

Key Points

The essential character of a tourist road is that it provides a scenic experience.

While parts of the Great Ocean Road pass through public land, extensive sections do not. Other than some sections of coastal reserve, the Great Ocean Road does not traverse any public land areas not already within a national or state park.

Full or part-time residents of the area and other frequent travellers, such as local commercial traffic, will always have a need to use the Great Ocean Road for access between coastal towns.

Under any of the alternatives, it may be useful for the Great Ocean Road to be defined in a consistent manner – by a standard road reserve width (say 30 metres wide), by the width of the actual road formation (which may vary) or by a width measured from the centre line of the road formation (for example, 10 metres as used where the road passes through the Otway National Park east of Hordern Vale).

Discussion Point

VEAC is interested in receiving submissions outlining possible benefits of including the Great Ocean Road within any national park that it may pass through or abut.



CHARACTERISTICS OF NATIONAL PARKS AND STATE FOREST

Relevance of State Forest for Areas without Timber Harvesting

Land that does not meet the definitions of national park, state park or nature conservation reserve may be appropriately allocated to state forest even if it does not contain vegetation types that are productive for timber harvesting. That is, areas unsuited to sawlog and pulpwood production may still be of value for other forest products such as firewood, poles and posts. Areas with special value to extractive industries or recreational activities which are not permitted or are restricted in national parks may also be suitable for allocation to state forest.

Key Point

The 'state forest' land-use category may be appropriate for areas where timber harvesting will not occur.

Permitted Uses

The range of activities permitted within a national park or state forest is driven by the land-use objectives of each category (see Table 5.7).

Table 5.7: National Park and State Forest Descriptions and Objectives

CATEGORY	SOURCE	DESCRIPTION	OBJECTIVE
National Park	ECC (2001) ⁵	A substantial tract of land of nation-wide significance because of its outstanding natural environments and features, scenic landscapes and diverse land types.	Protection and conservation of native flora, fauna, and natural features and the protection of sites of archaeological and historical significance. Supply of water and protection of catchments. Recreation and education associated with the enjoyment and understanding of, and compatible with the protection of, the natural environment. Limited areas of development for more-intensive recreation.
	National Parks Act 1975	Defined by inclusion on Schedule 2 of the National Parks Act 1975.	Provide for the preservation and protection of the natural environment including wilderness areas and remote and natural areas in those parks. Provide for the protection and preservation of indigenous flora and fauna and of features of scenic or archaeological, ecological, geological, historic or other scientific interest in those parks. Provide for the study of ecology, geology, botany, zoology and other sciences relating to the conservation of the natural environment in those parks. And, more particularly, be controlled and managed to: Preserve and protect the park in its natural condition for the use, enjoyment and education of the public. Preserve and protect indigenous flora and fauna in the park Exterminate or control exotic fauna in the park. Eradicate or control exotic flora in the park. Preserve and protect wilderness areas in the park and features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest.
State Forest	ECC (2001) ⁵	An extensive area of land supporting native forests and other native vegetation and containing a mosaic of land types, diverse conservation and recreation values, and a range of resources needed to supply community demands.	Provision of timber and other forest products on a sustainable-yield basis. Supply of water and protection of catchments. Protection and conservation of native flora and fauna, landscape, and other natural values, and archaeological and historical values. Provide opportunities for public recreation and education and other public services.
	Forests Act 1958	Defined by inclusion on the Second Schedule of the Forests Act 1958 or as dedicated by Order of the Governor in Council.	None prescribed, but the Act primarily provides for the control and management of forest produce. Other sections provide for grazing, sawmilling and digging of stone and gravel.

The objectives of national parks are laid down by the *National Parks Act 1975* and focus on the protection and conservation of natural values and protection of the park in its natural condition for the use, enjoyment and education of the public. There are no specific objectives for state forest under the *Forests Act 1958*, however, the Act primarily provides for the control and management of forest produce, as well as grazing, saw-milling and removal of stone and gravel.

Recreation

A key difference between national parks and state forest is the approach taken to recreation. In national parks there is a specific legislative objective to provide for recreation 'associated with the enjoyment and understanding of the natural environment'. Although there is no legislative

requirement to provide for recreation in state forest, there is also no limitation applied to the type of recreation which may occur.

As can be seen in Table 5.8, recreational activities are generally managed through regulations and management plans rather than legislation. Different restrictions and exceptions may apply in different parks or between different state forest areas. Where legislative restrictions or exceptions apply to particular parks, these generally arise from a specific recommendation of the LCC or the ECC. Overall, very few recreational activities are totally prohibited in either national parks or state forests. Where restrictions apply, they are generally greater in national parks. Additional restrictions on recreational activity may, however, also apply in state forests where a special nature conservation value is threatened.

Table 5.8: Summary of Provisions for Recreation in National Parks and State Forest^a

	National Parks Act	Forests Act	National Park	Forest	Otway National Park	Otways State Forest
ACTIVITY	LEGISLATION		REGULATION		MANAGEMENT PLAN	
Bushwalking, walking	No specific provision	No specific provision	No specific provision	No specific provision	Permitted.	Permitted.
Camping	No specific provision.	No specific provision	Permitted in defined areas.	Generally permitted, subject to conditions.	Permitted in designated sites and dispersed.	Permitted in designated sites and dispersed.
Car touring, 4-wheel driving, trial bike riding	No specific provision	No specific provision	No specific provision	No specific provision	Permitted subject to seasonal closures.	Permitted subject to seasonal closures.
Cycling, mountain bike riding	No specific provision	No specific provision	No specific provision	No specific provision	Permitted on vehicular tracks.	Permitted on vehicular tracks.
Dog-walking	No specific provision	No specific provision	Permitted in defined areas.	No specific provision	Not permitted, except in one defined area.	No specific provision
Fishing	No specific provision	No specific provision	Not permitted within 'indigenous fish preservation areas'.	No specific provision	Permitted	Permitted
Horse-riding	No specific provision	No specific provision	Permitted in defined areas.	No specific provision	Permitted on designated tracks and beaches.	Permitted on vehicular tracks.
Hunting and use or carrying of firearms	Not permitted except in parts of defined parks. ^b	No specific provision	No specific provisions (other than for some parks).	Not permitted in defined areas.	No specific provision	Permitted.
Organised events (eg car rallies, competitions)	No specific provision	No specific provision	May be permitted subject to permit.	No specific provision	Orienteering and rogaining not permitted.	Generally permitted.
Prospecting (metal detecting, gemstone seeking and gold panning).	Permitted in parts of a few defined parks, subject to conditions.	No specific provision	Removal of gravel, rock, etc prohibited.	No specific provision	Not permitted except in defined 'fossicking area'.	No specific provision

Notes: a. This table is a summary only, refer to the respective Act, regulation or management plan for details. In addition to provisions specified here, most activities are also bound by other legislation and regulations that apply across all tenures – for example, obtaining licences under the Transport Act 1983, Fisheries Act 1995, Wildlife Act 1975 and the Mineral Resources Development Act 1990.

b. Mostly in large national parks remote from settled areas.

Key Points

Few recreational activities are specifically prohibited in either national parks or state forest, and even these can be permitted if special provision is made.

Recreational activities may be subject to a range of conditions, including area-specific restrictions, especially in national parks. Dog-walking and organised events where large numbers of people congregate or travel off track could be totally excluded in national parks.

Commercial Activities

A number of commercial activities that rely on the removal of material are, except for limited circumstances, prohibited or greatly restricted in national parks (see Table 5.9).



Few recreational activities are specifically prohibited in national parks or state forest, although restrictions are generally greater in national parks.

Table 5.9: Summary of Provisions for Commercial Activities in National Parks and State Forest^a

	National Parks Act	Forests Act	National Park	Forest	Otway National Park	Otways State Forest
ACTIVITY	LEGISLATION		REGULATION		MANAGEMENT PLAN	
Apiculture	Pre-existing and ongoing use permitted where recommended by the LCC.	Permitted subject to licence.	Not permitted (as vertebrate and invertebrate animals generally not permitted in parks).	Permitted, subject to licence and conditions	Not permitted.	Permitted subject to conditions.
Commercial tourism operations	Permitted, subject to permit or licence.	No specific provision	No specific provision	Permitted, subject to permit.	Permitted, subject to permit.	Permitted subject to permit.
Extractive industries (removal of sand, gravel and stone)	Generally not permitted. ^b	Permitted subject to licence.	Removal of gravel, rock, etc prohibited.	No specific provision	No specific provision	Generally permitted subject to lease.
Firewood collection	No specific provision	Permitted subject to licence.	Not permitted, except if collected from defined area and used in park.	Permitted, subject to licence or permit and conditions.	No specific provision	Permitted in defined zones.
Grazing by domestic stock	Permitted only in a number of defined parks subject to conditions.	Permitted subject to licence or permit.	Not permitted (animals in a vehicle in transit permitted).	Permitted, subject to licence or permit and conditions.	No specific provision	No specific provision
Mineral exploration and extraction	Generally not permitted. ^{b,c}	No specific provision	No specific provision	No specific provision	No specific provision	Generally permitted subject to conditions
Petroleum exploration and extraction	Subject to Ministerial consent. ^{b,c}	No specific provision	No specific provision	No specific provision	No specific provision	No specific provision
Timber production and harvesting	Permitted only in a number of defined parks subject to conditions.	Permitted subject to licence or permit.	Removal of vegetation prohibited.	Permitted, subject to licence or permit and conditions.	No specific provision	Permitted, subject to conditions.

Notes: a. This table is a summary only, refer to the respective Act, regulation or management plan for details. In addition to provisions specified here, most activities are also bound by other legislation and regulations that apply across all tenures – for example, obtaining licences under the Transport Act 1983, Fisheries Act 1995, Wildlife Act 1975 and the Mineral Resources Development Act 1990.

b. Existing uses otherwise not permitted under the National Parks Act 1975 may continue where subject to a notice giving effect to a specific recommendation by the LCC permitting such use to continue.

c. A few national parks are reserved only to depth of 100 metres, which enables mineral resources below this depth to be retrieved by underground mining techniques. All marine national parks are reserved to a depth of 200 metres.

The *Mineral Resources Development Act 1990* prescribes that national parks are exempt from exploration and mining – that is, exploration and mining is not permitted in national parks (nor is it permitted in reference areas, state parks and wilderness parks). However, the entitlements of holders of existing rights to explore or mine minerals are normally (although not necessarily) maintained through the recommendation of a specific provision subsequently being included in the legislation enacting any new park. Restrictions on exploration and mining also apply in nature conservation reserves, regional parks and natural features reserves where it is permitted only with the consent of the Minister generally responsible for the land.

The *Extractive Industries Development Act 1995* contains similar provisions which prohibit the searching for stone resources within national parks (and reference areas, state parks and wilderness parks). Petroleum extraction is governed by the *Petroleum Act 1998*. It is only specifically precluded from reference areas and wilderness zones or wilderness parks – but not from national parks.

Key Point

The inclusion of additional lands to national parks may have an adverse impact on a number of commercial activities, especially extractive industries and mineral exploration and mining.

Implications for the Management of Threatening Processes

As previously noted, threatening processes need to be managed irrespective of land tenure.

With respect to fire, the Department of Sustainability and Environment is responsible for fire protection on all public land, irrespective of whether it is park or state forest. Regional fire protection plans are prepared by DSE and apply to all public lands, again irrespective of whether it is park or state forest.

Pest plants and weeds are a threat to both national parks and state forests and both are subject to regional strategies prepared by catchment management authorities under the *Catchment and Land Protection Act 1994*. Foxes, rabbits and weeds are all subject to government management strategies that apply across all land tenures and land-use categories. Management plans for individual parks and state forest include proposed actions dealing with the control of pest plants and animals.

More particularly, the manager of a national park and the manager of a state forest (or reserved forest) have very similar legal obligations to control fire and pest plants and animals (see Table 5.10).

Table 5.10: Management Obligations for the Control of Threatening Processes

THREAT	OBLIGATIONS UNDER THE NATIONAL PARKS ACT 1975 FOR NATIONAL PARKS	OBLIGATIONS UNDER THE FORESTS ACT 1958 FOR RESERVED FOREST
Fire	"The Director shall ... ensure that appropriate and sufficient measures are taken to protect each national park from injury by fire."	"It shall be the duty of the [manager] to carry out proper and sufficient work for the prevention and suppression of fire in every state forest ..."
Pest plants and animals	"The Director shall ... exterminate or control exotic fauna in the park [and] eradicate or control exotic flora in the park."	No specific provisions.

Difference between National Park and State Park

There is very little practical difference between a national park and a state park. Under the *National Parks Act 1975*, the objectives for national parks are identical to those of state parks. The main difference between the two land-use categories lies in their definition, with state parks generally smaller and containing less in the way of outstanding natural features (see Table 5.11).

Table 5.11: National Park and State Park Descriptions^{5,6,19}

TENURE	DESCRIPTION
National Park	A substantial tract of land of nation-wide significance because of its outstanding natural environments and features, scenic landscapes and diverse land types.
State Park	A tract of land of containing natural environments and features, scenic landscapes and one or more diverse land types complementing those found in national parks to provide a system representing the major land types of the state.

In the past, fewer restrictions have generally been placed on recreational activities undertaken in state parks than in national parks. This may reflect past management arrangements for state parks. Between 1973, when the first state parks were recommended by the LCC, and 1989 the management of state parks was allocated to either the National Parks Service, the Forests Commission of Victoria or the Fisheries and Wildlife Division, depending on each agencies' on-ground capability in the vicinity of the park. Many state parks were managed under the *Forests Act 1958* (by the Forests Commission) and consequently may have been subject to fewer restrictions than those placed under the *National Parks Act 1975*. In 1989 it became government policy to include all state parks under the *National Parks Act 1975*.

Effect of National Park Status on National Government Funding

While Victoria's national parks are defined as being of national significance, the Commonwealth *Constitution Act 1973* clearly provides that the states are responsible for the management of Crown lands within their state. Consequently, the Commonwealth Government has no management or financial responsibility for Victorian national parks. Commonwealth assistance may, nonetheless, be sought from special funding programs that arise from time to time. Depending on the program, such assistance may be sought for all areas of public land.

Providing Maximum Protection for Nature Conservation Values

The reference area land-use category provides the highest level protection. In effect, no public access is permitted to such areas and management is directed solely at keeping the areas undisturbed to the maximum extent possible. As reference areas are generally small and selected to represent land systems, rather than the presence of significant flora and fauna values, their role in wildlife protection is limited.

Nature conservation reserves that have been permanently reserved under the *Crown Land (Reserves) Act 1978* provide a similar level protection to national parks in that they can only be revoked by Parliament. Given that their management objectives are focussed entirely on the protection of natural features they may in fact offer higher level protection than national parks, as national parks must also provide for other objectives such as providing opportunities for recreation. Such differences in management objectives are tempered by the fact that most national parks are very much larger than most nature conservation reserves.

RESOURCING

A number of submissions perceived a downsizing of natural resource funding and staff levels and sought increases in resourcing and expenditure. In particular, some felt that there was a need to improve current management of parks, for example on the resources available to manage pest plants and animals, before contemplating additional parks.

VEAC notes that the management of threatening processes needs to be addressed across all public land use categories and requires suitable on-going funding for monitoring as well as control.

While differences in land status do not necessarily imply changes to the quality of management, VEAC notes that the Government committed new funding and staff positions as part of its implementation of the ECC's recommended marine national parks system and for parks and reserves arising from the Box-Ironbark Investigation.

Key Point

Any adopted VEAC recommendations will require appropriate support and resource allocation from the Government. In particular, identified long-term benefits of recommendations, including biodiversity conservation, tourism development and public awareness, will only be fully realised if appropriate resourcing is allocated for their implementation.

Information Sources (see 'References' section for full citations)

- ¹ Council of Australian Governments (1992)
- ² ENRC (2000)
- ³ JANIS (1997)
- ⁴ Commonwealth of Australia and State of Victoria (2000)
- ⁵ LCC (1988)
- ⁶ ECC (2001)
- ⁷ IUCN (1994)
- ⁸ Sinclair Knight Merz (2000)
- ⁹ Parks Victoria (2000)
- ¹⁰ Davies (1997)
- ¹¹ DCNR (1995)
- ¹² McCarthy and Tollhurst (2001)
- ¹³ Saunders et al. (1995)
- ¹⁴ Ministry for Planning and Environment (1987)
- ¹⁵ Department of Infrastructure (2002)
- ¹⁶ Schulz and Bamford (1987)
- ¹⁷ Landsberg et al. (2001)
- ¹⁸ Seebeck et al. (1996)
- ¹⁹ LCC (1994)

CHAPTER 6 POSSIBLE APPROACHES TO FUTURE PUBLIC LAND USE

Having previously outlined the nature of the Angahook-Otway Investigation and the area's land use history, resources and social profile, this final chapter sets out possible approaches to future public land use in the study area within the context of the strategic issues identified in Chapter 5.



A VISION

The Otways are clearly an outstanding area, the features and resources of which are greatly valued by a diverse and growing community. The most significant attribute of the Otways is that the great majority of natural features – whether forests, waterfalls or foreshores – remain in public ownership. Just as the development of national and state parks in the Otways in the 1980s provided a major boost to the attraction of the region for both visitors and residents, a "single national park in the Otway Ranges" may well lead to the development of new opportunities.

VEAC offers the following 'vision' as a reference point for its investigation of public land in the Otways.

The public land of the Otways will become an inspiring example of sustainable and integrated land use and deliver enhanced environmental and socio-economic outcomes. Its core will be a new 'single national park' of magnificent forests and beautiful landscapes, which will permanently protect and conserve the full range of ecosystems and biodiversity in the Otway Ranges. Together with the Great Ocean Road, the park will be a focus for tourists and involve the local and wider community. The role and importance of other areas of natural vegetation for biodiversity, soil and water conservation and local landscape amenity will be recognised, and opportunities provided for recreational pursuits reliant upon, or enhanced by, natural environments. Other services and goods that can only be, or are best sourced, from the public lands of the study area will be provided for in a sustainable manner.

Making the Vision A Reality

This preliminary vision for the public lands of the Otway Ranges could be met in a number of ways. The designation of public land-use categories with distinct objectives will be the primary building block for making the vision a reality.

Natural values can be protected by inclusion in large permanent reserves such as national or state parks, but may be complemented by smaller nature conservation or natural features reserves. Corridor links can be provided through management zones in other land-use categories, for example, special protection zones within state forest. Tourist interest could be enhanced through the provision of appropriate facilities in parks and more intensive support facilities on adjoining public land areas outside parks and on nearby freehold lands.

Opportunities for desired goods and services such as gravel extraction, transport routes, firewood and fence posts, mineral exploration and mining – and for recreational pursuits such as shooting or dog walking – could be best provided by allocating land with high capability for such uses outside parks and reserves or, in some cases, by inclusion in management zones within a park.

Discussion Points

How should areas with high capability for both nature conservation and consumptive uses be allocated?

Council is keen to hear community views on any options that people may propose for particular areas and public land-use categories (see the inside cover for details on making submissions). That said, Council also recognises that outlining some specific approaches in this Discussion Paper may encourage or assist people in preparing their submissions. To this end, VEAC has developed the following approaches.


A HOLISTIC APPROACH

In addition to investigating boundaries of "a single national park in the Otway Ranges", the Terms of Reference also require investigation of lands suitable for addition to existing or new state parks or nature conservation reserves. These could be located within the Otway Ranges or elsewhere in the study area.

One of the frameworks for VEAC's task of considering possible new parks and nature conservation reserves is provided by the 'CAR reserve system', outlined by the National Reserve System Program and the National Forest Policy Statement and adopted by Commonwealth, State and Territory Governments. The intention of the CAR concept is to create a comprehensive, adequate and representative reserve system of protection, in accordance with defined criteria (known as the JANIS criteria – see Figure 6.1). The criteria cover the protection of biodiversity, old-growth forest and wilderness (no wilderness areas have been identified in the study area).

FIGURE 6.1: Summary of JANIS Criteria ¹

<i>Biodiversity criteria</i>	
1.	As a general criterion, 15 percent of the pre-1750 distribution of each ecosystem should be protected in the CAR reserve system.
2.	At least 60 percent of the remaining extent of vulnerable ecosystems (those that have been depleted in area by 70 percent or more) should be reserved.
3.	All remaining occurrences of rare and endangered ecosystems should be reserved or protected by other means as far as possible.
4.	Reserved areas should be replicated across the geographic range of the ecosystem.
5.	The reserve system should seek to maximise the area of high quality habitat.
6.	Reserves should be large enough to sustain the viability, quality and integrity of populations.
7.	The reserve system should sample the full range of biological variation within each ecosystem.
8.	In fragmented landscapes, remnants that contribute to sampling the full range of biodiversity are vital parts of a reserve system. The areas should be identified and protected as part of the development of integrated regional conservation strategies.
<i>Old-growth Forest Criteria</i>	
1.	Where old-growth forest is rare or depleted (generally less than 10 percent of the extant distribution) within a forest system, all viable samples should be protected.
2.	For other forest ecosystems, 60 percent of the old-growth forest should be protected.
<i>Wilderness Criteria</i>	
1.	Ninety percent or more of the area of high quality wilderness that meet minimum area requirements should be protected in reserves.



The Regional Forest Agreement encompassing the Otway Ranges, included the creation of a reserve system based on these nationally agreed criteria. The CAR reserve system not only consists of dedicated reserves, but also informal reserves and areas protected by prescription. A key principle of the CAR reserve system is that "all reasonable effort should be made to provide for biodiversity and old-growth forest protection and wilderness in the Dedicated Reserve system on public land." Use of informal reserves (such as special protection zones established in approved management plans) applies only "in situations where it is not possible or practical to include conservation values into dedicated reserves". Some ecosystems in the Otway Ranges are currently under-represented in dedicated reserves. The CAR reserve system was discussed in more detail in Chapter 5.

Public land in the study area supplies a range of other goods and services as well as opportunities for forms of recreation that may be prohibited or restricted in parks and reserves because they are inconsistent with the management objectives of the parks. As well as taking such desired uses into account, land-use planning should ensure that active consideration is given to actually providing for such uses outside parks and reserves.

A holistic approach to public land-use planning thus requires assessment and consideration of all values and needs. In the past, strategic public land-use planning took into account the inherent capability of the land for a particular use and provided a balance between desired uses in the context of both private and public land. VEAC will place particular emphasis on the objectives and principles of ecologically sustainable development – that is, to enhance well-being and welfare, provide equity, and protect ecological processes for present and future generations in an integrated manner:

Key Points

Much of the current reserve system in the Otways is in the form of informal reserves (such as management zones) rather than as dedicated reserves (such as national parks and nature conservation reserves). Dedicated reserves offer enhanced security of tenure for the protection of conservation values.

A comprehensive approach requires an assessment of the values of all areas – including existing parks and reserves and the nature conservation and recreation values of state forest – prior to the consideration of new parks and reserves.

Activities that conflict with the management objectives of parks and nature conservation reserves should be taken into account and, where such services and goods can only be, or are best sourced from, the public lands of the study area, it would seem desirable that at least some public lands provide for such uses.

POSSIBLE APPROACHES TO PARK BOUNDARIES

Council has developed a number of possible approaches to boundaries for 'a single national park'. Each possible approach includes a simple description, along with a number of key points arising from the approach.

THE FOLLOWING POSSIBLE APPROACHES ARE INCLUDED TO ENCOURAGE FEEDBACK AND ASSIST THOSE WISHING TO MAKE SUBMISSIONS AS TO THEIR VIEWS ON BOUNDARIES TO INFORM COUNCIL BEFORE IT BEGINS THE TASK OF ASSIGNING BOUNDARIES. THE APPROACHES ARE NOT MEANT TO BE COMPREHENSIVE NOR RESTRICT ALTERNATIVE PROPOSALS IN SUBMISSIONS. THEY ARE MERELY INTENDED TO PROVIDE A STARTING POINT FOR DISCUSSION.

A National Park Formed by Separate Blocks

This approach involves the creation of a new park comprising two separate blocks managed as a single entity. For example, the existing Otway National Park and Angahook-Lorne State Park could form the basis of each separate block. Each block could be the status quo boundary of the two existing parks, or one or both blocks could be expanded to encompass adjoining lands with 'park values' (such as rainforest communities or outstanding scenic features), or to create better management boundaries (for example, by including the headwaters of catchments).

Key Points

This approach may not offer optimal protection for all of the values identified within the Otway Ranges, although the parks could be complemented by additional nature conservation reserves.

The opportunity to create a major new park and gain the associated tourism and other benefits would not be fully realised.

On the other hand, this approach would retain extensive opportunities for uses inconsistent with park objectives on other public lands.

A National Park Formed by Separate Blocks Linked by a Corridor

A single national park could be formed by physically linking larger blocks with a corridor of public land. Such a corridor could link significant areas lying between the two existing parks, could be centred on connecting ridges or walking track routes, or be based on, for example, the entire or upper part of the southern fall of the ranges. Thus the corridor could be narrow or quite wide.

The separate blocks being linked could be the status quo boundary of the two existing parks, or expanded areas based on one or both of the existing parks. Another alternative would be for an additional block or blocks of public land to be defined, perhaps distinct areas of high conservation or catchment value, and be linked to the existing park blocks by a corridor of land.

Key Points

This approach would provide protection of additional areas of special value identified within the Otway Ranges, while still enabling considerable scope for provision of uses conflicting with park objectives.

Areas of park value not lying between or near the two main existing parks would be omitted from the park and would require other forms of protection to be created.

A Large Consolidated National Park

A single national park could be formed by, in effect, designing a park from first principles. Such a park would encompass those areas with high nature conservation value, scenic features and landscapes, and ensure comprehensive representation of the full range of land types and ecological communities occurring in the Otway Ranges. Such a park may or may not include all parts of existing parks and reserves.

Key Points

This approach could provide a high level of protection of most areas of special value identified within the Otway Ranges and enable the full realisation of the possible benefits to be gained from the opportunity to create a major new park.

Depending on the extent and exact location of the boundaries of such a park, opportunities for uses inconsistent with park objectives could be severely affected.

All Large Public Land Blocks in the Study Area

A single national park could be formed by the incorporation of all, or the great majority, of the large naturally vegetated public land blocks in the study area.

Key Points

The inclusion of all large public land blocks within a national park would ensure that all areas of park value were given highest level protection and enable the management (and marketing) of the public lands to be unified.

Given the history of land use in the study area and the public land boundaries, a park created using this approach may encompass areas not ordinarily considered to meet national park criteria.

Unless specific provisions were made, opportunities for uses inconsistent with park objectives would be severely affected.

Logical Boundaries

In determining the boundaries of a "single national park in the Otway Ranges", VEAC wishes to reflect accepted national park concepts and consequently it considers it appropriate to make use of the selection and design criteria used in the development of Victoria's current national parks system. These were outlined in Chapter 5.

The application of criteria has always been tempered by the actual physical situation on the ground, as well as the need to accommodate other competing land uses to ensure balanced use of all lands. For instance, park boundaries may be drawn to avoid highly disturbed areas or avoid areas with special capability for desired uses that conflict with park values. Alternatively, such areas may be included within a park to retain a logical boundary or enable appropriate management, with special provision made for the continuance of such non-conforming uses within the park. The latter approach is, however, generally minimised, as it tends to degrade the principle of national parks.

In any case, the criteria are met by the totality of the park, not necessarily by each individual portion. Additions to a park would, however, be expected to contribute to the values of the park.

Discussion Point

Is it better to have a number of smaller parks where nature conservation objectives are not compromised at all, or larger consolidated parks encompassing disturbed areas and providing for a wider range of pre-existing activities within their boundaries?

Possible Phase-in of Changes

On occasion, such as where the creation of a national park entailed major changes to existing land use, the implementation of the park has been in stages. Alternatively, non-conforming uses have been phased-out over time or been subject to sunset provisions. For example, the proclamation of parts of the Alpine National Park was deferred to permit logging, and licensed grazing was terminated in the Murray-Sunset National Park over a number of years according to a defined timetable.

Discussion Point

In the context of a new or expanded national park being proposed, under what circumstances would it be appropriate to provide for the:

- (a) Phase-in of new areas or additions; or*
- (b) Phase-out of non-conforming activities?*

NEW OR ENLARGED PARKS AND RESERVES

As previously noted, new parks and reserves or additions to existing parks or nature conservation reserves could be located within the Otway Ranges themselves or elsewhere in the study area.

Extensive areas of public land lie in the north and west of the study area, beyond or on the edge of the Otway Ranges. Areas with high nature conservation, scenic and recreation value occur in these lands and may be suitable for inclusion in new parks and reserves or for addition to existing parks and reserves. Any such additional parks and reserves could complement the protection of nature conservation values that may be provided by "a single national park in the Otway Ranges".

Key Point

Additional parks and reserves could complement the protection of nature conservation values that may be provided by "a single national park in the Otway Ranges".

APPROACHES TO STATE FOREST NOT PROPOSED FOR INCLUSION IN PARKS OR RESERVES

In general, parks and nature conservation reserves are managed mainly to protect their high nature conservation value, with timber production the focus of the management of most state forests. As outlined in Chapter 2, both land-use categories also provide for other uses, such as water supply and recreation.

If the state forest in the Otway Ranges is no longer used for timber production and is not proposed for inclusion in a national or state park or in a nature conservation reserve, the issue arises as to what is the most appropriate land-use category for such land.

VEAC does not consider that state forest should be used as a land-use category for the 'left over bits'. It considers that a strategic approach to land use allocation demands that all areas be critically evaluated and allocated to a land-use category that best reflects the actual capability of the land for particular uses (and to provide a balance between all uses and the best outcomes for the community in the longer term).

An overview of land-use categories that best provide for particular land uses is provided in Table 6.1.

Table 6.1: Overview of Potential Land-use Categories

LAND USE CAPABILITY / DESIRED PRIMARY USE	POTENTIAL LAND-USE CATEGORY (see Chapter 2 for details)
Gravel extraction.	Mineral and stone production reserve or state forest.
Mineral exploration and mining.	Mineral and stone production reserve, or as a permitted use in any land-use category other than those under the <i>National Parks Act 1975</i> .
Minor forest produce (posts and poles, firewood).	State forest.
Nature conservation.	National park, state park, nature conservation reserve.
Recreation associated with enjoying and understanding the natural environment.	National park, state park.
Recreation in natural surroundings.	Regional park. Also, less specifically, state forest.
Sawlog and integrated harvesting.	State forest.
Special natural feature.	National park, state park, natural features reserve.
Water production	Water supply reserve, or designated special value of national park or state forest.

Discussion Points

There will be at least some areas currently managed as state forest that do not include high nature conservation values or significant natural features worthy of protection within a park or nature conservation reserve. Such land may, however, have high capability for recreation in natural surroundings and/or water production. Would such areas be appropriately designated as regional park or some other land-use category rather than included in state forest?

If the community requires access to public land for minor forest produce, such as the taking of posts, poles and firewood, as well as for stone production (gravel) and other products, should land currently managed as state forest be retained as state forest to retain opportunities for such activities?

PLEASE NOTE THAT THE COUNCIL HAS NOT CONSIDERED POSSIBLE NEW BOUNDARIES OF "A SINGLE NATIONAL PARK IN THE OTWAY RANGES", NOR OF ANY OTHER PARK OR RESERVE, AND WILL NOT DO SO UNTIL IT CONSIDERS:

- a) THE INFORMATION CONTAINED IN SUBMISSIONS TO THIS DISCUSSION PAPER;
- b) INFORMATION ON NATURE CONSERVATION AND RECREATIONAL VALUES;
- c) INFORMATION ON THE POTENTIAL AND VALUE OF OTHER NATURAL RESOURCES OF THE LAND;
- d) OTHER MATTERS AS REQUIRED BY SECTION 18 OF THE VICTORIAN ENVIRONMENTAL ASSESSMENT COUNCIL ACT 2001 AND THE TERMS OF REFERENCE FOR THE INVESTIGATION; AND
- e) THE ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPLICATIONS OF POSSIBLE BOUNDARY ALTERNATIVES.

THE COUNCIL WILL PUBLISH PROPOSED BOUNDARIES IN ITS DRAFT PROPOSALS PAPER IN APRIL NEXT YEAR.



Information Sources (see 'References' section for full citations)

¹ JANIS (1997)

GLOSSARY

Acronyms

AAV	Aboriginal Affairs Victoria, a division of the Department for Victorian Communities
ABS	Australian Bureau of Statistics
ANZECC	Australian and New Zealand Environment and Conservation Council
CAR	Comprehensive, Adequate and Representative
CMA	Catchment Management Authority
CCMA	Corangamite Catchment Management Authority
DCE	the former Department of Conservation and Environment
DCNR	the former Department of Conservation and Natural Resources
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment
ECC	Environment Conservation Council
ENRC	(Victorian Parliamentary) Environment and Natural Resources Committee
EVC	Ecological Vegetation Class
ESD	Ecologically Sustainable Development
FFG	Flora and Fauna Guarantee
FMA	Forest Management Area
FRB	Fuel Reduction Burning
GIS	Geographic Information System
IUCN	International Union for the Conservation of Nature and Natural Resources now generally referred to as the World Conservation Union.
JANIS	Joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee
LCC	Land Conservation Council
LWRRDC	Land and Water Resources Research and Development Corporation
NRE	the former Department of Natural Resources and Environment, recently split into DPI and DSE
SLA	Statistical Local Area
SMZ	Special Management Zone in state forest
SPZ	Special Protection Zone in state forest
RFA	Regional Forest Agreement
VPC	Victorian Coastal Council
VPC	Victorian Plantation Corporation

Apiculture The raising and tending of bees for commercial or agricultural purposes.

Basalt A dark-coloured volcanic rock. Also known as bluestone.

Biodiversity The variety of all life: the different plants, animals and micro-organisms; the genes they contain; and the ecosystems they form. Biodiversity is usually considered at three levels: genetic diversity, species diversity, and ecosystem diversity.

Biodiversity Strategy Victoria's *Biodiversity Strategy* fulfils commitments in the national *Strategy for the Conservation of Biodiversity* and requirements under the *Victorian Flora and Fauna Guarantee Act 1988*. It details strategic frameworks to prevent further loss of habitat, and a focus for better management of existing habitats and the continuation of natural ecological processes.

Bioregion A region determined by vegetation cover and the earth's physical features and climate.

Calcarenite A type of limestone consisting predominantly of reworked sand-sized particles of calcite. Calcite is a mineral composed of calcium carbonate.

CAR reserve system A system of forest reserves established by agreement between Commonwealth, State and Territory governments to provide for biodiversity protection. The system is based on the principles of comprehensiveness, adequacy and representativeness.

Catchment management authority (CMA) Regional bodies responsible for strategic planning and coordination of Victoria's land and water resources. The Angahook-Otway study area is wholly contained within the Corangamite Catchment Management Authority region.

Code of Forest Practices A set of principles and minimum standards adopted by Government for the conduct of timber harvesting and associated works on public land in Victoria. The code aims to ensure that impacts on environment and heritage values are minimised.

Conservation reserve system The system of reserves based on public land that are managed primarily for nature conservation. This system aims to represent all different vegetation types and land systems in permanently protected reserves via dedicated reserves, informal reserves and protection by prescription. In Victoria, they are generally considered to consist of national, state and wilderness parks, reference areas and nature conservation reserves (including flora, fauna and non-hunting wildlife reserves).

Conservation status An assessment of the susceptibility of a biological entity (usually a species or ecological unit such as an ecosystem or vegetation type) to changes in abundance and extinction. In Victoria, the World Conservation Union (IUCN 2000) classification is used to describe the conservation status of vertebrates. In order to qualify for a threatened category, a taxon must meet one or more assessment criteria, based on features such as numbers of individuals and populations, previous or projected declines in numbers or habitat, extent of occurrence, area of occupancy and extreme fluctuations in numbers or habitat. The categories in descending level of threat are critically endangered, endangered and vulnerable. Other categories are extinct, near-threatened and data deficient (see Appendices 6 and 7).

Contact era The period from about 1790 to 1840 when Aboriginal people first had contact with European explorers, settlers and others.

Coupe An area of forest of variable size, shape and orientation from which logs for sawmilling or other processing are harvested.

Crown land At the time of European settlement, all lands in Victoria were claimed as Crown land. Crown land is a class of public land that includes unreserved land, land temporarily and permanently reserved under the *Crown land (Reserves) Act 1978*, state forest within the meaning of the *Forests Act 1958* and park, within the meaning of the *National Parks Act 1975*. It is managed and held in trust by the Government for the benefit of the Victorian community. Crown lands may be licensed or leased or vested. Crown land does not include freehold land whether or not owned by a public authority.

Cultural heritage value Historic, scientific, social or aesthetic value for past, present or future generations.

Declared water supply catchment areas Under the *Catchment and Land Protection Act 1994*, water catchments can be declared as 'special water supply catchment areas'. It is a device that identifies the importance of the area for water supply. 'Special area plans' can be prepared for such areas to guide land use.

Dedicated reserve A term used in the CAR reserve system to describe reserves that are equivalent to the IUCN Protected Area Management Categories I, II, III or IV as defined by the International Commission for National Parks and Protected Areas (IUCN 1994) and have secure tenure that requires action by a Parliament to be revoked. In practice such reserves include natural feature reserves (such as bushland reserves and scenic reserves), historic and cultural feature reserves and regional parks, as well as national, state and wilderness parks, reference areas and nature conservation reserves. See also 'informal reserves'.

Diversion weir A structure built across a river to enable water flow to be diverted into a water supply system.

Ecological Vegetation Classes (EVCs) Components of a vegetation classification system derived from groupings of vegetation communities based on floristic, structural and ecological features.

Ecologically Sustainable Development (ESD) Development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future Australians (see Chapter 5).

Ecosystem A community of naturally co-occurring and interacting species and their physical environment in which they live and with which they also interact.

Endemic species Species confined to a particular region or locality.

EVC complex A vegetation unit where two or more EVCs are unable to be distinguished in an area but are known to exist discretely elsewhere.

EVC mosaic A vegetation unit consisting of discrete EVCs which were unable to be distinguished in the mapping due to the scale used.

Exempt Crown land Crown land which, under the *Mineral Resources Development Act 1990*, is in a public land-use category in which exploration or mining is not permitted. Exempt Crown land includes national, state and wilderness parks, and reference areas. Exceptions to allow mining exist under Section 40 of the *National Parks Act 1975* and where an exploration or mining licence is current at the time the land is declared in one of those public land-use categories.

Exploration licence A licence under the *Mineral Resources Development Act 1990*, issued by the Minister for Energy and Resources, entitling the holder to carry out exploration on the land covered by the licence, subject to satisfying the criteria for commencement of work.

Fire Protection Plan Plans prepared within the context of the Code of Practice for Fire Management on Public Land. They define fire protection strategies adopted to achieve those objectives. Each Fire Protection Plan has four main strategies: wildfire prevention, wildfire preparedness, wildfire suppression and wildfire recovery.

Flora and Fauna Guarantee (FFG) Action Statement Documents prepared for selected species, ecological communities and potentially threatening processes listed under the *Flora and Fauna Guarantee Act 1988*.

Forest management area (FMA) plan A plan developed to address the full range of values and uses in state forest, including nature conservation and timber production. There are 14 forest management areas in Victoria, and a plan is produced for each FMA. The Angahook-Otway study area is entirely contained in the Otway FMA for which a plan was published in 1992.

Forest structure Refers to the main physical features of the forest—such as the density and height of vegetation layers (e.g. canopy, shrub layer, ground layer), and size and density of trees.

Fuel reduction burning (FRB) Deliberately lit fires of low intensity used to remove the fine, more flammable fuel from parts of forests and parks. The objective is that bushfires in a fuel reduced area will have lower flame height, reduced intensity and will spread at a slower rate, making firefighting easier.

Geographic information system (GIS) A system which holds spatially referenced data which can be classified, overlaid, analysed and presented in map, tabular or graphic form.

Geomorphological Pertaining to the development of present landforms and to the history of changes in the earth's structure as recorded by surface features.

Gully erosion Erosion of soil or soft rock material by running water that forms large and deep channels.

Habitat links Areas of often linear remnant or planted vegetation that connect two or more patches of vegetation. These links may be continuous or discontinuous strips and patches of vegetation. Often referred to as corridors.

Habitat The place or environment in which an organism naturally occurs.

Heritage All those things which we have inherited from previous generations and which we value. Heritage includes places (including National Estate places), things (movable objects) and folklore (customs, songs and sayings).

Heytesbury Land Development Scheme This scheme was commenced in 1956 by the Rural Finance and Settlement Commission. The scheme involved the clearance of 42,500 ha of land much of which was sown to pasture. Dairy farms, as well as beef enterprises, also developed.

Indigenous vegetation Vegetation native to a particular location.

Informal reserve A term used in the CAR reserve system to describe areas clearly identified in management plans suitable for and set aside for conservation purposes. See also 'dedicated reserves'.

Interpretation program Information, signage, nature trails and guided nature walks, aimed at providing insight and awareness of natural features, ecological systems, cultural heritage, and park management.

Intertidal zone The zone between high and low water as determined by tidal movements.

JANIS criteria Criteria defined by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee for the establishment of the CAR system of forest reserves.

Mining licence A licence under the *Mineral Resources Development Act 1990*, issued by the Minister for Energy and Resources, entitling the holder to carry out exploration and mining on the land covered by the licence, subject to receiving an authority to commence work.

Myrtle Wilt A form of tree dieback in myrtle beeches caused by a fungus, *Chalara australis*. The incidence of the disease is greatly increased in disturbed forests.

National estate Places are listed on the Register of the National Estate, maintained by the Commonwealth Government. Each place being components of the natural or cultural environment of Australia that have aesthetic, historic, scientific or social significance or other special value for future generations and for the present community.

Old growth forest Forest that contains significant amounts of its oldest growth stage in the upper stratum – usually aging trees – and which has been not been disturbed or; only experienced disturbance the effect of which is now negligible.

Post-contact era The period after initial cultural contact between Aboriginal people and European settlers (see contact era).

Pre-1750 EVC The extent of an ecological vegetation class prior to the year 1750 as defined by existing vegetation supplemented by predictions and modelling of vegetation that has been cleared since European settlement.

Prospecting The use of metal detectors, hand tools, pans or simple sluices to search for minerals, such as gold and gemstones.

Public land As defined under the *Victorian Environmental Assessment Council Act 2001*: means (a) any unalienated land of the Crown, including land temporarily or permanently reserved under the *Crown Land (Reserves) Act 1978*; (b) state forest within the meaning of the *Forests Act 1958*; (c) park, within the meaning of the *National Parks Act 1975*; (d) land under the ownership or control of Melbourne Parks and Waterways, established under the *Water Industry Act 1994*; (e) land vested in any public authority, other than – (i) a municipal council; or (ii) an Authority under the *Water Act 1989*, to the extent that the land vested in the Authority is within a sewerage district listed in column 3 of Schedule 12 of that Act.

Public Land Use Categories A classification of public lands into major land-use categories such as parks, nature conservation reserves, state forest and so forth. Each land-use category in essence defines the primary purpose of the land. For many of the land-use categories a range of additional purposes are also defined. Each land-use category is generally subject to particular legislation and management arrangements (see Chapter 2 Table 2.2).

Regional Forest Agreement (RFA) An agreement between the Commonwealth and a State or Territory Government, for the long-term management and use of forests in a particular region.

Regional water authority Statutory authorities responsible for supplying water primarily to urban consumers and the disposal of waste-water from towns. Barwon Water, South West Water, and Southern Rural Water are the water authorities in the Angahook-Otway study area.

Restricted Crown land Land owned by the Crown upon which, under the *Mineral Resources Development Act 1990*, any

exploration or mining requires the consent of the Minister for Environment and Conservation; includes nature conservation reserves, regional parks and natural features reserves.

Rill erosion The development of numerous minute closely spaced channels resulting from the uneven removal of surface soil by running water.

Riparian Associated with river banks.

Scoria A vesicular form of lava, created by the escape of volcanic gases before solidification.

Sheet erosion Erosion that occurs when rain washes away a thin more or less even layer of topsoil from an extensive area of gently sloping land.

Special area plan A plan developed under the *Catchment and Land Protection Act 1994* which provides detailed prescriptions on use and development of land. To date most deal with land use in declared water supply catchments.

Special Management Zone (in state forest) Delineates an area that is managed to maintain specified values, such as flora and fauna habitat or catchment values, while catering for timber production under certain conditions.

Special Protection Zone (in state forest) Delineates an area that is managed for the conservation of natural or cultural values and where timber harvesting is excluded. It forms part of a network designed to link and complement conservation reserves.

Species A group of similar organisms generally capable of interbreeding only with each other to produce fertile offspring. For clarity, the term 'species' is frequently used in this Discussion Paper when, technically, 'taxon' (see below) would more accurately.

Statistical Local Area A subdivision of a municipality used by the Australian Bureau of Statistics for the purposes of collection and analysis of census data.

Taxon (plural: taxa) The named classification unit to which individuals or sets of species are assigned, such as subspecies, species, genus or family.

Terrestrial On land, pertaining to the earth and its dry land.

Unrestricted Crown land Land owned by the Crown that, under the *Mineral Resources Development Act 1990*, can generally be prospected, explored or mined, but over which conditions may apply.

Visitor days Accumulated number of visits to a site including overnight stays.

Wet sclerophyll forest Broad reference to the forest vegetation community dominated by tall eucalypts, particularly mountain ash *Eucalyptus regnans*, occurring on moist and protected slopes throughout the ranges.

Work authority An authority made under the (*Extractive Industries Development Act 1995*) to undertake an extractive industry.

World Conservation Union (IUCN) The World Conservation Union was created in 1948. It is the world's largest conservation-related organisation and brings together 76 states, 111 government agencies as well as a large number of non-government organisations, and some 10 000 scientists and experts, from 181 countries. Through various programs it supports the conservation of natural heritage – for instance the work of the IUCN World Commission on Protected Areas aims to promote the establishment and effective management of a worldwide, representative network of terrestrial and marine protected areas.

REFERENCES

- Abele, C. (1977). *Explanatory Notes on the Queenscliff 1:250,000 Geological Map*, Geological Survey Report 1977/5, Mines Department Victoria, Melbourne.
- ALP (2002). *Forests and National Parks*, Australian Labor Party, Melbourne.
- Anon (2003). *Mineral Exploration and Extraction Statistical Review 2001/02*, Minerals and Petroleum Division, Department of Primary Industries, Melbourne.
- Barwon Water (2003). *Water Resource Development Plan*. Barwon Water, Geelong.
- Birch, W.D. (ed.) (1989). *Zeolites of Victoria*. Special Publication No. 2, The Mineralogical Society of Victoria, Melbourne.
- Birch, W.D. and Henry D.A. (eds.) (1993). *Phosphate Minerals of Victoria*, Special Publication No. 3, The Mineralogical Society of Victoria, Melbourne.
- Birch, W.D. and Henry, D.A. (1997). *Gem Minerals of Victoria*, Special Publication No. 4, The Mineralogical Society of Victoria, Melbourne.
- Brinkman, R. and Farrell, S. (1990). *Statement of Resources, Uses and Values for the Otway Forest Management Area*. Department of Conservation and Environment, Melbourne.
- Buckley, R.W. (1993). *Sites of Geological and Geomorphological Significance along the Victorian Coast*. Unpublished report Geological Survey of Victoria 1993/4.
- CCMA (2002). *Corangamite Regional Catchment Strategy, Community Draft 2002- 2007*. Corangamite Catchment Management Authority, Colac.
- Clark, I.D. (1995). *Scars in the Landscape. A Register of Massacre Sites in Western Victoria, 1803-1859*. Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.
- Commonwealth of Australia (1999). *Australian Guidelines for Establishing the National Reserve System*. Environment Australia, Canberra.
- Commonwealth of Australia and State of Victoria (2000). *West Victoria Regional Forest Agreement*. The Commonwealth of Australia and the State of Victoria, Melbourne.
- Cooney, A.M. (1986). *Assessment of the Stone Resource in Quarry and Other Small Reserves of Public Land for the Land Conservation Council's Review of Melbourne Area, District 1*, Unpublished report No. 1986/15, Geological Survey of Victoria, Department of Industry, Technology and Resources.
- Corangamite Catchment and Land Protection Board (1997). *Corangamite Regional Catchment Strategy*. Corangamite Catchment and Land Protection Board, Colac.
- Council of Australian Governments (1992). *The National Strategy for Ecologically Sustainable Development*. Australian Government Publishing Service, Canberra.
- Country Victoria Tourism Council and Tourism Victoria (1996). *Great Ocean Road Tourism Development Plan*. Country Victoria Tourism Council Inc.
- Country Victoria Tourism Council and Tourism Victoria (2000). *Great Ocean Road Tourism Development Plan Revised September 2000*. Country Victoria Tourism Council Inc.
- Davies, C. (1997). *Analysis of Fire Causes on or Threatening Public Land in Victoria 1976/77 to 1996/1997*. NRE Fire Management Branch Research Report No. 49. Department of Natural Resources and Environment, Melbourne.
- DCE (1992). *Forest Management Plan for the Otway Forest Management Area*. Department of Conservation and Environment, Melbourne.
- DCNR (1995). *Code of Practice for Fire Management on Public Land*. Department of Conservation and Natural Resources, Melbourne.
- Department of Infrastructure (2000). *Victoria in Future—Overview*. Department of Infrastructure, Melbourne.
- Department of Infrastructure (2001). *Great Ocean Road Region Towards a Vision for the Future. Discussion Paper 2001*. Department of Infrastructure, Melbourne.
- Department of Infrastructure (2002). *Road Standards and Legal Duties of Road Authorities*. Department of Infrastructure, Melbourne.
- DSE (in prep.). *Advisory List of Threatened Vertebrate Fauna in Victoria – 2003*. Department of Sustainability and Environment, East Melbourne.
- Douglas, J.G. and Ferguson, J.A. (eds.) (1988). *Geology of Victoria*. Geological Society of Australia Special Publication 5, Melbourne, Australia.
- ECC (2000). *Marine, Coastal and Estuarine Investigation Final Report*. Environment Conservation Council, Melbourne.
- ECC (2001). *Box-Ironbark Forests and Woodlands Investigation Final Report*. Environment Conservation Council, Melbourne.
- Edwards J., Leonard, J.G., Pettifer, G.R. and McDonald, P.A. (1996). *Colac 1:250,000 Map Geological Report*, Report No. 98, Geological Survey of Victoria.
- ENRC (2000). *Inquiry into the Utilisation of Victorian Native Flora and Fauna*. Environment and Natural Resources Committee, Melbourne.
- Fisheries Victoria (2002). *Victorian Eel Fishery Management Plan*, Department of Natural Resources and Environment, Melbourne.
- Foster, E. and MacDonald, M. (1999). *Orchids of the Anglesea District. A Field Guide*. Inverted Logic, Melbourne.
- Government of Victoria (1997). *Victoria's Biodiversity—Directions in Management*. Department of Natural Resources and Environment, Melbourne.
- Interim Marine and Coastal Regionalisation for Australia Technical Group (1998). *Interim Marine and Coastal Regionalisation for Australia: an ecosystem*. Environment Australia, Commonwealth Department of the Environment, Canberra.
- IUCN (1994). *Guidelines for Protected Area Management Categories*. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN (2001). *IUCN Red List Categories: Version 3.1*. Report prepared by IUCN Species Survival Commission, Gland, Switzerland and Cambridge, UK.
- JANIS (1997). *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*. Commonwealth of Australia, Canberra.
- Jones, A. (1988). *Canoeing Guide to Victoria*. Touring Committee, Victorian Amateur Canoe Association, Melbourne.
- King, R.L. and Weston, K.S. (1997). *Dimension Stone in Victoria*, Geological Survey of Victoria Report 112, Geological Survey of Victoria

- Knox, K. (1977). *Fishing the Victorian Coastline*, Garry Sparke and Associates, Melbourne.
- Koehn, J.D. and O'Connor, W.G. (1990). Distribution of Freshwater Fish in the Otway Region, South-Western Victoria. *Proceedings of the Royal Society of Victoria* 102: 29-39.
- Landsberg, J., Shorthouse, D. and Logan, B. (2001). Horse riding in urban conservation areas: Reviewing scientific evidence to guide management. *Ecological Management & Restoration* 2: 36-46.
- Landy, J. (1993). *A Coastal Diary. A Study of One of the Australia's Wildest and Most Beautiful Coastlines*. Pan Macmillan, Sydney.
- LCC (1976). *Report on the Corangamite Study Area*. Land Conservation Council, Melbourne.
- LCC (1977). *Melbourne Area Final Recommendations*. Land Conservation Council, Melbourne.
- LCC (1978). *Corangamite Area Final Recommendations*. Land Conservation Council, Melbourne.
- LCC (1985). *Report on the Melbourne Area, District 1 – Review*. Land Conservation Council, Melbourne.
- LCC (1987). *Melbourne Area District 1 Review Final Recommendations*. Land Conservation Council, Melbourne.
- LCC (1988). *Statewide Assessment of Public Land Use*. Land Conservation Council, Melbourne.
- LCC (1991). *Rivers and Streams Special Investigation Final Recommendations*. Land Conservation Council, Melbourne.
- LCC (1994). *Melbourne Area District 2 Review Final Recommendations*. Land Conservation Council, Melbourne.
- LCC (1997). *Historic Places Special Investigation South-western Victoria Final Recommendations*. Land Conservation Council, Melbourne.
- LWRRDC (1996). Watering Stock from Natural Water Sources. *Farming Ahead* 54: 38-52.
- Marchant, S. and Higgins, P.J. (1993). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2: Raptors to Lapwings*. Oxford University Press, Melbourne.
- McHaffie, I.W. and Buckley, R.W. (1995). *Industrial Minerals and Rocks of Victoria*, Geological Survey of Victoria Report 102, Geological Survey of Victoria, Melbourne.
- McCarthy, G.J. and Tolhurst, K.G. (2001). *Effectiveness of Broadscale Fuel Reduction Burning in Assisting with Wildfire Control in Parks and Forests in Victoria*. Forest Science Centre Research Report No. 51. Department of Natural Resources and Environment, Melbourne.
- Ministry for Planning and Environment (1987). *The Rural Land Mapping Project—Shire of Otway*. Ministry for Planning and Environment.
- Mitchell, M.M. and King, R.L. (in prep). *Sites of Geological and Geomorphological Significance in the Queenscliff 1:250 000 mapsheet area*. Technical Record Geological Survey of Victoria.
- NRE (2001). *Rare or Threatened Vascular Plants in Victoria—2001. An alphabetic list of vascular plants of conservation significance*. Department of Natural Resources and Environment, Melbourne.
- NRE (2002). *Commercial Fish Production Information Bulletin 2002*. Fisheries Division, Department of Natural Resources and Environment, Melbourne.
- O'Shea, B. and Byrne, N. (1989). *Great Ocean Road Walk – Feasibility Study of a Long Distance Walking Track Between Anglesea and Portland*. Occasional Paper Series NPW No. 1, Department of Conservation, Forests and Lands, Melbourne.
- Parks Victoria (2000). *State of the Parks 2000. Volume 2—Park Profiles*. Parks Victoria, Melbourne.
- Peel, B. (1999). *Rainforests and Cool Temperate Mixed Forests of Victoria*. Flora and Fauna Program, Department of Natural Resources and Environment, Melbourne.
- Pescott, T. (1998). *The Otway Ranges*. Yaugher Print, Geelong.
- Pitt, A.J. (1981). *A Study of the Land in the Catchments of the Otway Range and Adjacent Plains*. Soil Conservation Authority, Melbourne.
- Ransome, S.W. (1983). *Report on a Proposed Land Use Determination for the Gellibrand River Catchment*. Soil Conservation Authority, Melbourne.
- Rawson, R., Billing, P. and Rees, B. (1985). *Effectiveness of Fuel Reduction Burning—10 Case Studies*. Department of Natural Resources and Environment, Melbourne.
- Richards, T. (1998). *A Predictive Model of Aboriginal Archaeological Site Distribution in the Otway Range*. *Aboriginal Affairs Victoria Occasional Report No. 49*. Aboriginal Affairs Victoria, Melbourne.
- Rooney, S., Gough, P., Cochrane, R.M. and King, R.L. (1992). *Sites of Geological Significance in the Colac 1:250 000 map area*. Unpublished report Geological Survey of Victoria 1992/15.
- Rose, C. (ed.) (2001). *Walking the Otways*. Geelong Bushwalking Club, Geelong.
- Rowan, J. (1990). *Land Systems of Victoria*. Department of Conservation and Environment, and Land Conservation Council, Melbourne.
- Sandiford, M. (2003). Geomorphic constraints on the Late Neogene tectonics of the Otway Ranges, Victoria. *Australian Journal of Earth Sciences* 50: 69-80.
- Saunders, G.B., Coman, B.J., Kinneary, J. and Brasher, M.L. (1985). *Managing Vertebrate Pests: Foxes*. Australian Government Publishing Service, Canberra.
- Schulz, M. and Bamford, M. (1987). *The Hooded Plover and RAOU Conservation Statement*. RAOU Report No. 35. Royal Australian Ornithologists Union, Melbourne.
- Seebeck, J., Menkhurst, P., Wilson, B. and Lowe, K.W. (1996). *New Holland Mouse Pseudomys novaehollandiae*. *Flora and Fauna Guarantee Action Statement No. 14*. Department of Conservation and Environment, Melbourne.
- Sinclair Knight Merz (2000). *Impact of Logging Practices on Water Yield and Quality in the Otway Forests*. Unpublished Report.
- URS Australia and AgInsight (2002). *Communication, Engagement and Social Change Benchmarking – Final Report. Demographics and Characteristics of the Corangamite People*. Report prepared for the Corangamite Catchment Management Authority, Colac, Victoria.
- VCC (1997). *Victorian Coastal Strategy*. Victorian Coastal Council, Melbourne.
- VCC (2002). *Victorian Coastal Strategy 2002*. Victorian Coastal Council, Melbourne.
- White, M.D. (1989). *The Flowers of the Anglesea River Valley*. Lutheran Publishing, Adelaide.
- White, M.D. (1995). *Coastal Vegetation of the Anglesea – Airey's Inlet Region*. Openbook Publishers, Adelaide.

APPENDIX I MATTERS THAT THE COUNCIL MUST TAKE INTO CONSIDERATION

Under the Terms of Reference for the Angahook-Otway Investigation, the Council is specifically required to take into account the following matters.

VICTORIAN GOVERNMENT'S POLICIES WITH RESPECT TO LOGGING AND WOODCHIPPING IN THE OTWAYS

Prior to the 2002 state election the Premier released the Forests and National Parks Policy at Triplet Falls in the Otway Ranges.¹ This policy makes specific commitments with regard to forests and parks in the Otways.

The Government will provide \$14million over the next four years to:

- Reduce wood chipping and logging in the Otways,
- Create a single National Park, extending from Anglesea to Cape Otway following the Great Ocean Road on the eastern side of the range. This will protect key areas of the Otways including some of Victoria's most striking waterfalls and rainforest areas.
- Buy-back native forest timber licences and provide financial assistance for new plantations in western Victoria.
- As further licences are surrendered or expire, provide further protection to other native forest areas in the Otway Ranges and complete the exit from native forests in the Otways by 2008.
- Invest in tourism developments and create new jobs in parks management for former timber industry workers.
- Invest \$9 million over four years in a Victorian Plantation Incentive Strategy to build a sustainable timber industry.

The entire text of the Forest and National Parks Policy can be found at: <http://www.vic.alp.org.au/policy/index.html>

DEFINITION OF 'NATIONAL PARK' USED BY THE FORMER LAND CONSERVATION COUNCIL AND THE FORMER ENVIRONMENT CONSERVATION COUNCIL

The following definitions of 'national park' are taken directly from the Land Conservation Council's (LCC) Melbourne Area District 2 Review Final Recommendations² and the Environment Conservation Council's (ECC) Box-Ironbark Forests and Woodlands Investigation Final Report.³ They were the most recent definitions used by those bodies. The

ECC material also includes its definition of state park.

In summary, the main distinction between national and state parks is the size, with national parks generally in excess of 10,000 ha and state parks between 2,000 and 10,000 ha.

LCC Definition of National Park

An extensive area of public land of nationwide significance because of its outstanding natural features and diverse land types, set aside primarily to provide public enjoyment, education, and inspiration in natural environments.

The conservation of native flora, and other natural features would be an essential part of national park management. Interpretative services would be provided. Development of facilities would be confined to a very small portion of the park. Activities would largely consist of sightseeing and the observation of natural features.

ECC Definition of National Park

An extensive area of public land containing highly significant natural values, and land and vegetation types, set aside:

- primarily to protect biodiversity (within those ecosystems);
- to provide for public enjoyment, interpretation, education, inspiration, recreation and tourism in natural environments;
- to protect Aboriginal cultural sites and places; and
- to protect heritage values.

The conservation of biodiversity including flora, fauna, other biota and natural values would be an essential part of national park management. Interpretative and education services would be provided. Development of facilities would be confined to a very small portion of any national park. Visitor activities such as sightseeing, ecotourism, observation of flora and fauna and heritage features, and obtaining inspiration in natural environments, have low impact and would be encouraged.

ECC Selection and Design Criteria for National Parks

- national parks should generally be larger than 10,000 ha;
- national parks should meet relevant comprehensive, adequate and representative reserve system criteria;
- national parks should contain outstanding scenic landscapes and natural features that are suitable for recreation, and may contain significant cultural heritage;
- national parks should, together with state parks, comprise



a system which represents the range of land and vegetation types across Victoria;

- each national park should represent several land systems or ecological vegetation classes;
- boundaries should be set in a landscape context with strong ecological integrity such as along catchment boundaries, where possible;
- boundary length to area ratios should be minimised and fragmented areas avoided to better provide for biodiversity conservation and reduce external impacts;
- linear national parks should generally be avoided; and
- areas adjoining urban land, or intensive agricultural land, should generally be avoided;
- national parks should be located so as to minimise the impact of threatening processes from adjoining areas

National parks are dedicated reserves permanently reserved under Schedule 2 of the *National Parks Act 1975* and are equivalent to Category 2 of the IUCN Commission for National Parks and Protected Areas.

ECC Criteria of State Park

State parks have similar criteria to national parks, but are generally smaller in size. The differences are:

- State parks should generally be larger than 2000 ha
- each state park should represent one or more land systems or ecological vegetation classes
- State parks are dedicated reserves permanently reserved under Schedule 2B of the *National Parks Act 1975*.

LCC and ECC reports can be obtained from InfoVic phone (toll free): 1300 366 356 or from VEAC online: www.veac.vic.gov.au/previous.htm

OBJECTS OF THE NATIONAL PARKS ACT WITH RESPECT TO NATIONAL PARKS

The purpose of the *National Parks Act 1975* is to ensure that certain Crown land characterised by its predominantly unspoilt landscape, and its flora, fauna or other features, should be reserved and preserved and protected permanently for the benefit of the public. The following extracts are taken directly from Section 4 and Section 17(2) 4 of the current version of the Act (dating from 16 November 2002 – that is, incorporating the most recent amendments in accordance with the *National Parks (Box-Ironbark and Other Parks) Act 2002*).

Objects of Act

The objects of this Act are—

- (a) to make provision, in respect of national parks, State parks, marine national parks and marine sanctuaries—
 - (i) for the preservation and protection of the natural environment including wilderness areas

and remote and natural areas in those parks;

- (ii) for the protection and preservation of indigenous flora and fauna and of features of scenic or archaeological, ecological, geological, historic or other scientific interest in those parks; and
- (iii) for the study of ecology, geology, botany, zoology and other sciences relating to the conservation of the natural environment in those parks; and
- (iv) for the responsible management of the land in those parks;
- (aa) to make further provision in respect of designated water supply catchment areas in national parks—
 - (i) for the protection of those areas; and
 - (ii) for the maintenance of the water quality and otherwise for the protection of the water resources in those areas; and
 - (iii) for the restriction of human activity in those areas for the purposes of sub-paragraphs (i) and (ii);

... [Section 4(ab) and 4(b) pertain to wilderness parks and parks described in Schedule 3 – none of which are national parks] ...

(c) to make provision in accordance with the foregoing for the use of parks by the public for the purposes of enjoyment, recreation or education and for the encouragement and control of that use.

National Parks and State Parks

(2) The Secretary [of the Department of Sustainability and Environment] shall subject to this Act—

- (a) ensure that each national park and State park is controlled and managed, in accordance with the objects of this Act, in a manner that will—
 - (i) preserve and protect the park in its natural condition for the use, enjoyment and education of the public;
 - (ii) preserve and protect indigenous flora and fauna in the park;
 - (iii) exterminate or control exotic fauna in the park;
 - (iv) eradicate or control exotic flora in the park; and
 - (v) preserve and protect wilderness areas in the park and features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest;
- (aa) have regard to all classes of management actions that may be implemented for the purposes of maintaining and improving the ecological function of the park;

(b) ensure that appropriate and sufficient measures are taken to protect each national park and State park from injury by fire;

(ba) ensure that appropriate and sufficient measures are taken (including seeking the making of an appropriate agreement under section 32(1))—

(i) to protect designated water supply catchment areas; and

(ii) to maintain the water quality of and otherwise protect the water resources in those areas; and

(iii) to restrict human activity in those areas for the purposes of sub-paragraphs (i) and (ii);

(c) promote and encourage the use and enjoyment of national parks and State parks by the public and the understanding and recognition of the purpose and significance of national parks and State parks;

(d) prepare a plan of management in respect of each national park and State park.

The *National Parks Act 1975* can be obtained from InfoVic phone (toll free): 1300 366 356 or online: www.dms.dpc.vic.gov.au (click on 'Law Today').

VICTORIAN COASTAL STRATEGY 2002

The Victorian Coastal Council (VCC) is appointed under the *Coastal Management Act 1995* as the peak body for the strategic planning and management of the Victorian coast, and to provide advice to the Minister for Planning. It is supported by the Western, Central and Gippsland regional coastal boards. The VCC produced its first coastal strategy in 1997⁴ and released its current strategy in January 2002.⁵ The strategy sets the broad planning framework for the Victorian coast and zones the whole coast into Protection Zones, Recreation Zones, existing parks and reserves and private land (including ports etc.). Coastal Recreation Zones are defined in the strategy as areas capable of sustaining recreational opportunities for large numbers of people. These zones should be managed for appropriate recreational use whilst minimising impacts on remnant values and the coastal environment. Coastal Protection Zones are areas in relatively natural condition or with significant natural or cultural values, including sites or fragile environments which are sensitive to modification. These zones should be managed to provide for low impact recreation, consistent with protection of natural and cultural values of the area. The Victorian Coastal Strategy 2002 can be obtained from InfoVic phone (toll free): 1300 366 356 or online: www.vcc.vic.gov.au

VICTORIAN GOVERNMENT'S GREAT OCEAN ROAD REGION STRATEGY

Development of the Great Ocean Road Region Strategy is being led by the Department of Sustainability and Environment (DSE), in partnership with the community.

The Strategy Steering Committee comprises representatives from DSE, the Department of Innovation and Regional Development, the Department of Primary Industries, VicRoads, Tourism Victoria, Victorian Coastal Council, Parks Victoria, and the Shires of Surf Coast, Colac-Otway, Corangamite, Moyne and Warrnambool City. The main purpose of the strategy is "to balance community interests, business and industry growth, recreation, tourism activities, and lifestyle options with the natural assets in the region".

The Discussion Paper was released in October 2001, flagging issues that will be considered and outlining the process for public consultation in development of the Strategy.⁶ The Draft Strategy itself is expected to be published in October 2003.

The Discussion Paper and other background material can be obtained from InfoVic phone (toll free): 1300 366 356 or online: www.doi.vic.gov.au. (click on 'More key projects and programs', and then look under 'G')

GREAT OCEAN ROAD REGIONAL TOURISM DEVELOPMENT PLAN


The Great Ocean Road Regional Tourism Development Plan was developed by the Country Victoria Tourism Council and Tourism Victoria and was launched in 1996 to facilitate the growth of tourism in the region through strategies to sustainably increase visitor numbers, length of stay, and expenditure by improvements to marketing programs, infrastructure, services and industry structures.⁷

The Great Ocean Road region extends from Geelong and Queenscliff to the South Australian border and includes the hinterland. The region boasts spectacular coastlines, strong maritime and shipwreck heritage, outstanding national parks, a scenic hinterland including volcanic plains and built attractions.

The Great Ocean Road is the most popular region for tourism in country Victoria. It attracted 2.8 million overnight visitors and 5.4 million daytrips and these visitors spent \$941 million in the region in 1998.

The plan identifies a long-term vision for the Great Ocean Road, controls to protect its unique environment, and challenges facing regional operators aiming to build new and existing markets.

It also draws on the Victorian Regional Travel and Tourism Survey which provides an analysis of people visiting each region, reasons for visiting, spending habits, activities and other key information. The plan highlights natural assets, matching markets to attractions. Key strategies in the plan include, targeting high-yield overseas travellers including Europe, North America, Canada, New Zealand and Asian markets such as Singapore, Malaysia and Japan; placing greater emphasis on local food and wine; establishing major entry and exit point arches or features at Torquay and Allansford; developing the Great Ocean Road Walk; increasing information services and signage; and



implementing appropriate planning and development policies and controls.

Other relevant points from the plan include:

- the need to increase Koori cultural tourism;
- the need for more DSE literature, toilets in national parks, more walking trails, guided walks/tours and educational programs and need to consider joint ventures with the private sector in the provision of visitor facilities and services;
- the lack of interpretive material;
- the need for public transport to key sites in national parks especially for backpackers;
- the possibility of skyline cableway to top of the ranges in the Lorne Apollo Bay area;
- a proposal to develop a walking track linking Surf Coast Walk which finishes at Aireys Inlet and Apollo Bay. A trail has already been mapped out through this area and incorporates 15 waterfalls and Lorne, and there is also the possibility of staged development or smaller loop walks near towns; and
- investigate more personal guided activities in key areas such as in Angahook-Lorne State Park.

Update of Plan

An update of the plan released in September 2000 included the following relevant points:

- The Great Ocean Road itself and the Twelve Apostles are icons of national and international significance.
- The hinterland, rainforest and wildlife experiences complement the coast and beach attractions of the area.
- The region will gain an increasing share of independent travellers and special interest markets such as backpackers and adventure travellers.
- There are currently poor services to natural attractions and a lack of designated tourist drives through the hinterland.
- A cycle path route and walking trails have been proposed and could be developed along the Great Ocean Road (e.g. Apollo Bay to Port Campbell area).⁸

The Great Ocean Road Regional Tourism Development Plan can be obtained from InfoVic phone (toll free): 1300 366 356 or online: www.tourismvictoria.com.au (click on 'Plans & Strategies' in the left margin, and then 'Regional Plans')

ANGLESEA HEATHLAND AGREEMENT BETWEEN THE SECRETARY TO THE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT AND ALCOA AUSTRALIA LIMITED

Although Alcoa's lease area is excluded from the Angahook-Otway study area, it is immediately adjacent to the Angahook-Lorne State Park in the study area. Alcoa is keen to be involved in the investigation as it prides itself in its custodial role of the high conservation values within its lease area.

Within the lease area: Alcoa Australia Limited operates an open cut coal mine and power station near Anglesea to supply electricity to its aluminium refinery at Point Henry near Geelong. The *Mines (Aluminium Agreement) Act 1961* granted a lease to Alcoa to explore for and mine coal until 2011, with a right of renewal for a further 50 years. The current arrangements for the cooperative management of this area are specified in the 'Anglesea Heathland Agreement' between the then Department of Natural Resources and Environment and Alcoa which was signed in 2000. The lease area contains a mining area and land for conservation. The mining area is managed by Alcoa and comprises an open cut brown coal mine, power station buildings and other infrastructure it covers 490 hectares in total with 80 ha being freehold owned by Alcoa. The land for conservation covers an area of 6,860 ha and contains extremely diverse heathland communities with high biodiversity and supporting threatened species such as the New Holland mouse. The majority of the land for conservation (6,600 ha) is listed as a significant natural place on the Register of the National Estate. The agreement applies only to the land for conservation, as opposed to the mining area.

The Anglesea Heathland Agreement specifies that:

- the designated land for conservation is to be managed by Parks Victoria essentially as if it were part of the Angahook-Lorne State Park, with funding from Alcoa;
- the land on the Register of the National Estate is to be managed to protect its conservation values;
- Alcoa is not permitted to damage any indigenous flora or fauna without approval in writing; and
- the above notwithstanding "Alcoa has a right to explore and extend mining into the Land for Conservation as circumstances require".

Further information on the Anglesea Heathland Agreement can be obtained from the: Mine Manager, Alcoa World Alumina Australia, Anglesea, Victoria 3230, ph: (03) 5263 3209 or online: www.alcoa.com/australia/en/info_page/smelting_environment.asp

RELEVANT REGIONAL CATCHMENT STRATEGIES

The *Catchment and Land Protection Act 1994* established a framework for the integrated and coordinated management of catchments in Victoria. The framework was created to maintain and enhance the long-term productivity of land and water resources, establish monitoring processes and encourage the participation of landholders, resource managers and other community members in catchment management.

There are ten Catchment Management Authorities (CMAs) across Victoria which are responsible for preparing regional catchment strategies. The Angahook-Otway study area is entirely contained within the Corangamite CMA region. Under the *Catchment and Land Protection Act 1994*, the Corangamite Catchment Management Authority has responsibility for developing a Regional Catchment Strategy, monitoring its implementation and undertaking a five-year review. The first Strategy was completed in 1997,⁹ and there is currently a draft under review through consultation with technical experts and community members.¹⁰

Purpose of the Regional Catchment Strategy The Regional Catchment Strategy sets long-term direction for natural resource management in the Corangamite Region, from its headwaters to the coast and offshore. The strategy:

- assesses threats to environmental, economic and social assets;
- sets preliminary targets for the condition of assets over the next 20 to 30 years;
- identifies opportunities for improving natural resource management processes over the five year review period;
- recommends an Investment Framework for generating a Five Year Investment Plan; and
- sets guidelines for monitoring and evaluation of progress.

The Strategy guides individuals and organisations with responsibility for natural resource management as they take action within their sphere of influence. It has a pivotal role between: (i) higher levels of government that set broad principles and goals; (ii) the grass roots community developing its own aspirations, plans and actions; and (iii) regional agencies and local governments working in, and with, the community. Supporting strategies, each addressing a particular aspect of natural resources management in the region, develop priorities and action plans aligned with the Regional Catchment Strategy's goals and targets. These strategies include:

- Waterway Health Strategy Floodplain Management Strategy
- Nutrient Management Strategy
- Salinity Action Plan Coastal Action Plans
- Native Vegetation Strategy
- Weeds Action Plans

- Rabbit and Fox Management Strategies
- Action Plans for Ramsar Sites and National Parks in the Region.

The Corangamite Regional Catchment Strategy 2002-2007 Community Draft can be obtained from InfoVic phone (toll free): 1300 366 356 or online: www.ccma.vic.gov.au

Information Sources (see 'References' section for full citations)

¹ ALP (2002)

² LCC (1994)

³ ECC (2001)

⁴ VCC (1997)

⁵ VCC (2002)


⁶ Department of Infrastructure (2001)

⁷ Country Victoria Tourism Council and Tourism Victoria (1996)

⁸ Country Victoria Tourism Council and Tourism Victoria (2000)

⁹ Corangamite Catchment and Land Protection Board (1997)

¹⁰ CCMA (2002)



APPENDIX 2 COMMUNITY REFERENCE GROUP AND GOVERNMENT CONTACT GROUP MEMBERS AND ORGANISATIONS

Community Reference Group

Name	Organisation
Mr Geoff Beilby	Our Parks
Mr Allan Billings	Timber Communities Australia
Mr Simon Birrell	Otway Ranges Environment Network
Mr Jim Bufton	Victorian Farmers Federation
Mr John Doran	Victorian Trades Hall Council
Mr John Edmonds	Public Land Council of Victoria
Mr Bob Flett	Country Fire Authority
Mr Mark Halliday	Construction Material Processors Association
Cr Stephen Hart	Colac Otway Shire
Ms Joan Lindros	Victorian National Parks Association
Ms Margaret MacDonald	Friends of Angahook-Lorne State Park, Angair Inc
Mr Trevor Pescott	Geelong Environment Council
Mr David Pinney	Geelong Bushwalking Club
Mr John Rial	Victorian Minerals and Energy Council
Ms Kate Robertson	Geelong Otway Tourism
Mr Chris Rolland	Alcoa World Alumina Australia
Cr Glenda Shomaly	Surf Coast Shire
Mr Des Symonds	Otway Four Wheel Drive Club
Mr Philip Voigt	Sporting Motorcycle Club, Otway Trail Riders
Dr Barbara Wilson	School of Ecology and Environment, Deakin University, Geelong
Mr Pat Wilson	Victorian Association of Forest Industries



Government Contact Group

Name

Mr Paul Albone
Mr John Edwards
Ms Rachel Faggetter
Mr Richard Ford
Mr Ian Karutz
Mr John Johnstone
Mr David May
Mr George Mifsud
Mr Ian Miles
Mr Paul Northey
Ms Chantal Parslow
Mr Tom Richards
Ms Joan Phillips
Ms Janice Stanford
Mr Stuart Toplis

Organisation

Tourism Victoria
Policy and Research, Department of Sustainability and Environment
Western Coastal Board
Land Victoria, Department of Sustainability and Environment
VicRoads
Catchment and Water, Department of Sustainability and Environment
Corangamite Catchment Management Authority
Land Victoria, Department of Sustainability and Environment
Forests Service, Department of Sustainability and Environment
Barwon Water
Department of Primary Industries
Aboriginal Affairs Victoria, Department of Victorian Communities
Parks, Flora and Fauna, Department of Sustainability and Environment
Department of Infrastructure
Tourism Victoria

APPENDIX 3 NATURAL FEATURES RESERVE DETAILS

Name of Reserve	Area (ha)	LCC rec (1978)	Current Legal Status	Date of creation	Manager	Comments
Bushland Reserves						
Aire Bushland Reserve	48	113	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1989	Parks Victoria	Isolated block.
Aireys Inlet Bushland Reserve	2.2	Melb IR (1987) – O7	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1989		Reservation as bushland reserve supersedes the earlier LCC recommendation.
Bambra Bushland Reserve	35	18	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1984	Parks Victoria	Isolated block.
Barwon Downs Bushland Reserve		Nil	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .			On former Birregurra – Forrest railway line.
Coradji Bushland Reserve	161	12	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1992	Parks Victoria	Isolated block.
Gellibrand Bushland Reserve	80	15	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Isolated block.
Gellibrand North Bushland Area		Nil	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .			On former Colac – Crowes railway line.
Gherang Gherang Bushland Reserve	113.5	110	Unreserved Crown land.	Not formally implemented.	Parks Victoria	Part of an isolated public land block, traversed by a water supply pipeline (which lies within a narrow water supply reserve). Remainder of block is gravel reserve.
Johanna Bushland Reserve	64	112	Part reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> and part unreserved.	1983	Parks Victoria	Isolated block.
Latrobe Bushland Reserve	182	111	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	Partly implemented in 1984.	Parks Victoria	Isolated block. Part was formerly freehold lands.
Marengo Bushland Reserve		Nil	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .			Abuts the Marengo Basin water supply reserve.
Murroon Bushland Reserve	2	16	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1982	Parks Victoria	Isolated block.
Pennyroyal Creek Bushland Reserve	11	17	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Isolated block.
Tomahawk Creek Bushland Reserve	1742	13	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1992	Parks Victoria	Includes reference area and part of the Kennedy Creek 'representative river'. Abuts state forest (forest area).

Name of Reserve	Area (ha)	LCC rec (1978)	Current Legal Status	Date of creation	Manager	Comments
Wensleydale Bushland Reserve	12	I9	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Isolated block.
Wiridjil Bushland Reserve	1069	I4	Unreserved Crown land.	Not formally implemented.	Parks Victoria	Abuts state forest (hardwood production area)
Wongarra Bushland Reserve	1.5	II4	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Isolated block.
Wildlife Reserves						
Aire River Wildlife Reserve	229	C28	Mostly reserved for management of wildlife under the <i>Crown Land (Reserves) Act 1978</i> .	1987 (part)	Parks Victoria	Hunting is permitted. A State Game reserve. Includes Lakes Hordern, Costin and Craven.
Lake Reserves						
Six Mile Dam Lake Reserve	5.5	N60	Reserved for public purposes and recreation under the <i>Crown Land (Reserves) Act 1978</i> .	Not formally implemented.	Committee of Management	An isolated block formerly used as a swimming hole by locals.
Scenic Reserves						
Barham Paradise Scenic Reserve	157	P6	Mostly reserved for public purposes under the <i>Crown Land (Reserves) Act 1978</i> .	Not formally implemented.	Committee of Management	Encompasses river frontage.
Beauchamps Falls Scenic Reserve	32	P7	Part section 50 reserve, <i>Forests Act 1958</i> , part unreserved Crown land vested in the Victorian Plantations Corporation.	Not formally implemented.	Parks Victoria and Victorian Plantations Corporation	Abuts state forest (hardwood production area). Physical access to the falls is through the VPC controlled lands.
Beauty Spot Scenic Reserve	16	P11	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1988	Parks Victoria	Isolated block at Lavers Hill.
Carisbrook Falls Scenic Reserve	58	P5	Reserved for conservation of an area of natural beauty under the <i>Crown Land (Reserves) Act 1978</i> .		Parks Victoria	Abuts Angahook-Lorne State Park
Glasgow Falls Scenic Reserve	13	P10	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Abuts state forest (hardwood production area)
Hopetoun Falls Scenic Reserve	2	P8	Reserved for conservation of an area of natural beauty under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Inlier to softwood plantation area.
Johanna Falls Scenic Reserve	12	P12	Reserved for conservation of an area of natural beauty under the <i>Crown Land (Reserves) Act 1978</i> .	1989	Parks Victoria	Isolated block
Sabine Falls Scenic Reserve	9	P4	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1981	Parks Victoria	Abuts state forest (hardwood production area)
Stevenson Falls Scenic Reserves	10	P3	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1982	Parks Victoria	Abuts softwood plantation area.
Wyalangta Scenic Reserve	30	P9	Reserved for conservation of an area of natural beauty under the <i>Crown Land (Reserves) Act 1978</i> .		Parks Victoria	Waterfall on Little Aire Creek. Inlier to state forest (hardwood production area)

Name of Reserve	Area (ha)	LCC rec (1978)	Current Legal Status	Date of creation	Manager	Comments
Frontage and Streamside Reserves						
Yaughter Streamside Reserve	2.1	K9	Part reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> and part unreserved.		Parks Victoria	Isolated block formerly managed by the Forests Commission on Lardners Creek. Also known as the Gellibrand Streamside Reserve.
Wangerrip Streamside Reserve	17	K11	Part reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> , part unreserved Crown.	Partly implemented in 1986.	Parks Victoria	Abuts state forest (uncommitted land) at the confluence of Nariel Creek and the Gellibrand River. Part was formerly freehold lands.
Wild Dog Creek Streamside Reserve	18	K10	Reserved for conservation of an area of natural interest under the <i>Crown Land (Reserves) Act 1978</i> .	1985	Parks Victoria	Isolated block on Wild Dog Creek (Apollo Bay).
Yeo Streamside Reserve	5.2	K8	Camping and water reserve.		Parks Victoria	Isolated block.
Water frontage reserves		K1	Mostly reserved for public purposes under the <i>Crown Land (Reserves) Act 1978</i> .	Mostly pre-existing reserves created in 1881.	Catchment Management Authorities	Many are encompassed by licences administered by Land Victoria.

Note: Although some of these areas are not formally reserved, all are managed as if they were so reserved.

APPENDIX 4 PROTECTED VALUES IN STATE FORESTS

Location	Special Value to be Protected (LCC 1978) ¹	Features of Conservation Zones Defined in Forest Management Plan (1992) ^{2,a}	Special Protection Zones defined in West Victoria Regional Forest Agreement (2002) ^{3,b}	Special Investigations (LCC 1991 and LCC 1997) ^{4,c}	Declared Water Supply Catchments
Aire State Forest	Wet gully plant communities along the river and its tributaries.	Rainforest conservation areas (two large blocks), rainforest community and buffers (widespread areas), geological conservation areas (notably the Aire River gorge).	Yes, including additional areas.	Aire River – heritage river. One significant and one notable historic place (sawmills).	No
Angelsea River headwaters	Maintain future options ('uncommitted land').	Significant floristic area (eastern block).	Yes, including one small addition.	None defined.	No
Arkins Creek catchment	Maintain future options and protect water catchments ('uncommitted land').	Water supply area. ^c	Yes (no change).	None defined.	Yes
Barongarook State Forest	Maintain future options ('uncommitted land').	Significant floristic areas (extensive areas), geological conservation area (Kawarren East – valley swamp).	Yes, including some additional areas.	One significant (water supply) and two notable historic places (sawmills)	Yes (southern part).
Janacourt State Forest	Example of original Heytesbury forest – low-intensity timber production only.	Significant floristic areas (a number of areas).	Yes, including extensive additional areas.	None defined.	No
Kennedys Creek State Forest	None defined.	Significant floristic areas (a number of areas).	Yes, including an additional area.	None defined.	No
Lardner Creek State Forest	Plantation buffer ('forest area').	Rainforest community and buffers (small areas), significant floristic area.	Yes, including some additional areas.	Gellibrand River – representative river. Three significant and one notable historic places (sawmills).	Yes
Otway Forest - Barham sector	Landscape values of slopes visible from Turtons Track and on the Wild Dog Spur.	Rainforest community and buffers (especially along East Barham River and Wild Dog Creek), geological conservation area (Barham River East Branch landslide).	Yes, including additional areas. Also three special management zone areas.	Two significant historic places (sawmills).	Yes (part).
Otway Forest - Barwon sector	Recreation values of Lake Elizabeth. Maintain future options ('uncommitted land').	Significant floristic areas (small areas), geological conservation area (Lake Elizabeth and Barwon River West Branch swamp), rainforest community and buffers (small areas).	Yes, including extensive additional areas. Also a special management zone area.	Three significant and four notable historic places (sawmills).	Yes
Otway Forest – Boonah sector	Plantation buffer ('forest area').	Significant floristic areas (a number of areas).	Yes, including minor additions.	One significant and two notable historic places (sawmill and mine).	Yes (part).
Otway Forest - South-eastern sector	Recreational use in association with the adjacent Angahook-Lorne State Park.	Rainforest community and buffers (scattered).	Yes, including extensive additions. Also three special management zone areas.	One significant historic place (sawmill).	Yes (part).

Location	Special Value to be Protected (LCC 1978) ¹	Features of Conservation Zones Defined in Forest Management Plan (1992) ^{2,a}	Special Protection Zones defined in West Victoria Regional Forest Agreement (2002) ^{3,b}	Special Investigations (LCC 1991 and LCC 1997) ^{4,5}	Declared Water Supply Catchments
Pennyroyal forest	Maintain future options ('uncommitted land').	None defined.	Yes, a new area.	None defined.	Yes (part).
Sheepyard Creek State Forest	None defined.	Significant floristic areas (four areas).	Yes, including small additional areas.	None defined.	Yes.
Tomahawk Creek forest	Plantation buffer ('forest area'), Maintain future options ('uncommitted land').	Significant floristic areas (two small areas).	Yes, including extensive additional areas.	None defined.	Yes (part).
West Gellibrand catchment	Maintain future options and protect water catchments ('uncommitted land').	Rainforest community and buffers (scattered areas), water supply areas. ^c	Yes, including additional areas.	None defined.	Yes
Western Otways State Forest	None defined.	Rainforest community and buffers (small areas), significant floristic areas (extensive areas).	Yes, including additional areas. Also two special management zone areas.	Two significant and two notable historic places (sawmills).	Yes (part).
Wonga State Forest	Maintain future options ('uncommitted land').	Significant floristic areas (a number of areas).	Yes, including extensive additional areas. Also special management zone area.	Kennedy Creek – representative river.	Yes (part).
Wornbete State Forest	Plantation buffer ('forest area').	Significant floristic areas (two small areas).	Yes, including additional areas.	None defined.	No
Yauger forest	Maintain future options ('uncommitted land').	Significant floristic areas (a number of areas).	Yes (no change).	None defined.	No

Notes: a. Most state forest areas also include designated 'wildlife corridors and native fish stream reserves'.

b. The special protection zones were based on the conservation zones defined in the Forest Management Plan. Where additional areas were included in the Regional Forest Agreement's special protection zone, this is stated in the table.

c. The Forest Management Plan did not cover the public land owned by Barwon Water within the Arkins Creek and West Gellibrand catchments.

Information Sources (see 'References' section for full citations)

- 1 LCC (1978)
- 2 DCE (1982)
- 3 Commonwealth of Australia and State of Victoria (2000)
- 4 LCC (1991)
- 5 LCC (1997)

APPENDIX 5 FLORA SPECIES RECORDED IN THE ANGAHOOK-OTWAY STUDY AREA

As of August 2003, the Department of Sustainability and Environment's Flora Information System database contained records for the following taxa in Angahook-Otway study area. The System has comprehensive coverage of all terrestrial and aquatic woody plants (trees, shrubs, grasses and herbs), but coverage of lower plants (mosses, lichens, algae, etc.) does not yet accurately reflect the true abundance or distribution. The species are listed in systematic order:

LEGEND:

EPBC: status under *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

- x – extinct
- ce – critically endangered
- e – endangered
- v – vulnerable
- cd – conservation dependent

Vic: conservation status in Victoria, after NRE (2001) and DSE's Flora Information System

- x – extinct
- ce – critically endangered
- e – endangered
- v – vulnerable
- r – rare
- k – poorly known

FFG: status under the *Victorian Flora and Fauna Guarantee Act 1988*

- N – nominated for listing, awaiting recommendation;
- R – recommended for listing;
- I – rejected or ineligible for listing;
- L – listed, no action statement published;
- D – de-listed;
- numbers indicate action statement number where published

* denotes introduced species

denotes non-indigenous native species

The table immediately below lists species mentioned in the text, but not in the main list of species recorded in the study area (next page).

English Name

Scientific Name

Huon Pine	<i>Lagarostrobos franklinii</i>
Norfolk Island Pine	<i>Araucaria heterophylla</i>
Southern Sassafras	<i>Atherospermum moschatum</i>



English Name	Scientific Name	EPBC	Vic	FFG
*Monterey Cypress	<i>Cupressus macrocarpa</i>			
*Corsican Pine	<i>Pinus nigra</i> var. <i>corsicana</i>			
*Cluster Pine	<i>Pinus pinaster</i>			
*Radiata Pine	<i>Pinus radiata</i>			
*Pine	<i>Pinus</i> spp.			
Common Maidenhair	<i>Adiantum aethiopicum</i>			
Green Rock-fern	<i>Cheilanthes austrotenuifolia</i>			
Sickle Fern	<i>Pellaea falcata</i> s.l.			
Shiny Shield-fern	<i>Lastreopsis acuminata</i>			
Bristly Shield-fern	<i>Lastreopsis hispida</i>		r	
Mother Shield-fern	<i>Polystichum proliferum</i>			
Leathery Shield-fern	<i>Rumohra adiantiformis</i>			
Ground Spleenwort	<i>Asplenium appendiculatum</i> ssp. <i>appendiculatum</i>		r	
Mother Spleenwort	<i>Asplenium bulbiferum</i> ssp. <i>gracillimum</i>			
Necklace Fern	<i>Asplenium flabellifolium</i>			
Weeping Spleenwort	<i>Asplenium flaccidum</i> ssp. <i>flaccidum</i>			
Austral Lady-fern	<i>Diplazium australe</i>			
Pacific Azolla	<i>Azolla filiculoides</i>			
Gristle Fern	<i>Blechnum cartilagineum</i>			
Lance Water-fern	<i>Blechnum chambersii</i>			
Ray Water-fern	<i>Blechnum fluviatile</i>			
Soft Water-fern	<i>Blechnum minus</i>			
Fishbone Water-fern	<i>Blechnum nudum</i>			
Strap Water-fern	<i>Blechnum patersonii</i> ssp. <i>patersonii</i>			
Water Fern	<i>Blechnum</i> spp.			
Hard Water-fern	<i>Blechnum wattsii</i>			
Common Rasp-fern	<i>Doodia australis</i>			
Rough Tree-fern	<i>Cyathea australis</i>			
Slender Tree-fern	<i>Cyathea cunninghamii</i>		v	L
Skirted Tree-fern	<i>Cyathea X marcescens</i>		v	
Lacy Ground-fern	<i>Dennstaedtia davallioides</i>			
Bat's Wing Fern	<i>Histiopteris incisa</i>			
Austral Ground-fern	<i>Hypolepis amaurorachis</i>			
Downy Ground-fern	<i>Hypolepis glandulifera</i>			
Ruddy Ground-fern	<i>Hypolepis rugosula</i>			
Ground Fern	<i>Hypolepis</i> spp.			
Austral Bracken	<i>Pteridium esculentum</i>			
Soft Tree-fern	<i>Dicksonia antarctica</i>			
Pouched Coral-fern	<i>Gleichenia dicarpa</i>			
Scrambling Coral-fern	<i>Gleichenia microphylla</i>			
Spreading Fan-fern	<i>Sticherus lobatus</i>			
Silky Fan-fern	<i>Sticherus tener</i> s.l.			
Tasman Fan-fern	<i>Sticherus tener</i> s.s.		r	
Gipsy Fern	<i>Ctenopteris heterophylla</i>			
Gipsy x Finger Fern hybrids	<i>Ctenopteris heterophylla</i> x <i>Grammitis billardieri</i>		r	
Common Finger-fern	<i>Grammitis billardieri</i>			
Beech Finger-fern	<i>Grammitis magellanica</i> ssp. <i>nothofageti</i>		v	

English Name	Scientific Name	EPBC	Vic	FFG
Finger Fern	<i>Grammitis</i> spp.			
Veined Bristle-fern	<i>Crepidomanes venosum</i>			
Austral Filmy Fern	<i>Hymenophyllum australe</i>			
Common Filmy Fern	<i>Hymenophyllum cupressiforme</i>			
Shiny Filmy Fern	<i>Hymenophyllum flabellatum</i>			
Narrow Filmy Fern	<i>Hymenophyllum rarum</i>			
Screw Fern	<i>Lindsaea linearis</i>			
Long Clubmoss	<i>Huperzia varia</i>		v	
Slender Clubmoss	<i>Lycopodiella lateralis</i>			
Bog Clubmoss	<i>Lycopodiella serpentina</i>		r	
Bushy Clubmoss	<i>Lycopodium deuterodensum</i>			
Pigmy Clubmoss	<i>Phylloglossum drummondii</i>			
Common Nardoo	<i>Marsilea drummondii</i>			
Austral King-fern	<i>Todea barbara</i>			
Kangaroo Fern	<i>Microsorium pustulatum</i> ssp. <i>pustulatum</i>			
Slender Fork-fern	<i>Tmesipteris elongata</i> ssp. <i>elongata</i>		v	
Long Fork-fern	<i>Tmesipteris obliqua</i>			
Rough Comb-fern	<i>Schizaea asperula</i>			
Forked Comb-fern	<i>Schizaea bifida</i>			
Narrow Comb-fern	<i>Schizaea fistulosa</i>			
Comb Fern	<i>Schizaea</i> spp.			
Swamp Selaginella	<i>Selaginella uliginosa</i>			
Brake	<i>Pteris</i> spp.			
Tender Brake	<i>Pteris tremula</i>			
Common Ground-fern	<i>Calochlaena dubia</i>			
*White Arum-lily	<i>Zantedeschia aethiopica</i>			
Pointed Centrolepis	<i>Centrolepis aristata</i>			
Tufted Centrolepis	<i>Centrolepis fascicularis</i>			
Wiry Centrolepis	<i>Centrolepis polygyna</i>			
Hairy Centrolepis	<i>Centrolepis strigosa</i> ssp. <i>strigosa</i>			
*Wandering Jew	<i>Tradescantia fluminensis</i>			
Pale Twig-sedge	<i>Baumea acuta</i>			
Fine Twig-sedge	<i>Baumea arthropphylla</i>			
Jointed Twig-sedge	<i>Baumea articulata</i>			
Slender Twig-sedge	<i>Baumea gunnii</i>			
Bare Twig-sedge	<i>Baumea juncea</i>			
Soft Twig-rush	<i>Baumea rubiginosa</i> s.l.			
Twig Sedge	<i>Baumea</i> spp.			
Square Twig-sedge	<i>Baumea tetragona</i>			
Marsh Club-sedge	<i>Bolboschoenus medianus</i>			
Club Sedge	<i>Bolboschoenus</i> spp.			
Tall Sedge	<i>Carex appressa</i>			
Plains Sedge	<i>Carex bichenoviana</i>			
Common Grass-sedge	<i>Carex breviculmis</i>			
*Grey Sedge	<i>Carex divulsa</i> ssp. <i>divulsa</i>			
Tassel Sedge	<i>Carex fascicularis</i>			
Fen Sedge	<i>Carex gaudichaudiana</i>			



English Name	Scientific Name	EPBC	Vic	FFG
Swamp Sedge	<i>Carex gunniana</i> var. <i>gunniana</i>			
Knob Sedge	<i>Carex inversa</i>			
Strand Sedge	<i>Carex pumila</i>			
Sedge	<i>Carex</i> spp.			
Hollow Sedge	<i>Carex tereticaulis</i>			
Curly Wig	<i>Caustis flexuosa</i>			
Thick Twist-rush	<i>Caustis pentandra</i>			
Slender Twist-rush	<i>Caustis restiacea</i>		r	
Southern Bristle-sedge	<i>Chorizandra australis</i>		k	
Sedge	<i>Cyperaceae</i> spp.			
*Drain Flat-sedge	<i>Cyperus eragrostis</i>			
Tall Flat-sedge	<i>Cyperus exaltatus</i>			
Flecked Flat-sedge	<i>Cyperus gunnii</i> ssp. <i>gunnii</i>			
Leafy Flat-sedge	<i>Cyperus lucidus</i>			
*Tiny Flat-sedge	<i>Cyperus tenellus</i>			
Common Spike-sedge	<i>Eleocharis acuta</i>			
Slender Spike-sedge	<i>Eleocharis gracilis</i>			
Small Spike-sedge	<i>Eleocharis pusilla</i>			
Tall Spike-sedge	<i>Eleocharis sphacelata</i>			
Spike Sedge	<i>Eleocharis</i> spp.			
Knobby Club-sedge	<i>Ficinia nodosa</i>			
Tall Saw-sedge	<i>Gahnia clarkei</i>			
Chaffy Saw-sedge	<i>Gahnia filum</i>			
Thatch Saw-sedge	<i>Gahnia radula</i>			
Red-fruit Saw-sedge	<i>Gahnia sieberiana</i>			
Saw Sedge	<i>Gahnia</i> spp.			
Coast Saw-sedge	<i>Gahnia trifida</i>			
Button Grass	<i>Gymnoschoenus sphaerocephalus</i>			
Nodding Club-sedge	<i>Isolepis cernua</i>			
Floating Club-sedge	<i>Isolepis fluitans</i>			
Grassy Club-sedge	<i>Isolepis hookeriana</i>			
Swamp Club-sedge	<i>Isolepis inundata</i>			
Little Club-sedge	<i>Isolepis marginata</i>			
Broad-fruit Club-sedge	<i>Isolepis platycarpa</i>			
Nutty Club-sedge	<i>Isolepis producta</i>			
*African Club-sedge	<i>Isolepis sepulcralis</i>			
Club Sedge	<i>Isolepis</i> spp.			
Tufted Club-sedge	<i>Isolepis wakefieldiana</i>		r	
Hoary Rapier-sedge	<i>Lepidosperma canescens</i>		r	
Sandhill Sword-sedge	<i>Lepidosperma concavum</i>			
Clustered Sword-sedge	<i>Lepidosperma congestum</i>			
Little Sword-sedge	<i>Lepidosperma curtisiae</i>			
Tall Sword-sedge	<i>Lepidosperma elatius</i>			
Tall Sword-sedge	<i>Lepidosperma elatius</i> var. <i>ensiforme</i>			
Common Rapier-sedge	<i>Lepidosperma filiforme</i>			
Large-flower Rapier-sedge	<i>Lepidosperma forsythii</i>			
Coast Sword-sedge	<i>Lepidosperma gladiatum</i>			

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Slender Sword-sedge	<i>Lepidosperma gunnii</i>			
Variable Sword-sedge	<i>Lepidosperma laterale</i>			
Variable Sword-sedge	<i>Lepidosperma laterale</i> var. <i>laterale</i>			
Variable Sword-sedge	<i>Lepidosperma laterale</i> var. <i>majus</i>			
Pithy Sword-sedge	<i>Lepidosperma longitudinale</i>			
Stiff Rapier-sedge	<i>Lepidosperma neesii</i>			
Wire Rapier-sedge	<i>Lepidosperma semiteres</i>			
Sword Sedge	<i>Lepidosperma</i> spp.			
Sticky Sword-sedge	<i>Lepidosperma viscidum</i>			
Sharp Club-sedge	<i>Schoenoplectus pungens</i>			
River Club-sedge	<i>Schoenoplectus tabernaemontani</i>			
Common Bog-sedge	<i>Schoenus apogon</i>			
Matted Bog-sedge	<i>Schoenus breviculmis</i>			
Zig-zag Bog-sedge	<i>Schoenus brevifolius</i>			
Wiry Bog-sedge	<i>Schoenus carsei</i>		r	
Slender Bog-sedge	<i>Schoenus lepidosperma</i>			
Leafy Bog-sedge	<i>Schoenus maschalinus</i>			
Shiny Bog-sedge	<i>Schoenus nitens</i>			
Bog Sedge	<i>Schoenus</i> spp.			
Soft Bog-sedge	<i>Schoenus tesquorum</i>			
Top Bog-sedge	<i>Schoenus turbinatus</i>		r	
Club Sedge	<i>Scirpus</i> spp. (s.l.)			
Hair Sedge	<i>Tetraria capillaris</i>			
Needle Bog-sedge	<i>Tricostularia pauciflora</i>			
Delicate Hook-sedge	<i>Uncinia tenella</i>			
*Aloe	<i>Aloe</i> spp.			
*Brown-top Bent	<i>Agrostis capillaris</i> s.l.			
*Dryland Brown-top	<i>Agrostis castellana</i>			
*Red-top Bent	<i>Agrostis gigantea</i>			
Bent/Blown Grass	<i>Agrostis</i> s.l. spp.			
Forest Bent	<i>Agrostis</i> spp. agg. aff. <i>hiemalis</i>			
*Creeping Bent	<i>Agrostis stolonifera</i>			
*Silvery Hair-grass	<i>Aira caryophyllea</i>			
*Quicksilver Grass	<i>Aira cupaniana</i>			
*Delicate Hair-grass	<i>Aira elegantissima</i>			
*Hair Grass	<i>Aira</i> spp.			
*Marsh Fox-tail	<i>Alopecurus geniculatus</i>			
*Meadow Fox-tail	<i>Alopecurus pratensis</i>			
*Marram Grass	<i>Ammophila arenaria</i>			
Pointed Swamp Wallaby-grass	<i>Amphibromus archeri</i>			
Southern Swamp Wallaby-grass	<i>Amphibromus neesii</i>			
Common Swamp Wallaby-grass	<i>Amphibromus nervosus</i>			
Dark Swamp Wallaby-grass	<i>Amphibromus recurvatus</i>			
Swamp Wallaby-grass	<i>Amphibromus</i> spp.			
Grey-beard Grass	<i>Amphipogon</i> spp.			
Grey-beard Grass	<i>Amphipogon strictus</i> var. <i>setifer</i>			
*Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>			



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*False Oat-grass	<i>Arrhenatherum elatius</i> var. <i>bulbosum</i>			
Common Wallaby-grass	<i>Austrodanthonia caespitosa</i>			
Brown-back Wallaby-grass	<i>Austrodanthonia duttoniana</i>			
Hill Wallaby-grass	<i>Austrodanthonia eriantha</i>			
Kneed Wallaby-grass	<i>Austrodanthonia geniculata</i>			
Shiny Wallaby-grass	<i>Austrodanthonia induta</i>			
Smooth Wallaby-grass	<i>Austrodanthonia laevis</i>			
Slender Wallaby-grass	<i>Austrodanthonia penicillata</i>			
Velvet Wallaby-grass	<i>Austrodanthonia pilosa</i>			
Stiped Wallaby-grass	<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>			
Bristly Wallaby-grass	<i>Austrodanthonia setacea</i>			
Bristly Wallaby-grass	<i>Austrodanthonia setacea</i> var. <i>setacea</i>			
Wallaby Grass	<i>Austrodanthonia</i> sp. aff. <i>setacea</i>			
Wallaby Grass	<i>Austrodanthonia</i> spp.			
Purplish Wallaby-grass	<i>Austrodanthonia tenuior</i>			
Hooker Fescue	<i>Austrofestuca hookeriana</i>			
Coast Fescue	<i>Austrofestuca littoralis</i>		r	
Fescue	<i>Austrofestuca</i> spp.			
Dense Spear-grass	<i>Austrostipa densiflora</i>			
Feather Spear-grass	<i>Austrostipa elegantissima</i>			
Coast Spear-grass	<i>Austrostipa flavescens</i>			
Supple Spear-grass	<i>Austrostipa mollis</i>			
Wiry Spear-grass	<i>Austrostipa muelleri</i>			
Tall Spear-grass	<i>Austrostipa pubinodis</i>			
Veined Spear-grass	<i>Austrostipa rudis</i>			
Veined Spear-grass	<i>Austrostipa rudis</i> ssp. <i>nervosa</i>			
Veined Spear-grass	<i>Austrostipa rudis</i> ssp. <i>rudis</i>			
Fibrous Spear-grass	<i>Austrostipa semibarbata</i>			
Spear Grass	<i>Austrostipa</i> spp.			
*Avellinia	<i>Avellinia michelii</i>			
*Bearded Oat	<i>Avena barbata</i>			
*Wild Oat	<i>Avena fatua</i>			
*Bristle Oat	<i>Avena strigosa</i>			
*Large Quaking-grass	<i>Briza maxima</i>			
*Lesser Quaking-grass	<i>Briza minor</i>			
*Prairie Grass	<i>Bromus catharticus</i>			
*Prairie Grass	<i>Bromus catharticus</i> var. <i>catharticus</i>			
*Great Brome	<i>Bromus diandrus</i>			
*Soft Brome	<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>			
Brome	<i>Bromus</i> spp.			
*Fern Grass	<i>Catapodium rigidum</i>			
*Pampas Grass	<i>Cortaderia selloana</i>			
*Pampas Grass	<i>Cortaderia</i> spp.			
*Sea Barley-grass	<i>Critesion marinum</i>			
*Wall Barley-grass	<i>Critesion murinum</i> ssp. <i>leporinum</i>			
Couch	<i>Cynodon dactylon</i>			
*Couch	<i>Cynodon dactylon</i> var. <i>dactylon</i>			

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Couch	<i>Cynodon spp.</i>			
*Crested Dog's-tail	<i>Cynosurus cristatus</i>			
*Rough Dog's-tail	<i>Cynosurus echinatus</i>			
*Cocksfoot	<i>Dactylis glomerata</i>			
Wallaby Grass	<i>Danthonia s.l. spp.</i>			
Heath Bent-grass	<i>Deyeuxia densa</i>			
Small Bent-grass	<i>Deyeuxia minor</i>			
Reed Bent-grass	<i>Deyeuxia quadriseta</i>			
Tasman Bent-grass	<i>Deyeuxia rodwayi</i>			
Rough Bent-grass	<i>Deyeuxia scaberula</i>			
Bent-grass	<i>Deyeuxia spp.</i>			
Long-hair Plume-grass	<i>Dichelachne crinita</i>			
Common Plume-grass	<i>Dichelachne rara</i>			
Short-hair Plume-grass	<i>Dichelachne sciurea spp. agg.</i>			
Rough Plume-grass	<i>Dichelachne sieberiana</i>			
Plume Grass	<i>Dichelachne spp.</i>			
*Summer Grass	<i>Digitaria sanguinalis</i>			
Australian Salt-grass	<i>Distichlis distichophylla</i>			
Common Hedgehog-grass	<i>Echinopogon ovatus</i>			
*Perennial Veldt-grass	<i>Ehrharta calycina</i>			
*Panic Veldt-grass	<i>Ehrharta erecta var. erecta</i>			
*Annual Veldt-grass	<i>Ehrharta longiflora</i>			
*Goose-grass	<i>Eleusine indica</i>			
*American Crows-foot Grass	<i>Eleusine tristachya</i>			
Common Wheat-grass	<i>Elymus scaber var. scaber</i>			
Common Love-grass	<i>Eragrostis brownii</i>			
*Stink Grass	<i>Eragrostis cilianensis</i>			
Weeping Love-grass	<i>Eragrostis parviflora</i>			
Love Grass	<i>Eragrostis spp.</i>			
*Tall Fescue	<i>Festuca arundinacea</i>			
*Red Fescue	<i>Festuca rubra</i>			
Fescue	<i>Festuca spp.</i>			
Australian Sweet-grass	<i>Glyceria australis</i>			
*Manna Grass	<i>Glyceria declinata</i>			
Sweet Grass	<i>Glyceria spp.</i>			
Mat Grass	<i>Hemarthria uncinata var. uncinata</i>			
*Yorkshire Fog	<i>Holcus lanatus</i>			
*Annual Fog	<i>Holcus setosus</i>			
Blady Grass	<i>Imperata cylindrica</i>			
Swamp Millet	<i>Isachne globosa</i>			
Scaly-foot Wallaby-grass	<i>Joycea lepidopoda</i>			
Silvertop Wallaby-grass	<i>Joycea pallida</i>			
Leafy Blown-grass	<i>Lachnagrostis aemula s.l.</i>			
Coast Blown-grass	<i>Lachnagrostis billardiarei s.l.</i>			
Common Blown-grass	<i>Lachnagrostis filiformis</i>			
Wetland Blown-grass	<i>Lachnagrostis filiformis (perennial variety)</i>		k	
Common Blown-grass	<i>Lachnagrostis filiformis var. filiformis</i>			



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Ruddy Blown-grass	<i>Lachnagrostis rudis</i>		r	
*Hare's-tail Grass	<i>Lagurus ovatus</i>			
*Perennial Rye-grass	<i>Lolium perenne</i>			
*Wimmera Rye-grass	<i>Lolium rigidum</i>			
*Rye Grass	<i>Lolium spp.</i>			
*Darnel	<i>Lolium temulentum</i> var. <i>temulentum</i>			
Weeping Grass	<i>Microlaena stipoides</i> var. <i>stipoides</i>			
*Serrated Tussock	<i>Nassella trichotoma</i>			
Fox-tail Mulga-grass	<i>Neurachne alopecuroidea</i>			
Wetland Wallaby-grass	<i>Notodanthonia semiannularis</i>			
*Coast Barb-grass	<i>Parapholis incurva</i>			
*Barb Grass	<i>Parapholis spp.</i>			
*Slender Barb-grass	<i>Parapholis strigosa</i>			
*Paspalum	<i>Paspalum dilatatum</i>			
*Water Couch	<i>Paspalum distichum</i>			
*Kikuyu	<i>Pennisetum clandestinum</i>			
Five-awned Spear-grass	<i>Pentapogon quadrifidus</i>			
*Toowoomba Canary-grass	<i>Phalaris aquatica</i>			
*Reed Canary-grass	<i>Phalaris arundinacea</i>			
*Timothy Grass	<i>Phleum pratense</i>			
Common Reed	<i>Phragmites australis</i>			
*Annual Meadow-grass	<i>Poa annua</i>			
Tussock Grass	<i>Poa australis</i> spp. agg.			
Noah's Ark	<i>Poa clelandii</i>			
Sword Tussock-grass	<i>Poa ensiformis</i>			
Common Tussock-grass	<i>Poa labillardierei</i>			
Common Tussock-grass	<i>Poa labillardierei</i> var. <i>labillardierei</i>			
Soft Tussock-grass	<i>Poa morrisii</i>			
Coast Tussock-grass	<i>Poa poiiformis</i>			
Coast Tussock-grass	<i>Poa poiiformis</i> var. <i>poiiformis</i>			
Dune Poa	<i>Poa poiiformis</i> var. <i>ramifer</i>		r	
Velvet Tussock-grass	<i>Poa rodwayi</i>			
Grey Tussock-grass	<i>Poa sieberiana</i>			
Grey Tussock-grass	<i>Poa sieberiana</i> var. <i>hirtella</i>			
Grey Tussock-grass	<i>Poa sieberiana</i> var. <i>sieberiana</i>			
Tussock Grass	<i>Poa spp.</i>			
Slender Tussock-grass	<i>Poa tenera</i>			
Grass	<i>Poaceae spp.</i>			
*Annual Beard-grass	<i>Polypogon monspeliensis</i>			
*Water Bent	<i>Polypogon viridis</i>			
Australian Saltmarsh-grass	<i>Puccinellia stricta</i>			
Plains Saltmarsh-grass	<i>Puccinellia stricta</i> var. <i>perlaxa</i>			
*Annual Cat's-tail	<i>Rostraria cristata</i>			
Tasmanian Wallaby-grass	<i>Rytidosperma dimidiatum</i>		r	
*Slender Pigeon Grass	<i>Setaria gracilis</i>			
*Heath Grass	<i>Sieglingia decumbens</i>			
Hairy Spinifex	<i>Spinifex sericeus</i>			

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*Rat-tail Grass	<i>Sporobolus africanus</i>			
Salt Couch	<i>Sporobolus virginicus</i>			
*Buffalo Grass	<i>Stenotaphrum secundatum</i>			
Pointed Rice-grass	<i>Tetrarrhena acuminata</i>			
Hairy Rice-grass	<i>Tetrarrhena distichophylla</i>			
Forest Wire-grass	<i>Tetrarrhena juncea</i>			
Rice Grass	<i>Tetrarrhena</i> spp.			
Kangaroo Grass	<i>Themeda triandra</i>			
*Sea Wheat-grass	<i>Thinopyrum junceiforme</i>			
*Desmazeria	<i>Tribolium obliterum</i>			
*Squirrel-tail Fescue	<i>Vulpia bromoides</i>			
*Fringed Fescue	<i>Vulpia ciliata</i>			
*Dune Fescue	<i>Vulpia fasciculata</i>			
*Wall Fescue	<i>Vulpia muralis</i>			
*Rat's-tail Fescue	<i>Vulpia myuros</i>			
*Fox-tail Fescue	<i>Vulpia myuros</i> f. <i>megalura</i>			
*Fescue	<i>Vulpia</i> spp.			
Prickly Couch	<i>Zoysia macrantha</i>			
*Canadian Pondweed	<i>Elodea canadensis</i>			
Yellow star	<i>Hypoxis glabella</i> s.l.			
Tiny Star	<i>Hypoxis glabella</i> var. <i>glabella</i>			
Golden Weather-glass	<i>Hypoxis hygrometrica</i>			
Yellow Star	<i>Hypoxis vaginata</i>			
Yellow Star	<i>Hypoxis vaginata</i> var. <i>brevistigmata</i>			k
*Montbretia	<i>Crocasmia X crocosmiiflora</i>			
*Freesia	<i>Freesia alba</i> x <i>Freesia leichtlinii</i>			
*Wild Gladiolus	<i>Gladiolus undulatus</i>			
Irid	<i>Iridaceae</i> spp.			
*Variable Ixia	<i>Ixia polystachya</i>			
*Ixia	<i>Ixia</i> spp.			
Pretty Grass-flag	<i>Libertia pulchella</i>			
*One-leaf Cape-tulip	<i>Moraea flaccida</i>			
Short Purple-flag	<i>Patersonia fragilis</i>			
Long Purple-flag	<i>Patersonia occidentalis</i>			
Purple Flag	<i>Patersonia</i> spp.			
*Onion Grass	<i>Romulea rosea</i>			
*Common Onion-grass	<i>Romulea rosea</i> var. <i>australis</i> s.s.			
*Blue Pigroot	<i>Sisyrinchium iridifolium</i>			
*Sisyrinchium	<i>Sisyrinchium</i> spp.			
*Bulbil Watsonia	<i>Watsonia meriana</i> var. <i>bulbillifera</i>			
*Watsonia	<i>Watsonia versfeldii</i>			
Hollow Rush	<i>Juncus amabilis</i>			
*Jointed Rush	<i>Juncus articulatus</i>			
Austral Rush	<i>Juncus australis</i>			
Bass Rush	<i>Juncus bassianus</i>			k
Toad Rush	<i>Juncus bufonius</i>			
*Bulbous Rush	<i>Juncus bulbosus</i>			



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Grassy Rush	<i>Juncus caespiticius</i>			
*Capitate Rush	<i>Juncus capitatus</i>			
Gold Rush	<i>Juncus flavidus</i>			
Green Rush	<i>Juncus gregiflorus</i>			
Joint-leaf Rush	<i>Juncus holoschoenus</i>			
Wiry Rush	<i>Juncus homalocaulis</i>			
Sea Rush	<i>Juncus kraussii</i> ssp. <i>australiensis</i>			
*Tiny-headed Rush	<i>Juncus microcephalus</i>			
Pale Rush	<i>Juncus pallidus</i>			
Loose-flower Rush	<i>Juncus pauciflorus</i>			
Broad-leaf Rush	<i>Juncus planifolius</i>			
Tall Rush	<i>Juncus procerus</i>			
Broom Rush	<i>Juncus sarophorus</i>			
	<i>Juncus</i> sp. (sect. <i>genuini</i>)			
Rush	<i>Juncus</i> spp.			
Finger Rush	<i>Juncus subsecundus</i>			
Billabong Rush	<i>Juncus usitatus</i>			
Field Woodrush	<i>Luzula campestris</i> spp. agg.			
Common Woodrush	<i>Luzula meridionalis</i>			
Common Woodrush	<i>Luzula meridionalis</i> var. <i>densiflora</i>			
Common Woodrush	<i>Luzula meridionalis</i> var. <i>flaccida</i>			
Woodrush	<i>Luzula</i> spp.			
Southern Water-ribbons	<i>Triglochin alcockiae</i>			
Dwarf Arrowgrass	<i>Triglochin nanum</i>			
Water Ribbons	<i>Triglochin procerum</i> s.l.			
Common Water-ribbons	<i>Triglochin procerum</i> s.s.			
Water Ribbons	<i>Triglochin</i> spp.			
Streaked Arrowgrass	<i>Triglochin striatum</i>			
Common Duckweed	<i>Lemna disperma</i>			
Common Duckweed	<i>Lemna minor</i> s.l.			
Ivy-leaf Duckweed	<i>Lemna trisulca</i>			k
Tiny Duckweed	<i>Wolffia australiana</i>			
Lily	<i>Liliaceae</i> spp. (sensu lato)			
Gnat Orchid	<i>Acianthus exsertus</i> s.l.			
Small Mosquito-orchid	<i>Acianthus pusillus</i>			
Mosquito Orchid	<i>Acianthus</i> spp.			
Swamp Pelican-orchid	<i>Anzybas fordhamii</i>			r
Small Pelican-orchid	<i>Anzybas unguiculatus</i>			
Southern Spider-orchid	<i>Arachnorchis australis</i>			k
Heart-lip Spider-orchid	<i>Arachnorchis cardiochila</i>			
Plain-lip Spider-orchid	<i>Arachnorchis clavigera</i>			
Green-comb Spider-orchid	<i>Arachnorchis dilatata</i> s.l.			
Green-comb Spider-orchid	<i>Arachnorchis dilatata</i> s.s.			k
Summer Spider-orchid	<i>Arachnorchis flavovirens</i>			r
Wine-lipped Spider-orchid	<i>Arachnorchis oenochila</i>			v
Small Spider-orchid	<i>Arachnorchis parva</i>			
Common Spider-orchid	<i>Arachnorchis patersonii</i> s.l.			

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Brown-clubbed Spider-orchid	<i>Arachnorchis phaeoclavia</i>			
Veined Spider-orchid	<i>Arachnorchis reticulata</i> s.l.			
Mantis Orchid	<i>Arachnorchis tentaculata</i>			
Robust Spider-orchid	<i>Arachnorchis valida</i>		e	L
Large White Spider-orchid	<i>Arachnorchis venusta</i>		r	I
Lizard Orchid	<i>Burnettia cuneata</i>		r	
Pink Fairies	<i>Caladenia latifolia</i>			
Caladenia s.l.	<i>Caladenia</i> s.l. spp.			
Large Duck-orchid	<i>Caleana major</i>			
Copper Beard-orchid	<i>Calochilus campestris</i>			
Slender Beard-orchid	<i>Calochilus gracillimus</i>		k	
Red Beard-orchid	<i>Calochilus paludosus</i>			
Purple Beard-orchid	<i>Calochilus robertsonii</i>			
White Daddy-long-legs	<i>Calonema capillatum</i>			
Green Bird-orchid	<i>Chiloglottis cornuta</i>			
Common Bird-orchid	<i>Chiloglottis gunnii</i> s.l.			
Autumn Bird-orchid	<i>Chiloglottis reflexa</i>			
Bird Orchid	<i>Chiloglottis</i> spp.			
Dainty Bird-orchid	<i>Chiloglottis trapeziformis</i>			
Common Bird-orchid	<i>Chiloglottis valida</i>			
Variable Midge-orchid	<i>Corunastylis archeri</i>			
Fringed Midge-orchid	<i>Corunastylis ciliata</i>		k	
Bearded Midge-orchid	<i>Corunastylis morrisii</i>			
Green Midge-orchid	<i>Corunastylis pumila</i>		r	I
Midge Orchid	<i>Corunastylis</i> spp.			
Helmet Orchid	<i>Corybas</i> (s.l.) spp.			
Veined Helmet-orchid	<i>Corysanthes diemenica</i>			
Slaty Helmet-orchid	<i>Corysanthes incurva</i>			
Large Tongue-orchid	<i>Cryptostylis subulata</i>			
Blue Fairy	<i>Cyanicula caerulea</i>			
Small Gnat-orchid	<i>Cyrtostylis reniformis</i>			
Gnat Orchid	<i>Cyrtostylis</i> spp.			
Spotted Hyacinth-orchid	<i>Dipodium pardalinum</i>		r	
Hyacinth Orchid	<i>Dipodium punctatum</i> s.l.			
Rosy Hyacinth-orchid	<i>Dipodium roseum</i> s.l.			
Wallflower Orchid	<i>Diuris orientis</i>			
Leopard Orchid	<i>Diuris pardina</i>			
Diuris	<i>Diuris</i> spp.			
Tiger Orchid	<i>Diuris sulphurea</i>			
Parson's Bands	<i>Eriochilus cucullatus</i>			
Tall Potato-orchid	<i>Gastrodia procera</i>			
Cinnamon Bells	<i>Gastrodia sesamoides</i> s.l.			
Cinnamon Bells	<i>Gastrodia sesamoides</i> s.s.			
Potato Orchid	<i>Gastrodia</i> spp.			
Wax-lip Orchid	<i>Glossodia major</i>			
Wax-lip Orchid	<i>Glossodia</i> spp.			
Fringed Hare-orchid	<i>Leporella fimbriata</i>			



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Hare Orchid	<i>Leptoceras menziesii</i>			
Brown-beaks	<i>Lyperanthus suaveolens</i>			
Yellow Onion-orchid	<i>Microtidium atratum</i>			
Notched Onion-orchid	<i>Microtis arenaria</i>			
Slender Onion-orchid	<i>Microtis parviflora</i>			
Sweet Onion-orchid	<i>Microtis rara</i>			
Onion Orchid	<i>Microtis spp.</i>			
Common Onion-orchid	<i>Microtis unifolia</i>			
Mayfly Orchid	<i>Nemacianthus caudatus</i>			
Orchid	<i>Orchidaceae spp.</i>			
Horned Orchid	<i>Orthoceras strictum</i>			
Small Duck-orchid	<i>Paracaleana minor</i>			
Pink Fingers	<i>Petalochilus carneus s.s.</i>			
Pink Fingers	<i>Petalochilus carneus sensu Entwisle (1994)</i>			
Pink Fingers	<i>Petalochilus carneus sensu Willis (1970)</i>			
Dusky Fingers	<i>Petalochilus fuscatus</i>			
Cryptic Pink-fingers	<i>Petalochilus mentiens</i>		k	
Tiny Pink-fingers	<i>Petalochilus pusillus</i>			
Slender Pink-fingers	<i>Petalochilus vulgaris</i>		r	
Bluebeard Orchid	<i>Pheladenia deformis</i>			
Heathland Leek-orchid	<i>Prasophyllum affine</i>	e	k	
Austral Leek-orchid	<i>Prasophyllum australe</i>			
Short-lip Leek-orchid	<i>Prasophyllum brevilabre</i>			
Gaping Leek-orchid	<i>Prasophyllum correctum</i>	e	e	57
Tall Leek-orchid	<i>Prasophyllum elatum</i>			
Yellow Leek-orchid	<i>Prasophyllum flavum</i>			
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	e	e	L
Green Leek-orchid	<i>Prasophyllum lindleyanum</i>		v	I
Scented Leek-orchid	<i>Prasophyllum odoratum</i>			
Broad-lip Leek-orchid	<i>Prasophyllum patens</i>		r	
Graceful Leek-orchid	<i>Prasophyllum pyriforme s.l.</i>			
Dense Leek-orchid	<i>Prasophyllum spicatum</i>	v	v	
Leek Orchid	<i>Prasophyllum spp.</i>			
Alpine Greenhood	<i>Pterostylis alpina s.l.</i>			
Dark-tip Greenhood	<i>Pterostylis atrans</i>			
Trim Greenhood	<i>Pterostylis concinna</i>			
Leafy Greenhood	<i>Pterostylis cucullata</i>	v	v	54
Blunt Greenhood	<i>Pterostylis curta</i>			
Large Sickie Greenhood	<i>Pterostylis falcata s.s.</i>			
Slender Greenhood	<i>Pterostylis foliata</i>			
Tall Greenhood	<i>Pterostylis longifolia s.l.</i>			
Tall Greenhood	<i>Pterostylis melagramma</i>			
Dwarf Greenhood	<i>Pterostylis nana</i>			
Nodding Greenhood	<i>Pterostylis nutans</i>			
Tiny Greenhood	<i>Pterostylis parviflora s.l.</i>			
Tiny Greenhood	<i>Pterostylis parviflora s.s.</i>			
Maroonhood	<i>Pterostylis pedunculata</i>			

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Bearded Greenhood	<i>Pterostylis plumosa</i> s.l.			
Banded Greenhood	<i>Pterostylis sanguinea</i>			
Red-tip Greenhood	<i>Pterostylis</i> sp. aff. <i>parviflora</i> (Large Red-brown)			
Large Autumn Greenhood	<i>Pterostylis</i> sp. aff. <i>revoluta</i>			
Greenhood	<i>Pterostylis</i> spp.			
Southern Plume-orchid	<i>Pterostylis tasmanica</i>		k	
Swamp Greenhood	<i>Pterostylis tenuissima</i>	v	v	
Red-beaks	<i>Pyrorchis nigricans</i>			
Butterfly Orchid	<i>Sarcochilus australis</i>			
Black-tongue Hood	<i>Stegostyla congesta</i>			
Musk Hood	<i>Stegostyla gracilis</i>			
Western Bronzewood	<i>Stegostyla iridescens</i>			
Rabbit Ears	<i>Thelymitra antennifera</i>			
Great Sun-orchid	<i>Thelymitra aristata</i>			
Blotched Sun-orchid	<i>Thelymitra benthamiana</i>		v	
Pink Sun-orchid	<i>Thelymitra carnea</i>			
Naked Sun-orchid	<i>Thelymitra circumsepta</i>		v	
Veined Sun-orchid	<i>Thelymitra cyanea</i>			
Twisted Sun-orchid	<i>Thelymitra flexuosa</i>			
Blue-star Sun-orchid	<i>Thelymitra holmesii</i>			
Spotted Sun-orchid	<i>Thelymitra ixioides</i> s.l.			
Spotted Sun-orchid	<i>Thelymitra ixioides</i> s.s.			
Spiral Sun-orchid	<i>Thelymitra matthewsii</i>	v	v	L
Tall Sun-orchid	<i>Thelymitra media</i> s.l.			
Merran's Sun-orchid	<i>Thelymitra merraniae</i>		e	L
Plum Orchid	<i>Thelymitra mucida</i>		v	
Plain Sun-orchid	<i>Thelymitra nuda</i>			
Slender Sun-orchid	<i>Thelymitra pauciflora</i> s.l.			
Salmon Sun-orchid	<i>Thelymitra rubra</i>			
Anglesea Sun-orchid	<i>Thelymitra</i> sp. aff. <i>pauciflora</i> (Anglesea)		v	I
Sun Orchid	<i>Thelymitra</i> spp.			
Hybrid Sun-orchid complex	<i>Thelymitra X truncata</i> complex			
Elbow Orchid	<i>Thynniorchis huntianus</i>			
Bluebeard Wax-lip Hybrid Orchid	<i>X Calassodia tutelata</i>		r	
Curly Pondweed	<i>Potamogeton crispus</i>			
Blunt Pondweed	<i>Potamogeton ochreatus</i>			
Fennel Pondweed	<i>Potamogeton pectinatus</i>			
Floating Pondweed	<i>Potamogeton tricarinatus</i> s.l.			
Tassel Cord-rush	<i>Baloskion tetrphyllum</i> ssp. <i>tetrphyllum</i>			
Long Rope-rush	<i>Calorophus elongatus</i>		v	
Spreading Rope-rush	<i>Empodisma minus</i>			
Tassel Rope-rush	<i>Hypolaena fastigiata</i>			
Common Scale-rush	<i>Lepyrodia muelleri</i>			
Narrow-leaf Cumbungi	<i>Typha domingensis</i>			
Broad-leaf Cumbungi	<i>Typha orientalis</i>			
Bulrush	<i>Typha</i> spp.			
Slender Yellow-eye	<i>Xyris gracilis</i>			



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Tall Yellow-eye	<i>Xyris operculata</i>			
Long-fruit Water-mat	<i>Lepilaena cylindrocarpa</i>			
Dwarf Grass-wrack	<i>Zostera muelleri</i>			
Wattle Mat-rush	<i>Lomandra filiformis</i>			
Wattle Mat-rush	<i>Lomandra filiformis ssp. coriacea</i>			
Wattle Mat-rush	<i>Lomandra filiformis ssp. filiformis</i>			
Spiny-headed Mat-rush	<i>Lomandra longifolia</i>			
Cluster-headed Mat-rush	<i>Lomandra longifolia ssp. exilis</i>			
Spiny-headed Mat-rush	<i>Lomandra longifolia ssp. longifolia</i>			
Small-flower Mat-rush	<i>Lomandra micrantha s.l.</i>			
Small-flower Mat-rush	<i>Lomandra micrantha ssp. micrantha</i>			
Many-flowered Mat-rush	<i>Lomandra multiflora ssp. multiflora</i>			
Dwarf Mat-rush	<i>Lomandra nana</i>			
Mat-rush	<i>Lomandra spp.</i>			
Austral Grass-tree	<i>Xanthorrhoea australis</i>			
Small Grass-tree	<i>Xanthorrhoea minor ssp. lutea</i>			
Yacca	<i>Xanthorrhoea semiplana ssp. semiplana</i>		r	
*Yellow Alstroemeria	<i>Alstroemeria aurea</i>			
*Agapanthus	<i>Agapanthus praecox ssp. orientalis</i>			
*Three-corner Garlic	<i>Allium triquetrum</i>			
*Crow Garlic	<i>Allium vineale</i>			
Pale Vanilla-lily	<i>Arthropodium milleflorum s.l.</i>			
Chocolate Lily	<i>Arthropodium strictum s.l.</i>			
Blue Stars	<i>Chamaescilla corymbosa var. corymbosa</i>			
Dwarf Wire-lily	<i>Laxmannia orientalis</i>			
Branching Fringe-lily	<i>Thysanotus juncifolius</i>			
Twining Fringe-lily	<i>Thysanotus patersonii</i>			
Common Fringe-lily	<i>Thysanotus tuberosus</i>			
Common Fringe-lily	<i>Thysanotus tuberosus ssp. tuberosus</i>			
*Asparagus Fern	<i>Asparagus scandens</i>			
*Onion Weed	<i>Asphodelus fistulosus</i>			
Bulbine Lily	<i>Bulbine bulbosa</i>			
Tall Astelia	<i>Astelia australiana</i>	v	v	7
Milkmaids	<i>Burchardia umbellata</i>			
Common Early Nancy	<i>Wurmbea dioica</i>			
Turquoise Berry	<i>Drymophila cyanocarpa</i>			
Blue Grass-lily	<i>Caesia calliantha</i>			
Pale Grass-lily	<i>Caesia parviflora</i>			
Pale Grass-lily	<i>Caesia parviflora var. minor</i>		k	
Pale Grass-lily	<i>Caesia parviflora var. parviflora</i>			
Grass Lily	<i>Caesia spp.</i>			
Small-flower Flax-lily	<i>Dianella brevicaulis</i>			
Swamp Flax-lily	<i>Dianella callicarpa</i>		r	
Pale Flax-lily	<i>Dianella longifolia</i>			
Black-anther Flax-lily	<i>Dianella revoluta s.l.</i>			
Black-anther Flax-lily	<i>Dianella revoluta s.s.</i>			
Flax Lily	<i>Dianella spp.</i>			

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Tasman Flax-lily	<i>Dianella tasmanica</i>			
Tufted Lily	<i>Thelionema caespitosum</i>			
Clustered Lily	<i>Thelionema umbellatum</i>		r	
Yellow Rush-lily	<i>Tricoryne elatior</i>			
Many-fruit Tassel	<i>Ruppia polycarpa</i>			
*Angled Pigface	<i>Carpobrotus aequilaterus</i>			
*Hottentot Fig	<i>Carpobrotus edulis</i>			
Karkalla	<i>Carpobrotus rossii</i>			
Pigface	<i>Carpobrotus</i> spp.			
Rounded Noon-flower	<i>Disphyma crassifolium</i> ssp. <i>clavellatum</i>			
*Galenia	<i>Galenia pubescens</i> var. <i>pubescens</i>			
Bower Spinach	<i>Tetragonia implexicoma</i>			
New Zealand Spinach	<i>Tetragonia tetragonioides</i>			
Lesser Joyweed	<i>Alternanthera denticulata</i> s.l.			
*Spreading Amaranth	<i>Amaranthus deflexus</i>			
Trailing Hemichroa	<i>Hemichroa pentandra</i>			
Sea Box	<i>Alyxia buxifolia</i>			
Twining Silkpod	<i>Parsonsia brownii</i>			
*Blue Periwinkle	<i>Vinca major</i>			
*English Ivy	<i>Hedera helix</i>			
Wiry Bauera	<i>Bauera rubioides</i>			
*Fiddle Neck	<i>Amsinckia</i> spp.			
Forest Hound's-tongue	<i>Austrocynoglossum latifolium</i>			
Australian Hound's-tongue	<i>Cynoglossum australe</i>			
Sweet Hound's-tongue	<i>Cynoglossum suaveolens</i>			
*Paterson's Curse	<i>Echium plantagineum</i>			
Austral Forget-me-not	<i>Myosotis australis</i>			
*Yellow-and-blue Forget-me-not	<i>Myosotis discolor</i>			
Sweet Forget-me-not	<i>Myosotis exarrhena</i>			
*Water Forget-me-not	<i>Myosotis laxa</i> ssp. <i>caespitosa</i>			
Forget-me-not	<i>Myosotis</i> spp.			
*Wood Forget-me-not	<i>Myosotis sylvatica</i>			
Blue Pincushion	<i>Brunonia australis</i>			
Short Water-starwort	<i>Callitriche brachycarpa</i>		v	L
Round Water-starwort	<i>Callitriche muelleri</i>			
Water Starwort	<i>Callitriche</i> spp.			
*Common Starwort	<i>Callitriche stagnalis</i>			
Swamp Isotome	<i>Isotoma fluviatilis</i> ssp. <i>australis</i>			
Angled Lobelia	<i>Lobelia anceps</i>			
Showy Lobelia	<i>Lobelia beaugleholei</i>		r	
Tall Lobelia	<i>Lobelia gibbosa</i> s.l.			
Salt Pratia	<i>Lobelia irrigua</i>			
Matted Pratia	<i>Lobelia pedunculata</i> s.l.			
Poison Lobelia	<i>Lobelia pratioides</i>			
Tufted Lobelia	<i>Lobelia rhombifolia</i>			
Narrow Lobelia	<i>Lobelia simplicicaulis</i>			
Lobelia	<i>Lobelia</i> spp.			



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Tufted Bluebell	<i>Wahlenbergia communis</i> s.l.			
Annual Bluebell	<i>Wahlenbergia gracilentia</i> s.l.			
Sprawling Bluebell	<i>Wahlenbergia gracilis</i> s.l.			
Naked Bluebell	<i>Wahlenbergia gymnoclada</i>			
Bronze Bluebell	<i>Wahlenbergia luteola</i>			
Branching Bluebell	<i>Wahlenbergia multicaulis</i>			
Bluebell	<i>Wahlenbergia</i> spp.			
Tall Bluebell	<i>Wahlenbergia stricta</i>			
*Japanese Honeysuckle	<i>Lonicera japonica</i>			
White Elderberry	<i>Sambucus gaudichaudiana</i>			
*Lesser Thyme-leaved Sandwort	<i>Arenaria leptoclados</i>			
*Common Mouse-ear Chickweed	<i>Cerastium glomeratum</i> s.l.			
*Mouse-ear Chickweed	<i>Cerastium semidecandrum</i> s.l.			
*Mouse-ear Chickweed	<i>Cerastium</i> spp.			
*Common Mouse-ear Chickweed	<i>Cerastium vulgare</i>			
Coast Colobanth	<i>Colobanthus apetalus</i> var. <i>apetalus</i>			
*Fine-leaved Sandwort	<i>Minuartia mediterranea</i>			
*Erect Chickweed	<i>Moenchia erecta</i>			
*Velvety Pink	<i>Petrorhagia velutina</i>			
*Four-leaved Allseed	<i>Polycarpon tetraphyllum</i>			
*Common Pearlwort	<i>Sagina apetala</i>			
*Sea Pearlwort	<i>Sagina maritima</i>			
*Spreading Pearlwort	<i>Sagina procumbens</i>			
*French Catchfly	<i>Silene gallica</i>			
*French Catchfly	<i>Silene gallica</i> var. <i>gallica</i>			
*Mediterranean Catchfly	<i>Silene nocturna</i>			
*Corn Spurrey	<i>Spergula arvensis</i>			
Salt Sand-spurrey	<i>Spergularia marina</i> s.l.			
Coast Sand-spurrey	<i>Spergularia media</i> s.l.			
*Red Sand-spurrey	<i>Spergularia rubra</i> s.l.			
Swamp Starwort	<i>Stellaria angustifolia</i>			
Forest Starwort	<i>Stellaria flaccida</i>			
*Chickweed	<i>Stellaria media</i>			
Prickly Starwort	<i>Stellaria pungens</i>			
Starwort	<i>Stellaria</i> spp.			
Black Sheoak	<i>Allocasuarina littoralis</i>			
Slender Sheoak	<i>Allocasuarina misera</i>			
Slender/Green Sheoak	<i>Allocasuarina misera/paradoxa</i>			
Scrub Sheoak	<i>Allocasuarina paludosa</i>			
Dwarf Sheoak	<i>Allocasuarina pusilla</i> s.l.			
Sheoak	<i>Allocasuarina</i> spp.			
Drooping Sheoak	<i>Allocasuarina verticillata</i>			
Glistening Saltbush	<i>Atriplex billardieri</i>		x	
*Hastate Orache	<i>Atriplex prostrata</i>			
Berry Saltbush	<i>Atriplex semibaccata</i>			
Glaucous Goosefoot	<i>Chenopodium glaucum</i>			
*Sowbane	<i>Chenopodium murale</i>			

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Nodding Saltbush	<i>Einadia nutans ssp. nutans</i>			
Ruby Saltbush	<i>Enchylaena tomentosa var. tomentosa</i>			
Grey Glasswort	<i>Halosarcia halocnemoides ssp. halocnemoides</i>			
Seaberry Saltbush	<i>Rhagodia candolleana ssp. candolleana</i>			
Thick-head Glasswort	<i>Sarcocornia blackiana</i>			
Beaded Glasswort	<i>Sarcocornia quinqueflora</i>			
Austral Seablite	<i>Suaeda australis</i>			
Coast Bonefruit	<i>Threlkeldia diffusa</i>			
*Milfoil	<i>Achillea millefolium</i>			
Dune Thistle	<i>Actites megalocarpa</i>			
Salt Angianthus	<i>Angianthus preissianus</i>			
Showy Cassinia	<i>Apalochlamys spectabilis</i>			
*Cape Weed	<i>Arctotheca calendula</i>			
Woolly Everlasting	<i>Argentipallium blandowskianum</i>			
Blunt Everlasting	<i>Argentipallium obtusifolium</i>			
*Aster-weed	<i>Aster subulatus</i>			
Composite	<i>Asteraceae spp.</i>			
Blanket-leaf	<i>Bedfordia arborescens</i>			
*English Daisy	<i>Bellis perennis</i>			
*African Thistle	<i>Berkheya rigida</i>			
Branching Daisy	<i>Brachyscome aculeata</i>			
Swamp Daisy	<i>Brachyscome cardiocarpa</i>			
Tall Daisy	<i>Brachyscome diversifolia</i>			
Grass Daisy	<i>Brachyscome graminea</i>			
Cut-leaf Daisy	<i>Brachyscome multifida</i>			
Coast Daisy	<i>Brachyscome parvula</i>			
Daisy	<i>Brachyscome spp.</i>			
Small Swamp-daisy	<i>Brachyscome uliginosa</i>			
Milky Beauty-heads	<i>Calocephalus lacteus</i>			
*Slender Thistle	<i>Carduus pycnocephalus</i>			
*Slender Thistle species aggregate	<i>Carduus pycnocephalus/tenuiflorus</i>			
*Slender Thistle	<i>Carduus spp.</i>			
*Winged Thistle	<i>Carduus tenuiflorus</i>			
Common Cassinia	<i>Cassinia aculeata</i>			
Shiny Cassinia	<i>Cassinia longifolia</i>			
Common Sneezeweed	<i>Centipeda cunninghamii</i>			
Spreading Sneezeweed	<i>Centipeda minima s.l.</i>			
*Boneseed	<i>Chrysanthemoides monilifera</i>			
*African Boneseed	<i>Chrysanthemoides monilifera ssp. monilifera</i>			
Common Everlasting	<i>Chrysocephalum apiculatum s.l.</i>			
Clustered Everlasting	<i>Chrysocephalum semipapposum</i>			
*Perennial Thistle	<i>Cirsium arvense</i>			
*Spear Thistle	<i>Cirsium vulgare</i>			
*Tall Fleabane	<i>Conyza albida</i>			
*Smooth Fleabane	<i>Conyza bilbaoana</i>			
*Flaxleaf Fleabane	<i>Conyza bonariensis</i>			
*Canadian Fleabane	<i>Conyza canadensis s.l.</i>			



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*Fleabane	<i>Conyza</i> spp.			
Common Cotula	<i>Cotula australis</i>			
*Ferny Cotula	<i>Cotula bipinnata</i>			
*Water Buttons	<i>Cotula coronopifolia</i>			
Common Billy-buttons	<i>Craspedia glauca</i> spp. agg.			
Billy Buttons	<i>Craspedia</i> spp.			
*Smooth Hawksbeard	<i>Crepis capillaris</i>			
Austral Bear's-ear	<i>Cymbonotus preissianus</i>			
*Cape Ivy	<i>Delairea odorata</i>			
*Stinkwort	<i>Dittrichia graveolens</i>			
*Seaside Daisy	<i>Erigeron karvinskianus</i>			
Clustered/Creeping Cudweed	<i>Euchiton collinus</i> s.l.			
Creeping Cudweed	<i>Euchiton collinus</i> s.s.			
Common Cudweed	<i>Euchiton involucratus</i> s.l.			
Star Cudweed	<i>Euchiton involucratus</i> s.s.			
Annual Cudweed	<i>Euchiton sphaericus</i>			
Cudweed	<i>Euchiton</i> spp.			
*Silky Cudweed	<i>Gamochaeta calviceps</i>			
*Purple Cudweed	<i>Gamochaeta purpurea</i> s.l.			
*Spiked Cudweed	<i>Gamochaeta purpurea</i> s.s.			
Tiny Cudweed	<i>Gnaphalium indutum</i>			
Cudweed	<i>Gnaphalium</i> spp.			
Satin Everlasting	<i>Helichrysum leucopsidium</i>			
Button Everlasting	<i>Helichrysum scorpioides</i>			
Everlasting	<i>Helichrysum</i> spp.			
*Ox-tongue	<i>Helminthotheca echioides</i>			
Moss Sunray	<i>Hyalosperma demissum</i>			
*Smooth Cat's-ear	<i>Hypochoeris glabra</i>			
*Cat's Ear	<i>Hypochoeris radicata</i>			
Ixodia	<i>Ixodia achillaeoides</i>			
Ixodia	<i>Ixodia achillaeoides</i> ssp. <i>alata</i>			
*Willow-leaf Lettuce	<i>Lactuca saligna</i>			
*Lettuce	<i>Lactuca</i> spp.			
Slender Bottle-daisy	<i>Lagenophora gracilis</i>			
Bottle Daisy	<i>Lagenophora</i> spp.			
Common Bottle-daisy	<i>Lagenophora stipitata</i>			
Wrinkled Buttons	<i>Leiocarpa gatesii</i>	v	v	98
*Hairy Hawkbit	<i>Leontodon taraxacoides</i> ssp. <i>taraxacoides</i>			
Creeping Cotula	<i>Leptinella reptans</i> s.l.			
Creeping Cotula	<i>Leptinella reptans</i> s.s.			
Shiny Buttons	<i>Leptorhynchus nitidulus</i>			
Scaly Buttons	<i>Leptorhynchus squamatus</i>			
Wiry Buttons	<i>Leptorhynchus tenuifolius</i>			
*Oxeye Daisy	<i>Leucanthemum vulgare</i>			
Cushion Bush	<i>Leucophyta brownii</i>			
*Pitch Weed	<i>Madia sativa</i>			
Yam Daisy	<i>Microseris scapigera</i> spp. agg.			

English Name	Scientific Name	EPBC	Vic	FFG
Woolly-heads	<i>Myriocephalus rhizocephalus</i>			
Musk Daisy-bush	<i>Olearia argophylla</i>			
Coast Daisy-Bush	<i>Olearia axillaris</i>			
Moth Daisy-bush	<i>Olearia erubescens</i>			
Swamp Daisy-bush	<i>Olearia glandulosa</i>			
Sticky Daisy-bush	<i>Olearia glutinosa</i>			
Snowy Daisy-bush	<i>Olearia lirata</i>			
Silky Daisy-bush	<i>Olearia myrsinoides</i>			
Velvet Daisy-bush	<i>Olearia pannosa ssp. cardiophylla</i>		v	L
Dusty Daisy-bush	<i>Olearia phlogopappa</i>			
Twiggy Daisy-bush	<i>Olearia ramulosa</i>			
Twiggy Daisy-bush	<i>Olearia ramulosa var. ramulosa</i>			
Netted Daisy-bush	<i>Olearia speciosa</i>		k	
Daisy Bush	<i>Olearia spp.</i>			
Starry Daisy-bush	<i>Olearia stellulata</i>		k	
Cypress Daisy-bush	<i>Olearia teretifolia</i>			
Rayless Daisy-bush	<i>Olearia tubuliflora</i>		r	
*Scotch Thistle	<i>Onopordum acanthium ssp. acanthium</i>			
Tree Everlasting	<i>Ozothamnus ferrugineus</i>			
Nunniong Everlasting	<i>Ozothamnus rogersianus</i>		r	
Rosemary Everlasting	<i>Ozothamnus rosmarinifolius</i>			
Coast Everlasting	<i>Ozothamnus turbinatus</i>			
Native Picris	<i>Picris angustifolia</i>			
Picris	<i>Picris spp.</i>			
Sticky Long-heads	<i>Podotheca angustifolia</i>			
Jersey Cudweed	<i>Pseudognaphalium luteoalbum</i>			
Jagged Fireweed	<i>Senecio biserratus</i>			
*Purple Groundsel	<i>Senecio elegans</i>			
Annual Fireweed	<i>Senecio glomeratus</i>			
Rough Fireweed	<i>Senecio hispidulus</i>			
*Ragwort	<i>Senecio jacobaea</i>			
Fireweed Groundsel	<i>Senecio linearifolius</i>			
Shrubby Fireweed	<i>Senecio minimus</i>			
Scented Groundsel	<i>Senecio odoratus var. odoratus</i>			
Variable Groundsel	<i>Senecio pinnatifolius</i>			
Cotton Fireweed	<i>Senecio quadridentatus</i>			
Beaked Fireweed	<i>Senecio sp. aff. tenuiflorus</i>			
Dune Groundsel	<i>Senecio spathulatus s.l.</i>			
Groundsel	<i>Senecio spp.</i>			
Leafy Fireweed	<i>Senecio squarrosus</i>			
Slender Fireweed	<i>Senecio tenuiflorus</i>			
Forest Groundsel	<i>Senecio velleioides</i>			
Coast Fireweed	<i>Senecio X orarius</i>		r	
Indian Weed	<i>Sigesbeckia orientalis ssp. orientalis</i>			
*Variegated Thistle	<i>Silybum marianum</i>			
Smooth Solenogyne	<i>Solenogyne dominii</i>			
Solenogyne	<i>Solenogyne spp.</i>			



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*Jo Jo	<i>Soliva sessilis</i>			
*Rough Sow-thistle	<i>Sonchus asper</i> s.l.			
*Blue Sow-thistle	<i>Sonchus asper</i> ssp. <i>glaucescens</i>			
Native Sow-thistle	<i>Sonchus hydrophilus</i>			
*Common Sow-thistle	<i>Sonchus oleraceus</i>			
Sow Thistle	<i>Sonchus</i> spp.			
Spoon Cudweed	<i>Stuartina muelleri</i>			
*Garden Dandelion	<i>Taraxacum officinale</i> spp. agg.			
Dandelion	<i>Taraxacum</i> spp.			
*White Cudweed	<i>Vellereophyton dealbatum</i>			
*Bathurst Burr	<i>Xanthium spinosum</i>			
Forest Bindweed	<i>Calystegia marginata</i>			
Large Bindweed	<i>Calystegia sepium</i>			
*Greater Bindweed	<i>Calystegia silvatica</i>			
*Common Bindweed	<i>Convolvulus arvensis</i>			
Pink Bindweed	<i>Convolvulus erubescens</i> spp. agg.			
Kidney-weed	<i>Dichondra repens</i>			
Narrow-leaf Wilsonia	<i>Wilsonia backhousei</i>			
Stalked Crassula	<i>Crassula closiana</i>			
Spreading Crassula	<i>Crassula decumbens</i> var. <i>decumbens</i>			
Swamp Crassula	<i>Crassula helmsii</i>			
*Shade Crassula	<i>Crassula multicava</i> ssp. <i>multicava</i>			
*Water Crassula	<i>Crassula natans</i> var. <i>minus</i>			
Sieber Crassula	<i>Crassula sieberiana</i>			
Australian Stonecrop	<i>Crassula sieberiana</i> ssp. <i>tetramera</i>			
*Shrubby Crassula	<i>Crassula tetragona</i> ssp. <i>robusta</i>			
*White Turnip	<i>Brassica rapa</i>			
*Mediterranean Turnip	<i>Brassica tournefortii</i>			
*Indian Mustard	<i>Brassica X juncea</i>			
*American Sea Rocket	<i>Cakile edentula</i>			
*Sea Rocket	<i>Cakile maritima</i> ssp. <i>maritima</i>			
Common Bitter-cress	<i>Cardamine gunnii</i> s.l.			
*Common Bitter-cress	<i>Cardamine hirsuta</i> s.l.			
Forest Bitter-cress	<i>Cardamine papillata</i>		v	
Annual Bitter-cress	<i>Cardamine paucijuga</i> s.l.			
*Wallflower	<i>Cheiranthus cheiri</i>			
*Buchan Weed	<i>Hirschfeldia incana</i>			
Hairy Shepherd's Purse	<i>Microlepidium pilosulum</i>		e	
*Wild Radish	<i>Raphanus raphanistrum</i>			
Forest Bitter-cress	<i>Rorippa dictyosperma</i>			
Long-style Bitter-cress	<i>Rorippa gigantea</i>			
*Watercress	<i>Rorippa nasturtium-aquaticum</i>			
*Marsh Yellow-cress	<i>Rorippa palustris</i>			
Bitter Cress	<i>Rorippa</i> spp.			
*Indian Hedge-mustard	<i>Sisymbrium orientale</i>			
Dodder	<i>Cuscuta</i> spp.			
Prickly Guinea-flower	<i>Hibbertia acicularis</i>			

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Southern Guinea-flower	<i>Hibbertia appressa</i>			
Rough Guinea-flower	<i>Hibbertia aspera</i> s.l.			
Tangled Guinea-flower	<i>Hibbertia empetrifolia</i> s.l.			
Bundled Guinea-flower	<i>Hibbertia fasciculata</i> var. <i>prostrata</i>			
Spreading Guinea-flower	<i>Hibbertia procumbens</i>			
Erect Guinea-flower	<i>Hibbertia riparia</i>			
Silky Guinea-flower	<i>Hibbertia sericea</i> s.l.			
Silky Guinea-flower	<i>Hibbertia sericea</i> s.s.			
Silky Guinea-flower	<i>Hibbertia sericea</i> vars. <i>densiflora/sericea</i>			
Guinea Flower	<i>Hibbertia</i> spp.			
Upright Guinea-flower	<i>Hibbertia stricta</i> s.l.			
*Wild Teasel	<i>Dipsacus fullonum</i> ssp. <i>fullonum</i>			
Forked Sundew	<i>Drosera binata</i>			
Scarlet Sundew	<i>Drosera glanduligera</i>			
Climbing Sundew	<i>Drosera macrantha</i>			
Pale Sundew	<i>Drosera peltata</i>			
Tall Sundew	<i>Drosera peltata</i> ssp. <i>auriculata</i>			
Pale Sundew	<i>Drosera peltata</i> ssp. <i>peltata</i>			
Tiny Sundew	<i>Drosera pygmaea</i>			
Rosy Sundew	<i>Drosera spatulata</i>			
Scented Sundew	<i>Drosera whittakeri</i> ssp. <i>aberrans</i>			
Waterwort	<i>Elatine gratioloides</i>			
Ridged Ground-berry	<i>Acrotriche affinis</i>			
Trailing Ground-berry	<i>Acrotriche prostrata</i>			
Honey-pots	<i>Acrotriche serrulata</i>			
Ground Berry	<i>Acrotriche</i> spp.			
Cranberry Heath	<i>Astroloma humifusum</i>			
Fringed Brachyloma	<i>Brachyloma ciliatum</i>			
Heath	<i>Epacridaceae</i> spp.			
Common Heath	<i>Epacris impressa</i>			
Common Heath	<i>Epacris impressa</i> var. <i>impressa</i>			
Woolly-style Heath	<i>Epacris lanuginosa</i>			
Coral Heath	<i>Epacris microphylla</i> s.l.			
Blunt-leaf Heath	<i>Epacris obtusifolia</i>			
Spike Beard-heath	<i>Leucopogon australis</i>			
Pink Beard-heath	<i>Leucopogon ericoides</i>			
Twisted Beard-heath	<i>Leucopogon glacialis</i>			
Coast Beard-heath	<i>Leucopogon parviflorus</i>			
Beard Heath	<i>Leucopogon</i> spp.			
Common Beard-heath	<i>Leucopogon virgatus</i>			
Peach Heath	<i>Lissanthe strigosa</i> ssp. <i>subulata</i>			
Tree Broom-heath	<i>Monotoca elliptica</i> s.l.			
Currant-wood	<i>Monotoca glauca</i>		r	
Prickly Broom-heath	<i>Monotoca scoparia</i>			
Pink Swamp-heath	<i>Sprengelia incarnata</i>			
*Berry-flower Heath	<i>Erica baccans</i>			
*Spanish Heath	<i>Erica lusitanica</i>			



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Snow-berry	<i>Gaultheria hispida</i>		e	L
Broom Spurge	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>			
Pale Turpentine Bush	<i>Beyeria lechenaultii</i>			
*Eyebane	<i>Chamaesyce maculata</i>			
*Sea Spurge	<i>Euphorbia paralias</i>			
*Terracina Spurge	<i>Euphorbia terracina</i>			
Thyme Spurge	<i>Phyllanthus hirtellus</i>			
Small Poranthera	<i>Poranthera microphylla</i>			
Wedding Bush	<i>Ricinocarpos pinifolius</i>			
Myrtle Beech	<i>Nothofagus cunninghamii</i>			
*Bastards Fumitory	<i>Fumaria bastardii</i>			
*Common Centaury	<i>Centaureum erythraea</i>			
Spiked Centaury	<i>Centaureum spicatum</i>			
*Centaury	<i>Centaureum</i> spp.			
*Slender Centaury	<i>Centaureum tenuiflorum</i>			
*Slender Cicendia	<i>Cicendia filiformis</i>			
*Square Cicendia	<i>Cicendia quadrangularis</i>			
White Sebaea	<i>Sebaea albidiflora</i>			
Yellow Sebaea	<i>Sebaea ovata</i>			
Sebaea	<i>Sebaea</i> spp.			
*Big Heron's-bill	<i>Erodium botrys</i>			
*Common Heron's-bill	<i>Erodium cicutarium</i>			
*Oval Heron's-bill	<i>Erodium malacoides</i>			
Heron's Bill	<i>Erodium</i> spp.			
*Cut-leaf Cranesbill	<i>Geranium dissectum</i>			
Northern Cranesbill	<i>Geranium homeanum</i>			
*Dovesfoot	<i>Geranium molle</i> var. <i>molle</i>			
Cinquefoil Cranesbill	<i>Geranium potentilloides</i>			
Grassland Cranesbill	<i>Geranium retrorsum</i> s.l.			
Austral Cranesbill	<i>Geranium solanderi</i> s.l.			
Crane's Bill	<i>Geranium</i> spp.			
*Greater Herb-Robert	<i>Geranium yeoi</i>			
Austral Stork's-bill	<i>Pelargonium australe</i>			
Kopata	<i>Pelargonium inodorum</i>			
Coast Stork's-bill	<i>Pelargonium littorale</i>		k	
*Oak-leaf Pelargonium	<i>Pelargonium quercifolium</i>			
Magenta Stork's-bill	<i>Pelargonium rodneyanum</i>			
Stork's Bill	<i>Pelargonium</i> spp.			
Bent Goodenia	<i>Goodenia geniculata</i>			
Slender Goodenia	<i>Goodenia gracilis</i>			
Swamp Goodenia	<i>Goodenia humilis</i>			
Trailing Goodenia	<i>Goodenia lanata</i>			
Hop Goodenia	<i>Goodenia ovata</i>			
Goodenia	<i>Goodenia</i> spp.			
Small-fruit Fan-flower	<i>Scaevola albida</i>			
Shiny Swamp-mat	<i>Selliera radicans</i>			
Shade Raspwort	<i>Gonocarpus humilis</i>			

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Creeping Raspwort	<i>Gonocarpus micranthus</i>			
Creeping Raspwort	<i>Gonocarpus micranthus</i> ssp. <i>micranthus</i>			
Raspwort	<i>Gonocarpus</i> spp.			
Common Raspwort	<i>Gonocarpus tetragynus</i>			
Germander Raspwort	<i>Gonocarpus teucroides</i> s.l.			
Rough Raspwort	<i>Haloragis aspera</i>			
Swamp Raspwort	<i>Haloragis brownii</i>			
Broad Water-milfoil	<i>Myriophyllum amphibium</i>			
Coarse Water-milfoil	<i>Myriophyllum caput-medusae</i>			
Tiny Water-milfoil	<i>Myriophyllum integrifolium</i>			
Amphibious Water-milfoil	<i>Myriophyllum simulans</i>			
Water-milfoil	<i>Myriophyllum</i> spp.			
*Tutsan	<i>Hypericum androsaemum</i>			
*Aaron's Beard	<i>Hypericum calycinum</i>			
Small St John's Wort	<i>Hypericum gramineum</i>			
Matted St John's Wort	<i>Hypericum japonicum</i>			
*St John's Wort	<i>Hypericum perforatum</i>			
Austral Bugle	<i>Ajuga australis</i>			
Australian Gipsywort	<i>Lycopus australis</i>			
*Horehound	<i>Marrubium vulgare</i>			
*Lemon Balm	<i>Melissa officinalis</i>			
River Mint	<i>Mentha australis</i>			
Forest Mint	<i>Mentha laxiflora</i>			
*Spearmint	<i>Mentha spicata</i>			
*African Spur-flower	<i>Plectranthus ciliatus</i>			
Victorian Christmas-bush	<i>Prostanthera lasianthos</i>			
Victorian Christmas-bush	<i>Prostanthera lasianthos</i> var. <i>lasianthos</i>			
Balm Mint-bush	<i>Prostanthera melissifolia</i>			
*Self-heal	<i>Prunella vulgaris</i>			
Dwarf Skullcap	<i>Scutellaria humilis</i>			
Slender Dodder-laurel	<i>Cassytha glabella</i>			
Coarse Dodder-laurel	<i>Cassytha melantha</i>			
Downy Dodder-laurel	<i>Cassytha pubescens</i> s.s.			
Yellow Bladderwort	<i>Utricularia australis</i>			
Fairies' Aprons	<i>Utricularia dichotoma</i> s.l.			
Tiny Bladderwort	<i>Utricularia lateriflora</i>			
Pink Bladderwort	<i>Utricularia tenella</i>			
Native Flax	<i>Linum marginale</i>			
*French Flax	<i>Linum trigynum</i>			
Oval-leaf Logania	<i>Logania ovata</i>		r	
Hairy Mitrewort	<i>Mitrasacme pilosa</i>			
Hairy Mitrewort	<i>Mitrasacme pilosa</i> var. <i>pilosa</i>			
Hairy Mitrewort	<i>Mitrasacme pilosa</i> var. <i>stuartii</i>			
Thyme Mitrewort	<i>Mitrasacme serpyllifolia</i>			
Mitrewort	<i>Mitrasacme</i> spp. (s.l.)			
Wiry Mitrewort	<i>Phyllangium divergens</i>			
Drooping Mistletoe	<i>Amyema pendula</i>			



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Creeping Mistletoe	<i>Muellerina eucalyptoides</i>			
Small Loosestrife	<i>Lythrum hyssopifolia</i>			
Purple Loosestrife	<i>Lythrum salicaria</i>			
Hemp Bush	<i>Gynatrix pulchella</i> s.l.			
Salt Lawrencia	<i>Lawrencia spicata</i>		r	
*Small-flower Mallow	<i>Malva parviflora</i>			
Mallow	<i>Malva</i> spp.			
*Red-flower Mallow	<i>Modiola caroliniana</i>			
Running Marsh-flower	<i>Villarsia reniformis</i>			
Marsh Flower	<i>Villarsia</i> spp.			
Gold-dust Wattle	<i>Acacia acinacea</i> s.l.			
Thin-leaf Wattle	<i>Acacia aculeatissima</i>			
*Cootamundra Wattle	<i>Acacia baileyana</i>			
Heath Wattle	<i>Acacia brownii</i>			
Silver Wattle	<i>Acacia dealbata</i>			
*Early Black-wattle	<i>Acacia decurrens</i>			
*Cedar Wattle	<i>Acacia elata</i>			
#White Sallow-wattle	<i>Acacia floribunda</i>			
Spreading Wattle	<i>Acacia genistifolia</i>			
#Coast/Sallow Wattle	<i>Acacia longifolia</i> s.l.			
#Sallow Wattle	<i>Acacia longifolia</i> ssp. <i>longifolia</i>			
#Coast Wattle	<i>Acacia longifolia</i> ssp. <i>sophorae</i>			
Black Wattle	<i>Acacia mearnsii</i>			
Blackwood	<i>Acacia melanoxylon</i>			
Narrow-leaf Wattle	<i>Acacia mucronata</i> ssp. <i>longifolia</i>			
Myrtle Wattle	<i>Acacia myrtifolia</i>			
Dwarf Silver Wattle	<i>Acacia nano-dealbata</i>		r	
Spike Wattle	<i>Acacia oxycedrus</i>			
Hedge Wattle	<i>Acacia paradoxa</i>			
Golden Wattle	<i>Acacia pycnantha</i>			
#Wirilda	<i>Acacia retinodes</i>			
#Wirilda	<i>Acacia retinodes</i> var. <i>retinodes</i>			
*Golden Wreath Wattle	<i>Acacia saligna</i>			
*Frosty Wattle	<i>Acacia schinoides</i>			
Wattle	<i>Acacia</i> spp.			
Hop Wattle	<i>Acacia stricta</i>			
Sweet Wattle	<i>Acacia suaveolens</i>			
Varnish Wattle	<i>Acacia verniciflua</i>			
Prickly Moses	<i>Acacia verticillata</i>			
Ovoid Prickly Moses	<i>Acacia verticillata</i> ssp. <i>ovoidea</i>			
Broad-leaf Prickly Moses	<i>Acacia verticillata</i> ssp. <i>ruscifolia</i>		r	
Prickly Moses	<i>Acacia verticillata</i> ssp. <i>verticillata</i>			
*Cape Wattle	<i>Paraserianthes lophantha</i> ssp. <i>lophantha</i>			
Austral Mulberry	<i>Hedycarya angustifolia</i>			
#Common Boobialla	<i>Myoporum insulare</i>			
Sticky Boobialla	<i>Myoporum</i> sp. <i>l</i>			
Rosy Baeckea	<i>Baeckea ramosissima</i>			

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Rosy Baeckea	<i>Baeckea ramosissima ssp. prostrata</i>		r	
Common Fringe-myrtle	<i>Calytrix tetragona</i>			
Otway Grey-gum	<i>Eucalyptus aff. cypellocarpa (Anglesea)</i>		v	l
West Coast Peppermint	<i>Eucalyptus aff. willisii (South-western Victoria)</i>			
Scentbark	<i>Eucalyptus aromaphloia</i>			
Brown Stringybark	<i>Eucalyptus baxteri s.l.</i>			
Brown Stringybark	<i>Eucalyptus baxteri s.s.</i>			
#Southern Mahogany	<i>Eucalyptus botryoides</i>			
Brooker's Gum	<i>Eucalyptus brookeriana</i>		r	
River Red-gum	<i>Eucalyptus camaldulensis</i>			
Mountain Grey-gum	<i>Eucalyptus cypellocarpa</i>			
#Southern Blue-gum	<i>Eucalyptus globulus</i>			
#Southern Blue-gum	<i>Eucalyptus globulus ssp. globulus</i>		r	
Gippsland Blue-gum	<i>Eucalyptus globulus ssp. pseudoglobulus</i>			
Bundy	<i>Eucalyptus gonicalyx s.l.</i>			
Bog Gum	<i>Eucalyptus kitsoniana</i>		r	
Bellarine Yellow-gum	<i>Eucalyptus leucoxylon ssp. bellarinensis</i>		e	L
Messmate Stringybark	<i>Eucalyptus obliqua</i>			
Swamp Gum	<i>Eucalyptus ovata</i>			
West-coast Swamp-gum	<i>Eucalyptus ovata var. grandiflora</i>		r	
Swamp Gum	<i>Eucalyptus ovata var. ovata</i>			
White Sallee	<i>Eucalyptus pauciflora ssp. pauciflora</i>			
Narrow-leaf Peppermint	<i>Eucalyptus radiata s.l.</i>			
Narrow-leaf Peppermint	<i>Eucalyptus radiata ssp. radiata</i>			
Mountain Ash	<i>Eucalyptus regnans</i>			
Eucalypt	<i>Eucalyptus spp.</i>			
Red Ironbark	<i>Eucalyptus tricarpa</i>			
Manna Gum	<i>Eucalyptus viminalis</i>			
Rough-barked Manna-gum	<i>Eucalyptus viminalis ssp. cygnetensis</i>			
Manna Gum	<i>Eucalyptus viminalis ssp. viminalis</i>			
Shining Peppermint	<i>Eucalyptus willisii</i>			
Yarra Gum	<i>Eucalyptus yarraensis</i>		k	l
Prickly Tea-tree	<i>Leptospermum continentale</i>			
Smooth Tea-tree	<i>Leptospermum glabrescens s.l.</i>			
#Coast Tea-tree	<i>Leptospermum laevigatum</i>			
Woolly Tea-tree	<i>Leptospermum lanigerum</i>			
Heath Tea-tree	<i>Leptospermum myrsinoides</i>			
Manuka	<i>Leptospermum scoparium</i>			
Tea Tree	<i>Leptospermum spp.</i>			
#Shiny Tea-tree	<i>Leptospermum turbinatum</i>		r	
#Giant Honey-myrtle	<i>Melaleuca armillaris ssp. armillaris</i>		r	
#Totem-poles	<i>Melaleuca decussata</i>			
*Green Honey-myrtle	<i>Melaleuca diosmifolia</i>			
*Hillock Bush	<i>Melaleuca hypericifolia</i>			
Moonah	<i>Melaleuca lanceolata ssp. lanceolata</i>			
*Showy Honey-myrtle	<i>Melaleuca nesophila</i>			
Rough-barked Honey-myrtle	<i>Melaleuca parvistaminea</i>			



English Name	Scientific Name	EPBC	Vic	FFG
Swamp Honey-myrtle	<i>Melaleuca squamea</i>			
Scented Paperbark	<i>Melaleuca squarrosa</i>			
*Weeping Honey-myrtle	<i>Melaleuca viminea</i>			
*Water-lily	<i>Nymphaea</i> spp.			
*Ash	<i>Fraxinus</i> spp.			
*European Privet	<i>Ligustrum vulgare</i>			
Privet Mock-olive	<i>Notelaea ligustrina</i>			
Variable Willow-herb	<i>Epilobium billardierianum</i>			
Smooth Willow-herb	<i>Epilobium billardierianum</i> ssp. <i>billardierianum</i>			
Grey Willow-herb	<i>Epilobium billardierianum</i> ssp. <i>cinereum</i>			
Variable Willow-herb	<i>Epilobium billardierianum</i> ssp. <i>intermedium</i>			
*Glandular Willow-herb	<i>Epilobium ciliatum</i>			
Hairy Willow-herb	<i>Epilobium hirtigerum</i>			
Showy Willow-herb	<i>Epilobium pallidiflorum</i>			
Willow Herb	<i>Epilobium</i> spp.			
*Fuchsia	<i>Fuchsia magellanica</i>			
*Reddish Evening-primrose	<i>Oenothera glazioviana</i>			
Yellow Wood-sorrel	<i>Oxalis corniculata</i> s.l.			
*Creeping Wood-sorrel	<i>Oxalis corniculata</i> s.s.			
Shady Wood-sorrel	<i>Oxalis exilis</i>			
*Pale Wood-sorrel	<i>Oxalis incarnata</i>			
Snowdrop Wood-sorrel	<i>Oxalis magellanica</i>		r	
Grassland Wood-sorrel	<i>Oxalis perennans</i>			
*Soursob	<i>Oxalis pes-caprae</i>			
*Large-flower Wood-sorrel	<i>Oxalis purpurea</i>			
Stout-rooted Wood-sorrel	<i>Oxalis radicata</i>			
Wood Sorrel	<i>Oxalis</i> spp.			
*Wood Sorrel	<i>Oxalis</i> spp. (naturalised)			
*Long-headed Poppy	<i>Papaver dubium</i>			
Wiry Bush-pea	<i>Almaleea subumbellata</i>			
Common Aotus	<i>Aotus ericoides</i>			
Showy Bossiaea	<i>Bossiaea cinerea</i>			
Wiry Bossiaea	<i>Bossiaea cordigera</i>		r	
Creeping Bossiaea	<i>Bossiaea prostrata</i>			
*Tree Lucerne	<i>Chamaecytisus palmensis</i>			
Dusky Scurf-pea	<i>Cullen microcephalum</i>			
Small Scurf-pea	<i>Cullen parvum</i>	e	e	31
*English Broom	<i>Cytisus scoparius</i>			
Leafless Bitter-pea	<i>Daviesia brevifolia</i>			
Narrow-leaf Bitter-pea	<i>Daviesia leptophylla</i>			
Gorse Bitter-pea	<i>Daviesia ulicifolia</i>			
Southern Tick-trefoil	<i>Desmodium gunnii</i>			
Slender Tick-trefoil	<i>Desmodium varians</i>		k	
Grey Parrot-pea	<i>Dillwynia cinerascens</i> s.l.			
Smooth Parrot-pea	<i>Dillwynia glaberrima</i>			
Red Parrot-pea	<i>Dillwynia hispida</i>			
Showy Parrot-pea	<i>Dillwynia sericea</i> s.l.			

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Parrot Pea	<i>Dillwynia</i> spp.			
*Common Dipogon	<i>Dipogon lignosus</i>			
*Flax-leaf Broom	<i>Genista linifolia</i>			
*Montpellier Broom	<i>Genista monspessulana</i>			
Twining Glycine	<i>Glycine clandestina</i>			
Small-leaf Glycine	<i>Glycine microphylla</i>			
Dwarf Wedge-pea	<i>Gompholobium ecostatum</i>			
Common Wedge-pea	<i>Gompholobium huegelii</i>			
Wedge Pea	<i>Gompholobium</i> spp.			
Golden Tip	<i>Goodia lotifolia</i>			
Common Hovea	<i>Hovea heterophylla</i>			
Austral Indigo	<i>Indigofera australis</i>			
Running Postman	<i>Kennedia prostrata</i>			
#Dusky Coral-pea	<i>Kennedia rubicunda</i>			
*Slender Bird's-foot Trefoil	<i>Lotus angustissimus</i>			
Austral Trefoil	<i>Lotus australis</i>			k
*Bird's-foot Trefoil	<i>Lotus corniculatus</i>			
*Narrow Bird's-foot Trefoil	<i>Lotus corniculatus</i> var. <i>tenuifolius</i>			
Trefoil	<i>Lotus</i> spp.			
*Trefoil	<i>Lotus</i> spp. (naturalised)			
*Hairy Bird's-foot Trefoil	<i>Lotus suaveolens</i>			
*Greater Bird's-foot Trefoil	<i>Lotus uliginosus</i>			
*Spotted Medic	<i>Medicago arabica</i>			
*Black Medic	<i>Medicago lupulina</i>			
*Little Medic	<i>Medicago minima</i>			
*Burr Medic	<i>Medicago polymorpha</i>			
*Medic	<i>Medicago</i> spp.			
*Sweet Melilot	<i>Melilotus indicus</i>			
*Sand Bird's-foot	<i>Ornithopus pinnatus</i>			
Handsome Flat-pea	<i>Platylobium formosum</i>			
Common Flat-pea	<i>Platylobium obtusangulum</i>			
*Blue Psoralea	<i>Psoralea pinnata</i>			
Coast Bush-pea	<i>Pultenaea canaliculata</i>			r
Large-leaf Bush-pea	<i>Pultenaea daphnoides</i>			
Clustered Bush-pea	<i>Pultenaea dentata</i>			
#Prickly Bush-pea	<i>Pultenaea forsythiana</i>			
Golden Bush-pea	<i>Pultenaea gunnii</i>			
Golden Bush-pea	<i>Pultenaea gunnii</i> ssp. <i>gunnii</i>			
Dwarf Bush-pea	<i>Pultenaea humilis</i>			
Prickly Bush-pea	<i>Pultenaea juniperina</i> s.l.			
Soft Bush-pea	<i>Pultenaea mollis</i>			
Mueller's Bush-pea	<i>Pultenaea muelleri</i>			
Mueller's Bush-pea	<i>Pultenaea muelleri</i> var. <i>muelleri</i>			
Mueller's Bush-pea	<i>Pultenaea muelleri</i> var. <i>reflexifolia</i>			k
Otway Bush-pea	<i>Pultenaea prolifera</i>			r
Rough Bush-pea	<i>Pultenaea scabra</i>			
Bush-pea	<i>Pultenaea</i> spp.			



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Rigid Bush-pea	<i>Pultenaea stricta</i>			
Slender Bush-pea	<i>Pultenaea tenuifolia</i>			
Eastern Globe-pea	<i>Sphaerolobium minus</i>			
Globe Pea	<i>Sphaerolobium</i> spp.			
Leafless Globe-pea	<i>Sphaerolobium vimineum</i> s.l.			
Coast Swainson-pea	<i>Swainsona lessertiifolia</i>			
*Narrow-leaf Clover	<i>Trifolium angustifolium</i> var. <i>angustifolium</i>			
*Hare's-foot Clover	<i>Trifolium arvense</i> var. <i>arvense</i>			
*Hop Clover	<i>Trifolium campestre</i> var. <i>campestre</i>			
*Drooping-flower Clover	<i>Trifolium cernuum</i>			
*Suckling Clover	<i>Trifolium dubium</i>			
*Strawberry Clover	<i>Trifolium fragiferum</i> var. <i>fragiferum</i>			
*Cluster Clover	<i>Trifolium glomeratum</i>			
*Annual White Clover	<i>Trifolium michelianum</i> var. <i>michelianum</i>			
*White Clover	<i>Trifolium repens</i> var. <i>repens</i>			
*Rough Clover	<i>Trifolium scabrum</i>			
*Clover	<i>Trifolium</i> spp.			
*Subterranean Clover	<i>Trifolium subterraneum</i>			
Fenugreek	<i>Trigonella</i> spp.			
*Gorse	<i>Ulex europaeus</i>			
*Tiny Vetch	<i>Vicia hirsuta</i>			
*Common Vetch	<i>Vicia sativa</i>			
*Narrow-leaf Vetch	<i>Vicia sativa</i> ssp. <i>nigra</i>			
*Common Vetch	<i>Vicia sativa</i> ssp. <i>sativa</i>			
*Vetch	<i>Vicia</i> spp.			
*Slender Vetch	<i>Vicia tetrasperma</i>			
Golden Spray	<i>Viminaria juncea</i>			
Passion Flower	<i>Passiflora</i> spp.			
Purple Apple-berry	<i>Billardiera longiflora</i> var. <i>longiflora</i>			
Common Apple-berry	<i>Billardiera scandens</i>			
Common Apple-berry	<i>Billardiera scandens</i> var. <i>scandens</i>			
Sweet Bursaria	<i>Bursaria spinosa</i> ssp. <i>spinosa</i>			
Banyalla	<i>Pittosporum bicolor</i>			
#Sweet Pittosporum	<i>Pittosporum undulatum</i>			
White Marianth	<i>Rhytidoporum procumbens</i>			
*Bluebell Creeper	<i>Sollya heterophylla</i>			
*Southern Plantain	<i>Plantago australis</i>			
*Buck's-horn Plantain	<i>Plantago coronopus</i>			
*Buck's-horn Plantain	<i>Plantago coronopus</i> ssp. <i>coronopus</i>			
Shade Plantain	<i>Plantago debilis</i>			
Hairy Plantain	<i>Plantago hispida</i>			
*Ribwort	<i>Plantago lanceolata</i>			
*Greater Plantain	<i>Plantago major</i>			
Plantain	<i>Plantago</i> spp.			
Variable Plantain	<i>Plantago varia</i>			
Blue-spike Milkwort	<i>Comesperma calymega</i>			
Leafless Milkwort	<i>Comesperma defoliatum</i>			

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Heath Milkwort	<i>Comesperma ericinum</i>			
Small Milkwort	<i>Comesperma polygaloides</i>		v	96
Mountain Milkwort	<i>Comesperma retusum</i>			
Milkwort	<i>Comesperma</i> spp.			
Love Creeper	<i>Comesperma volubile</i>			
*Myrtle-leaf Milkwort	<i>Polygala myrtifolia</i> var. <i>myrtifolia</i>			
*Rambling Dock	<i>Acetosa sagittata</i>			
*Sheep Sorrel	<i>Acetosella vulgaris</i>			
Climbing Lignum	<i>Muehlenbeckia adpressa</i>			
Slender Knotweed	<i>Persicaria decipiens</i>			
Water Pepper	<i>Persicaria hydropiper</i>			
Pale Knotweed	<i>Persicaria lapathifolia</i>			
Spotted Knotweed	<i>Persicaria praetermissa</i>			
Creeping Knotweed	<i>Persicaria prostrata</i>			
Knotweed	<i>Persicaria</i> spp.			
*Prostrate Knotweed	<i>Polygonum aviculare</i> s.l.			
*Hogweed	<i>Polygonum aviculare</i> s.s.			
Hogweed	<i>Polygonum</i> spp.			
Mud Dock	<i>Rumex bidens</i>			
Slender Dock	<i>Rumex brownii</i>			
*Clustered Dock	<i>Rumex conglomeratus</i>			
*Curled Dock	<i>Rumex crispus</i>			
*Broad-leaf Dock	<i>Rumex obtusifolius</i> ssp. <i>obtusifolius</i>			
*Fiddle Dock	<i>Rumex pulcher</i> ssp. <i>pulcher</i>			
Dock	<i>Rumex</i> spp.			
White Purslane	<i>Neopaxia australasica</i>			
*Pimpernel	<i>Anagallis arvensis</i>			
Creeping Brookweed	<i>Samolus repens</i>			
Silver Banksia	<i>Banksia marginata</i>			
Victorian Smoke-bush	<i>Conospermum mitchellii</i>			
Anglesea Grevillea	<i>Grevillea infecunda</i>		v	v
Small-flower Grevillea	<i>Grevillea linearifolia</i> s.l.			
*Pincushion Hakea	<i>Hakea laurina</i>			
Western Furze Hakea	<i>Hakea repullulans</i>			
Bushy Needlewood	<i>Hakea sericea</i> s.l.			
Hakea	<i>Hakea</i> spp.			
Furze Hakea	<i>Hakea ulicina</i>			
Horny Cone-bush	<i>Isopogon ceratophyllus</i>			
Tree Lomatia	<i>Lomatia fraseri</i>			
Holly Lomatia	<i>Lomatia ilicifolia</i>			
Prickly Geebung	<i>Persoonia juniperina</i>			
Mountain Clematis	<i>Clematis aristata</i>			
Small-leaved Clematis	<i>Clematis microphylla</i>			
Clematis	<i>Clematis</i> spp.			
Small River Buttercup	<i>Ranunculus amphitrichus</i>			
River Buttercup	<i>Ranunculus inundatus</i>			
Australian Buttercup	<i>Ranunculus lappaceus</i>			



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*Sharp Buttercup	<i>Ranunculus muricatus</i>			
*Small-flower Buttercup	<i>Ranunculus parviflorus</i>			
Forest/Hairy Buttercup	<i>Ranunculus plebeius</i> s.l.			
Ferny Small-flower Buttercup	<i>Ranunculus pumilio</i>			
Ferny Small-flower Buttercup	<i>Ranunculus pumilio</i> var. <i>politus</i>		k	
*Creeping Buttercup	<i>Ranunculus repens</i>			
River Buttercup complex	<i>Ranunculus rivularis</i> s.l.			
Annual Buttercup	<i>Ranunculus sessiliflorus</i>			
Buttercup	<i>Ranunculus</i> spp.			
*Large Annual Buttercup	<i>Ranunculus trilobus</i>			
*Weld	<i>Reseda luteola</i>			
Cryptandra	<i>Cryptandra</i> spp.			
Prickly Cryptandra	<i>Cryptandra tomentosa</i>			
Hazel Pomaderris	<i>Pomaderris aspera</i>			
Small-leaf Pomaderris	<i>Pomaderris elachophylla</i>			
Rusty Pomaderris	<i>Pomaderris ferruginea</i>			
Coast Pomaderris	<i>Pomaderris paniculosa</i> ssp. <i>paralia</i>			
Cluster Pomaderris	<i>Pomaderris racemosa</i>			
Pomaderris	<i>Pomaderris</i> spp.			
Dusty Miller	<i>Spyridium parvifolium</i>			
Winged Spyridium	<i>Spyridium vexilliferum</i> var. <i>vexilliferum</i>			
Hairy Sheep's Burr	<i>Acaena agnipila</i>			
Sheep's Burr	<i>Acaena echinata</i>			
Bidgee-widgee	<i>Acaena novae-zelandiae</i>			
Australian Sheep's Burr	<i>Acaena ovina</i>			
Sheep's Burr	<i>Acaena</i> spp.			
*Parsley Piert	<i>Aphanes arvensis</i>			
Australian Piert	<i>Aphanes australiana</i>			
Piert	<i>Aphanes</i> spp.			
*Hawthorn	<i>Crataegus monogyna</i>			
*Apple	<i>Malus pumila</i>			
*Cherry Plum	<i>Prunus cerasifera</i>			
*Prunus	<i>Prunus</i> spp.			
*Sweet Briar	<i>Rosa rubiginosa</i>			
*Blackberry	<i>Rubus erythrops</i>			
*Blackberry	<i>Rubus fruticosus</i> spp. agg.			
*Cut-leaf Bramble	<i>Rubus laciniatus</i>			
*Blackberry	<i>Rubus laciniatus</i> ssp. <i>selmeri</i>			
Small-leaf Bramble	<i>Rubus parvifolius</i>			
*Blackberry	<i>Rubus polyanthemus</i>			
*Blackberry	<i>Rubus</i> sp. aff. <i>armeniacus</i>			
Bramble	<i>Rubus</i> spp.			
*Blackberry	<i>Rubus ulmifolius</i>			
*Blackberry	<i>Rubus vestitus</i>			
Common Woodruff	<i>Asperula conferta</i>			
Mountain Woodruff	<i>Asperula gunnii</i>			
Prickly Woodruff	<i>Asperula scoparia</i>			

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Woodruff	<i>Asperula spp.</i>			
Water Woodruff	<i>Asperula subsimplex</i>			
Rough Coprosma	<i>Coprosma hirtella</i>			
Prickly Currant-bush	<i>Coprosma quadrifida</i>			
*Mirror Bush	<i>Coprosma repens</i>			
*Cleavers	<i>Galium aparine</i>			
Tangled Bedstraw	<i>Galium australe</i>			
Reflexed Bedstraw	<i>Galium binifolium</i>			
Hairy Bedstraw	<i>Galium ciliare</i>			
Compact Bedstraw	<i>Galium compactum</i>		r	
Rough Bedstraw	<i>Galium gaudichaudii</i>			
*Small Goosegrass	<i>Galium murale</i>			
Maori Bedstraw	<i>Galium propinquum</i>			
Bedstraw	<i>Galium spp.</i>			
Dwarf Nertera	<i>Leptostigma reptans</i>			
Broad-leaf Stinkweed	<i>Opercularia ovata</i>			
Variable Stinkweed	<i>Opercularia varia</i>			
*Field Madder	<i>Sherardia arvensis</i>			
Forest Boronia	<i>Boronia muelleri</i>			
Dwarf Boronia	<i>Boronia nana</i>			
Dwarf Boronia	<i>Boronia nana var. hyssopifolia</i>			
Dwarf Boronia	<i>Boronia nana var. nana</i>		r	
Dwarf Boronia	<i>Boronia nana var. pubescens</i>		r	
Swamp Boronia	<i>Boronia parviflora</i>			
White Correa	<i>Correa alba</i>			
Coast Correa	<i>Correa backhouseana var. backhouseana</i>		v	
Mountain Correa	<i>Correa lawrenceana</i>			
Mountain Correa	<i>Correa lawrenceana var. latrobeana</i>			
Common Correa	<i>Correa reflexa</i>			
Common Correa	<i>Correa reflexa var. reflexa</i>			
Eastern Correa	<i>Correa reflexa var. speciosa</i>			
Satinwood	<i>Nematolepis squamea</i>			
Satinwood	<i>Nematolepis squamea ssp. squamea</i>		r	
Stinkwood	<i>Zieria arborescens</i>			
*White Poplar	<i>Populus alba</i>			
*Weeping Willow	<i>Salix babylonica s.l.</i>			
*Willow	<i>Salix spp.</i>			
*Basket Willow	<i>Salix X rubens</i>			
Cherry Ballart	<i>Exocarpos cupressiformis</i>			
Pale-fruit Ballart	<i>Exocarpos strictus</i>			
Coast Ballart	<i>Exocarpos syrticola</i>		r	
*Purple Hop-bush	<i>Dodonia viscosa 'Purpurea'</i>			
Derwent Speedwell	<i>Derwentia derwentiana</i>			
*Foxglove	<i>Digitalis purpurea</i>			
Small Mud-mat	<i>Glossostigma elatinoides</i>			
Austral Brooklime	<i>Gratiola peruviana</i>			
Glandular Brooklime	<i>Gratiola pubescens</i>			



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Brooklime	<i>Gratiola spp.</i>			
Swamp Mazus	<i>Mazus pumilio</i>			
*Musk Monkey-flower	<i>Mimulus moschatus</i>			
Creeping Monkey-flower	<i>Mimulus repens</i>			
*Red Bartsia	<i>Parentucellia latifolia</i>			
*Yellow Bartsia	<i>Parentucellia viscosa</i>			
*Wall Speedwell	<i>Veronica arvensis</i>			
Hairy Speedwell	<i>Veronica calycina</i>			
Slender Speedwell	<i>Veronica gracilis</i>			
Forest Speedwell	<i>Veronica notabilis</i>			
*Persian Speedwell	<i>Veronica persica</i>			
Trailing Speedwell	<i>Veronica plebeia</i>			
Speedwell	<i>Veronica spp.</i>			
*African Box-thorn	<i>Lycium ferocissimum</i>			
*Alkekengi	<i>Physalis alkekengi</i>			
*Cape Gooseberry	<i>Physalis peruviana</i>			
*Glossy Nightshade	<i>Solanum americanum</i>			
Kangaroo Apple	<i>Solanum aviculare</i>			
*Douglas' Nightshade	<i>Solanum douglasii</i>			
Large Kangaroo Apple	<i>Solanum laciniatum</i>			
*Tomato	<i>Solanum lycopersicum</i>			
*White-edge Nightshade	<i>Solanum marginatum</i>			
*Black Nightshade	<i>Solanum nigrum sensu Willis (1972)</i>			
Gunyang	<i>Solanum vescum</i>			
Creamy Stackhousia	<i>Stackhousia monogyna</i>			
Coast Stackhousia	<i>Stackhousia spathulata</i>			k
Slender Stackhousia	<i>Stackhousia viminea</i>			
Slender Velvet-bush	<i>Lasiopetalum baueri</i>			
Paper Flower	<i>Thomasia petalocalyx</i>			r
Beaglehole's Trigger-plant	<i>Stylidium beagleholei</i>			
Grass Trigger-plant	<i>Stylidium graminifolium s.l.</i>			
Grass Trigger-plant	<i>Stylidium graminifolium s.s.</i>			
Hundreds and Thousands	<i>Stylidium inundatum</i>			
Trigger Plant	<i>Stylidium spp.</i>			
*Nasturtium	<i>Tropaeolum majus</i>			
Bootlace Bush	<i>Pimelea axiflora</i>			
Bootlace Bush	<i>Pimelea axiflora ssp. axiflora</i>			
Curved Rice-flower	<i>Pimelea curviflora s.l.</i>			
Yellow Rice-flower	<i>Pimelea flava</i>			
Yellow Rice-flower	<i>Pimelea flava ssp. flava</i>			
Smooth Rice-flower	<i>Pimelea glauca</i>			
Common Rice-flower	<i>Pimelea humilis</i>			
Tall Rice-flower	<i>Pimelea ligustrina</i>			
Tall Rice-flower	<i>Pimelea ligustrina ssp. ligustrina</i>			
Slender Rice-flower	<i>Pimelea linifolia</i>			
Slender Rice-flower	<i>Pimelea linifolia ssp. linifolia</i>			
Woolly Rice-flower	<i>Pimelea octophylla</i>			

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Heath Rice-flower	<i>Pimelea phyllicoides</i>			
Thyme Rice-flower	<i>Pimelea serpyllifolia</i> ssp. <i>serpyllifolia</i>			
Rice Flower	<i>Pimelea</i> spp.			
Pink-bells	<i>Tetratheca ciliata</i>			
Umbellifer	<i>Apiaceae</i> spp.			
Annual Celery	<i>Apium annuum</i>			
Sea Celery	<i>Apium prostratum</i> ssp. <i>prostratum</i>			
Sea Celery	<i>Apium prostratum</i> ssp. <i>prostratum</i> var. <i>filiforme</i>			
Centella	<i>Centella cordifolia</i>			
*Slender Celery	<i>Ciclospermum leptophyllum</i>			
*Hemlock	<i>Conium maculatum</i>			
Australian Carrot	<i>Daucus glochidiatus</i>			
Blue Devil	<i>Eryngium ovium</i>			
*Fennel	<i>Foeniculum vulgare</i>			
Small Pennywort	<i>Hydrocotyle callicarpa</i>			
Yellow Pennywort	<i>Hydrocotyle foveolata</i>			
Hairy Pennywort	<i>Hydrocotyle hirta</i>			
Stinking Pennywort	<i>Hydrocotyle laxiflora</i>			
Wing Pennywort	<i>Hydrocotyle pterocarpa</i>			
Shining Pennywort	<i>Hydrocotyle sibthorpioides</i>			
Pennywort	<i>Hydrocotyle</i> spp.			
Slender Pennywort	<i>Hydrocotyle tripartita</i>			
Australian Lilaeopsis	<i>Lilaeopsis polyantha</i>			
Slender Platysace	<i>Platysace heterophylla</i>			
Shrubby Platysace	<i>Platysace lanceolata</i>			
Cut-leaf Xanthosia	<i>Xanthosia dissecta</i> s.l.			
Native Parsley	<i>Xanthosia dissecta</i> s.s.			
Heath Xanthosia	<i>Xanthosia huegelii</i>			
Parsley Xanthosia	<i>Xanthosia leiophylla</i>		r	
Heath Xanthosia	<i>Xanthosia pusilla</i> spp. agg.			
Xanthosia	<i>Xanthosia</i> spp.			
Southern Xanthosia	<i>Xanthosia tasmanica</i>		r	
Shade Nettle	<i>Australina pusilla</i>			
Shade Nettle	<i>Australina pusilla</i> ssp. <i>muelleri</i>			
Small Shade-nettle	<i>Australina pusilla</i> ssp. <i>pusilla</i>		r	
Shade Pellitory	<i>Parietaria debilis</i> s.l.			
Scrub Nettle	<i>Urtica incisa</i>			
*Small Nettle	<i>Urtica urens</i>			
Tree Violet	<i>Hymenanthera dentata</i> s.l.			
Hidden Violet	<i>Viola cleistogamoides</i>			
Ivy-leaf Violet	<i>Viola hederacea</i> sensu Entwisle (1996)			
Ivy-leaf Violet	<i>Viola hederacea</i> sensu Willis (1972)			
*Common Violet	<i>Viola odorata</i>			
Tiny Violet	<i>Viola sieberiana</i> spp. agg.			
Violet	<i>Viola</i> spp.			
Mountain Pepper	<i>Tasmania lanceolata</i>			
Coast Twin-leaf	<i>Zygophyllum billardiieri</i>		r	



English Name	Scientific Name	EPBC	Vic	FFG
*Indian Hemp	<i>Cannabis sativa</i>			
Spear Moss	<i>Acrocladium chlamydophyllum</i>			
Marsh Feather-moss	<i>Leptodictyum riparium</i>			
Pale Tree-fern Moss	<i>Leptotheca gaudichaudii</i>			
Common Apple-moss	<i>Bartramia ithyphylla</i>			
Pale Apple-moss	<i>Bartramidula pusilla</i>			
Common Breutelia	<i>Breutelia affinis</i>			
Mountain Breutelia	<i>Breutelia pendula</i>			
Apple Moss	<i>Philonotis tenuis</i>			
Rough-stalked Feather-moss	<i>Brachythecium rutabulum</i>			
Smooth-stalk Feather-moss	<i>Brachythecium salebrosum</i>			
Feather Moss	<i>Eurhynchium asperipes</i>		k	
Feather Moss	<i>Platyhypnidium austrinum</i>			
Feather Moss	<i>Rhynchostegiella muriculata</i>			
Feather Moss	<i>Rhynchostegium laxatum</i>			
Feather Moss	<i>Rhynchostegium tenuifolium</i>			
Rosy Silver-moss	<i>Bryum blandum</i>			
Bloody Bryum	<i>Bryum chrysoneuron</i>			
Acorn-fruited Thread-moss	<i>Bryum pachythea</i>			
Thread Moss	<i>Bryum sullivanii</i>			
Common Thread-moss	<i>Rosulabryum billardiarei</i>			
Cryphaea	<i>Cryphaea ovalifolia</i>			
Golden Cryphaea	<i>Cyrtodon muelleri</i>			
River Cryphaea	<i>Dendrocryphaea tasmanica</i>			
Tall Dawsonia	<i>Dawsonia superba</i>			
Heath Star Moss	<i>Campylopus introflexus</i>			
Dwarf Swan-neck Moss	<i>Campylopus pyriformis</i>			
Forklet Moss	<i>Dicranella dietrichiae</i>			
Pale Fork-moss	<i>Dicranoloma dicarpum</i>			
Ming's Fingers	<i>Dicranoloma menziesii</i>			
Fork Moss	<i>Dicranoloma platycaulon</i>		r	
Redshank Moss	<i>Ceratodon purpureus</i>			
Common Ditrichum	<i>Ditrichum difficile</i>			
Earth Moss	<i>Pleuridium nervosum</i>			
Madeira Moss	<i>Echinodium hispidum</i>		r	
Spleenwort Pocket-moss	<i>Fissidens asplenioides</i>			
Portuguese Pocket-moss	<i>Fissidens curvatus</i>			
Nerveless Pocket-moss	<i>Fissidens dealbatus</i>		r	
Limestone Pocket-moss	<i>Fissidens leptocladus</i>			
Curly Pocket-moss	<i>Fissidens megalotis</i>			
Oblong Pocket-moss	<i>Fissidens oblongifolius</i>			
Pale Pocket-moss	<i>Fissidens pallidus</i>			
Tall Pocket-moss	<i>Fissidens rigidulus</i>			
Tiny Pocket-moss	<i>Fissidens serratus</i> var. <i>serratus</i>			
Pygmy Pocket-moss	<i>Fissidens taylorii</i>			
Cord Moss	<i>Entosthodon apophysatus</i>			
Cord Moss	<i>Entosthodon subnudus</i> var. <i>gracilis</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Common Cord-moss	<i>Funaria hygrometrica</i>			
Bladder Moss	<i>Physcomitrium conicum</i>			
Blunt-beak Grimmia	<i>Grimmia pulvinata</i> var. <i>africana</i>			
Common Fringe-moss	<i>Racomitrium crispulum</i> var. <i>crispulum</i>			
Sessile Grimmia	<i>Schistidium apocarpum</i>			
Grey Hoar-moss	<i>Hedwigia ciliata</i>			
Toothed Mitre-moss	<i>Achrophyllum dentatum</i>			
Priest's-cap Mitre-moss	<i>Calypstrochaeta apiculata</i>			
Dalton Mitre-moss	<i>Daltonia splachnoides</i>			k
Unbordered Mitre-moss	<i>Distichophyllum microcarpum</i>			
Soft Mitre-moss	<i>Sauloma tenella</i>			
Common Plait-moss	<i>Hypnum cupressiforme</i>			
Umbrella Moss	<i>Hypnodendron spininervium</i> ssp. <i>archeri</i>			
Umbrella Moss	<i>Hypnodendron vitiense</i> ssp. <i>australe</i>			
False Fern Moss	<i>Cyathophorum bulbosum</i>			
Umbrella Moss	<i>Hypopterygium muelleri</i>			
Umbrella Moss	<i>Hypopterygium rotulatum</i>			
Fern Moss	<i>Lopidium concinnum</i>			
Tufted Mound-moss	<i>Camptochaete arbuscula</i> var. <i>arbuscula</i>			
Tufted Mound-moss	<i>Camptochaete deflexa</i>			
Catkin Moss	<i>Lembophyllum divulsum</i>			
Coarse Festoon-moss	<i>Weymouthia cochlearifolia</i>			
Fine Festoon-moss	<i>Weymouthia mollis</i>			
Festoon Moss	<i>Papillaria crocea</i>			
Festoon Moss	<i>Papillaria flavolimbata</i>			
Glow-worm Moss	<i>Mittenia plumula</i>			
Nodding Thread-moss	<i>Pohlia nutans</i>			
Pale Thread-moss	<i>Pohlia wahlenbergii</i>			
Copper Moss	<i>Schizymenium bryoides</i>			
Feather Moss	<i>Thamnobryum pumilum</i>			
Yoke Moss	<i>Amphidium cyathicarpum</i>			
Macromitrium	<i>Macromitrium archeri</i>			
Macromitrium	<i>Macromitrium microstomum</i>			
Macromitrium	<i>Macromitrium tenue</i>			
Bristle Moss	<i>Orthotrichum tasmanicum</i>			
Common Zygodon	<i>Zygodon intermedius</i>			
Zygodon	<i>Zygodon menziesii</i>			
Silk Moss	<i>Isopterygium limatum</i>			
Silk Moss	<i>Plagiothecium novaeseelandiae</i>			
Forest Smoothcap	<i>Atrichum androgynum</i>			
Forest Haircap	<i>Pogonatum subulatum</i>			
Common Haircap	<i>Polytrichum commune</i>			
Juniper Haircap	<i>Polytrichum juniperinum</i>			
Beard Moss	<i>Barbula subcalycina</i>			
Pincushion Moss	<i>Calyptopogon mnioides</i>			
Beard Moss	<i>Didymodon torquatus</i>			
Tall Beard-moss	<i>Leptodontium paradoxum</i>			



English Name	Scientific Name	EPBC	Vic	FFG
Crisp Moss	<i>Tortella cirrhata</i>			
Screw Moss	<i>Tortula papillosa</i>			
Crisp Moss	<i>Trichostomopsis australasiae</i>			
Common Twine-moss	<i>Triquetrella papillata</i>			
Green-tufted Stubble-moss	<i>Weissia controversa</i>			
Trachyloma	<i>Trachyloma planifolium</i>		r	
Pincushion	<i>Ptychomitrium australe</i>			
Arc Moss	<i>Glyphothecium sciuroides</i>			
Paper Moss	<i>Ptychomnion aciculare</i>			
Common Carpet-moss	<i>Racomitrium cuspidigerum</i> var. <i>convolutaceum</i>			
Thyme Moss	<i>Goniobryum subbasilare</i>			
Tree-fern Thyme-moss	<i>Hymenodon pilifer</i>			
Umbrella Thyme-moss	<i>Pyrrhobryum bifarium</i>		v	
Woolly-stem Thyme-moss	<i>Pyrrhobryum mnioides</i>			
Tassel Thyme-moss	<i>Pyrrhobryum paramattense</i>			
Thyme Moss	<i>Pyrrhobryum spiniforme</i>			
Thyme Moss	<i>Rhizogonium distichum</i>			
Thyme Moss	<i>Rhizogonium novaehollandiae</i>			
Dwarf Blindia	<i>Blindia magellanica</i>		k	
Creeping Mound-moss	<i>Fallaciella gracilis</i>			
Common Signal-moss	<i>Rhaphidorrhynchium amoenum</i>			
Swamp Signal-moss	<i>Rhaphidorrhynchium jolliffii</i>			
Pallid Signal-moss	<i>Sematophyllum contiguum</i>			
Bronze Signal-moss	<i>Sematophyllum homomallum</i>			
Bleached Signal-moss	<i>Sematophyllum leucocytus</i>			
Spear Moss	<i>Wijkia extenuata</i>			
Peat Moss	<i>Sphagnum australe</i>			
Peat Moss	<i>Sphagnum cristatum</i>			
Peat Moss	<i>Sphagnum falciculatum</i>			
Peat Moss	<i>Sphagnum novozelandicum</i>			
Peat Moss	<i>Sphagnum</i> spp.			
Golden Weft-moss	<i>Thuidiopsis furfurosa</i>			
Weft Moss	<i>Thuidiopsis sparsa</i>			
Forest Weft-moss	<i>Thuidium laeviusculum</i> s.s.		v	
Earth Moss	<i>Trematodon flexipes</i>			
Earth Moss	<i>Trematodon mackayii</i>		k	
Milk Moss	<i>Leucobryum candidum</i>			
Feather-tail Moss	<i>Catagonium nitens</i> ssp. <i>nitens</i>			
Cape Thread-moss	<i>Orthodontium lineare</i> ssp. <i>sulcatum</i>			
River Cushion-moss	<i>Tridontium tasmanicum</i>			
Mister Whiskers	<i>Goebelobryum unguiculatum</i>			
Pouchwort	<i>Tylimanthus tenellus</i>			
Cup Germanderwort	<i>Riccardia cochleata</i>			
Germanderwort	<i>Riccardia colensoi</i>			
Yellow Germanderwort	<i>Riccardia crassa</i>			
Crimson Coalwort	<i>Cephaloziella exiliflora</i>			
Green Threadwort	<i>Cephaloziella hirta</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Scalewort	<i>Frullania clavata</i>			
Rufous Scalewort	<i>Frullania falciloba</i>			
Chocolate Scalewort	<i>Frullania probosciphora</i>			
Slender Scalewort	<i>Frullania rostrata</i>			
Fuzzy Crestwort	<i>Chiloscyphus muricatus</i>			
Common Crestwort	<i>Chiloscyphus semiteres</i>			
Crestwort	<i>Heteroscyphus coalitus</i>			
Crestwort	<i>Heteroscyphus fissistipus</i>			
Crestwort	<i>Heteroscyphus limosus</i>			
Fernwort	<i>Hymenophyton flabellatum</i>			
Pouncewort	<i>Cheilelejeunea mimosa</i>			
Common Pouncewort	<i>Lejeunea drummondii</i>			
Fingerwort	<i>Hyalolepidozia longiscypha</i>			
Common Fingerwort	<i>Lepidozia ulothrix</i>			
Blue Threadwort	<i>Telaranea centipes</i>			
Common Marchantia	<i>Marchantia berteroana</i>			
Common Veilwort	<i>Metzgeria decipiens</i>			
Forked Veilwort	<i>Metzgeria furcata</i>			
Smooth Ribbonwort	<i>Podomitrium phyllanthus</i>			
Toothed Ribbonwort	<i>Symphyogyna podophylla</i>			
Common Scalewort	<i>Radula buccinifera</i>			
Common Pocketwort	<i>Schistochila lehmanniana</i>			
Forest Woollywort	<i>Trichocolea mollissima</i>			
Lichen	<i>Lichen spp.</i>			
Bone Coral-lichen	<i>Cladia retipora</i>			



APPENDIX 6 FAUNA SPECIES RECORDED IN THE ANGAHOOK-OTWAY STUDY AREA

As of August 2003, the Department of Sustainability and Environment's Atlas of Victorian Wildlife database contained records for the following taxa in Angahook-Otway study area. The Atlas of Victoria Wildlife has comprehensive coverage of all vertebrate taxa except marine fish. Several exclusively marine mammal, bird and reptile species (e.g. whales, albatrosses and turtles) are in the Atlas of Victorian Wildlife list for the study area (typically records of beach-washed carcasses), but these are not included in the following list because they do not inhabit the study area as such. Some predominantly marine species (e.g. penguins,

gannets) are included in this list because they at least occasionally come ashore or forage in near shore waters.

The Atlas of Victorian Wildlife is improving its coverage of aquatic and terrestrial invertebrates – and has a large percentage of records of some threatened taxa – but for nearly all invertebrate species, even coverage of all records would not accurately reflect the true abundance or distribution. The invertebrate taxa listed for the study area are included in the list below.

The species are listed in systematic order.

LEGEND:

EPBC: status under *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

x – extinct

ce – critically endangered

e – endangered

v – vulnerable

cd – conservation dependent

Vic: conservation status in Victoria, after DSE (in prep.), and DSE's Victorian Fauna Display

x – extinct

ce – critically endangered

e – endangered

v – vulnerable

lr – lower risk

dd – data deficient

FFG: status under the *Victorian Flora and Fauna Guarantee Act 1988*

N – nominated for listing, awaiting recommendation;

R – recommended for listing;

I – rejected or ineligible for listing;

L – listed, no action statement published;

D – de-listed;

numbers indicate action statement number where published

* denotes introduced species

The list immediately below is of species mentioned in the text, but not in the following main list of species recorded in the study area. Note that some of these species occur in the study area and some do not.

English Name	Scientific Name
Sooty Owl	<i>Tyto tenebricosa</i>
Superb Lyrebird	<i>Menura novaehollandiae</i>
Eastern Whipbird	<i>Psophodes olivaceus</i>
Greater Glider	<i>Petauroides volans</i>
Sambar Deer	<i>Cervus unicolor</i>
Rock Flathead	<i>Thysanophrys cirronasus</i>
King George Whiting	<i>Sillaginodes punctata</i>
Sea Sweep	<i>Scorpius aequipinnis</i>
Mackerel (Common)	<i>Scomber australasicus</i>
Silver Trevally	<i>Pseudocaranx dentex</i>
Crayfish (Red Rock Lobster)	<i>Jasus edwardsii</i>
Black Lip Abalone	<i>Haliotis rubra</i>
Barracouta	<i>Thyrsites atun</i>
Pike (Short finned)	<i>Sphyræna novaehollandiae</i>
Garfish (Southern Sea)	<i>Hyporhamphus melanochir</i>
Leather Jacket	<i>Meuschenia spp.</i>
Rock Cod (Red)	<i>Scorpaena cardinalis</i>
Parrot Fish (Blue throat)	<i>Notolabrus tetricus</i>

English Name	Scientific Name	EPBC	Vic	FFG
Emu	<i>Dromaius novaehollandiae</i>			
Fiordland Penguin	<i>Eudyptes pachyrhynchus</i>			
Little Penguin	<i>Eudyptula minor</i>			
Stubble Quail	<i>Coturnix pectoralis</i>			
Brown Quail	<i>Coturnix ypsilophora</i>		lr	
Painted Button-quail	<i>Turnix varia</i>			
Plains-wanderer	<i>Pedionomus torquatus</i>	v	ce	66
Diamond Dove	<i>Geopelia cuneata</i>		lr	
Common Bronzewing	<i>Phaps chalcoptera</i>			
Brush Bronzewing	<i>Phaps elegans</i>			
Crested Pigeon	<i>Ocyphaps lophotes</i>			
Lewin's Rail	<i>Rallus pectoralis</i>		v	L
Buff-banded Rail	<i>Gallirallus philippensis</i>			
Australian Spotted Crake	<i>Porzana fluminea</i>			
Baillon's Crake	<i>Porzana pusilla</i>		v	L
Dusky Moorhen	<i>Gallinula tenebrosa</i>			
Purple Swampphen	<i>Porphyrio porphyrio</i>			
Eurasian Coot	<i>Fulica atra</i>			
Great Crested Grebe	<i>Podiceps cristatus</i>			
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>			
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Short-tailed Shearwater	<i>Puffinus tenuirostris</i>			
Great Cormorant	<i>Phalacrocorax carbo</i>			
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>			
Black-faced Cormorant	<i>Phalacrocorax fuscescens</i>		lr	
Pied Cormorant	<i>Phalacrocorax varius</i>		lr	
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>			
Darter	<i>Anhinga melanogaster</i>			
Australasian Gannet	<i>Morus serrator</i>			
Australian Pelican	<i>Pelecanus conspicillatus</i>			
Whiskered Tern	<i>Chlidonias hybridus</i>		lr	
Gull-billed Tern	<i>Sterna nilotica</i>		e	L
Caspian Tern	<i>Sterna caspia</i>		lr	L
White-fronted Tern	<i>Sterna striata</i>		lr	
Crested Tern	<i>Sterna bergii</i>			
Fairy Tern	<i>Sterna nereis</i>		e	L
Silver Gull	<i>Larus novaehollandiae</i>			
Pacific Gull	<i>Larus pacificus</i>		lr	
Arctic Jaeger	<i>Stercorarius parasiticus</i>			
Ruddy Turnstone	<i>Arenaria interpres</i>			
Pied Oystercatcher	<i>Haematopus longirostris</i>			
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>		lr	
Red-kneed Dotterel	<i>Erythronyx cinctus</i>			
Masked Lapwing	<i>Vanellus miles</i>			
Hooded Plover	<i>Thinornis rubricollis</i>		v	9
Double-banded Plover	<i>Charadrius bicinctus</i>			
Red-capped Plover	<i>Charadrius ruficapillus</i>			
Black-fronted Dotterel	<i>Elseyornis melanops</i>			
Black-winged Stilt	<i>Himantopus himantopus</i>			
Banded Stilt	<i>Cladorhynchus leucocephalus</i>			
Common Sandpiper	<i>Actitis hypoleucos</i>		v	
Common Greenshank	<i>Tringa nebularia</i>			
Curlew Sandpiper	<i>Calidris ferruginea</i>			
Red-necked Stint	<i>Calidris ruficollis</i>			
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>			
Sanderling	<i>Calidris alba</i>		lr	
Latham's Snipe	<i>Gallinago hardwickii</i>		lr	
Bush Stone-curlew	<i>Burhinus grallarius</i>		e	78
Brolga	<i>Grus rubicunda</i>		v	119
Glossy Ibis	<i>Plegadis falcinellus</i>		lr	
Australian White Ibis	<i>Threskiornis molucca</i>			
Straw-necked Ibis	<i>Threskiornis spinicollis</i>			
Royal Spoonbill	<i>Platalea regia</i>		v	
Yellow-billed Spoonbill	<i>Platalea flavipes</i>			
Little Egret	<i>Egretta garzetta</i>		e	120
Intermediate Egret	<i>Ardea intermedia</i>		ce	120
Great Egret	<i>Ardea alba</i>		v	120



English Name	Scientific Name	EPBC	Vic	FFG
White-faced Heron	<i>Egretta novaehollandiae</i>			
White-necked Heron	<i>Ardea pacifica</i>			
Nankeen Night Heron	<i>Nycticorax caledonicus</i>		lr	
Australasian Bittern	<i>Botaurus poiciloptilus</i>		e	L
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>		lr	
Magpie Goose	<i>Anseranas semipalmata</i>		v	
Australian Wood Duck	<i>Chenonetta jubata</i>			
Black Swan	<i>Cygnus atratus</i>			
Australian Shelduck	<i>Tadorna tadornoides</i>			
Pacific Black Duck	<i>Anas superciliosa</i>			
Chestnut Teal	<i>Anas castanea</i>			
Grey Teal	<i>Anas gracilis</i>			
Australasian Shoveler	<i>Anas rhynchotis</i>		v	
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>			
Hardhead	<i>Aythya australis</i>		v	
Blue-billed Duck	<i>Oxyura australis</i>		e	L
Musk Duck	<i>Biziura lobata</i>		v	
Spotted Harrier	<i>Circus assimilis</i>		lr	
Swamp Harrier	<i>Circus approximans</i>			
Grey Goshawk	<i>Accipiter novaehollandiae</i>		v	
Brown Goshawk	<i>Accipiter fasciatus</i>			
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>			
Wedge-tailed Eagle	<i>Aquila audax</i>			
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		v	60
Whistling Kite	<i>Haliastur sphenurus</i>			
Black Kite	<i>Milvus migrans</i>			
Black-shouldered Kite	<i>Elanus axillaris</i>			
Australian Hobby	<i>Falco longipennis</i>			
Peregrine Falcon	<i>Falco peregrinus</i>			
Black Falcon	<i>Falco subniger</i>		v	
Brown Falcon	<i>Falco berigora</i>			
Nankeen Kestrel	<i>Falco cenchroides</i>			
Southern Boobook	<i>Ninox novaeseelandiae</i>			
Barking Owl	<i>Ninox connivens</i>		e	116
Powerful Owl	<i>Ninox strenua</i>		v	92
Barn Owl	<i>Tyto alba</i>			
Masked Owl	<i>Tyto novaehollandiae</i>		e	L
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>			
Musk Lorikeet	<i>Glossopsitta concinna</i>			
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>			
Little Lorikeet	<i>Glossopsitta pusilla</i>			
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>			
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>			
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>			
Little Corella	<i>Cacatua sanguinea</i>			
Long-billed Corella	<i>Cacatua tenuirostris</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Galah	<i>Cacatua roseicapilla</i>			
Australian King-Parrot	<i>Alisterus scapularis</i>			
Crimson Rosella	<i>Platycercus elegans</i>			
Eastern Rosella	<i>Platycercus eximius</i>			
Red-rumped Parrot	<i>Psephotus haematonotus</i>			
Blue-winged Parrot	<i>Neophema chrysostoma</i>			
Elegant Parrot	<i>Neophema elegans</i>		v	
Swift Parrot	<i>Lathamus discolor</i>	e	e	L
Budgerigar	<i>Melopsittacus undulatus</i>			
Ground Parrot	<i>Pezoporus wallicus</i>		e	L
Tawny Frogmouth	<i>Podargus strigoides</i>			
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>			
Azure Kingfisher	<i>Alcedo azurea</i>		lr	
Laughing Kookaburra	<i>Dacelo novaeguineae</i>			
Sacred Kingfisher	<i>Todiramphus sanctus</i>			
Rainbow Bee-eater	<i>Merops ornatus</i>			
White-throated Needletail	<i>Hirundapus caudacutus</i>			
Fork-tailed Swift	<i>Apus pacificus</i>			
Pallid Cuckoo	<i>Cuculus pallidus</i>			
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>			
Brush Cuckoo	<i>Cacomantis variolosus</i>			
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>		lr	
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>			
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>			
Welcome Swallow	<i>Hirundo neoxena</i>			
Tree Martin	<i>Hirundo nigricans</i>			
Fairy Martin	<i>Hirundo ariel</i>			
Grey Fantail	<i>Rhipidura fuliginosa</i>			
Rufous Fantail	<i>Rhipidura rufifrons</i>			
Willie Wagtail	<i>Rhipidura leucophrys</i>			
Leaden Flycatcher	<i>Myiagra rubecula</i>			
Satin Flycatcher	<i>Myiagra cyanoleuca</i>			
Restless Flycatcher	<i>Myiagra inquieta</i>			
Jacky Winter	<i>Microeca fascians</i>			
Scarlet Robin	<i>Petroica multicolor</i>			
Flame Robin	<i>Petroica phoenicea</i>			
Pink Robin	<i>Petroica rodinogaster</i>			
Rose Robin	<i>Petroica rosea</i>			
Hooded Robin	<i>Melanodryas cucullata</i>		lr	L
Eastern Yellow Robin	<i>Eopsaltria australis</i>			
Golden Whistler	<i>Pachycephala pectoralis</i>			
Rufous Whistler	<i>Pachycephala rufiventris</i>			
Olive Whistler	<i>Pachycephala olivacea</i>			
Grey Shrike-thrush	<i>Colluricincla harmonica</i>			
Magpie-lark	<i>Grallina cyanoleuca</i>			
Crested Shrike-tit	<i>Falcunculus frontatus</i>			



English Name	Scientific Name	EPBC	Vic	FFG
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>			
White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>			
White-winged Triller	<i>Lalage sueurii</i>			
Spotted Quail-thrush	<i>Cinclosoma punctatum</i>		lr	
White-fronted Chat	<i>Epthianura albifrons</i>			
Weebill	<i>Smicromis brevirostris</i>			
Striated Thornbill	<i>Acanthiza lineata</i>			
Yellow Thornbill	<i>Acanthiza nana</i>			
Brown Thornbill	<i>Acanthiza pusilla</i>			
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>			
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>			
White-browed Scrubwren	<i>Sericornis frontalis</i>			
Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>		v	
Striated Fieldwren	<i>Calamanthus fuliginosus</i>			
Speckled Warbler	<i>Chthonicola sagittata</i>		v	L
Brown Songlark	<i>Cincloramphus cruralis</i>			
Rufous Songlark	<i>Cincloramphus mathewsi</i>			
Rufous Bristlebird	<i>Dasyornis broadbenti</i>		lr	49
Little Grassbird	<i>Megalurus gramineus</i>			
Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>			
Golden-headed Cisticola	<i>Cisticola exilis</i>			
Southern Emu-wren	<i>Stipiturus malachurus</i>			
Superb Fairy-wren	<i>Malurus cyaneus</i>			
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>			
White-browed Woodswallow	<i>Artamus superciliosus</i>			
Dusky Woodswallow	<i>Artamus cyanopterus</i>			
Varied Sittella	<i>Daphoenositta chrysoptera</i>			
Brown Treecreeper	<i>Climacteris picumnus</i>		lr	
White-throated Treecreeper	<i>Cormobates leucophaeus</i>			
Mistletoebird	<i>Dicaeum hirundinaceum</i>			
Spotted Pardalote	<i>Pardalotus punctatus</i>			
Silvereye	<i>Zosterops lateralis</i>			
White-naped Honeyeater	<i>Melithreptus lunatus</i>			
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>			
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>			
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>			
Tawny-crowned Honeyeater	<i>Phylidonyris melanops</i>			
White-fronted Honeyeater	<i>Phylidonyris albifrons</i>			
Regent Honeyeater	<i>Xanthomyza phrygia</i>	e	ce	41
Singing Honeyeater	<i>Lichenostomus virescens</i>			
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>			
White-eared Honeyeater	<i>Lichenostomus leucotis</i>			
Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>			
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>			
Crescent Honeyeater	<i>Phylidonyris pyrrhoptera</i>			
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Noisy Miner	<i>Manorina melanocephala</i>			
Little Wattlebird	<i>Anthochaera chrysoptera</i>			
Red Wattlebird	<i>Anthochaera carunculata</i>			
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>			
Richard's Pipit	<i>Anthus novaeseelandiae</i>			
Singing Bushlark	<i>Mirafra javanica</i>			
Beautiful Firetail	<i>Stagonopleura bella</i>			
Red-browed Finch	<i>Neochmia temporalis</i>			
Olive-backed Oriole	<i>Oriolus sagittatus</i>			
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>			
White-winged Chough	<i>Corcorax melanorhamphos</i>			
Pied Currawong	<i>Strepera graculina</i>			
Grey Currawong	<i>Strepera versicolor</i>			
Pied Butcherbird	<i>Cracticus nigrogularis</i>			
Grey Butcherbird	<i>Cracticus torquatus</i>			
Australian Magpie	<i>Gymnorhina tibicen</i>			
Bassian Thrush	<i>Zoothera lunulata</i>			
Forest Raven	<i>Corvus tasmanicus</i>			
White Wagtail	<i>Motacilla alba</i>			
Australian Raven	<i>Corvus coronoides</i>			
Pomarine Jaeger	<i>Stercorarius pomarinus</i>			
Mallard*	<i>Anas platyrhynchos</i>			
Common Tern	<i>Sterna hirundo</i>			
Little Raven	<i>Corvus mellori</i>			
Rock Dove*	<i>Columba livia</i>			
Striated Pardalote	<i>Pardalotus striatus</i>			
Cattle Egret	<i>Ardea ibis</i>			
Spotted Turtle-Dove*	<i>Streptopelia chinensis</i>			
Common Blackbird*	<i>Turdus merula</i>			
Skylark*	<i>Alauda arvensis</i>			
House Sparrow*	<i>Passer domesticus</i>			
European Goldfinch*	<i>Carduelis carduelis</i>			
European Greenfinch*	<i>Carduelis chloris</i>			
Common Myna*	<i>Acridotheres tristis</i>			
Common Starling*	<i>Sturnus vulgaris</i>			
Platypus	<i>Ornithorhynchus anatinus</i>			
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>			
Spot-tailed Quoll	<i>Dasyurus maculatus</i>	v	e	15
Eastern Quoll	<i>Dasyurus viverrinus</i>		ex	14
Agile Antechinus	<i>Antechinus agilis</i>			
Dusky Antechinus	<i>Antechinus swainsonii</i>			
Swamp Antechinus	<i>Antechinus minimus</i>		lr	L
White-footed Dunnart	<i>Sminthopsis leucopus</i>		v	
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>		lr	
Long-nosed Bandicoot	<i>Perameles nasuta</i>			
Eastern Barred Bandicoot	<i>Perameles gunnii</i>	e	ce	4



English Name	Scientific Name	EPBC	Vic	FFG
Common Brushtail Possum	<i>Trichosurus vulpecula</i>			
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>			
Yellow-bellied Glider	<i>Petaurus australis</i>			
Sugar Glider	<i>Petaurus breviceps</i>			
Feathertail Glider	<i>Acrobates pygmaeus</i>			
Eastern Pygmy-possum	<i>Cercartetus nanus</i>			
Koala	<i>Phascolarctos cinereus</i>			
Common Wombat	<i>Vombatus ursinus</i>			
Long-nosed Potoroo	<i>Potorous tridactylus</i>	v	e	L
Black Wallaby	<i>Wallabia bicolor</i>			
Red-necked Wallaby	<i>Macropus rufogriseus</i>			
Eastern Grey Kangaroo	<i>Macropus giganteus</i>			
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	v	v	
White-striped Freetail Bat	<i>Tadarida australis</i>			
Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>			
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>			
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>			
Chocolate Wattled Bat	<i>Chalinolobus morio</i>			
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>			
Southern Forest Bat	<i>Vespadelus regulus</i>			
Little Forest Bat	<i>Vespadelus vulturnus</i>			
Large Forest Bat	<i>Vespadelus darlingtoni</i>			
Bush Rat	<i>Rattus fuscipes</i>			
Swamp Rat	<i>Rattus lutreolus</i>			
Black Rat*	<i>Rattus rattus</i>			
Brown Rat*	<i>Rattus norvegicus</i>			
House Mouse*	<i>Mus musculus</i>			
Water Rat	<i>Hydromys chrysogaster</i>			
Broad-toothed Rat	<i>Mastacomys fuscus</i>		lr	
New Holland Mouse	<i>Pseudomys novaehollandiae</i>		e	74
Smoky Mouse	<i>Pseudomys fumeus</i>	e	e	L
European Rabbit*	<i>Oryctolagus cuniculus</i>			
Pig (feral)*	<i>Sus scrofa</i>			
Cattle (feral)*	<i>Bos taurus</i>			
Goat (feral)*	<i>Capra hircus</i>			
Sheep (feral)*	<i>Ovis aries</i>			
Fallow Deer*	<i>Cervus dama</i>			
Red Deer*	<i>Cervus elaphus</i>			
Red Fox*	<i>Canis vulpes</i>			
Cat (feral)*	<i>Felis catus</i>			
Australian Fur Seal	<i>Arctocephalus pusillus</i>			
Southern Elephant Seal	<i>Mirounga leonina</i>	v		
Leopard Seal	<i>Hydrurga leptonyx</i>			
Subantarctic Fur Seal	<i>Arctocephalus tropicalis</i>	v		
Dingo	<i>Canis familiaris dingo</i>		dd	
Dog*	<i>Canis familiaris familiaris</i>			

English Name	Scientific Name	EPBC	Vic	FFG
Common Long-necked Tortoise	<i>Chelodina longicollis</i>			
Mountain Dragon (Anglesea form)	<i>Tympanocryptis diemensis</i>		dd	
Tree Dragon	<i>Amphibolurus muricatus</i>			
Swamp Skink	<i>Egernia coventryi</i>		v	L
White's Skink	<i>Egernia whitii</i>			
McCoy's Skink	<i>Nannoscincus maccoyi</i>			
Garden Skink	<i>Lampropholis guichenoti</i>			
Weasel Skink	<i>Saproscincus mustelinus</i>			
Coventry's Skink	<i>Niveoscincus coventryi</i>			
Metallic Skink	<i>Niveoscincus metallicus</i>			
Spencer's Skink	<i>Pseudemoia spenceri</i>			
Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>			
Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>			
White-lipped Snake	<i>Drysdalia coronoides</i>			
Tiger Snake	<i>Notechis scutatus</i>			
Eastern Three-lined Skink	<i>Bassiana duperreyi</i>			
Eastern Brown Snake	<i>Pseudonaja textilis</i>			
Little Whip Snake	<i>Suta flagellum</i>			
Southern Water Skink	<i>Eulamprus tympanum tympanum</i>			
Lowland Copperhead	<i>Austrelaps superbus</i>			
Southern Grass Skink	<i>Pseudemoia entrecasteauxii</i>			
Southern Smooth Froglet	<i>Geocrinia laevis</i>			
Victorian Smooth Froglet	<i>Geocrinia victoriana</i>			
Southern Bullfrog	<i>Limnodynastes dumerilii</i>			
Striped Marsh Frog	<i>Limnodynastes peronii</i>			
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>			
Common Spadefoot Toad	<i>Neobatrachus sudelli</i>			
Bibron's Toadlet	<i>Pseudophryne bibronii</i>		e	
Southern Toadlet	<i>Pseudophryne semimarmorata</i>		v	
Common Froglet	<i>Crinia signifera</i>			
Southern Brown Tree Frog	<i>Litoria ewingii</i>			
Growling Grass Frog	<i>Litoria raniformis</i>	v	e	L
Verreaux's Tree Frog	<i>Litoria verreauxii</i>			
Southern Brown Tree Frog (southern)	<i>Litoria ewingii (southern)</i>			
Southern Bullfrog (south-western)	<i>Limnodynastes dumerilii variegatus</i>			
Short-headed Lamprey	<i>Mordacia mordax</i>			
Pouched Lamprey	<i>Geotria australis</i>			
Shortfin Eel	<i>Anguilla australis</i>			
Rainbow Trout*	<i>Oncorhynchus mykiss</i>			
Brown Trout*	<i>Salmo trutta</i>			
Australian Smelt	<i>Retropinna semoni</i>			
Australian Grayling	<i>Prototroctes maraena</i>	v	v	L
Broadfin Galaxias	<i>Galaxias brevipinnis</i>			
Australian Mudfish	<i>Galaxias cleaveri</i>		ce	I 15
Common Galaxias	<i>Galaxias maculatus</i>			
Mountain Galaxias	<i>Galaxias olidus</i>			



English Name	Scientific Name	EPBC	Vic	FFG
Spotted Galaxias	<i>Galaxias truttaceus</i>			
Dwarf Galaxias	<i>Galaxiella pusilla</i>	v	v	L
Goldfish*	<i>Carassius auratus</i>			
Roach*	<i>Rutilus rutilus</i>			
Tench*	<i>Tinca tinca</i>			
Small-mouthed Hardyhead	<i>Atherinosoma microstoma</i>			
Mosquitofish*	<i>Gambusia holbrooki</i>			
Soldierfish	<i>Gymnapistes marmoratus</i>			
Estuary Perch	<i>Macquaria colonorum</i>			
Yarra Pigmy Perch	<i>Nannoperca obscura</i>	v	lr	L
Southern Pigmy Perch	<i>Nannoperca australis</i>			
Redfin*	<i>Perca fluviatilis</i>			
Silver Trevally	<i>Pseudocaranx dentex</i>			
Tommy Rough	<i>Arripis georgianus</i>			
Eastern Australian Salmon	<i>Arripis trutta</i>			
Black Bream	<i>Acanthopagrus butcheri</i>			
River Blackfish	<i>Gadopsis marmoratus</i>			
Yelloweye Mullet	<i>Aldrichetta forsteri</i>			
Sea Mullet	<i>Mugil cephalus</i>			
Tupong	<i>Pseudaphritis urvillii</i>			
Bridled Goby	<i>Arenigobius bifrenatus</i>			
Tamar River Goby	<i>Afurcagobius tamarensis</i>			
Blue-spot Goby	<i>Pseudogobius olorum</i>			
Lagoon Goby	<i>Tasmanogobius lasti</i>			
Flatheaded Gudgeon	<i>Philypnodon grandiceps</i>			
Long-snouted Flounder	<i>Ammotretis rostratus</i>			
Smooth Toadfish	<i>Tetractenos glaber</i>			
Otway Stonefly	<i>Eusthenia nothofagi</i>			D,45
Otway Caddisfly	<i>Taskiria otwayensis</i>		e	
Glenelg Freshwater Mussel	<i>Hyridella glenelgensis</i>		r	L
Otway Black Snail	<i>Victaphanta compacta</i>		v	L
Common Freshwater Shrimp	<i>Paratya australiensis</i>			
Southern Victorian Spiny Cray	<i>Euastacus yarraensis</i>			
Common Yabbie	<i>Cherax destructor</i>			
freshwater cray	<i>Geocharax falcata</i>			
freshwater cray	<i>Geocharax gracilis</i>			
Otway Burrowing Cray	<i>Engaeus fultoni</i>			
south-eastern river mussel	<i>Velesunio ambiguus</i>			

APPENDIX 7 SITES OF GEOLOGICAL AND GEOMORPHOLOGICAL SIGNIFICANCE

The following table lists 121 sites of geological and geomorphological significance that have been identified in the Angahook-Otway study area.^{1,2,3}

Site Name	Significance	Land Status
Dinosaur Cove	international	Crown
Torquay to Aireys Inlet	international	Crown
Lion Headland to Slippery Point	national	both
Pebble Point	national	Crown
Point Lewis dinosaur locality	national	Crown
Port Campbell National Park sites	national	Crown
Racecourse Steps, Moonlight Head	national	Crown
Ramsdens Cave, Cape Patton	national	Crown
Sentinel Rocks fossil locality	national	Crown
Binns Road quarry	state	Crown
Cape Otway	state	Crown
Cape Volney fossil locality	state	Crown
Devils Kitchen fossil locality	state	Crown
Floating Islands	state	Crown
Kaanglang Road quarry	state	Crown
Love Creek pillow basalt	state	freehold
Point Franklin	state	Crown
Aire River "pot-holes"	regional	Crown
Aire River gorge	regional	Crown
Artillery Rocks	regional	Crown
Barham River mouth	regional	Crown
Bell Point	regional	Crown
Birregurra scarp	regional	both
Boggaley Creek boulder beach	regional	Crown
Carisbrook Falls, Kennett River	regional	Crown
Cape Horn quarry	regional	Crown
Castle Cove fault	regional	Crown
Cat Reef Point	regional	Crown
Clancys Hill	regional	both
Coastline to Sentinel Rock	regional	Crown
Cobden-Lavers Hill Road gravel pit	regional	Crown
Cumberland River cave, Lorne	regional	Crown
Duck Point	regional	freehold
Eagle Nest Rock fossil locality	regional	Crown
Eastern View	regional	Crown
Erskine Falls	regional	Crown
Gellibrand ballast quarry	regional	freehold
Gellibrand bentonite quarry	regional	freehold



Site Name	Significance	Land Status
Glasgow Falls	regional	Crown
Guerards Hill	regional	Crown
Johanna River dunefield	regional	both
Kennett River emerged shore platform	regional	Crown
Lake Elizabeth And Landslide	regional	Crown
Lake Hordern	regional	Crown
Lorne Shore platform	regional	Crown
Loves Creek brown coal and limestone	regional	both
Lower Gellibrand River Spurs	regional	both
Moomowroong Sand, Gellibrand River	regional	Crown
Moonlight Head	regional	Crown
Moonlight Head australite field	regional	Crown
Mt Defiance anticline	regional	Crown
Parker River mouth	regional	Crown
Phantom Falls	regional	Crown
Point Flinders fossil locality	regional	both
Point Sturt terrace	regional	Crown
Port Campbell australite strewnfield	regional	both
Prinetown quarry	regional	Crown
Point Ronald	regional	Crown
Point Ronald to Point Margaret	regional	Crown
Pirron Yallock stony rise cuttings	regional	Crown
Quarry Hill and cutting	regional	both
Rotten Point to Johanna River	regional	Crown
Rusty Road Falls	regional	Crown
Sabine Falls	regional	Crown
Shelly Beach	regional	Crown
Skenes Creek monocline	regional	Crown
Spud Point	regional	freehold
Stoneyford Stony Rises	regional	freehold
Stony Creek	regional	Crown
Straw Falls	regional	Crown
Swallow Cave & Sheoak Falls	regional	Crown
The Blowhole	regional	both
The Gable	regional	Crown
Tuxion Road cutting	regional	Crown
View Point emerged platform	regional	Crown
Wensleydale coal mine	regional	Crown
Wild Dog Road cutting	regional	Crown
Wiridjil Gravel, Gellibrand River	regional	Crown
Aire River landslips	local	Crown
Amiets Track fossil locality	local	Crown
Askew Falls	local	freehold
Beauchamps Falls	local	Crown
Benwerrin coal mine	local	Crown
Bunker Hill fault	local	both

Site Name	Significance	Land Status
Carlisle-Gellibrand Road basalt dyke	local	Crown
Charleys Creek Road cutting	local	Crown
Cobden-Lavers Hill Road cutting	local	Crown
Colac-Forrest Road cutting	local	Crown
Cora Lynn Cascade	local	Crown
Ford River Quarry	local	freehold
Gellibrand River floodplain and gorge	local	both
Gellibrand River Road cutting	local	Crown
Great Ocean Road cutting, Glenaire	local	Crown
Great Ocean Road cutting, Princetown	local	Crown
Henderson Falls	local	Crown
Hopetoun Falls	local	Crown
Irrewillipe lunette	local	freehold
Jacobsens Road gravel pit	local	Crown
Johanna Falls	local	Crown
Kennett River outcrop	local	Crown
Love Creek limestone quarry	local	freehold
Lower Kalimna Falls	local	Crown
Majestic Drive laterite	local	Crown
Margaret Falls	local	Crown
Marriners Falls	local	Crown
Melba Falls	local	Crown
Mount McKenzie	local	Crown
Nightingale Road cutting	local	Crown
Old Beech Forest Road sand pit	local	freehold
Parker Falls	local	Crown
Red Johanna Road cutting	local	Crown
Sandy Creek perched lakes	local	Crown
Triplet Falls	local	Crown
Unnamed Falls Johanna River	local	freehold
Unnamed waterfalls	local	freehold
Upper Gellibrand Falls	local	Crown
Upper Kalimna Falls	local	Crown
Wait-A-While Creek laterite	local	Crown
Westwood Road gravel pit	local	Crown
Wonwondah Falls	local	Crown
Wye River valley	local	Crown

Information Sources (see 'References' section for full citations)

1 Buckley (1993)

2 Mitchell and King (in prep.)

3 Rooney et al. (1992)



APPENDIX 8 MAIN ECOLOGICAL VEGETATION CLASSES (EVCs) OF THE ANGAAHOOK-OTWAY STUDY AREA

These descriptions are adapted from those of the West Victoria Regional Forest Agreement (Commonwealth of Australia and State of Victoria 2000).

* denotes alien species

Identification of EVCs

In nature, species with similar habitat requirements tend to co-occur at places where their requirements are met. Ecologists call these co-occurring collections of species communities. A vegetation community is a collection of co-occurring plant species – it reflects the vegetation's response to environmental influences such as geology, soils, landform and rainfall.

Vegetation communities can be identified by recording the abundance of plant species at a large number of sites, and then systematically comparing the sites to identify clusters of sites which are most similar to each other in terms of the abundance of plant species. As long as the procedures for comparing and grouping sites are systematic and consistent, the clusters – or, more accurately, the vegetation associations which they support – will form the fundamental units of any classification of vegetation associations.

Across Victoria, around 32 000 sites have been surveyed and analysed in this way. The fundamental units resulting from these analyses are called (vegetation) sub-communities. Sub-communities may indicate different types of disturbance, or different stages in the succession of a particular vegetation type. Vegetation communities, then, can be identified by aggregating sub-communities that are similar in terms of their structure, major environmental affinities, and abundance of species.

A further level of aggregation generates Ecological Vegetation Classes (EVCs) – groups of one or more vegetation communities which exist under a common regime of ecological processes and which are linked to broad landscape features. The similarity of environmental regimes is apparent in comparable life forms, genera and vegetation structure. The communities within an EVC differ due to geographical separation rather than major ecological differences. Sub-communities, communities and EVCs are levels in a hierarchy.

Mapping of EVCs

Once EVCs have been identified, it is possible to map their distributions with the aid of maps of sites where they are known to occur; aerial photographs; maps of the main environmental determinants of vegetation distribution (such as soils, rainfall, topography); any pre-existing vegetation mapping; and extensive field work to identify boundaries and ground-check that EVCs do indeed occur where they have been mapped.

As well as the standard EVCs, the process of mapping generates two variations of the standard EVCs – mosaics and complexes. A **mosaic** consists of two or more discrete EVCs which cannot be mapped separately due to the scale of the map. A **complex** occurs where two or more EVCs are unable to be distinguished in an area but are known to exist discretely elsewhere. A slash is used to separate the component EVCs in the name of a mosaic or complex – Herb-rich Foothill Forest/Shrubby Foothill Forest Complex, for example. Some EVCs occur only in mosaics. The units identified on a single vegetation map, then, may be communities, EVCs, mosaics or complexes, depending on the resolution at which the units were described and mapped. However, for convenience, mapped vegetation units of any of these types are referred to simply as 'EVCs'.

The extent to which vegetation has been depleted – that is, cleared as a result of European settlement – is a key consideration in the establishment of conservation reserve systems (see Chapter 3). To assess the extent of depletion of each EVC, it is necessary to map the extent of EVCs prior to European settlement, as well as the current distribution of EVCs. The mapping of vegetation prior to European settlement is called 'pre-1750 mapping'; 1750 being a round-number year closely pre-dating European settlement in Australia. Essentially pre-1750 mapping involves predicting, or modelling, the vegetation that was originally cleared from areas which no longer support indigenous vegetation. It involves a similar process to mapping the current distribution of EVCs, but (of course) with little or no assistance from aerial photographs and ground-checking.

Pre-1750 EVC mapping for the Angahook-Otway study area is provided in Map B. This mapping shows 38 EVCs in the Angahook-Otway study area. Complementing Map B is Appendix 9 which provides statements of the spatial extent of each of the EVCs.

The following pages provide descriptions of the main 31 EVCs in the study area.

EVC DESCRIPTIONS

Otways Extant Vegetation Descriptions

EVC 1 Coastal Dune Scrub Mosaic

This EVC was often mapped in mosaic with Coastal Tussock Grassland. Due to limitations of scale (i.e. 100,000) it was often not possible to separate these two EVCs in the floristic vegetation mapping exercise so they were mapped as a mosaic. They also have floristic affinities with each other.

Coastal Dune Scrub/Coastal Tussock Grassland Mosaic occurs on exposed fore-dunes or on more protected secondary dunes extending from west of Port Campbell to the Bellarine Peninsula. Wind-blown calcareous sands form the dune system behind the rocky headland. The average altitude is 10-30m above sea level and average annual rainfall is 900mm.

There are two forms of this mosaic. The first is predominantly treeless, with the occasional Swamp Gum *Eucalyptus ovata* or Messmate *E. obliqua*. The shrub layer may be dense or patchy and is characterised by Coast Beard-heath *Leucopogon parviflorus* with Coast Daisy-bush *Olearia axillaris*, Seaberry Saltbush *Rhagodia candolleana* ssp. *candolleana*, the rare *Exocarpos syrticola*, the rare Velvet Correa *Correa backhouseana* and the scrambling Bower Spinach *Tetragonia implexa*.

The dominant lifeforms are tussock-forming graminoids and forbs. Blue Tussock-grass *Poa poiformis* and Knobby Club-sedge *Isolepis nodosa* dominate this layer; with Coast Sword-sedge *Lepidosperma gladiatum* and Black-anther Flax-lily *Dianella brevicaulis/revoluta* s.l. often interspersed. On the fore dune the tussock-dominated grassland is often dominated by the introduced Marram Grass **Ammophila arenaria* which replaces the native sand-binding grass Hairy Spinifex *Spinifex sericeus*. Forbs are common and include Yellow Wood-sorrel *Oxalis corniculata* ssp. agg., Branched Centaury **Centaureum tenuiflorum*, Pimpernel **Anagallis arvensis*, Bidgee-widgee *Acaena novae-zelandiae*, Coast Groundsel *Senecio spathulatus*, Ivy-leaf Violet *Viola hederacea* and Cat's Ear **Hypochoeris radicata*. Both floristic alliances are easily disturbed due to the proximity to beaches and subsequently weeds comprise a large proportion of species present.

The second form of this mosaic grows on exposed fore dunes of the Bellarine Peninsula at Breamlea Spit. It is less diverse than the previous form. Coast Tea-tree *Leptospermum laevigatum* is the dominant shrub with Coast Beard-heath *Leucopogon parviflorus*, Coast Wattle *Acacia sophorae*, Cushion Bush *Leucophyta brownii*, Seaberry Saltbush *Rhagodia candolleana* ssp. *candolleana* comprising the remaining shrub layer. The dominance of Coast Tea-tree *Leptospermum laevigatum* is one of the main differences between the two forms. Forbs and grasses comprise a large percentage of the ground layer and include Coast Sow-thistle *Actites megalocarpa*, Beach Rocket **Cakile maritima* ssp. *maritima*, Hairy Spinifex *Spinifex sericeus*, Marram Grass

**Ammophila arenaria*, Sea Celery *Apium prostratum* ssp. *prostratum*, Bidgee-widgee *Acaena novae-zelandiae*, Pimpernel **Anagallis arvensis*, Angled Pigface **Carpobrotus aequilaterus* and Knobby Club-sedge *Isolepis nodosa*. This form also carries a diverse array of weeds.

EVC 3 Damp Sands Herb-rich Woodland

Within the Otways region Damp Sands Herb-rich Woodland occurs on deep sandy loams, usually associated with adjacent creeks or seasonal lakes and swamps. In the Otways region it occurs on public land only near the coast with an average altitude of 70m above sea level. It does occur further inland in this area but mostly on private land. It grows in areas of average to high annual rainfall ranging from 650-700mm to 1000mm. Effective rainfall is increased by the shallow water tables associated with the creeks that provide adequate moisture to support a rich ground layer of forbs and grasses, including many weed species.

Due to a long history of and continuing land clearance and disturbance Damp Sands Herb-rich Woodland carries a high proportion of weed species. In addition, density of the overstorey has been significantly reduced in many areas. The high proportion of weed species is exacerbated by continued disturbance, proximity to farmland and good site quality.

The overstorey is dominated by Manna Gum *Eucalyptus viminalis*. In the drier Midlands region this grows in association with Scentbark *E. aromaphloia* or Candelbark *E. rubida* and with scattered Black Wattle *Acacia mearnsii* and Blackwood *A. melanoxylon*. In the higher rainfall areas of the Otways region it grows in association with Messmate *E. obliqua* and Swamp Gum *E. ovata*.

A few scattered shrubs may be present including Coast Beard-heath *Leucopogon parviflorus*, Prickly Moses *Acacia verticillata*, Sweet Bursaria *Bursaria spinosa*, Prickly Tea-tree *Leptospermum continentale*, Tree Everlasting *Ozothamnus ferrugineus*, Small-leaf Bramble *Rubus parvifolius*, Matted Rice-flower *Pimelea biflora* and Coast Pomaderris *Pomaderris oraria* ssp. *oraria* and Large-leaf Bush-pea *Pultenaea daphnoides*.

The ground stratum is dominated by dense Austral Bracken *Pteridium esculentum* above a diversity of forbs, grasses and other graminoids. Common forbs include Bidgee-widgee *Acaena novae-zelandiae*, Cat's Ears **Hypochoeris radicata*, , Austral Cranesbill *Geranium solanderi*, Common Raspwort *Gonocarpus tetragynus*, Common Centaury **Centaureum erythraea*, Kidney-weed *Dichondra repens*, Yellow Wood-sorrel *Oxalis corniculata* ssp. agg., Pimpernel **Anagallis arvensis*, Grassland Wood-sorrel *Oxalis perennans*, Prickly Starwort *Stellaria pungens* and Grass Trigger-plant *Stylidium graminifolium*, Common Lagenifera *Lagenifera stipitata*, Hairy Pennywort *Hydrocotyle hirta*, Ivy-leaf Violet *Viola hederacea*, Hairy Speedwell *Veronica calycina*, and Greenhoods *Pterostylis* spp.. Common graminoids include Weeping Grass *Microlaena stipoides*, Common Tussock-grass *Poa labillardierei*, Hare's Tail **Lagurus ovatus*, Spiny headed Mat-rush *Lomandra longifolia* and Black-anther Flax-lily s.l. *Dianella brevicaulis/revoluta*

EVC 6 Sand Heathland

This EVC grows on flat to gently undulating topography, at altitudes of 290-340m above sea level and has an average annual rainfall of approximately 700mm. Soils are Tertiary sands over an impervious clay layer which are periodically very dry or waterlogged on flat to gently undulating country. Due to these conditions, the tree layer is often absent.

When present, the overstorey carries sparse and spindly Messmate *Eucalyptus obliqua*. The shrub layer is very dense to 2m high and is dominated by Heath Tea-tree *Leptospermum myrsinoides* Prickly Tea-tree *L. continentale*, Silver Banksia *Banksia marginata* Common Aotus *Aotus ericoides* and Red-fruit Saw-sedge *Gahnia sieberiana*. The ground layer is sparse and includes Blue Squill *Chamaescilla corymbosa*, Milk-maids *Burchardia umbellata* and Sundew *Drosera* spp.

EVC 8 Wet Heathland

Wet Heathland, occurs within the Otways region, predominantly on flats and depressions with impeded drainage within Carlisle State Park, on Hanson Plain and on the coastal plains of the Otways National Park. The soils have varying depths of tertiary sandy loams, layered over clay loams. The clay layer impedes further drainage, creating an organic soil of low fertility. Such drainage lines are frequent in Carlisle State Park and Hanson Plain, north of the Otway Range.

Wet Heathland is most often treeless but Brown Stringybark *Eucalyptus baxteri*, Shining Peppermint *E. willisii* and Swamp Gum *E. ovata*, may occur as sparse, short (less than 20m tall) and scattered individuals.

The shrub layer is characterised by two shorter layers. The taller one is 1-2m tall and consists of a sometimes patchy and relatively dense thicket of shrubs including Prickly Tea-tree *Leptospermum continentale*, Scrub She-oak *Allocasuarina paludosa*, Scented Paperbark *Melaleuca squarrosa*, Smooth Parrot-pea *Dillwynia glaberrima* and Silver Banksia *Banksia marginata* (shrub form). The lower shrub stratum is characterised by epacrids including Pink Swamp-heath *Sprengelia incarnata*, Woolly-style Heath *Epacris lanuginosa* and Common Heath *Epacris impressa*. The climbers and scramblers Slender Dodder-laurel *Cassytha glabella* and Spreading Rope-rush *Empodisma minus* are usually present below and within this stratum. Wiry Bauera *Bauera rubioides* and Pouched Coral-fern *Gleichenia dicarpa* are also present.

Dense Button Grass *Gymnoschoenus sphaerocephalus* dominates and is characteristic of this EVC. Other tussock forming species include Tall Yellow-eye *Xyris operculata*, Austral Grass-tree *Xanthorrhoea australis* and Red-fruit Saw-sedge *Gahnia sieberiana*. Due to the low fertility of the soil and dense understorey, the ground cover is virtually non-existent, with the exception of Swamp Selaginella *Selaginella uliginosa* and Screw Fern *Lindsaea linearis* that may form in patches. Weeds are uncommon due to a lack of disturbance and the infertile, wet soils.

EVC 10 Estuarine Wetland

Estuarine Wetland is limited in occurrence within the Otways region being confined to lower reaches of streams near the coast. This EVC receives saline water from tidal movements and fresh water flows from inland. The inundating waters are usually salty, sometimes brackish and occasionally fresh over the period of a year depending upon river flooding regimes. Soils are anaerobic peat-rich muds. Rainfall is between 800-1000 mm per annum. Elevation is 0-2 m above sea level.

Estuarine Wetland is dominated by the Common Reed *Phragmites australis*, Creeping Monkey-flower *Mimulus repens*, Water Buttons *Cotula coronopifolia*, Streaked Arrow grass *Triglochin striatum*, Club Sedge *Bolboschoenus* spp. and Shiny Swamp-mat *Selliera radicans*. An example of Estuarine Wetland can be found adjacent to Lake Craven and Lake Hordern around the lower reaches of the Aire River.

EVC 16 Lowland Forest

Within the study area there are two forms of Lowland Forest. The first occurs on sandy loam to sandy orange clay loam soils in high rainfall areas, averaging 1100mm per annum and at moderate altitudes, averaging 150m above sea level. These areas are mostly concentrated in the vicinity of Cape Otway on duplex soils (sand/clay) and Carlisle State Park. Prior to European settlement Lowland Forest is presumed to have occurred extensively on the undulating terrain overlying the Gellibrand Marl geology. Limited examples of this remain.

The characteristic feature of this form of Lowland Forest is a diversity of species present. The overstorey is usually dominated by Brown Stringybark *Eucalyptus baxteri* but occasionally Messmate *E. obliqua*, Narrow-leaf Peppermint *E. radiata* and the rare Bog Gum *Eucalyptus kitsoniana* may co-occur.

The understorey includes a combination of drier, ericoid species due to the sandier soils. Characteristic species are Prickly Tea-tree *Leptospermum continentale*, Silver Banksia *Banksia marginata*, Prickly Moses *Acacia verticillata*, Common Heath *Epacris impressa*, Honey-pots *Acrotriche serrulata*, Common Correa *Correa reflexa*, Broom Sedge *Amperea xiphioclada*, Large-leaf Bush-pea *Pultenaea daphnoides* and Austral Grass-tree *Xanthorrhoea australis*. On sites with a higher proportion of clay in the soil, species such as Narrow-leaf Wattle *Acacia mucronata*, Dusty Miller *Spyridium parvifolium*, Hop Goodenia *Goodenia ovata*, Pink-bells *Tetratheca ciliata*, Red-fruit Saw-sedge *Gahnia sieberiana* and Tall Sword-sedge *Lepidosperma elatius* occur.

The ground layer consists of Spreading Rope-rush *Empodisma minus*, Common Raspwort *Gonocarpus tetragynus*, Ivy-leaf Violet *Viola hederacea*, Trailing Goodenia *Goodenia lanata*, Screw Fern *Lindsaea linearis* and climbers such as Common Apple-berry *Billardiera scandens* and Downy Dodder-laurel *Cassytha pubescens*. Austral Bracken *Pteridium esculentum* and Forest Wire-grass *Tetrarrhena juncea* are also quite common. Weed species are not common.

The second form of Lowland Forest differs in the dominance of species normally associated with EVC 48 Heathy Woodland and the higher diversity of tussock-forming plants. This form occurs on gentle to moderate slopes of the Otway Plain Natural Region. Here soils are early to late Tertiary sediments of sandy loams and silty clay loams. Rainfall is lower at around 900mm per annum.

The overstorey includes Narrow-leaf Peppermint *Eucalyptus radiata* ssp. *radiata*, Messmate *E. obliqua* and Scentbark *E. aromaphloia*. The shrub layer includes Common Heath *Epacris impressa*, Honey-pots *Acrotriche serrulata*, Prickly Geebung *Persoonia juniperina*, Pink-bells *Tetratheca ciliata* and Common Aotus *Aotus ericoides*. The ground strata include Common Raspwort *Gonocarpus tetragynus*, Trailing Goodenia *Goodenia lanata*, Reed Bent-grass *Deyeuxia quadriseta*, Black-anther Flax-lily *Dianella revoluta* and Spreading Rope-rush *Empodisma minus*. Sedges are also common and include Wattle Mat-rush *Lomandra filiformis*, Many-flowered Mat-rush *L. multiflora* and Spiny-headed Mat-rush *L. longifolia*.

EVC 17 Riparian Scrub Complex

Riparian Scrub is restricted to parts of the Otways study area with an underlying geology of Tertiary sands. The most well developed examples occur in drainage lines where stream alluvium is present. This EVC typically forms in broad, gently sloping drainage lines and is commonly surrounded by EVC 48 Heathy Woodland or EVC 8 Wet Heathland. The altitude range is between 20 and 170 m above sea level and average annual rainfall varies from approximately 650mm in the Anglesea area to 900-1300mm in the Carlisle River area. During the pre-1750 vegetation mapping exercise extensive areas of Riparian Scrub Complex were modelled on alluvial flood-plain deposits. It was modelled extensively along the Gellibrand River, at and near the junction with Carlisle River and further downstream on the flood-plain sections of the Gellibrand River.

Structurally, Riparian Scrub is a closed scrub 2.5-6 metres tall. Species diversity is low due to the dense cover of Scented Paperbark *Melaleuca squarrosa* and less commonly Prickly Tea-tree *Leptospermum continentale*. Scattered overstorey trees are often present, usually Manna Gum *Eucalyptus viminalis* and Messmate *E. obliqua*. Common species in the understorey include Red-fruit Saw-sedge *Gahnia sieberiana*, Spreading Rope-rush *Empodisma minus* and Variable Sword-sedge *Lepidosperma laterale* var. *majus*, which may be locally common.

EVC 18 Riparian Forest

Within the Otways Riparian Forest occurs along rivers and creeks, on alluvial terraces and occasionally in the heads of gullies leading into creeks and rivers. The rainfall is high, averaging 1250mm per annum and average altitude is 200m above sea level. Soils are alluvial, fine grey sand at the surface, gradually changing to a mottled orange clay loam at depth.

The overstorey is dominated by Blackwood *Acacia melanoxylon*, Manna Gum *Eucalyptus viminalis* occurring in less than half of the sites surveyed. The rare Brooker's Gum *Eucalyptus brookeriana* may also be present.

The understorey includes a variety of tall shrubs including Austral Mulberry *Hedycarya angustifolia*, Prickly Currant-bush *Coprosma quadrifida*, Musk Daisy-bush *Olearia argophylla*, Hazel Pomaderris *Pomaderris aspera*, Banyalla *Pittosporum bicolor* and Privet Mock-olive *Notelaea ligustrina*.

The ground layer is dominated by a high diversity of moisture-dependent ferns. Taller ferns and epiphytes include Kangaroo Fern *Microsorium pustulatum*, Soft tree-fern *Dicksonia antarctica*, the rare Skirted Tree-fern *Cyathea X marcescens*, the rare Slender Tree-fern *Cyathea cunninghamii* and Rough Tree-fern *Cyathea australis*. Ground ferns include Mother Shield-fern *Polystichum proliferum*, Bat's Wing Fern *Histiopteris incisa*, Fishbone water-fern *Blechnum nudum*, Lance Water-fern *B. chambersii*, Hard Water-fern *B. wattsi*, the rare Bristly Shield-fern *Lastreopsis hispidula* and the rare Ground Spleenwort *Asplenium terrestre* ssp. *terrestre*. Other species in the ground layer include Scrub Nettle *Urtica incisa*, Shade Nettle *Australina pusilla* ssp. *muelleri*, the rare Tufted Club-sedge *Isolepis wakefieldiana*, the rare Snowdrop Wood-sorrel *Oxalis magellanica*, Forest Starwort *Stellaria flaccida*, Tall Sedge *Carex appressa* and Blackberry *Rubus fruticosus* spp. agg.

EVC 21 Shrubby Dry Forest

Within the Otways Shrubby Dry Forest has a limited distribution centred near the boundary of the lower Cretaceous and late Tertiary sediments near Aireys Inlet. The most well developed examples occur on exposed western and northern aspects on moderate slopes. The soils are orange-brown silty loams to silty clay loams. The average annual rainfall is 650-800mm and altitude is approximately 10-200 m above sea level.

The overstorey is an open forest dominated by Messmate *Eucalyptus obliqua*, Blue Gum *E. globulus*, Scentbark *E. aromaphloia* and Red Ironbark *E. tricarpa*.

The shrub stratum is diverse and dense and includes Large-leaf Bush-pea *Pultenaea daphnoides*, Common Heath *Epacris impressa*, Prickly Moses *Acacia verticillata*, Narrow-leaf Wattle *A. mucronata* and Netted Daisy-bush *Olearia speciosa*.

The ground stratum may vary in density and includes a number of grasses, the more common being Grey-tussock Grass *Poa sieberiana*, Silver-top Wallaby-grass *Joycea pallida* and Short-hair Plume-grass *Dichelachne micrantha*. Sedges are strongly represented by Wattle Mat-rush *Lomandra filiformis*, Many-flowered Mat-rush *L. multiflora*, Spiny-headed Mat-rush *L. longifolia* and Thatch Saw-sedge *Gahnia radula*. Other common species include Trailing Goodenia *Goodenia lanata*, Honey-pots *Acrotriche serrulata* and Love Creeper *Comesperma volubile*.

EVC 22 Grassy Dry Forest

Within the study area Grassy Dry Forest was only identified in an area just west of Lorne. Average annual rainfall is 800-950mm and elevation is 80-250m above sea level. Soils are shallow and rocky and are less weathered and have a higher iron content than soils of the adjacent EVC 21 Shrubby Foothill Forest. Grassy Dry Forest is confined to northern and western aspects on gentle to moderately steep slopes and ridges.

The overstorey is a low forest 15-20m tall dominated by Scentbark *Eucalyptus aromaphloia*, Blue Gum *E. globulus* and Mountain Grey Gum *E. cypellocarpa*.

The shrub stratum is low in diversity and sparse, except in areas affected by 1983 wildfires which are dominated by dense stands of Hop Wattle *Acacia stricta* and Hop Goodenia *Goodenia ovata*. These are behaving as post-fire regenerators, which take advantage of conditions during and immediately following a wildfire to dominate for a short period and are now senescing.

The diversity of grasses in the ground stratum characterises this EVC. Common species are Wallaby grasses *Austrodanthonia* spp, Plume-grasses *Dichelachne* spp, Silvertop Wallaby-grass *Joycea pallida*, Soft tussock-grass *Poa morrisii*, Grey Tussock-grass *P. sieberiana* and Weeping grass *Microlaena stipoides*. Sweet Vernal-grass **Anthoxanthum odoratum* and Common Tussock-grass *P. labillardierei* occur in sites with increased moisture availability. Common herbaceous species include Variable Stinkweed *Opercularia varia*, *Lagenifera* spp., Common Centaury **Centaureum erythraea*, Blue Pincushion *Brunonia australis*, Milkmaids *Burchardia umbellata* and Small St. John's Wort *Hypericum gramineum*.

EVC 23 Herb-rich Foothill Forest

Within the study area Herb-rich Foothill Forest occurs inland from the coast, in the Angahook Lorne State Park, Lorne State Forest and east of Carlisle State Park. The soils are gradational clay loams over mottled clays. This EVC occurs at an average altitude of 290m above sea level and mean annual rainfall is 1100mm.

The overstorey is dominated by Messmate *Eucalyptus obliqua* with Mountain Grey Gum *E. cypellocarpa* often co-dominant. Other species may include Narrow-leaf Peppermint *E. radiata*, Blue Gum *E. globulus*, Scentbark *E. aromaphloia* and Swamp Gum *E. ovata*. Blackwood *Acacia melanoxylon* is occasional as an understorey tree.

The shrub layer is unusually diverse and this may be in response to disturbance from frequent burning or high visitor pressure in recreational areas. Species present may include Tree Everlasting *Ozothamnus ferrugineus*, Narrow-leaf Wattle *Acacia mucronata*, Prickly Moses *A. verticillata*, Snow Daisy-bush *Olearia lirata*, Prickly Currant-bush *Coprosma quadrifida* and Hop Goodenia *Goodenia ovata*. Austral Bracken *Pteridium esculentum* is nearly always found beneath the shrubs.

The ground stratum is diverse in forbs and grasses, many of them weeds. Species present include the vulnerable Wrinkled Buttons *Leptorhynchus gatesii*, Austral Cranesbill *Geranium solanderi*, Ivy-leaf Violet *Viola hederacea*, Cat's Ears **Hypochoeris radicata*, Yellow Wood-sorrel *Oxalis corniculata* spp. agg., Bidgee-widgee *Acaena novae-zelandiae*, Prickly Starwort *Stellaria pungens*, Common Raspwort *Gonocarpus tetragynus*, Matted Pratia *Pratia pedunculata*, Grasses Slender Tussock-grass *Poa tenera*, Common Tussock-grass *P. labillardierei* and Weeping Grass *Microlaena stipoides* var *stipoides*. Wire Grass *Tetrarrhena juncea* is common and may intertwine through the shrubs and along the ground.

EVC 30 Wet Forest

Within the study area there are two forms of Wet Forest. The first is distributed along the Otway Range from the northern section of the Otway National Park and north of the Great Ocean Road to the Beech Forest Water Catchment. It has an extremely high annual rainfall or 1550mm and occurs in gullies or on protected south and south east-facing slopes of the Otway Range. In addition, it may extend out of more sheltered situations and on to ridges due to the protected nature of the topography and high rainfall and low cloud cover. Geology is mostly non-marine, early cretaceous sediments and soils are fertile loams, where slumping and erosion is common.

The overstorey is a tall forest dominated by pure stands of Mountain Ash *Eucalyptus regnans* on wetter sites and mixed stands of Mountain Ash with Mountain Grey Gum *Eucalyptus cypellocarpa* and Messmate *Eucalyptus obliqua*, the latter more frequent at lower altitudes. Blackwood *Acacia melanoxylon* forms a tall secondary tree layer.

The shrub layer is well established and is dominated by mesic shrubs including Musk Daisy-bush *Olearia argophylla*, Prickly Currant-bush *Coprosma quadrifida*, Austral Mulberry *Hedycarya angustifolia* and Blanket-leaf *Bedfordia arborescens*. Sclerophyllous, non-ericoid species, such as Bootlace Bush *Pimelea axiflora*, Hazel Pomaderris *Pomaderris aspera*, Banyalla *Pittosporum bicolor*, Satinwood *Phebalium squameum* and Privet Mock-olive *Notelaea ligustrina* are also common.

There is an abundance and diversity of ferns in all strata as ground ferns, tree ferns or epiphytes. Epiphytic ferns, fern allies and filmy ferns include the vulnerable Beech Finger-fern *Grammitis magellanica* ssp. *nothofageti*, Kangaroo Fern *Microsorium pustulatum*, Common Finger-fern *Grammitis billardieri*, Gipsy Fern *Ctenopteris heterophylla*, Austral Filmy Fern *Hymenophyllum cupressiforme* Leathery Shield-fern

Rumohra adiantiformis. Ground ferns include Mother Shield-fern *Polystichum proliferum*, Hard Water-fern *Blechnum wattsii* and Bat's Wing Fern *Histiopteris incisa*. Soft Tree-fern *Dicksonia antarctica* is nearly always present, with the rare Slender Tree-fern *Cyathea cunninghamii* and Rough Tree-fern *Cyathea australis* sometimes co-occurring.

The ground stratum is usually sparse with a high cover of leaf litter. Common forbs include the vulnerable Tall Astelia *Astelia australiana*, Forest Starwort *Stellaria flaccida*, Tall Sword-sedge *Lepidosperma elatius* and Shade Nettle *Australina pusilla* ssp. *muelleri*.

The second form of Wet Forest in the Otway study area is more wide spread and is located in the northern section of Otway National Park both south and north of the Great Ocean Road. This form occurs on more exposed northerly slopes and ridges at lower altitudes, averaging 330m above sea level and average annual rainfall is 1450mm. Geology is of cretaceous sediments and soils are moderate to high in fertility and less moist than the previous form of this EVC.

The overstorey is dominated by Mountain Ash *Eucalyptus regnans* overstorey over 40m tall. On drier sites this co-dominates with Messmate *E. obliqua*, Mountain Grey Gum *E. cypellocarpa* and Victorian Blue Gum *E. globulus* ssp. *bicostata*. Blackwood *Acacia melanoxylon* often forms a tall secondary tree layer.

The understorey is more open and species-rich in shrubs than the previous form and includes Musk Daisy-bush *Olearia argophylla*, Snow Daisy-bush *Olearia lirata*, Hazel Pomaderris *Pomaderris aspera*, Prickly Currant-bush *Coprosma quadrifida*, Satinwood *Phebalium squameum*, Privet Mock-olive *Notelaea ligustrina*, Austral Mulberry *Hedycarya angustifolia* and Victorian Christmas-bush *Prostanthera lasianthos*.

Ferns are neither common nor abundant. Those that are present include Soft Tree-fern *Dicksonia antarctica*, Kangaroo Fern *Microsorium pustulatum*, Austral Bracken *Pteridium esculentum*, Hard Water-fern *Blechnum wattsii*, Bat's Wing Fern *Histiopteris incisa* and Mother Shield-fern *Polystichum proliferum*. Other species in the ground stratum are more common and include Forest Starwort *Stellaria flaccida*, Hop Goodenia *Goodenia ovata*, Tall Sword-sedge *Lepidosperma elatius* and Mountain Clematis *Clematis aristata*. Forest Wire-grass *Tetrarrhena juncea* has a high cover and often dominates in response to disturbance.

EVC 31 Cool Temperate Rainforest

The following description is from Peel (1999).

On the southern fall of the Otway Ranges Cool Temperate Rainforest occurs in steeply dissected gullies and valleys which represent the wettest and most sheltered niches available. On the northern fall of the Ranges this EVC is restricted to the headwaters of streams near the main divide where rainfall is highest and cloud cover most persistent. Altitudes are low, averaging 250-350m asl and average annual rainfall is high at around 1000-1500mm. Generally soils are deep, well structured, reddish clays and

sandy clay loams high in organic content but on alluvial terraces they are chocolate brown to grey silts and silty clay loams.

The overstorey is usually well developed Myrtle Beech *Nothofagus cunninghamii* to 30m tall.

The understorey is dominated by a dense canopy of Soft Tree-fern *Dicksonia antarctica* along with a diversity of understorey trees and tall, mesic shrubs including Prickly Currant-bush *Coprosma quadrifida*, Austral Mulberry *Hedycarya angustifolia*, Banyalla *Pittosporum bicolor*, Musk Daisy-bush *Olearia argophylla* and Blackwood *Acacia melanoxylon*. The rare Slender Tree-fern *Cyathea cunninghamii* is also commonly present. Other tree ferns commonly present include the rare Skirted Tree-fern *Cyathea X marcescens* and Slender Tree-fern *Cyathea cunninghamii*, which has a National threatened status of rare, and a State-wide status of vulnerable.

This EVC is characterised by the diversity and abundance of obligate epiphytes or species that are epiphytic at crucial stages in their life cycle. This includes vascular species (predominantly ferns) and non-vascular species (mosses, liverworts and lichens). The usual epiphytic substrates are the caudexes ('trunk' or stem) of Soft tree-fern *Dicksonia antarctica* and the trunks of Myrtle Beech. Epiphytic ferns are particularly prominent and include Leathery Shield-fern *Rumohra adiantiformis*, Kangaroo Fern *Microsorium pustulatum*, Austral Filmy Fern *Hymenophyllum australe*, Shiny Filmy Fern *H. flabellatum*, Common Filmy Fern *H. cupressiforme*, Narrow Filmy Fern *H. rarum*, Common Finger-fern *Grammitis billardieri*, Weeping Spleenwort *Asplenium flaccidum* ssp. *flaccidum*, Mother Spleenwort *A. bulbiferum* ssp. *gracillimum*, the rare Ground Spleenwort *Asplenium terrestre* ssp. *terrestre* and Veined Bristle-fern *Polyphelebium venosum*.

Ground ferns with the occasional forb dominate the ground stratum. Ferns include Mother Shield-fern *Polystichum proliferum*, Ray Water-fern *Blechnum fluviatile*, Lance Water-fern *B. chambersii*, Austral Lady-fern *Allantodia australis* and the rare Bristly Shield-fern *Lastreopsis hispida*. Shade Nettle *Australina pusilla* ssp. *muelleri* is commonly present.

Cool Temperate Rainforest in the Otway Ranges contains a number of Nationally and State-wide listed rare and vulnerable species. See Peel (1999).

EVC 45 Shrubby Foothill Forest

Shrubby Foothill Forest occurs widely across the study area, on exposed aspects and slight to moderate slopes. It has been identified close to and remote from the coast, with an average annual rainfall greater than 1100mm. The soils are clay loams over medium to heavy clays. Closer to the coast the clay loams become more shallow over rock. Average altitude is 180m above sea level.

The overstorey is a medium forest dominated by Messmate *Eucalyptus obliqua* to 30m tall. Mountain Grey Gum *E. cypellocarpa* is also common. Occasional other species include Scentbark *E. aromaphloia*, Brown Stringybark *E.*

baxteri, the rare Brooker's Gum *E. brookeriana*, Blue Gum *E. globulus*, Swamp Gum *E. ovata*, Narrow-leaf Peppermint *E. radiata* s.l., Mountain Ash *E. regnans* and Manna Gum *E. viminalis* s.l. There is no understorey tree layer.

A diverse shrub layer characterises this EVC. The most common species include Hop Goodenia *Goodenia ovata*, Prickly Moses *Acacia verticillata*, Snow Daisy-bush *Olearia lirata*, Prickly Currant-bush *Coprosma quadrifida*, Narrow-leaf Wattle *Acacia mucronata*, Privet Mock-olive *Notelaea ligustrina*, Tree Everlasting *Ozothamnus ferrugineus*, Prickly Tea-tree *Leptospermum continentale*, Hazel Pomaderris *Pomaderris aspera* and Large-leaf Bush-pea *Pultenaea daphnoides*.

The ground stratum lacks diversity and is often dominated by Austral Bracken *Pteridium esculentum* and Forest Wire-grass *Tetrarrhena juncea*, which may dominate in response to disturbance. Other species include Tall Sword-sedge *Lepidosperma elatius*, the rare Cluster-headed Mat-rush *Lomandra longifolia* ssp. *exilis*, the vulnerable Swamp Flax-lily *Dianella callicarpa* and Ivy-leaf Violet *Viola hederacea*. Mountain Clematis *Clematis aristata* is the only climber.

EVC 48 Heathy Woodland

Two forms of Heathy Woodland have been identified within the Otways study area. The first is the most widespread, occurring from sites near Port Campbell and Lower Gellibrand along the tertiary sand belt and in the Eastern View to Anglesea area.

The overstorey is dominated by Brown Stringybark *Eucalyptus baxteri*, Narrow-leaf Peppermint *E. radiata* s.l., Messmate *E. obliqua* and Shining Peppermint *E. willisii* s.l.

The shrub stratum is diverse and includes Prickly Tea-tree *Leptospermum continentale*, Common Heath *Epacris impressa*, Narrow-leaf Wattle *Acacia mucronata*, Prickly Geebung *Persoonia juniperina*, Common Beard-heath *Leucopogon virgatus*, Silver Banksia *Banksia marginata*, Pink Bells *Tetratheca ciliata*, Smooth Parrot-pea *Dillwynia glaberrima*, Western Furze *Hakea repullulans*, Common Aotus *Aotus ericoides* and Slender Rice-flower *Pimelea linifolia*. Species in the ground stratum include Austral Grass-tree *Xanthorrhoea australis*, Tassel Rope-rush *Hypolaena fastigata*, Spreading Rope-rush *Empodisma minus*, Spiny-headed Mat-rush *Lomandra longifolia* and Swamp Selaginella *Selaginella uliginosa*.

The second form of Heathy Woodland in the Otways study area occurs on late Tertiary sediments between Eastern View and Point Addis of Anglesea. Average annual rainfall is 550-700mm. Distinguishing features of this form of Heathy Woodland are its relatively high species richness and the frequency of tussock forming species compared with the previous form.

Common overstorey species are Messmate *Eucalyptus obliqua*, Brown Stringybark *E. baxteri* and Scentbark *E. aromaphloia*. The diverse shrub layer includes Silver Banksia *Banksia marginata*, Common Flat-pea *Platylobium obtusangulum*, Common Heath *Epacris impressa*, Honey-

pots *Acrotriche serrulata*, Prickly Tea-tree *Leptospermum continentale*, Heath Tea-tree *L. myrsinoides*, Erect Guinea Flower *Hibbertia riparia*, Prickly Geebung *Persoonia juniperina*, Pink-bells *Tetratheca ciliata*, Common Beard-heath *Leucopogon virgatus*, Dwarf Wedge-pea *Gompholobium ecostatum*, Myrtle Wattle *Acacia myrtifolia*, Common Rice-flower *Pimelea humilis*, Smooth Parrot-pea *Dillwynia glaberrima* and Leafless Globe-pea *Sphaerolobium vimineum*.

Common species in the ground stratum include Thatch Saw-sedge *Gahnia radula*, Bent Goodenia *Goodenia geniculata*, Wattle Mat-rush *Lomandra filiformis*, Blue Squill *Chamaescilla corymbosa* var. *corymbosa*, Wire Rapier-sedge, *Lepidosperma semiteres*, Variable Stinkweed *Opercularia varia*, Heath Xanthosia *Xanthosia pusilla*, Screw fern *Lindsaea linearis*, Button Everlasting *Helichrysum scorpioides* and Hidden Violet *Viola cleistogamoides*. Other common species include Austral Grass-tree *Xanthorrhoea australis*, Tassel Rope-rush *Hypolaena fastigata*, Common Rapier-sedge *Lepidosperma filiforme*, Tall Sundew *Drosera peltata* ssp. *auriculata* and Milkmaids *Burchardia umbellata*.

EVC 52 Coastal Saltmarsh Complex

Coastal Saltmarsh Complex occurs on the Bellarine Peninsula, south-west of Anglesea along the Painkalac Creek and at Queenscliff in the Breamlea estuary and within the Port Campbell National Park. This EVC occurs at or just above sea level and has an average annual rainfall range of 600 - 780mm. Fertile clay loam soils and disturbance from recreation activities combine to encourage a high proportion of weeds. Species diversity is low, reflecting the saline nature of the estuarine environment.

There are two forms of Coastal Saltmarsh Complex mapped within the study area. Both are treeless with rushes, sedges, forbs and aquatic plants dominating. Within the Bramlea estuary dominant species include Beaded Glasswort *Sarcocornia quinqueflora*, Austral Seablite *Suaeda australis* and Shrubby Glasswort *Sclerostegia arbuscula* whilst elsewhere Creeping Brookweed *Samolus repens* is most common, co-occurring with Sea Rush *Juncus kraussii*. Grasses such as Australian Salt-grass *Distichlis distichophylla*, Blue Tussock-grass *Poa poiformis*, Annual Beard-grass *Polypogon monspeliensis* grow on the fringes of the estuary. Buck's-horn Plantain **Plantago coronopus*, Shiny Swamp-mat *Selliera radicans*, Beaded Glasswort *Sarcocornia quinqueflora*, Aster-weed **Aster subulatus*, Water Buttons **Cotula coronopifolia* and Smooth Willow-herb *Epilobium billardierianum* ssp. *billardierianum* also occur on the margins of this complex. Nodding Club-sedge *Isolepis cernua* and Knobby Club-sedge *Isolepis nodosa* are the most common sedges.

Examples of this EVC can be found at Painkalac Creek at Aireys Inlet, the estuarine flat of the Erskine River at Lorne and the wetland area south of the Old Great Ocean Road at Princetown, approximately 1 km from its intersection with the Great Ocean Road.

EVC 53 Swamp Scrub

Swamp Scrub occurs close to the coast in the study area and has affinities with Shallow Freshwater Marsh. Both occupy similar swamp habitats, however the Swamp Scrub occurs on slight rises where the soil is deeper and better drained.

This EVC lacks an overstorey and is dominated by tall Woolly Tea-tree *Leptospermum lanigerum* that forms dense impenetrable thickets, out-competing other species. Coast Saw-sedge *Gahnia trifida* and Common Reed *Phragmites australis* are also common

EVC 55 Plains Grassy Woodland

Due to a long history of grazing and clearing for agriculture the majority of this EVC has disappeared and that which is left is often severely degraded.

There is great variation within these areas and it is likely that several different floristic communities exist. However, due to the paucity of sampling of intact remnants, distinctions at the floristic community level have not been made here. All sites are virtually flat and annual rainfall is approximately 650mm. Soils are generally fertile, most sites occurring on Tertiary sands and clays.

Tree density within the areas mapped varies from almost forest to very open woodland. Dominance within the overstorey varies with soil moisture, which is related to the proportions of sand and clay within the soil. Fire and management history may also influence overstorey structure and species composition.

Dominant species within this EVC may include Yellow Gum *Eucalyptus leucoxylon*, Swamp Gum *E. ovata*, Yellow Box *E. melliodora* or Manna Gum *E. viminalis* with Silver Banksia *Banksia marginata* (tree form), Black She-oak *Allocasuarina littoralis* Blackwood *Acacia melanoxylon* and Black Wattle *A. mearnsii*. There is no shrub layer apart from localised thickets of Hedge Wattle *A. paradoxa* in the Bannockburn and Inverleigh areas.

The ground layer is very species rich with a mixture of low ericoid shrubs, such as Peach Heath *Lissanthe strigosa*, Cranberry Heath *Astroloma humifusum* and Honey-pots *Acrotriche serrulata*, and a diversity of lilies, forbs and grasses. Common species include Yellow Rush-lily *Tricoryne elatior*, Milkmaids *Burchardia umbellata*, Running Postman *Kennedia prostrata*, Common Rice-flower *Pimelea humifusum*, Creeping Bossiaea *Bossiaea prostrata*, Wiry Buttons *Leptorhynchus tenuifolius*, Scaly Buttons *L. squamatus*, Kidney-weed *Dichondra repens*, Sundew *Drosera peltata*, Spear-grasses *Austrostipa* spp., Wallaby-grasses *Danthonia* spp., Reed Bent-grass *Deyeuxia quadriseta*, Weeping Grass *Microlaena stipoides* and Kangaroo Grass *Themeda triandra*. In some areas there are dense patches of Black-anther Flax-lily *Dianella revoluta* and Variable Sword-sedge *Lepidosperma laterale*.

EVC 83 Swampy Riparian Woodland

Swampy Riparian Woodland occurs on Recent alluvial flats in association with Herb-rich Foothill Forest and Shrubby Foothill Forest. The area is nearly always wet. Altitude is 600m above sea level and average annual rainfall is approximately 850mm.

Swampy Riparian Woodland consists of a very open to virtually absent canopy of Swamp Gum *Eucalyptus ovata* and Manna Gum *E. viminalis*. The shrub layer is also very sparse with scattered Blackwood *Acacia melanoxylon*, Silver Wattle *A. dealbata*, Hazel Pomaderris *Pomaderris aspera*, Prickly Currant-bush *Coprosma quadrifida* and the occasional Rough Tree-fern *Cyathea australis* and Soft Tree-fern *Dicksonia antarctica*. The ground layer is dense, dominated by Fishbone Water-fern *Blechnum nudum*. Other common species include Mother Shield-fern *Polystichum proliferum*, Leafy Flat-sedge *Cyperus lucidus*, Tall Sedge *Carex appressa* and Hard Water-fern *Blechnum wattsi*. Patches between the ferns support herbs such as Bidgee-widgee *Acaena novae-zelandiae*, Kidney-weed *Dichondra repens*, Hairy Pennywort, *Hydrocotyle hirta* and Austral Brooklime *Gratiola peruviana*.

EVC 128 Grassy Forest

Grassy Forest occurs on relatively infertile soils derived from Ordovician sediments with moderate average annual rainfall of 700-850mm and an altitude range of 400-600m above sea level.

The overstorey is a low forest (20m tall) of Messmate Stringybark *Eucalyptus obliqua*, Narrow-leaf Peppermint *E. radiata* and Manna Gum *E. viminalis* growing in association with an understorey tree layer of Blackwood *Acacia melanoxylon*, Black Wattle *A. mearnsii* and Cherry Ballart *Exocarpos cupressiformis*. If present, the shrub layer is low and sparse and includes Narrow-leaf Wattle *A. mucronata*, Matted Bossiaea *Bossiaea buxifolia* and Parrot-peas *Dillwynia* spp.

The ground-layer is dominated by grasses, particularly Grey Tussock-grass *Poa sieberiana*, Silver-top Wallaby-grass *Joycea pallida*, Weeping Grass *Microlaena stipoides* and Plume Grasses *Dichelachne* spp. Other common species include Purple Coral-pea *Hardenbergia violacea*, Black-anther Flax-lily *Dianella revoluta*, Handsome Flat-pea *Platylobium formosum*, and Common Hovea *Hovea linearis*.

EVC 161 Coastal Headland Scrub

Coastal Headland Shrubland occurs in exposed situations on the limestone plains of coastal cliffs at Port Campbell and arkose sandstone cliffs at Cape Otway. The vegetation is often wind and salt-pruned due to exposure to prevailing south-west winds and salt spray. Fertile soils and high average annual rainfall of 950mm combine to maintain a diversity of species. Coastal Headland Shrubland occurs on the more protected south-west slopes and east-facing gullies.

Coastal Headland Shrubland is treeless, except for the occasional stunted Messmate *Eucalyptus obliqua*. It is dominated by a closed heath of Manuka *Leptospermum scoparium* with Silver Banksia *Banksia marginata*, Prickly Moses *Acacia verticillata*, Prickly Tea-tree *Leptospermum continentale* and Dusty Miller *Spyridium parvifolium* often occurring in lower densities. Honey-pots *Acrotriche serrulata*, Coast Beard-heath *Leucopogon parviflorus*, Ridged ground-berry *Acrotriche affinis*, Cranberry Heath *Astroloma humifusum*, Common Correa *Correa reflexa*, Common Heath *Epacris impressa* and Rough Guinea-flower *Hibbertia aspera* form a lower, ericoid shrub layer. Sedges such as Common Bog-sedge *Schoenus apogon*, Bare Twig-sedge *Baumea juncea*, Short-stem Sedge *Carex breviculmis* and Coast Saw-sedge *Gahnia trifida* are often present. Blue Tussock-grass *Poa poiformis* is the most common grass species, with occasional Grey Tussock-grass *Poa sieberiana*. A few scattered herbs are present including Branched Centaury **Centaureum tenuifolium*, Ivy-leaf Violet *Viola hederacea*, Common Raspwort *Gonocarpus tetragynus*, Kidney-weed *Dichondra repens* and Shiny Swamp-mat *Selliera radicans*.

EVC 163 Coastal Tussock Grassland

Coastal Tussock Grassland occurs on cliff-top plateaus affected by sea-spray. The soils are poorly structured with sands over bedrock that can only support shallow-rooted plants. Water availability at depth is often good due to the proximity of bedrock. Harsh site quality encourages stunted and poorly-formed plants. Rainfall for this EVC is 950mm and the average altitude is 36m above sea level.

This EVC is treeless and is dominated by Blue Tussock-grass *Poa poiformis*. Other grasses include Bristly Wallaby-grass *Austrodanthonia setacea*, Common Blown Grass *Agrostis avenacea* and Mat Grass *Hemarthria uncinata* var. *uncinata*. A few shrub species often occur, including Coast Beard-heath *Leucopogon parviflorus*, Manuka *Leptospermum scoparium*, Silver Banksia *Banksia marginata* and Coast Daisy-bush *Olearia axillaris*. The ground layer may carry sedges such as Bare Twig-sedge *Baumea juncea*, Common Bog-sedge *Schoenus apogon*, Short-stem sedge *Carex breviculmis*, Coast Saw-sedge *Gahnia trifida* and Coast Sword-sedge *Lepidosperma gladiatum*. Coastal Tussock Grassland supports a diversity of forbs in low densities. These include the endangered Metallic Sun-orchid *Thelymitra epipactoides*, Common Centaury **Centaureum erythraea*, Hairy Hawkbit **Leontodon taraxacoides*, Coast Daisy *Brachyscome parvula*, Kidney-weed *Dichondra repens*, Pimpernel **Anagallis arvensis*, Cat's Ear **Hypochoeris radicata*, Sow-thistle **Sonchus oleraceus*, Angled Lobelia *Lobelia alata*, Shiny Swamp-mat *Selliera radicans*, Ivy-leaf Violet *Viola hederacea*, Common Woodruff *Asperula conferta*, Grassland Wood-sorrel *Oxalis perennans*, Buck's-horn Plantain **Plantago coronopus*, Bidgee-widgee *Acaena novae-zelandiae*, Spear Thistle **Cirsium vulgare* and Rough Fireweed *Senecio hispidulus*. A diversity of weed species may occur within this Coastal Tussock Grassland.

Shallow ephemeral swamp depressions occur within this EVC. The zone where the water recedes allows herbs to establish, which links these ephemeral sites to the Coastal Tussock Grassland. For mapping purposes, these sites will be incorporated in Coastal Tussock Grassland.

EVC 165 Damp Heath Scrub

Damp Heath Scrub occurs on flat to gently sloping terrain, on or near coastal sites near Port Campbell and in a number of widely distributed locations including Coorimungle and Jancourt Forest/Hanson Plain public land blocks. During the pre-1750 vegetation mapping exercise, this EVC was modelled on an extensive flat near the coast between the Port Campbell National Park and the Coorimungle public land block. This extends its distribution from the valley-type environments it commonly occupies in the extant examples on public land. High rainfall and lack of drainage of the tableland-like area combine to retain high levels of moisture throughout the year.

Floristically this EVC carries influences of Wet Heath. The overstorey is generally sparse and includes Swamp Gum *Eucalyptus ovata* and less commonly Brown Stringybark *E. baxteri*. The shrub layer is very dense and includes Prickly Tea-tree *Leptospermum continentale*, Silver Banksia *Banksia marginata*, Prickly Moses *Acacia verticillata*, Scrub She-oak *Allocasuarina paludosa*, Common Heath *Epacris impressa*, Scented Paperbark *Melaleuca squarrosa*, Dusty Miller *Spyridium parvifolium* and Honey-pots *Acrotriche serrulata*.

Other common species are Austral Grass-tree *Xanthorrhoea australis*, Spreading Rope-rush *Empodisma minus*, Slender Dodder-laurel *Cassytha glabella*, Common Rapier-sedge *Lepidosperma filiforme*, Screw-fern *Lindsaea linearis* and Honey Cone-bush *Isopogon ceratophyllus*.

EVC 178 Herb-rich Foothill Forest/Shrubby Foothill Forest Complex

This complex contains the diverse herb layer of EVC 23 Herb-rich Foothill forest while retaining the diverse shrub layer of EVC 45 Shrubby Foothill Forest. It is usually dominated by species that occur at the drier end of both EVCs.

EVC 198 Sedgy Riparian Woodland

Within the Otways Sedgy Riparian Forest occurs on riparian flats of creeks that are frequently inundated by flooding or along drainage lines carrying ephemeral streams. The soils are alluvial grey silty loams to silty clay loams. These soils are typically deep but occasionally shallow over a layer of clay. Average altitude is 110m above sea level and an average annual rainfall is 800mm. Some sites mapped as Sedgy Riparian Forest are not directly associated with creeks or drainage lines but occur upslope from these areas. These tend to have more herbs and grasses dominating the ground layer and less sedges, thereby expressing an affinity with EVC 23 Herb-rich Foothill Forest.

Generally this EVC is dominated by a Swamp Gum *Eucalyptus ovata* overstorey, 25–30m tall and is often associated with Messmate *Eucalyptus obliqua*. Prickly Tea-tree *Leptospermum continentale*, Prickly Moses *Acacia verticillata*, Scented Paperbark *Melaleuca squarrosa* and Prickly Currant-bush *Coprosma quadrifida* often form dense stands in the shrub layer.

A dense layer of sedges in the ground stratum is characteristic of this EVC. This layer is commonly comprised of Variable Sword-sedge *Lepidosperma laterale* var. *majus* though Red-fruit Saw-sedge *Gahnia sieberiana* and Thatch Saw-sedge *Gahnia radula* can also form dense stands.

More open sites allow herbs to establish such as Common Raspwort *Gonocarpus tetragynus*, Cat's ear *Hypochoeris radicata*, Shady Wood-sorrel *Oxalis exilis*, Bidgee-widgee *Acaena novae-zelandiae*, Ivy-leaf Violet *Viola hederacea*, Matted Pratia *Pratia pedunculata*, Kidney-weed *Dichondra repens* and Hairy Pennywort *Hydrocotyle hirta*. Austral Brooklime *Gratiola peruviana* is present at creek sites. Slender Tussock-grass *Poa tenera* and Forest Wire-grass *Tetrarrhena juncea* are the dominant grasses, with the occasional Yorkshire Fog **Holcus lanatus* and Weeping Grass *Microlaena stipoides* var. *stipoides*. Often Sedgy Riparian Woodland borders fertile farmlands and subsequently weedy herbs and grass species such as Cat's Ear *Hypochoeris radicata* and Yorkshire Fog **Holcus lanatus* are present.

EVC 201 Shrubby Wet Forest

Within the Otways Shrubby Wet Forest is widely distributed. It occupies western and northern aspects and ridgelines and grows in association with EVC 30 Wet Forest where the elevation and rainfall within the study area decreases. Average annual rainfall is high at 1200mm, soils are fertile clay loams over medium to heavy clay and average altitude is 200m above sea level.

Shrubby Wet Forest differs from Wet Forest in generally having no epiphyte cover, a lower diversity of ground ferns, and Rough Tree-fern *Cyathea australis* is the common tree-fern, Soft Tree-fern *Dicksonia antarctica* occurring only rarely. In addition it has a higher diversity and cover of herbs due to increased light reaching the forest floor.

The overstorey is a tall forest dominated by Messmate *Eucalyptus obliqua*, Mountain Grey Gum *E. cypellocarpa* and Manna Gum *E. viminalis*. Blackwood *Acacia melanoxylon* and Hazel Pomaderris *Pomaderris aspera* form a lower tree layer.

The tall-shrub layer is dominated by mesic shrubs including Prickly Currant-bush *Coprosma quadrifida*, Musk Daisy-bush *Olearia argophylla*, Snow daisy-bush *O. lirata*, Hazel Pomaderris *Pomaderris aspera*, Tree Everlasting *Ozothamnus ferrugineus* and Austral Mulberry *Hedycarya angustifolia*. Prickly Moses *Acacia verticillata* and Hop Goodenia *Goodenia ovata* form a mid shrub layer. Tree-form Varnish Wattle *Acacia verniciflua* and Dwarf Silver Wattle *A. nano-dealbata* and the shrubs *Prostanthera melissifolia* and *Spyridium parvifolium* also commonly occur; their density varying, possibly in response to timber harvesting.

Rough Tree-fern *Cyathea australis* and Mother Shield-fern *Polystichum proliferum* are common ferns with Austral Bracken *Pteridium esculentum* dominating.

The ground layer may be sparse and includes the herbs Bidgee-widgee *Acaena novae-zelandiae*, Cinquefoil Cranesbill *Geranium potentilloides*, Ivy-leaf Violet *Viola hederacea*, Creeping Wood-sorrel *Oxalis corniculata*, *Galium* sp. and Forest Starwort *Stellaria flaccida*. Mountain Clematis *Clematis aristata* is the only climber and Tall Sword-sedge *Lepidosperma elatius* the only sedge. Forest Wire-grass *Tetrarrhena juncea* is commonly present and may dominate, often in response to disturbance.

EVC 203 Stony Rises Woodland

Stony Rises Woodland was only located at the Floating Islands Reserve along the Princes Highway west of Colac. The reserve has a history of grazing and much of it is in extremely poor condition and weed-invaded. Soils are derived from quaternary basalts and in some places may be absent where bedrock protrudes from the surface.

Structurally the vegetation is an open grassy woodland to 15m tall. The overstorey is dominated by Manna Gum *Eucalyptus viminalis* and Swamp Gum *E. ovata*. The shrub layer is scattered and includes Shiny Cassinia *Cassinia longifolia*, Blackwood *Acacia melanoxylon*, Tree Violet *Hymenanthera dentata*, Cherry Ballart *Exocarpos cupressiformis* and the occasional Musk Daisy-bush *Olearia argophylla* surviving on rocky rises. The ground layer is dominated by Common Tussock-grass *Poa labillardierei*, *Senecio* spp, Sickle Fern *Pellaea falcata*, Yorkshire Fog **Holcus lanatus*, *Geranium* spp, Spiny-headed Mat-rush *Lomandra longifolia* ssp. *longifolia*, Cat's Ear **Hypochoeris radiata*, **Aira* spp, Cleavers *Galium aparine*, *Pterostylis* spp and *Pelargonium* spp.

EVC 233 Wet Sands Thicket

Wet Sands Thicket has a limited distribution within the Otways study area and is restricted to areas that combine high rainfall with sandy Tertiary outwash geology. The average elevation is 200m above sea level and average annual rainfall is high at 1300mm where this EVC is best developed, dropping to 1000–1200mm in more marginal sites. The soils are characteristically deep, coarse grey sands.

The overstorey is a tall open forest dominated by Messmate *Eucalyptus obliqua*, Brown Stringybark *E. baxteri* and Blue Gum *E. globulus*, ranging in height from 30–50m. In the Cape Otway the rare Bog Gum *Eucalyptus kitsoniana* dominates. The shrub layer is characteristically dense to impenetrable and is strongly represented by Showy Bossiaea *Bossiaea cinerea*, Bushy Broom-heath *Monotoca glauca* and to a lesser extent by Forest Boronia *Boronia muelleri*, Victorian Christmas-bush *Prostanthera lasianthos*, Musk Daisy-bush *Olearia argophylla* and Scented Paperbark *Melaleuca squarrosa*. The ground layer is sparse to absent due to competition from the dense shrub stratum. Other characteristic species include Red-fruit Saw-sedge *Gahnia sieberiana*, Prickly Tea-tree *Leptospermum continentale*, Stinkwood *Zieria arborescens*, Handsome Flat-pea *Platylobium formosum*, Wiry Bauera *Bauera rubioides* and Austral Bracken *Pteridium esculentum*.

Otways Pre-1750 Vegetation Descriptions

EVC 56 Floodplain Riparian Woodland

During the pre-1750 mapping exercise Floodplain Riparian Woodland was modelled across the study area on major slow-moving rivers and creeks where they meander across the plains. Floodplain Riparian Woodland was mapped along the Barwon River and the lower reaches of the Leigh, Moorabool and Werribee Rivers and the Sutherland and Thompson Creeks. No fully intact remnants were found.

Floodplain Riparian Woodland covers the lowest, most frequently flooded terraces and generally encompasses a network of former channels and intermittent and permanent wetlands. Species composition and positioning within the EVC depends on the frequency of flooding and length of inundation of each area. Due to high levels of disturbance (natural and man-made), soil fertility, abundance of water and general accessibility and proximity to arable lands, few intact remnants of Floodplain Riparian Woodland remain and where they do occur, weeds are a dominant feature.

The overstorey is a tall woodland dominated by Red Gum *Eucalyptus camaldulensis* with occasional Manna Gum *E. viminalis* and Swamp Gum *E. ovata*. The shrub stratum is patchy and includes Silver Wattle *Acacia dealbata*, Black Wattle *A. mearnsii*, Tree Violet *Hymenanthera dentata*, River Bottlebrush *Callistemon sieberi*, and Woolly Tea-tree *Leptospermum lanigerum*. The ground layer is dominated by Common Tussock-grass *Poa labillardierei* on the drier elevated areas, with Common Reed *Phragmites australis*, Tall Sedge *Carex appressa*, Rushes *Juncus* spp., Spike Sedges *Eleocharis* spp. and Water-ribbons *Triglochin procerum* on inundated soils beside rivers. Herbs range from dryland herbs on the banks to aquatics in the river and wetland areas.

EVC 125 Plains Grassy Wetland

This EVC occurs where average annual rainfall is less than 700mm. Some of the areas modelled are meanders of prior streams, others are discrete depressions. The unifying feature is the heavy clay soil that holds moisture as distinct from the more free-draining soils of the adjacent terrestrial vegetation. Inundation is periodic over the winter months alternating with dry periods during the summer months.

This EVC is a (usually) treeless shallow seasonal wetland. River Red Gum *Eucalyptus camaldulensis* may occur on perimeter or, less frequently, scattered throughout. Structure is generally grassland, grading into sedgeland or herbland. Species present include a range of herbs and grasses that tolerate the seasonally inundated conditions. Aquatic species may be recorded during periods of inundation.

Grasses present include species include Veined Swamp Wallaby-grass *Amphibromus nervosus*, Brown-back Wallaby-grass *Austrodanthonia duttoniana*, Common Blown Grass *Agrostis avenacea*, Rigid Panic *Homopholis proluta*, and Forde Poa *Poa fordeana*. Barren Cane Grass *Eragrostis infecunda*

may also be present. Herbs include Drumsticks *Pycnosorus globosus*, Swamp Daisy *Brachyscome basaltica* var. *gracilis*, Hairy Willow-herb *Epilobium hirtigerum*, Rough Raspwort *Haloragis aspera*, Common Sneezeweed *Centipeda cunninghamii*, Small Loosestrife *Lythrum hyssopifolia*, Buttercups *Ranunculus* spp., Poison Lobelia *Lobelia pratensis*, Sprawling Bluebell *Wahlenbergia gracilis* s.l., River Bluebell *W. fluvialis* and Slender Monkey-flower *Mimulus gracilis*. Aquatic species typical of inundated sites include Common Nardoo *Marsilea drummondii*, Water Plantain *Alisma plantago-aquatica*, Pacific Azolla *Azolla filiculoides*, Ferny Azolla *Azolla pinnata*, Western Water Starwort *Callitriche cyclocarpa*, Common Spike-sedge *Eleocharis acuta*, Swamp Lily *Ottelia ovalifolia*, Upright Milfoil *Myriophyllum crispatum*, Tiny Milfoil *Myriophyllum integrifolium*, Ridged Milfoil *Myriophyllum porcatum* and Amphibious Milfoil *Myriophyllum simulans*. Rushes and sedges include Hollow Rush *Juncus amabilis*, Toad Rush *Juncus bufonius*, Yellow Rush *Juncus flavidus*, and Joint-leaf Rush *Juncus holoschoenus*. Rush Sedge *Carex tereticaulis* may dominate wetter areas.

Significant species include Stiff Groundsel *Senecio behrianus* (endangered in Victoria and Australia), Barren Cane Grass *Eragrostis infecunda* (vulnerable in Australia), Water Starwort *Callitriche cyclocarpa* (vulnerable in Victoria and Australia) and Ridged Milfoil *Myriophyllum porcatum* (vulnerable in Victoria and Australia).

EVC 175 Grassy Woodland

All Grassy Woodlands not considered part of the plains were placed in this group. It is therefore, a very broad EVC which encompasses a number of floristic communities – further sampling and analyses are required to resolve these groupings.

In general, Grassy Woodlands grow in areas with moderate to low rainfall and relatively fertile soils. The largest area of Grassy Woodland modelled is on the eastern section of the Otway Plain (including the Bellarine Peninsula). This is a large area of gently undulating plains extending from Portarlington to Colac. Geology is Tertiary sands, altitude is generally below 250m and the average annual rainfall varies from a low of 550mm per annum near Torquay to 700mm at Colac. The same land form and geology continues further west but with the increased rainfall that supports forested communities. In the drier eastern sections, the overstorey is dominated by Drooping She-oak *Allocasuarina verticillata* with Manna Gum *Eucalyptus viminalis* and Black Wattle *Acacia mearnsii*. The shrub layer is sparse and includes scattered Golden Wattle *Acacia pycnantha* and Sweet Bursaria *Bursaria spinosa*. The ground layer is likely to have been dominated by Wallaby-grasses *Austrodanthonia* spp. and Spear Grasses and *Austrostipa* spp. As rainfall increases to the west, Drooping She-oak and shrubs disappear, Manna Gum *E. viminalis* and Blackwood *Acacia melanoxylon* become dominant in the overstorey and Kangaroo Grass *Themeda triandra* dominates the ground layer.

Floristic Community 175-04

Low Rises Grassy Woodland

Low Rises Grassy Woodland was once widespread across north-central Victoria where it occurred on the boundary between the plains (usually *Riverina* Plains Grassy Woodland) and the dry forests (usually Box-Ironbark Forest) of the low hills. It has been largely cleared for agriculture and is described by Muir *et al.* (1995).

Within the pre-1750 mapping exercise for the Midland and Otways study areas Low Rises Grassy Woodland was modelled in the far northwest, around Ararat, Stawell and the Pyrenees Ranges and in a small, isolated area south of the Great Dividing Range in the dry rain shadow areas near Melton. Low Rises Grassy Woodland occurs on the lowest of rises on the boundary between the infertile Ordovician sediments of the hills and the more fertile Quaternary alluvial and colluvial geologies of the plains. Altitude varies from 200-300m, rainfall is generally below 550mm per annum.

The overstorey is dominated by Grey Box *Eucalyptus microcarpa*, though Yellow Gum *E. leucoxylon* may be co-dominant and Yellow Box *E. melliodora* is occasionally present. The shrub layer can be sparse or dense but is generally low and lacks diversity. Species include Sticky Wattle *Acacia verniciflua*, Gold-dust Wattle *A. acinacea*, Golden Wattle *A. pycnantha*, Drooping Cassinia *Cassinia arcuata*, Grey Everlasting *Ozothamnus obcordata* and Moonah *Melaleuca lanceolata*. The ground layer is often sparse but diverse in grasses and forbs including Spear-grasses *Austrostipa* spp., Wallaby-grasses *Austrodanthonia* spp. Grey Tussock-grass *Poa sieberiana*, Common Wheat-grass *Elymus scaber*, Windmill Grass *Chloris truncata*, Saloop *Einadia hastata*, Fuzzy New Holland Daisy *Vittadinia cuneata*, Pink Bindweed *Convolvulus erubescens*, Shiny Everlasting *Bracteantha viscosa* and Small-leaved Clematis *Clematis microphylla*.

EVC 858 Calcarenite Dune Woodland

Commonly occurs on the landward side of primary dunes and adjacent to Coastal Saltmarsh Complex in estuarine environments. It occurs on a variety of geologies and soil types Annual rainfall is approximately 550-600mm.

The overstorey is a dense woodland of Moonah *Melaleuca lanceolata* over a shrub layer including Wirilda *Acacia retinodes*, Coast Beard-heath *Leucopogon parviflorus*, and Thyme Rice-flower *Pimelea serpyllifolia* and a sparse understorey of Blue Tussock-grass *Poa poiformis*, Bower Spinach *Tetragonia implexicoma*, Seaberry Saltbush *Rhagodia candolleana* and Small-leaved Clematis *Clematis microphylla*.

EVC 863 Floodplain Reedbed

Floodplain Reedbed occurs on the broad swampy flats of the lower reaches of the Aire River. It occurs in the slightly deeper areas of inundation on these flats. The remainder of the flats was mapped as Swamp Scrub. Soils are Quaternary swamp and lagoonal deposits of clays, silts and peat. Altitude is just above sea level (less than 5m). Rainfall is greater than 1000mm per annum.

A dense sward of Common Reed *Phragmites australis* to 2m tall dominates this EVC. Other species recorded include Sea Rush *Juncus kraussii*, Creeping monkey-flower *Mimulus repens*, Water Buttons **Cotula coronopifolia*, Australian Gipsywort *Lycopus australis* and Water-ribbons *Triglochin procerum*.

APPENDIX 9 RESERVATION STATUS OF ECOLOGICAL VEGETATION CLASSES (EVCS) IN THE ANGAHOOK-OTWAY STUDY AREA

The following is a detailed key for the column headings and symbols used in the Representation Table which follows the key.

KEY

Data in the Representation Table were derived by GIS analysis, that is overlaying, on computer, maps of:

- the pre-1750 extent of EVCs (Map B); that is, the distribution of EVCs as it is thought to have been immediately prior to European settlement;
- current extent of tree cover; that is, areas where indigenous tree cover is present, based on satellite imagery; and
- current public land use categories.

Key features of the EVC-based system of vegetation classification are described in Appendix 8, including brief explanations of the methods used to determine the pre-1750 extent of EVCs and descriptions of EVCs.

Many small public land units are not picked up in the public land GIS layer. For example, none of these figures include roads and roadsides, for which no estimate of extent exists. In addition to the Representation Table for the study area as a whole, presented here, VEAC has prepared Representation Tables for each of the main bioregions which overlap with the study area. These tables are available by request from VEAC.

The total area of public land in the study area (see Table 2.3) is greater than the total area of public land in this table because several thousand hectares of public land that have been cleared are not included in this Appendix.

Column 1: Ecological Vegetation Classes

The names of the 38 Angahook-Otway EVCs mapped within the study area. Here, the term 'EVCs' is used to describe several units of classification: EVCs per se, and complexes and mosaics—see Appendix 8 for definitions of these units and their relationships to each other.

Column 2: Pre-1750 Extent

The total area in hectares thought to have been occupied by each EVC prior to European settlement, corresponding to the mapped extent of EVCs in Map B.

Column 3: Current extent (public and private land)

The total area in hectares currently occupied by each EVC – that is, that part of the pre-1750 distribution where indigenous tree cover is currently present.

Column 4: Percent Remaining

The current extent (column 3) as a percentage of the pre-1750 extent (column 2), for each EVC.

Column 5: Conservation Status (JANIS)

The status of each EVC in terms of the categories developed by JANIS.¹ The assessments refer to the study area as a whole and take no account of EVC distributions outside the study area or in bioregions within the study area. The percent remaining (column 4) is a key factor in assigning EVCs to JANIS categories. E = endangered, V = vulnerable, R = rare.

Column 6: Dedicated Reserves

The total area in hectares of each EVC in existing public land categories which comprise the conservation reserve system (see Chapter 3).

Column 7: Informal Reserves

The total area in hectares of each EVC in Special Protection Zones (SPZs) in state forest.

Column 8: Other public land

The total area in hectares of each EVC in all public land categories outside the dedicated and informal reserve systems.

Column 9: Dedicated Reserves as % of Pre-1750 Extent

The area of dedicated reserves (column 6) as a percentage of the pre-1750 extent (column 2), for each EVC.

Column 10: All Reserves as % of Pre-1750 Extent

The area of dedicated reserves (column 6) plus the area of informal reserves (column 7) as a percentage of the pre-1750 extent (column 2), for each EVC.

¹ JANIS (1997). *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for the Forests in Australia*. Report by the Joint ANZECC/MCFFA National Forest Policy Implementation Sub-committee. Commonwealth of Australia, Canberra.

Ecological Vegetation Classes (EVCs)	Area in ha		Percent Remaining	Conservation Status	Area in ha			Dedicated Reserves as % of Pre-1750 Extent	All Reserves as % of Pre-1750 Extent
	Pre-1750 Extent	Current Extent			Dedicated Reserves System	Informal Reserves	Other public land		
Aquatic Hermland / Plains Sedgy Wetland Mosaic	690	10	1.5	E, R	0	0	0	0	0
Calcarene Dune Woodland	25	5	21.1	V, R	1	0	1	2	2
Clay Heathland	2	2	100.0	R	2	0	0	100	100
Coastal Dune Scrub Mosaic	1,632	1,106	67.8		783	38	185	48	50
Coastal Headland Scrub	2,678	2,134	79.7		805	0	712	30	30
Coastal Headland Scrub / Headland Coastal Tussock Grassland Mosaic	254	194	76.5		102	0	3	40	40
Coastal Saltmarsh	5	5	100.0	R	0	0	3	0	0
Coastal Tussock Grassland	305	223	72.9		140	0	42	46	46
Cool Temperate Rainforest	9,660	6,424	66.5		1,459	2,143	3,546	15	37
Damp Heath Scrub	1,541	535	34.7		425	36	5	28	30
Damp Sands Herb-rich Woodland	3,337	1,593	47.8		612	0	140	18	18
Estuarine Wetland	208	114	54.5		26	0	55	12	12
Floodplain Reedbed	112	0	0.0	E, R	0	0	0	0	0
Floodplain Riparian Woodland	1,853	42	2.3	E, R	0	0	1	0	0
Grassy Dry Forest	291	275	94.5		158	0	59	54	54
Grassy Forest	1,595	138	8.7	E, R	0	0	1	0	0
Grassy Woodland	35,787	623	1.7	E, R	1	0	33	0	0
Heathy Woodland	20,579	13,230	64.3		7,586	4,503	2,211	37	59
Herb-rich Foothill Forest	10,113	4,337	42.9		1,044	1,159	2,234	10	22
Herb-rich Foothill Forest / Shrubby Foothill Forest Complex	6,107	2,876	47.1		17	1,289	2,147	0	21
Lowland Forest	74,659	30,301	40.6		6,902	2,266	13,136	9	12
Plains Grassy Wetland	11	2	15.3	V, R	0	0	0	0	0
Plains Grassy Woodland	4,725	47	1.0	E, R	0	0	1	0	0
Plains Sedgy Wetland	262	27	10.3	V, R	0	0	0	0	0
Riparian Forest	5,849	2,121	36.3		798	1,226	593	14	35
Riparian Scrub Complex	5,947	2,588	43.5		1,311	1,379	228	22	45
Sand Heathland	176	167	95.2		78	0	71	45	45
Scoria Cone Woodland	1	1	100.0	R	1	0	0	100	100
Sedgy Riparian Woodland	2,879	894	31.0		223	565	246	8	27
Shrubby Dry Forest	1,687	1,585	94.0		1,074	4	189	64	64
Shrubby Foothill Forest	36,857	27,765	75.3		10,404	1,824	11,070	28	33
Shrubby Wet Forest	37,579	29,799	79.3		5,446	2,649	18,400	14	22
Stony Rises Herb-rich Woodland	4,471	2,106	47.1		13	0	5	0	0
Swamp Scrub	9,367	497	5.3	E, R	5	0	110	0	0
Swampy Riparian Woodland	1,926	239	12.4	V, R	0	0	43	0	0
Water Body - Natural or man made	44	256	587.0		113	0	117	258	258
Wet Forest	48,911	36,113	73.8		8,571	4,831	19,802	18	27
Wet Heathland	4,074	1,232	30.2		803	785	76	20	39
Wet Sands Thicket	1,299	554	42.7		451	716	12	35	90
Total:	337,499	170,159	50.4		49,355	25,412	75,476	15	22

APPENDIX 10 LIST OF SUBMISSIONS RECEIVED IN RESPONSE TO THE NOTICE OF INVESTIGATION

Submission numbers preceded with 'I/' refer to those received in September-November 2002 on the Notice of Investigation for the then Angahook-Lorne Investigation. Submission numbers preceded with 'L' refer to those received after the closing date of 28 April 2003. Several submissions which had no name or an illegible name are not included in this list.

Sub no	Name	Group
213	Judy Adams	
402	Adam Addison	
263	Mary Alexander	
243	Troy Alexander	
303	Patricia Alford	
L19	David Anderson	VicRoads
421	Pam Andrews	
418	Ariane Armstrong	
361	E. Arnaud	
L17	Scott Ashby	Department of Primary Industries
48	Ken Asplin	
400	Daisy Atkin-Harrison	
156	Paul Backen	Midway Plantations Pty Ltd
36	Jocelyn M. Banks	
238	Fiona Baranowski	
250	T.H. & B.E. Barlow	
202	Jenny Barnett	Victorian National Parks Association Inc
293	Carlos Barrientos	
256	Grant Beale	
383	Helen & John Becley	
70	G.V. & Z.R. Beilby	
103	Chris Bell	
38	Judy Bell	
177	Christa Bennett	
318	Rita Bentley	Bush Users Group Victoria Inc.
63	Anny Beresford	
56	Ken Best	
L4	Wim Bezemer	
407	Kim Billington	
101	Malcolm Bird	
211	Simon Birrell	Otway Ranges Environment Network
167	John Boaler	
377	J. Bohauy	
433	Chloe Booker	
163	Sonia Borg	
395	Jennifer Borlingieri	
258	Geoffrey Brauer	
161	Nieka Brewster	

Sub no	Name	Group
149	Roger Brink	
132	Andrew Brook	
129	Susan Brook	
438	Lea Brown	
77	Philip Brown	Sporting Shooters Association of Australia
L3	Sally-Anne Brown	Otways Branch, Australian Greens Victoria
350	Mia Bullen	
58	David Burgess	
363	Helen Butler	
16	Bob Butt	
4	Ian Cahir	Aboriginal Affairs Victoria
100	Annie Cain	
208	Paul Caine	Glen Eira Environment Group Inc.
108	Andrew Cairns	
71	Geoff Caldwell	Camp Wilson Baptist Centre
210	Chris Callahan	Gerangamete Flats Landcare Group
316	Catherine Callahan	
220	Bronwynne Calvert	Otways Tourism Inc.
178	Judy Cameron	
159	Liz Carr	Apollo Bay Chamber of Commerce
L1	Russell Carrington	
354	Andy Carter	
239	Luke Chamberlain	
1/15, 319	Stephen Chenery	
321	Stephen Chenery	South West Region (Vic), Australian Greens Party
41	Malcolm Clarke	Mitlow Nominees Pty Ltd
351	David Close	
346	Selime Cocoli	
82	Graham Coe	
157	David Colless	Calco Timbers Pty Ltd
39	Angela Collins	
122	C.J. Collins	
17	Michelle Collins	
313	T.N. Collis	
147	Richard Collopy	
184	Brett Constable	
227	Phil Cooke	Alcoa World Alumina Australia
120	Henry Costin	
141	Brett Cox	
124	Noel Cox	
65	Dale & Michelle Cunningham	
66	R. Cunningham	
79	Jenny Cunningham	
232	Trevor Curran	Ararat & Stawell District Field & Game Inc.
420	B.J. Cuth	
30	Moreen Dainty	



Sub no	Name	Group
216	Stuart Dashper	Victorian Regional Group Conservation Committee
1/20	Beth Davidson	Surf Coast Shire Council
164	David Davies	
229	Ian Davis	Barwon Water
272	Wilfred Davis	
290	Geraldine Debono	
L11	H.R. Deering	
14	Kevin & Robyn Delaforce	
248	Kay Demmler	
428	Kaz Denton	
246	Karin Derkley	
1/1	Ralph Deszcz	
409	Janet Dickie	
111	Barbara Dickinson	
110	Lisa Dickinson	
85	Janet & Alec Donald	
289	Alex Donald	
222	Rod Drew	Field & Game Australia Inc.
116	Linda & Jaris Drezins	
424	Atrielle Drury	
1/21	Peter Duff	Velkyvale Pty Ltd
155	Ian & Ann Duryea	
158	Ann Duryea	Western Victorian Axeman's Association Inc.
87	W.A. & C.A. Duynhoven	
106	A.G. Duynhoven	
138	J.A. Duynhoven	
144	A.J. Duynhoven	
145	Julia Duynhoven	
218	Peter Dynes	Otway Timber Communities Australia
50	Ross Ebbels	Geelong Otways Tourism Inc.
121	Kerri Eberle	
287	Rebecca Eberle	
10	Wendy Eden	
L12	Peter Ellard	Australian Motorcycle Trail Riders Association
292	Paul Ernst	
268	D. & A. Evans	
381	Reg Evans	
298	Rosemary Eyssens	
299	Leo Eyssens	
160	Hans Fankhanel	Otway Planning Association Inc
380	Adam Fenderson	
1/18	Michael Fendley	Victorian National Parks Association
97	A.L. & D.M. Ferrari	
109	Andrew Ferrari	
130	Craig Ferrari	
128	Darren Ferrari	

Sub no	Name	Group
123	Heyley Ferrari	
126	Jennifer Ferrari	
270	G. & S. Ferrari	
140	K.J. Ferrari	
L23	Leon Ferrari	
125	Michael Ferrari	
273	Michelle Ferrari	
425	Vicky Fifis	
288	Nakia Firebrace	
342	G. Fithall	
345	Tess Fitzgerald	
1/2	James Fitzsimons	School of Ecology & Environment, Deakin University
47	Graeme Fleming	Asset Strategy & Environment, Powercor Australia
286	Ray Ford	
226	Judi Forrester	Friends of Otway National Park
366	A. Fra	
L8	Yvonne Francis	
1/8, 228	Chris Fraser	Victorian Minerals & Energy Council
114	Ronald Freiverts	
115	Karl & Silvia Freiverts	
12	Craig Fryers	
406	Nadia Galanopoulos	
91	Mark Gale	
154	Irene Gardiner	
251	J.L. & I. Gardiner	
362	Matthew Gedge	
217	Kersten Gentle	Victorian State Office, Timber Communities Australia
1/10	Roslyn Gibson	Angair Inc.
107	A. Gilson	
93	J.D. Gladstone	
309	A. Glasby	
305	Ken Gledhill	
341	Illegible Goddard	
117	Janelle Goddyn	
307	Pierre Goss	
21	Peter, Rose, Melanie, Julie, Trevor & Tanisha Graham	
266	Michael & Sharon Grant	
352	Meredith Greenwood	
73	John Gregurke	Field Naturalists Club of Ballarat
386	Robbie Grieg	
344	Melissa Gunner	
359	Samantha Hall	
369	Melissa Hall	
295	J.T Hamilton	
112	Paul Hampshire	
282	Roger Hardley	Apollo Bay Landcare Group



Sub no	Name	Group
9	Ben Hargreaves	
44	Chris Harkin	
27	B. Harper	
54	David Harris	
257	T.J. & L.E. Harris	
387	N. Harrison	
356	Carl Harvey	
L24	Jennie Harvie	Victorian Gem Clubs Association Inc
127	Audrey Hay	
40	Pasha Hayat	
67	Beatrice Head	
297	S. Hendricks	
172	Robyn Henriksen	
98	N. Henry	
L18	Lindsay Hesketh	Australian Conservation Foundation
L29	Andrew Hill	
194	Greg Hocking	
378	Elizabeth Horner	
L13	Rachel Hughes	
412	David Hut	
230	Bryce Hutton	Geelong Region, Scout Australia
249	D.R. Hutton	
51	Simone Jackson	
411	Greg Jacob	
348	Aylah James	
33	A.B. & S.A. Jamieson	
430	Janny Jason	
1	Margaret Jennings	
84	Jeff & Noreen Jennings	
99	R. Jennings	
330	Margaret & Ian Jennings	
278	Colin Jevons	
384	Di Johnson	
399	Laura Johnson	
L27	Graham Johnson	
308	R.B. Kee	
209	Estelle Kefford	
221	Sue Kelly-Turner	Geelong Community Forum
241	Geoff Kennedy	
434	Lisa Kennedy	
2	Adrian Kennelly	
1/14	Joan Kenwood	Queenscliffe Community Association Inc
247	Jim Kiellerup	
397	Alex Kirkham	
219	Damien Knight	South West Victoria Deer Advisory Group
315	Peter Koop	

Sub no	Name	Group
185	Phil Langdon	
L30	Susan Langridge	Forrest & District Community Group
119	Betty & Eric Larson	
301	Dorrie Lawson	
334	Kevin Lawson	
64	Philip Lawson	Marengo Residents Group
242	Steven Lawson	
325	Steven Lawson	Lavers Hill & District Progress Association
339	Cassandra Lawson	
18	Juliet Le Feuvre	
42	Josephine Lee	
401	Alex Leonard	
1/5	Val Lestrangle	Tallawalla Camp Management Authority, Barwon Region Guides Association
175	Catherine & Harry Lewis	
L14	Marina Lewis	
L9	Carol Liebscher	
253	Heather & Ian Light	
162	Joan Lindros	Geelong Environment Council Inc.
382	Matthew Linscott	
34	Dennis Livingston	
26	Hilary Louey	
260	Owen Lucas	
280	Iain Lygo	
191	Gary Mac	
L20	Ellen Mac Lennan	
1/13, 337	Margaret MacDonald	Friends of Angahook-Lorne State Park
L2	Kylie MacFarlane	
86	S.H. & V.J. MacKenzie	
396	Christopher Mahney	
151	Sheryl Mahoney	
264	J.T. & L.A. Manintveld	
277	P. Marchant	
199	Andrea Marian	
L28	Sean Marler	
83	John Marriner	
314	Cyril Marriner	Cape Otway Caravan & Camping Park & Bimbi Park Trail Rides
347	Sonia Marshall	
435	Don Marshall	
233	Darryl Marsland	Geelong Four Wheel Drive Club
353	Janet Martin	
200	Stuart McCallum	Friends of Bannockburn Bush
357	Sarah McDonald	
279	Michelle McEwan	
197	Gavan McFadzean	Wilderness Society
427	S. McGuirk	
245	Gillian McInnes	



Sub no	Name	Group
6	Angus McKenzie	Painkalac Pastoral Co Pty Ltd
137	Anthony McKenzie	
1/6, 5	Graeme McKenzie	
198	Sarah McLarty	
368	John McMullan	
373	Jasper McMullan	Environment Health & Safety, Santos Ltd
61	Catriona McTaggart	
102	Yolanda McVilly	
375	Shannon Merika	
176	Barbara Minchinton	
240	Jack Mitchell & Family	Environment Victoria Inc.
8	Christine Modra	
L16	Nicky Moffat	
410	K. Molnar	
275	Lawrence Moore	
261	Skeet Morrow	Peak Environmental Enterprises
7	Geoff Mosley	
364	Peter Mumre	
146	Michael Murnane	
L7	Bruce Murray	
436	Rachel Murray	E.T. & E.W. Murname Pty Ltd
394	Ellen Napper	
296	Sheila Nash	
254	Heather Neale	
300	Alana Neale	
	Wayne Neale	Otway Ranges Walking Track Association Inc.
139	A.D. Neave	
370	Anna Negri	
225	Fiona Nelson	
188	David Nicaastro	
349	Michelle Nielsen	
269	Michael Nocera	
379	Mark Norris	
80	Bill & Lorraine Norton	
365	Darcy Norwood	
72	Lesley Nosedá	
L15	Genevieve O'Connell	
340	Ruth O'Dowd	
267	Geoffrey O'Dwyer	
376	Justin O'Shea	
134	Trevor Owen	
104	Mara Pacers	
105	H. & I. Pacers	
150	Peter Pacers	
426	Sonja Paolinsan	
285	Edwin Parke	

Sub no	Name	Group
192	Simon Parker	
310	I. Parker	
372	Tess Parker	
276	Rodney Pearce	
190	Stephen Pennells	
235	Bill Pheasant	
148	Alix Phelan	
414	Chris Pierce	
415	Janet Pierce	
416	Janet P. Pierce	
329	John Pierce	
413	Nick Pierce	
320	Robert Pierce	
322	John Piesse	
323	John Piesse	Sabine Falls Community Management Committee
338	John Piesse	Doctors for Native Forests Inc.
1/17	David C. Pinney	Geelong Bushwalking Club Inc.
1/3	David Pollack	Aboriginal & Torres Strait Islander Commissioner
32	Franciszka Pomaranska	
173	Stuart Pougher	
13	Marjorie & Kevin Poulton	K. Poulton & Associates Pty Ltd
223	Trevor Poulton	ALP Otway Ranges Interest Group
89	Gavin Poustic	
49	Leanne Presipino	
317	Leanne Prestipino	
L25	Geoffrey Price	
205	Carl Punnuzzo	
271	D. Purcell	
35	Veronica & Keith Quinton	
11	Allan Rampal	
20	June L. Rea	
180	Jill Redwood	Concerned Residents of East Gippsland
324	Brett & Tina Reid	Sea Mist Horse Riding
390	Joanna Remengi	
392	Shona Rich	
193	Andrea Richardson	
L6	Garry Richardson	Lakes & Craters Horse Driving Club
183	Claire & Carl Rickard	
68	David Rimmer	Federation of Victorian Walking Clubs (Vicwalk) Inc
294	Rob Ritchie	
90	Denise Robbins	
259	J. Robbins	
92	J.T. Robbins	
94	K.M. Robbins	
96	Millie Robbins	



Sub no	Name	Group
3	Ian Roberts	Earth Resources Analysis Pty Ltd
262	L.C. Robertson	
398	Dave Robson	
231	Michael Roche	
74	John Romeril	
133	Greg Rooke	
22	Libby Ross	
204	Mick Rust	
355	Christina Sanders	
169	Dick Sandner	Purus Energy Limited
23	Willis Saunders	
24	Hugo Saunders	
25	Martin Saunders	
389	David Savage	
367	T. Schermacher	
304	S. Schmidt	
76	Andrew Schudmak	
113	John Sell	
131	Gayle Sell	National Native Title Tribunal
385	Kela Shakah	
121	Pat Shannon	
1/4	Tony Shelley	
358	Nathan Sherlock	
189	Brendan Shoebridge	
207	Alister & Kathy Sholl	
174	Glenda Shomaly	
374	Andrew Siagmulen	
311	Charles Silk	Santa Monica Campus, St Bernard's College
312	Fred Silk	
43	Pauline & Allan Simmonds	
237	Paul Simmons	
388	Bianca Sirianni	
171	Graeme Skinner	
360	Beav Slagmolen	
371	Brooke Slagmolen & Tony Wilson	
152	Leon Smart	
142	B.R. Smethurst	Wye River Residents Action Group
143	Joan Smethurst	
343	Barb Smith	
182	Colin Smith	
244	Colin Smith	
170	Mark Smith	
186	Sherryl Smith	
274	Judy Spafford	
335	Geoff Speirs	
75	Helen Speirs	

Sub no	Name	Group
15	J.A. & S.Y. Spiers	
332	Jim Speirs	Our Parks
88	Helen Spokes	
29	Warwick Spralison	
81	Anthony & Helen Stary	
212	Lorant & Lynette Stary	
78	Peter Stephen	
283	Peter & Sue Stephen	
135	Gwen Stevens	
252	Lisa Stephens	Colac & District Adult Riding Club
L10	Nicky Stewart	East Otway Landcare Group
1/11	Graeme Stockton	Jan Juc Coast Action
1/12	Graeme Stockton	Surfers Appreciating Natural Environment
423	Alexandra Stoley	
57	Edward Stucker	
L5	Catherine Sutterby	
265	David & Rhonda Tanis	
60	Cliff Tann	
196	Noelle Taylor	East Otway Residents Group
31	Miranda Thomson	
166	Christopher Tipler	Soudan Holdings Pty Ltd
393	Ruth Tommerhalden	
281	Simon Townsend	
179	Jenny Trezise	
333	Patricia Trotter	
234	Neil Tucker	Angair Inc.
306	PJ. Urqhart	
302	Tracey Urqhart	
118	Joel & Wilma Uwland	
62	Mark Van Den Enden	
291	Jenni Venner	
L26	Melinda Venner	
255	Theodore Vereker	
153	Ian & Marg Vesey	
95	G.F. & E.A. Vickers	
1/9	Phil Voigt	Sporting Motor Cycle Club / Otway Trail Riders
215	Adrian Volders	Western Coastal Board
55	L. & R. Vulcz	
28	Gillian Walker	
52	Heather Walker	
331	Jim Walker	Field Naturalists Club of Victoria Inc
168	Geoff Wallace	Otway Four Wheel Drive Club Inc
419	Helen Wanman	
195	Valerie Warren	
1/19, 69	Alison Watson	Geelong Field Naturalists Club Inc
53	Julie & Alistair Watt	Otway Blackwood Furniture



Sub no	Name	Group
203	Carole & David Webley	
181	Rob Wertheimer	
236	Geoff Wescott	
1/16	Annabel Wheeler	Natural Environment Assessment Section, Australian Heritage Commission
165	Pat Williams	
122	Barbara Wilson	Anglesea Heath Consultative Committee
136	Jenny Wilson	
224	John Wilson	Friends of Lorne
59	Kim Wilson	
214	Pat Wilson	Victorian Association of Forest Industry
37	Ruth Wilson	Friends of Queens Park
328	Keith Wiltshire	
46	Caroline Wood	Blazing Saddles
1/7, 45	Tim Wood	Blazing Saddles
187	Peter Wood	
326	W. Woods	Victorian Mountain Tramping Club Inc.
403	'Allister'	
422	'Christy'	
432	'Lillian'	
404	'Milly'	

SATELLITE IMAGE OF THE ANGAHOOK-OTWAY STUDY AREA

