

Box-Ironbark Forests & Woodlands Investigation

**Draft Report
for Public Comment**

**Environment
Conservation
Council**

What is the ECC?

The Environment Conservation Council (ECC) was formed in mid 1997 replacing the Land Conservation Council. The ECC advises the Victorian Government on the use of public land; it makes recommendations, not decisions. It investigates issues at the request of the relevant Minister and, in doing so, takes into account resource use and social issues as well as environmental needs. The ECC's aim is to balance the competing needs of the environment and public land users, in order to achieve ecologically sustainable and economically viable public land use.

The ECC members are Professor John Lovering AO (Chairman), Mrs Eda Ritchie and Ms Jane Cutler who are supported by a team of professional staff.

Professor Lovering was until recently President of the Murray Darling Basin Commission. He has held senior academic positions, chaired company boards, and served on national and international scientific and government committees.

Mrs Ritchie is a farmer from near Hamilton in Western Victoria. She is also Chairman of the Western Regional Coastal Board, Chairman of the Committee of Management for Rural Ambulance Victoria, a member of the Rural Finance Board, a trustee of the Ross Trust, and a Board Member of the Howard Florey Institute for Medical Research.

Ms Cutler has a Masters Degree in Environmental Science, holds a senior position in the finance sector and has many years of experience managing environmental issues for the resources industry. She has served on a number of boards and trusts including as a Director of Landcare Australia.

The Council works with a wide range of groups including local government, Commonwealth and State agencies, business and industry, environment and conservation groups, Aboriginal people, recreation and tourism bodies, and interested individuals. The ECC is independent of other government agencies and develops its recommendations through data collection, the commissioning of expert research, and extensive consultation. Public input into investigations is encouraged and welcomed.

At the end of each investigation the ECC makes recommendations to the Minister. The State Government then considers these recommendations and makes decisions.

About this report

This report contains the Environment Conservation Council's draft recommendations for the protection, use and management of Victoria's Box-Ironbark forests and woodlands. Following further community input, these recommendations will form the basis of the Final Report to Government due by 31 December 2000. It will mark the culmination of a process begun in 1996 by the then Land Conservation Council.

In developing the draft recommendations, the Council has visited all major sites within the investigation area and sought input from a wide range of stakeholders, interested groups and individuals to better understand the broad strategic issues as well as the fine detail of Box-Ironbark forests and woodlands. An Advisory Group appointed by the Council provided input and advice on technical issues associated with developing the recommendations. More than 2000 written submissions and letters received throughout the process have been considered in detail. Various special reports were commissioned by the Council. Reports commissioned or prepared by other agencies, other States and the Commonwealth have been considered as well.

Council has consistently sought to embrace and integrate the policies and strategies of various levels of government and other agencies as they relate to the forest environment.

Public comment

The Environment Conservation Council is seeking public comment on the draft recommendations contained in this report. Written submissions are strongly encouraged. The closing date for submissions is Tuesday, 8 August 2000.

Please direct written submissions and requests for further information to:

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May 2000

Environment Conservation Council

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Council's Message

At the time of European settlement some 13% of Victoria was covered with significant forests of box and ironbark trees with unique understorey vegetation. These forests provided a distinctive system of habitats for a highly diverse population of birds and other animals.

In the century-and-a-half since European settlement we have cleared the forests for agriculture and mining, continued to use them for mining and grazing, and harvest them for firewood, posts, sleepers and sawlogs. As a result only about 17% of the original cover remains; most is highly fragmented on public land. The reality is that most of the forests we see today have been cut twice or even three times.

Very little remains of the original Box-Ironbark forest structure and, as a consequence, there has been a drastic loss of biodiversity. There is growing community support for the need to halt the degradation of Box-Ironbark forests. Indeed, we need to put in place a comprehensive, adequate and representative system of fully protected parks and reserves to ensure at least the partial restoration of the forests and their biodiversity.

The Victorian Government has given the Environment Conservation Council (ECC) the task of proposing an appropriate system for the protection and management of Box-Ironbark forests and woodlands. The Government also required the ECC to consider the economic and social value of existing or proposed developments, land uses and resources.

In drawing up the draft recommendations in this report for the future protection and development of the Box-Ironbark forests and woodlands of Victoria, the ECC has taken possible social and economic outcomes as a fundamental consideration. For some these recommendations will go too far and for others they will not go nearly far enough.



ECC members Jane Cutler, John Lovering and Eda Ritchie at the base of a large, old, red ironbark (126cm diameter) along a roadside between Stawell and St Arnaud.

On balance, the ECC is strongly of the view that the environmental, economic and social benefits which should follow from the draft proposals will, in the reasonably near future, outweigh their possible short-term costs. Nevertheless, if the possible short-term costs can be demonstrated to fall disproportionately on any individual or particular group, then it would be reasonable for the Government to develop a strategy to minimise the effects of any such negative outcomes.

The ECC is confident that the recommendations provide for a fair, realistic and sustainable vision for the use, protection and management of Victoria's Box-Ironbark forests, their biodiversity and resources.

Professor John Lovering (Chairman)

Mrs Eda Ritchie

Ms Jane Cutler

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Executive Summary

Introduction

Few Victorian forest and woodland ecosystems are as poorly represented in parks and reserves as the distinctive Box-Ironbark ecosystems of northern Victoria. Since European settlement these forests and woodlands have been extensively cleared and fragmented for agriculture, urban development and gold mining, and cut for a variety of wood products. They once covered three million hectares of northern Victoria, but since then, 83% of the original Box-Ironbark vegetation has been cleared. The remaining forest is mostly on public land and these areas are ecologically important for a rich diversity of flora and fauna, much of which is also rare or threatened.

Box-Ironbark forests are highly accessible, and the visitor is rewarded by a vibrant array of bird species, carpets of wildflowers, the rich aroma of eucalypt nectar, and many sites of historical and cultural interest. Despite their apparent uniformity, these forests actually have great diversity. Around 1 500 species of higher plants and over 250 vertebrate species have been recorded in the region; many are largely restricted to Box-Ironbark forests and woodlands.

Some 137 Box-Ironbark plant species and 50 fauna species are now classified as threatened or near-threatened (see Appendix 1). In addition, at least ten plant and animal species have disappeared from the study area since the 1840s, and numerous others have become locally extinct. It is clear that many species, particularly birds, are continuing to decline.

Accordingly, a key feature of Box-Ironbark nature conservation is the promotion of 'recovery' for many species, rather than simply maintaining the *status quo*.

A high proportion of Australian animals are dependent upon large, old eucalypt trees which contain the hollows required for shelter and breeding. At least six of the threatened Box-Ironbark fauna species are strongly dependent upon these trees. The loss of large old trees is strongly implicated in the decline of these species and

perhaps many others. It is therefore recommended that as well as protecting existing large old trees, additional measures be taken to ensure that there will, over time, be more large old trees in the forests.

As well as individual species some entire ecological communities are also under threat. Recent work has identified 73 Box-Ironbark ecological vegetation classes (EVCs) present in the study area prior to European settlement (see Appendix 2).

By far the most extensive EVC prior to settlement was Plains Grassy Woodland (976 000 ha), with Grassy Woodland (528 000 ha) and Box-Ironbark Forest (408 000 ha) also widespread. Plains Grassy Woodland and Grassy Woodland, which were largely cleared for agriculture, are now among the most depleted EVCs, with less than 2% and 8% respectively of their original extent remaining. In contrast slightly over 50% of the original extent of the Box-Ironbark Forest EVC remains.

As well as high nature conservation values these forests and woodlands have high values for various other uses. These are detailed later in the Executive Summary.

Terms of reference

The Victorian Government asked the ECC to:

- identify and evaluate the extent, condition, values and uses of the Box-Ironbark forests and woodland areas in northern Victoria;
- make recommendations on the balanced use of these areas;

having regard to:

- the matters to be taken into account in investigations as provided in Section 20 of the *Environment Conservation Council Act 1997*, including the economic and social value of any existing and proposed development or use of the land or resources; and

- the nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system, recognising that informal reserves and prescriptions will be established through the regional forest management planning processes.

The ECC's Box-Ironbark *Resources and Issues Report* published in December 1997 contained no recommendations but identified and evaluated the extent, condition, values and uses of public land in the study area.

This Draft Report contains recommendations on the balanced use of these areas, having taken into account the matters specified above.

Social and economic effects

To assist with developing the proposals in this report, the ECC commissioned Read Sturgess and Associates and Essential Economics Pty Ltd to carry out an assessment of the social and economic effects of initial proposals and the resultant changes in existing uses and activities. The study assessed, as far as possible, the benefits and costs that could arise from the proposals, and the estimated social effects, including employment gain or loss. Chapter 1 discusses the costs and benefits, and Appendix 3 contains the consultants' report on anticipated social and economic effects resulting from the ECC's recommendations. Overall, the consultants anticipate a substantial benefit to the economy and to employment in the region.

Consultation process

During the preparation of this report, the ECC sought input from community and industry groups, State and Commonwealth Government agencies and interested individuals on the proposals under consideration (see Appendix 4). The ECC also took into account more than 2000 written submissions and letters, a huge resource of information and informed comment.

An overview of the major issues raised in the submissions and letters, and Council's response, can be found in Chapter 17.

In addition to inviting submissions, the ECC has met with individuals and groups in local communities, municipalities, industry, recreation and conservation groups, Members of Parliament,

and Government agencies, and carried out numerous field inspections.

An expertise-based Advisory Group was established by the ECC for this investigation to provide input and advice regarding technical issues associated with developing its recommendations. Members include people with backgrounds in relevant industry sectors (mining, apiculture and timber), recreational uses, research, rural communities, conservation, and individuals from State Government agencies (see Appendix 5).

A further public comment and consultation period of at least 60 days, to 8 August 2000, follows publication of this report.

Summary of proposals

Having considered alternatives proposed in submissions, the ECC decided to utilise the established land use categories previously applied to public land planning, as listed in the table on the next page.

The following proposals are included in this report.

Major new or additional areas of national parks:

- Chiltern–Pilot (addition of the Mt Pilot Multi-purpose Park and part of Barambogie State Forest to the existing Chiltern Box-Ironbark National Park); and
- St Arnaud Range (enlargement and upgrading of the existing Kara Kara State Park, and the addition of state forest and uncommitted land).

Major new or additional areas of state parks:

- Kooyoora (addition of parts of the Wehla, West Brenanah and Glenalbyn State Forests to the existing state park);
- Whipstick–Kamarooka (linking the two existing state parks with part of the Bendigo Whipstick eucalyptus oil production area and uncommitted land);
- Mt Black (establishment of a new park in state forest and a flora reserve, north of Graytown);
- Broken–Boosey (establishment of a new linear park alongside these northern plains creeks); and
- Warby Range (addition of Killawarra Forest to the existing state park).

Major new or additional regional park areas:

- Greater Bendigo (substantial additions of state forest, an historic area, water production land, small reserves and township land to the existing One Tree Hill and Eaglehawk Regional Parks);
- Castlemaine (establishment of a new park with a historic focus, including the existing Castlemaine–Chewton Historic Area, state forest and township land);
- Ararat (addition of Dunneworthy State Forest to the existing Ararat Regional Park);
- St Arnaud (establishment of a new park from state forest and township land at St Arnaud); and
- Heathcote (establishment of a new park from state forest, scenic reserves and township land at Heathcote).

Various nature conservation reserves:

There are numerous nature conservation reserves (some currently flora and fauna, or similar reserves) across the area.

Large areas of state forest:

121 738 ha in all (30% of public land), with harvested timber for value-added products the preferred output, and also managed to protect nature conservation values:

- Rushworth–Heathcote State Forests
- Bendigo State Forest
- Maryborough State Forest
- Dunolly–Inglewood State Forests
- North St Arnaud Range State Forest
- Pyrenees State Forest
- numerous small forests.

Other areas:

Numerous small natural features reserves, and areas of public land for community use (recreation), earth resources, services and utilities.

Summary:

Across the study area, land subject to the highest level of protection, in national and state parks and reference areas, will increase from 8.6% of public land to 20.5%; or from 1.3% of the original extent of Box-Ironbark forests and woodlands to 3%.

Summary of proposals

Public land use category	Existing public land use		Proposed public land use	
	ha	% of public land	ha	% of public land
National park*	7 900	1.8	38 226	8.9
State park*	25 685	6.0	46 091	10.8
Regional park*	21 415	5.0	28 534	6.6
Reference area*	3 287	0.8	3 287	0.8
Nature conservation reserve*	20 761	4.8	67 851	15.7
Water production	25 769	6.0	23 261	5.4
State forest	210 897	48.9	121 738	28.2
Historic and cultural features reserve	10 023	2.3	5 995	1.4
Natural features reserve	37 396	8.7	31 509	7.4
Community use area	6 295	1.5	4 817	1.1
Plantation	916	0.2	916	0.2
Earth resources	1 878	0.4	2 004	0.4
Services and utilities	1 830	0.4	1 830	0.4
Uncategorised public land	7 936	1.8	5 357	1.3
Land not required for public purposes	-	-	1 460	0.3
Commonwealth land	42 594	10.0	42 594	10.0
Other areas**	6 443	1.5	4 160	1.0

* These areas form part of the reserve system under the national forest (JANIS) criteria for protected areas (see conservation outcomes section later in Executive Summary).

** The 'Other areas' are small parcels not separately quantified in the following categories: natural features reserves, community use areas, earth resources, services and utilities, and uncategorised public land.

Uses

Box-Ironbark forests and woodlands are widely used for resource extraction, including several specialist Box-Ironbark industries.

Commercial gold production

The study area produces 95% of Victoria's gold, and much of the area is considered highly prospective. It is very important both to local communities and Victoria as a whole that exploration and mining continue. This report proposes continued access for exploration and mining to 79% of the public land in the study area (currently 91%). The proposed new or enlarged national and state parks generally do not contain areas of recognised goldfields. Existing exploration licences can continue in the new park areas, with any future mining subject to Government decision. There are recommendations that higher environmental standards should apply to all mining operations. These higher standards are already met by industry leaders.

Extractive industries

Numerous, relatively small, approved stone extraction sites on public land will continue to be operated. About 75% of the extraction sites in the study area are on private land with extractive material for a particular purpose generally located close to the site of use. General guidelines for extraction are proposed.

Honey production

Location of hives on public land for the production of honey and other apiairy outputs will continue with only minor changes.

Wood products

Following the recent Box-Ironbark Timber Assessment, the Department of Natural Resources and Environment's (NRE) Forests Service modelling of the potential timber harvest for various products has shown that, on the present area base, the volumes being cut are below the expected available volume for most products.

After allowing for the withdrawal of timber resources under the proposals in this report, and recognising that subsequent forest management planning will set aside additional resources from harvesting, the model indicates that current cut levels should generally be able to be maintained across the area as a whole, except for sleepers.

Additional broad guidelines for forest management are also proposed. These measures will enhance the measures currently in place to increase the number of larger trees in the forest and to ensure that there is ongoing recruitment into the large tree category.

Sawn timber

The recommendations should enable at least the current level of sawlog harvest to continue, with, as far as practicable, the sawn timber being kiln dried and used for value added products such as flooring, trims and furniture wood. The proposals should in fact permit some increase, with additional sawn timber cut from sawlogs previously allocated to sleepers. Sleeper cutting should be phased out of Box-Ironbark forests.

In determining land use, the recommendations were developed for a reserve system, as required by the terms of reference. In designing the system every effort was made to minimise the impact on current activities such as timber harvesting. After the reserve system was developed, the advice of NRE Forests Service was sought on the effects of the proposals.

The ECC's current view is that the reserve system as proposed provides overall balanced use of the area. If new information indicates that the volumes are different to that currently predicted, this would not automatically translate to a change in the reserve areas proposed. This matter will be further considered by the ECC before the Final Report is prepared later this year.

Eucalyptus oil

Cutting of eucalyptus leaf for oil can continue in general, but is proposed to be removed from key areas for nature conservation, for malleefowl habitat around Wedderburn and to link Whipstick and Kamarooka State Parks. Success has been achieved with mallee plantations for eucalyptus oil on freehold land (both in Victoria and interstate), and in the medium to long term that may well be the future of the industry.

Recreation and tourism

The single largest recreation activity in the study area is metal detecting for gold. This accounts for up to 20% of visitor expenditure in the region. Under these proposals the national park areas would not be available for prospecting, while parts of the state parks would be zoned to allow detecting. Under the proposed recommendations 86% (currently 94%) of public land in the study area will be available for prospecting. The new parks where prospecting will not be permitted are generally located in areas which

are currently not popular for detecting as there is little history of gold in these areas.

Many forms of tourism and recreation will be encouraged in the proposed parks and reserves, and publicity relating generally to Box-Ironbark forests and woodlands is likely to also increase visits to tourist and recreation sites in state forests.

Effects

In summary:

- there will be a significant increase in the conservation reserve system with better representation of depleted vegetation communities (see Appendix 6);
- the new parks and reserves will assist in attracting additional visitors to the area;
- national and state park areas will be unavailable to new exploration and mining; however, no recognised goldfield has been closed;
- existing mining and exploration licences in new park areas can continue;
- for recreational prospecting and commercial mining, 86% and 79% respectively of the public land in the investigation area will continue to be available;
- higher environmental standards for all mining operations are proposed;
- current volumes of timber are expected to continue to be available for sustainable harvesting in the study area as a whole, although some local areas will have less immediate access to timber resources;
- sleeper cutting will be phased out, with this timber used for sawn products;
- eucalyptus oil production will be removed from some key habitats which will be added to parks or reserves; and
- grazing will be excluded from some small areas.

Conservation outcomes

In terms of nature conservation, the ECC's proposals aim to at least meet the national forest (JANIS) criteria for a comprehensive, adequate and representative reserve system (Appendix 7). The proposals would enlarge the Box-Ironbark reserve system from 96 476 ha to 191 333 ha, an increase of 94 857 ha. The more extensive EVCs would be represented at levels ranging from 16% of pre-1750 extent for Box-Ironbark Forest EVC to about 70% for various other EVCs (see Appendix 6 for details of EVC representation).

Eight vulnerable EVCs have from 0% to 12% representation. For the many rare or endangered EVCs, representation varies from 0% to 57% of their pre-1750 extent. Many of these rare or endangered EVCs have a high proportion (up to 100%) of their present public land extent in the reserve system.

Several of the most depleted EVCs, mostly on the northern plains, remain poorly represented. Their occurrence is generally restricted to numerous small land parcels, mostly less than 20 ha in size.

Large old tree sites will be protected, either in reserves or by zoning in state forests. Management of parks and reserves will aim to increase the relative numbers of large trees, with consequent benefits for fauna habitat.

Other conservation outcomes, including representation of threatened flora and fauna, are detailed in Chapter 4 and Appendix 8.

In areas where management for nature conservation is greatly constrained because very little indigenous vegetation or public land remains, the ECC is proposing Local Habitat Conservation Networks to involve, cooperatively, all stakeholders with an interest in conserving the biodiversity that remains. This issue, and the proposal, are described more fully in Chapter 4 and Appendix 9.

A full list of recommendations in this Draft Report is provided in Appendix 10.

Social effects

The estimated social effects suggest that following implementation of the proposals, there will be approximately 85 new jobs, mainly in tourism and located in regional destinations, easily surpassing any job losses.

Possible job losses (or foregone increases) resulting from the recommendations are estimated to be as follows:

- zero to twelve jobs in mining companies (due to possible reduced exploration in national and state park areas) and small miners (due to higher standards);
- the forest modelling indicates that there are unlikely to be any net job losses in the timber industry, however, what may have been an actual increase in jobs is now unlikely to occur or will be less than anticipated; and

- small job losses in eucalyptus oil production (approximately one person) and grazing (less than one person).

Potential job losses would be felt in Bendigo and smaller towns. While employment losses would be small relative to total employment in the region, the areas most dependent on production from public land are those in the west of the study area which have relatively low incomes, high unemployment, and low population growth. However, few areas will experience large overall negative or positive impacts since job losses would be balanced by positive effects. Bendigo and Castlemaine would be likely to experience significant net positive effects.

It is recommended that the Government address the issue of funding for industry structural adjustment, if the need exists arising from implementation of the ECC's recommendations. In particular, any affected communities in the study area should have levels of support assessed according to principles similar to those for affected communities within areas covered by Regional Forest Agreements.

Economic effects

The economic assessment of benefits and costs of the ECC's proposals indicates that the economic benefits (greater than \$1.7M) are likely to substantially exceed the costs (less than \$0.6M).

The benefit of increased biodiversity and natural values resulting from the proposals has not been quantified but is likely to be substantial. The increased value of tourism in new and expanded parks and reserves is the main benefit quantified. Tourism is currently the second largest industry in the study area and only a small increase in visitor numbers would be required to surpass the estimated costs of recommendations in this report. The largest cost is the expected increased cost of park and reserve management when the proposals are implemented.

Outline of the Draft Report

Part One:

- explains the stages of the Box-Ironbark Forests and Woodlands Investigation, and outlines the process of consultation with interested groups and individuals undertaken to date.

Part Two sets the context for the investigation in terms of:

- the relationship of Aboriginal people to Box-Ironbark public lands and associated issues, and includes some general recommendations relating to the protection and management of Aboriginal places; and
- providing the background, principles and policies, and trends for the main uses of Box-Ironbark public lands. It contains recommendations that apply generally to certain uses, providing context for the area specific recommendations in Part Three.

Part Three:

- introduces several proposed new national and state parks and park additions, and minor changes to existing parks. Major proposals are described. It also outlines proposals for regional parks, nature conservation reserves, and historic and cultural features reserves;
- covers state forest management, and specific major forest areas; and describes proposals for other public land use categories; and
- contains, in Chapter 17, the ECC's response to major issues raised in written submissions.

References:

- provides full details, in alphabetical order, of all references cited throughout the report.

Appendices and Maps:

- are at the back of the report. They provide supporting information for recommendations contained in the body of the report.

Submissions on the Draft Report

Now that the ECC has identified specific proposals for public land across the Box-Ironbark study area, all stakeholders are encouraged to make submissions in response. These submissions, which are a critical part of the consultation process, will be considered in detail by the ECC in developing the Final Report for presentation to the Minister for Environment and Conservation later this year.

The closing date for written submissions is Tuesday 8th August 2000.

The Investigation

1 The investigation so far

1.1 Box-Ironbark forests and woodlands today

Few Victorian forest and woodland ecosystems are as poorly represented in parks and reserves as the distinctive Box-Ironbark ecosystems of northern Victoria.

Since European settlement, Box-Ironbark forests and woodlands have been extensively cleared and fragmented for agriculture, gold mining, urban development and wood products. Box-Ironbark forests and woodlands once covered three million hectares of northern Victoria, prior to European settlement. Since then, 83% of the original Box-Ironbark vegetation has been cleared. Today only 508 000 ha remains—most of that (378 000 ha) is on public land. The remaining forests are highly fragmented, and contain many threatened plant and animal species. Conservation values in many areas of Box-Ironbark are high, either because of the scarcity of what remains, or because of the risks of further degradation.

Box-Ironbark forests and woodlands are a major component of the vast belt of temperate woodlands that cover much of south-eastern Australia between the arid interior and the mountain forests of the Great Dividing Range.

Box-Ironbark may lack the spectacular scenic backdrops of some of the tall forests, but the sombre stands of red and mugga ironbark have their own understated charm. The visitor is rewarded by a vibrant array of bird species, carpets of wildflowers, the rich aroma of eucalypt nectar, and many sites of historical and cultural interest. The sparse understorey scattered with wildflowers, shrubs, herbs and grasses over gentle terrain provide a forest readily accessible to all. The dark trunks of the commanding grey box and red stringybark slice a striking contrast against their grey-green canopy. Yet despite their apparent uniformity, these forests actually take a great diversity of forms. Clouds of grey mallee shrubland skirt the northern fringes. Patches of heath and treeless granite outcrops intersperse the forests.

Around 1 500 species of higher plants have been recorded in this region, many of which, like the greenhoods, spider- and leek-orchids, are highly endangered. Entire communities in the Box-Ironbark forests are under threat. There are 73 ecological vegetation classes present in the Box-Ironbark study area. By far the most extensive types prior to European settlement were Plains Grassy Woodland (976 000 ha) and Grassy Woodland (528 000 ha) of which only 1.7 % and 7.9 % respectively remains.

Not surprisingly, the Box-Ironbark forests and woodlands are ecologically important for a rich faunal diversity, much of which is also rare or threatened. Over 250 vertebrate species have been recorded in the Box-Ironbark study area. Many of these, like the squirrel glider and woodland blind snake, are largely restricted to Box-Ironbark forests and woodlands. At least 10 plant and animal species have disappeared from the area since the 1840s, and numerous others have become locally extinct. At least 137 Box-Ironbark plant species and 50 fauna species are now classified as threatened or near-threatened. It is clear that many species, particularly birds, continue to decline. Unless these declines are reversed, it is inevitable that formerly more common species will become threatened, and many threatened species will become extinct. It is precisely this scenario, repeated at the continental scale, which has led to predictions that Australia will lose half its terrestrial bird species in the 21st century.

Accordingly, a key feature of Box-Ironbark nature conservation is the promotion of 'recovery' for many species—a return, even partially, to former numbers and distribution—as opposed to simply maintaining the *status quo*.

A high proportion of Australian animals are dependent upon large, old eucalypt trees. Large trees generate a taller, more open and structurally more complex forest. They provide abundant and reliable nectar, a variety of foraging sites, such as dead branches, peeling bark and fallen timber, and, importantly, have more hollows. Hollows are required by many species for shelter and breeding. Only large trees have large hollows suitable for certain species. At least six threatened species in the Box-Ironbark study area are dependent upon large trees—the brush-tailed phascogale, squirrel glider, swift parrot, powerful owl, barking owl and regent honeyeater. The loss of large old trees is strongly implicated in the decline of these species and perhaps many others.

Box-Ironbark forests and woodlands have a long history of land use. Much of Victoria's commercial and recreational gold production originated and continues from these forests. Box-Ironbark forest woods make handsome furniture timbers, durable structural timbers, and excellent firewood. Nectar from Box-Ironbark forests is sought by bee-keepers. The mallee trees of the region are the source of Victoria's eucalyptus oil production. The forests are highly accessible to many towns, and local communities use them for recreation, nature observation and domestic firewood collection.

Box-Ironbark forests and woodlands arouse passionate interest and responses from those using or interested in these areas. While in the mid-19th century these forests were seen as wastelands, of little value unless used or removed for agriculture or in the search for gold, it is now recognised that the forests and woodlands themselves have value for habitat conservation reasons, as well as providing many key resources.

This report publishes draft recommendations for the appropriate use of public land in the Box-Ironbark study area. The recommendations aim to achieve a balance between the need to protect the important values of the Box-Ironbark forests and woodlands, and the sustainable use of their resources. The ECC now seeks public comment on these recommendations.

1.2 Terms of reference and the investigation process

The Government has asked the Environment Conservation Council to carry out an investigation of Box-Ironbark forests and woodlands in northern Victoria. The investigation builds on earlier work by its precursor, the Land Conservation Council.

The Land Conservation Council, established under the *Land Conservation Act 1970*, began investigating Box-Ironbark forests and woodlands in northern Victoria under terms of reference provided by the Victorian Government in 1996. That investigation commenced, and much information was collected, with assistance from the Department of Natural Resources and Environment and Commonwealth agencies. In June 1997 the *Land Conservation Act 1970* was repealed and replaced by the *Environment Conservation Council Act 1997*. Under this Act the Land Conservation Council ceased to exist and the ECC was established to respond to specific references from the relevant Minister.

In December 1997 the then Minister for Conservation and Land Management requested that the ECC continue the investigation in accordance with the revised terms of reference quoted in full in Table 1.1. The ECC published its *Resources and Issues Report* in December 1997 and received public submissions. The flow chart in Table 1.2 outlines the investigation process. The Final Report must be given to the Minister by 31 December 2000.

Table 1.1 Terms of reference and requirements for the Box-Ironbark Forests and Woodlands Investigation

Terms of reference for the Box-Ironbark Forests and Woodlands Investigation

The Minister, under Section 17 of the *Environment Conservation Council Act 1997* requires the Environment Conservation Council to carry out an investigation of Victoria's Box-Ironbark forests and woodlands occurring on public land in northern Victoria. The area to be investigated is the Box-Ironbark ecosystem stretching from the Grampians in the west to Wodonga in the north-east. The investigation area is shown on the attached map.

In accordance with Section 23 of the Act the Environment Conservation Council is required to present a written report on the outcome of its investigation in the prescribed form by 31 December 2000.¹

Having regard to the matters to be taken into account in investigations as provided in Section 20 of the Act, including the economic and social value of any existing and proposed development or use of the land or resources, the investigation must:

- identify and evaluate the extent, condition, values and uses of the Box-Ironbark Forests and Woodland areas in northern Victoria;
- make recommendations on the balanced use of these areas; and
- in making recommendations on the balanced use of Box-Ironbark forest and woodland areas the Council should have regard to the nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system recognising that informal reserves and prescriptions will be established through the regional forest management planning processes.

¹ Originally 31 December 1998

What is the ECC required to consider in its investigations?

Under Section 20 of the *Environment Conservation Council Act 1997*, the Council must have regard to:

- the ability of any existing or proposed development or use of the land or resources to be ecologically sustainable and economically viable;
- the economic and social value of any existing or proposed development or use of the land or resources;
- the existence of and the need to conserve and protect any areas of ecological, historical, cultural or recreational value or areas of landscape significance on the land;
- the need for the creation and preservation of a comprehensive, adequate and representative system of parks and reserves within the State;
- any international obligations entered into by the Commonwealth and any national agreements entered into with or obligations undertaken in conjunction with the Commonwealth and the other States and Territories which relate to the subject matter of the investigation;
- the need to protect and conserve biodiversity.

The ECC has specifically met the following terms of reference:

- identify and evaluate the extent, condition, values and uses of the Box-Ironbark forests and woodland areas in northern Victoria

This has been done, within the limits of existing information, in the ECC's *Resources and Issues Report (1997)*.

- make recommendations on the balanced use of these areas

This Draft Report includes recommendations, for public comment, on the balanced use of Box-Ironbark forests and woodlands.

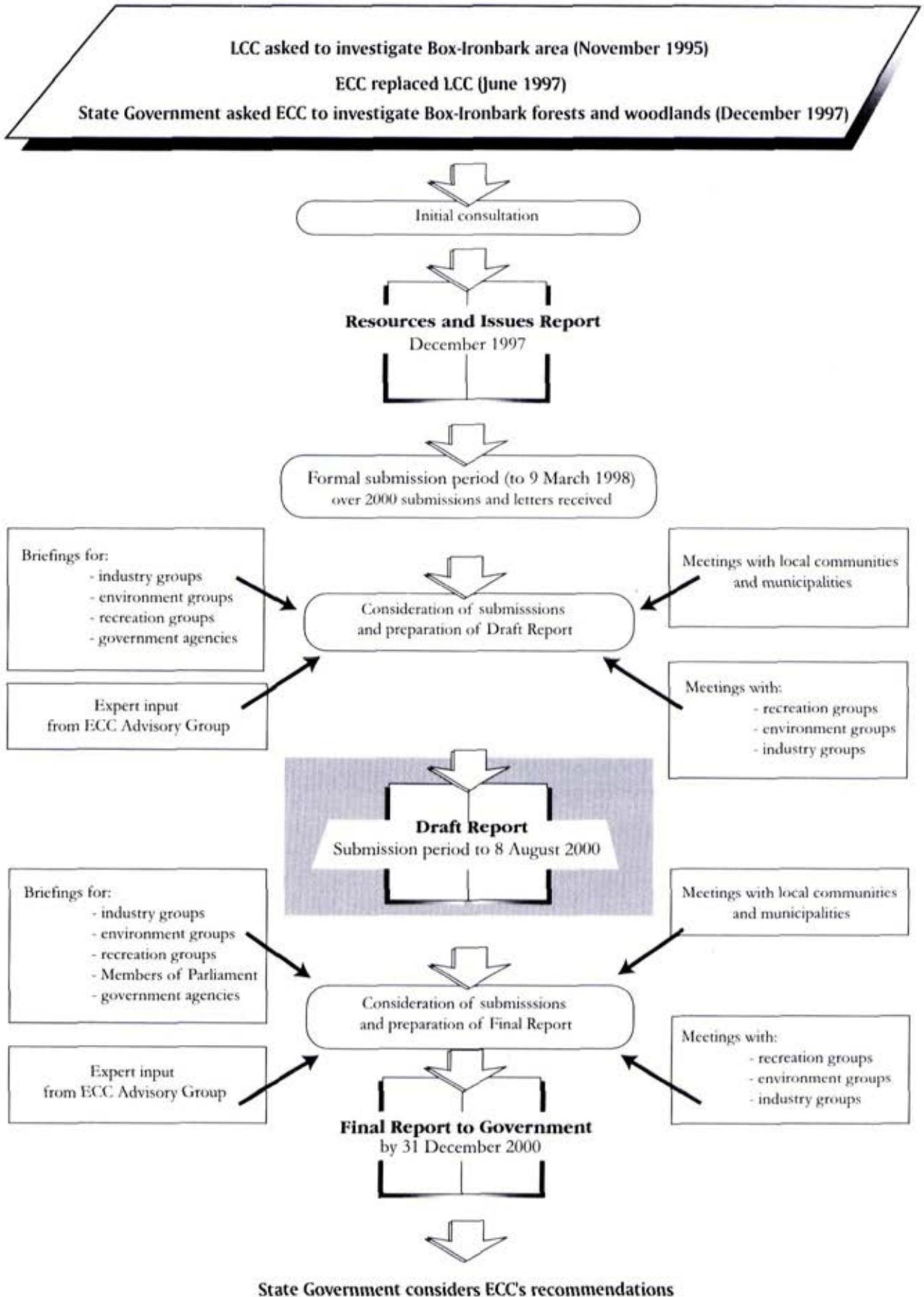
- have regard to the nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system

As explained in Part Two, Chapter 4, the ECC has had regard to the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee (JANIS) criteria in developing the proposals in this report.

- recognise that informal reserves and prescriptions will be established through the regional forest management planning processes

The ECC is aware that following Government consideration of its recommendations, planning for the Bendigo Forest Management Area (FMA) and other FMAs with Box-Ironbark vegetation will be carried out by NRE, and that this will establish informal reserves and prescriptions. The ECC's recommendations provide the public land use framework, and broad guidelines, within which that FMA planning will occur.

Table 1.2 The investigation process



1.3 Study area boundary

The terms of reference for this study included a generalised investigation area of approximately 5.9 million hectares, within which the ECC was to investigate public land with Box-Ironbark vegetation. The study area boundary, shown on Map A (see back pocket of the report), outlines the approximate area which supported Box-Ironbark vegetation at the commencement of European settlement (2.95 million hectares).

Since publication of the ECC's *Resources and Issues Report (1997)*, the study area boundary has been modified to reflect new information on the original extent of certain Box-Ironbark vegetation types. This has resulted in boundary changes in the north-west (from Ledcourt near Stawell to Charlton), north (Charlton–Rochester–Wyuna), south-west (from Ararat to Avoca and near Guildford) and other minor changes. This has had little effect on whether public land is included in the study, except as follows:

- Ledcourt Forest, the southern Pyrenees Forest, small parcels on the northern plains around Dingee and north of Rochester do not and/or did not carry Box-Ironbark vegetation and have been excluded; and
- Glynwylln Forest, parts of Morri Morri and Big Tottington Forests and Bolangum Flora and Fauna Reserve, land at Mt Deboobetic, and small parcels around Calivil have been included.

The modified study area in total covers 2 950 900 ha, with 431 000 ha of public land, 42 600 ha of Commonwealth land, and 2 519 200 ha of freehold land. Note that freehold land is outside the ECC's terms of reference.

As explained in the *Resources and Issues Report (1997)*, the ECC considered that the Box-Ironbark study area should include Box-Ironbark forests and woodlands on the inland hills and on the elevated terraces of the northern plains, but not include native grasslands on the elevated terraces, or river red gum and black box forests and woodlands on the lower elevation floodplains.

1.4 Public land use categories

The Victorian system of public land use categories has been established over many years in previous Land Conservation Council investigations. The system is familiar and well understood by groups and individuals interested in public land planning and actual land use. In this report the ECC is using the simplified public land use category system established in the Land Conservation Council's *Melbourne Area District 2 Review* in 1994. Some provisions for land use have been modified to reflect particular needs in the Box-Ironbark area. Table 1.3 summarises permitted uses in each of several major public land use categories. These are relevant when considering draft recommendations in later chapters of this report.

Table 1.3 Permitted uses in major public land categories

	National park	State park	Regional park	Nature conservation reserve	State forest
Recreation and tourism activities					
Nature observation	✓	✓	✓	✓	✓
Picnicking [& barbecues at constructed fireplaces]	✓ ¹	✓ ¹	✓	✓ ²	✓
Car touring	✓	✓	✓	✓	✓
Camping	✓ ^{3,4}	✓ ³	✓ ³	✗	✓ ⁴
Bushwalking [overnight]	✓	✓	✓	✗	✓
Short walks	✓	✓	✓	✓	✓
Dogs	✗	✗ ⁵	✓ ⁶	✗	✓
Hunting	✗	✗	✗	✗	✓
Appreciation of scenery	✓	✓	✓	✓	✓
Visiting historic features	✓	✓	✓	✓	✓
Orienteering	✓	✓	✓	✓	✓
Car rallies	✗	✗	✗	✗	✓ ⁶
Horse riding	✗	✗ ⁵	✗ ⁶	✗	✓
Trail bike riding ⁷	✓	✓	✓	✓	✓
Prospecting / metal detecting					
Metal detecting	✗	✓ ⁸	✓	✓	✓
Gold panning	✗	✓ ⁸	✓	✗	✓
Gemstone fossicking	✗ ⁹	✗	✓	✗	✓
Resource industries					
Mineral exploration	✗ ¹⁰	✗ ¹⁰	✓	✓	✓
Mining	✗ ¹⁰	✗ ¹⁰	✓	✓	✓
Sawlog, post and firewood production	✗	✗	✗	✗	✓
Domestic firewood	✗ ¹¹	✗ ¹¹	✗ ¹¹	✗ ¹¹	✓
Apiculture	✓ ¹²	✓ ¹²	✓	✓	✓
Eucalyptus oil production	✗	✗	✗	✗	✓
Other uses					
Environmental education	✓	✓	✓	✓	✓
Approved research	✓	✓	✓	✓	✓
Water production/distribution	✓	✓	✓	✓	✓
Stone extraction	✗ ¹³	✗ ¹³	✗ ¹³	✗	✓
Grazing	✗	✗	✗	✗	✓ ¹⁴
Utilities	✗ ¹⁵	✗ ¹⁵	✗ ¹⁵	✗ ¹⁵	✓

1. Permitted at sites provided.
2. Picnicking only.
3. At designated camp sites.
4. Bush camping.
5. Some exceptions.
6. Subject to certain conditions.
7. Tracks may be subject to seasonal or permanent closure at land managers' discretion.
8. In set zones in park management plans.
9. Permitted along Reedy Creek (Chiltern-Pilot National Park).
10. Existing mining titles continue in national and state parks. The Government may approve specific mining proposals following exploration under existing licences.
11. Some domestic firewood may become available through future thinning operations in parks and reserves.
12. Existing licensed sites.
13. Extraction for management use only.
14. Only small areas of Box-Ironbark state forests are suitable for grazing.
15. Some existing utilities are within the proposed parks and reserves. These may continue, where appropriate.

1.5 Social and economic effects study

To assist with developing the proposals in this report, the ECC commissioned Read Sturgess and Associates and Essential Economics Pty Ltd to carry out an assessment of the social and economic effects of initial proposals.

In particular the consultants assessed the implications of those proposals leading to changes in existing uses and activities. The study assessed, as far as possible, the benefits and costs that could arise from the proposals, and the estimated social effects, including employment gain or loss. Appendix 3 contains the consultants' report on anticipated regional and social impacts on economic activity and employment, resulting from the Council's proposals.

In brief, the estimated costs of the ECC proposals would be relatively small, and are likely to be exceeded by increased tourism in the region (see Table 1.4 below). The report indicates that between 12 and 34 present or potential future jobs could be lost, but these would be likely to be outweighed by some 85 new jobs in the tourism industry. The Box-Ironbark study area is well situated with respect to roads, transport services and tourism infrastructure. This makes it 'most likely that the declaration of additional and larger parks would lead to an increase in visitation to sites affected by the proposals'. The increased value of the non-use benefits of enhanced nature conservation would also contribute to positive economic benefits, but these have not been quantified. The consultants found that, an increase in tourism to the study area of only 9% would produce benefits sufficient to outweigh the total costs associated with implementation of the proposals.

Table 1.4 Summary of benefits and costs

Source: Read Sturgess and Essential Economics (2000)

Benefits of ECC proposals	
	Benefit from time of implementation (\$M p.a.)
Increased biodiversity and natural values	This appears to be the primary motivation for the ECC's recommendations. Benefit has not been quantified but is likely to be very substantial.
Increased value of tourism and recreation in new and expanded parks and reserves	\$1.70 or greater
Improved water quality	Not quantified but likely to be significant.
Total benefits:	Substantially greater than \$1.7 million per year
Costs of ECC proposals	
	Cost from time of implementation (\$M p.a.)
Additional park management	\$0.30
Reduction in future growth of timber industry	\$0.16
Reduction in value of future minerals exploration	Probably less than \$0.10 (max.)
Reduction in value of future eucalyptus oil production	\$0.01
Reduction income for graziers excluded from riparian grazing licences	\$0.05
Total costs:	Probably less than \$0.6 million per year (max.)

1.6 Recent forest information

The work of the ECC is based on the best available information, obtained through collation of existing data and commissioned research. During the course of this investigation, there have been a number of developments that have had an impact upon the way in which the ECC Box-Ironbark investigation has been conducted and the way in which information has been gathered. These developments are described below.

Mapping ecological vegetation classes

The Department of Natural Resources and Environment has recently completed modelling and mapping of the original (pre-1750) extent of ecological vegetation classes. This mapping (see Map B at the back of the report) is a key input to ECC's recommendations, as it provides the context for developing the proposed reserve system. Detailed descriptions of the ecological vegetation classes are in Appendix 2 and their implications are discussed in Chapter 4.

Box-Ironbark Timber Assessment

The recently completed Box-Ironbark Timber Assessment was the first comprehensive timber assessment of Box-Ironbark forests in the Bendigo Forest Management Area for many years. It was a major undertaking, led by NRE Forests Service, involving assessment of some 1 480 plots. It now provides a detailed record of these forests, with data on standing timber, growth, species, origin, stocking, potential products, productivity, habitat characteristics and forest management. This assessment and subsequent modelling concludes that Box-Ironbark forests can sustainably produce more timber for harvesting than is currently harvested. Chapters 9 and 15 provide detail on relevant ECC recommendations.

Large old tree site mapping

Additional studies commissioned by the ECC have assessed large old trees (with a diameter at breast height of more than 60 cm dbh) on Box-Ironbark public lands. Assuming average growth rates of 3.5 mm diameter per year, these trees were seedlings before pastoral settlement of Victoria. The importance of large old trees is detailed in Chapter 4.

1.7 Effects of the Regional Forest Agreement process on the investigation

The National Forest Policy Statement (1992) put forward the Regional Forest Agreement (RFA) process to resolve the conflicting demands, on forests, of conservation and industry. In Victoria, two forest regions, *North East* and *West*, intersect with the Box-Ironbark study area. The *Central Highlands* region overlaps only a small part of the study area, carrying no public forest, south of Seymour.

Originally, most of the Box-Ironbark study area was covered by the *West* region but, in March 1999, the *West* region boundary was modified and now overlaps with only a relatively small part of the south-west corner of the study area (see Map 1.1 below). The objectives of the RFA process are similar to the terms of reference for the Box-Ironbark investigation, and this change reduced the potential for confusion between two similar studies occurring at the same time.

This boundary modification has had several consequences. The Commonwealth ceased funding projects within the Box-Ironbark study area that were outside the *West* and *North East* regions. Most notably, this removed expected funding for social and economic studies, Aboriginal heritage studies, community consultation and surveys of large old tree sites and fauna refuges in the Box-Ironbark study area. The Department of Natural Resources and Environment provided alternative funding for social and economic studies and the survey of large old trees and fauna refuges.

Other effects of the *West* region boundary change include:

- Box-Ironbark industries affected by proposed forest land use changes are no longer eligible for Commonwealth funding for industry restructure;
- forests in the eastern and western parts of the Box-Ironbark study area are included in two forest processes, while the remainder are only affected by the ECC investigation; and
- Clunes and Tooborac Forests and other small areas are excluded from both processes.

Industry restructure

Under the Forest Industry Structural Adjustment Package (FISAP) component of the Regional Forest Agreement process, within RFA regions, the Commonwealth may provide funding to:

- promote development in the native forest timber industry; and
- assist those businesses and employees in the industry who are directly and adversely affected by the outcomes of the RFA processes.

The Box-Ironbark study area was included in the 1995 Deferred Forest Area process. The ECC has been advised that the FISAP program does not extend to impacts resulting from recommendations made by the ECC, as the Box-Ironbark study area is now excluded from the *West* RFA region. Businesses in the Box-Ironbark area are however able to participate in the Industry Development Assistance component.

The *West* region boundary change means that forest industries in parts of the Box-Ironbark study area may be treated differently from similar industries within RFA regions. This appears inequitable. The ECC considers that, regarding structural adjustment, comparable treatment should apply for timber industries inside and outside the Box-Ironbark study area (see Recommendation R45 in Chapter 9).

Commonwealth land

The Commonwealth agreed to participate in the ECC's investigation, to assist with the funding of projects, and to include the Puckapunyal, Mangalore and Longlea Defence Areas in the investigation. Since the change to the *West* RFA region, the Commonwealth has ceased funding projects, although cooperation with the Department of Defence is continuing. Proposals for Puckapunyal and Longlea are outlined in Chapter 11. Mangalore has relatively minor areas of native vegetation but will be considered further for the Final Report.

2 Consultation process

During the preparation of the draft recommendations in this report, the ECC has sought input from the community, industry, State and Commonwealth Government agencies and interested individuals, on the proposals under consideration.

In preparing this report, the ECC has taken into account more than 2000 written submissions and letters made to both to the former LCC and the present Council. This huge resource of information and informed comment has been enormously valuable in helping the ECC draft its recommendations. Major issues raised during public consultation, and Council's response to these issues, can be found in Chapter 17 of this report.

In addition to direct consultation, the ECC commissioned consultants to conduct a baseline social and economic study (Stage 1) which was followed by a questionnaire (Stage 1A). The consultants prepared an appraisal of the effects of ECC's draft proposals (Stage 2) and met many potentially affected individuals and groups. See Appendix 3 for the consultants' report.

2.1 Consultation to date

In addition to inviting submissions, the ECC has briefed and met with individuals and groups in local communities, municipalities, industries, recreation and conservation groups, as well as Members of Parliament and Government agencies. Numerous field inspections have been conducted and input sought from a wide range of stakeholders in an effort to better understand the 'big picture' as well as the fine detail of the Box-Ironbark region. Organisations consulted so far are listed in Appendix 4.

Mining and extraction industry

The Victorian Chamber of Mines is the peak industry body representing mining and extraction interests. The ECC has met with the Chamber and with representatives from mining and extractive companies over the past two years.

Timber industry

Timber Communities Australia Ltd (formerly Forest Protection Society) is the peak group representing the timber industry in the Box-Ironbark forests. The ECC has met and maintained contact with representatives of Timber Communities Australia. Council members and staff have also met with the two mill-owners in the study area, and firewood, sleeper and fence post cutters.

Eucalyptus oil industry

The ECC has met and consulted with five eucalyptus oil producers in the area and the Victorian Eucalyptus Oil Distillers' Association.

Apiculture industry

The Victorian Apianists Association (VAA) is the peak body representing apianists. Meetings have been held with the VAA and regional branches of the Association.

Conservation groups

The ECC has met with the Victorian National Parks Association as the peak conservation group on Box-Ironbark issues. Other groups have also been consulted such as Environment Victoria, the Goulburn Valley and Benalla District Environment Groups, the Friends of Chiltern Box-Ironbark National Park, and many field naturalists clubs.

Prospectors and small miners

The ECC has met with the Prospectors and Miners Association of Victoria, as the peak body established to represent prospectors and small miners, in Melbourne and in the field. Council has also met with individual prospectors and miners and metal detector tourism operators.

Recreation and tourism

The ECC has met with the Public Land Council, the Shire of Loddon Tourism Board, and individuals involved in local tourism groups. Consultation has also occurred with car clubs and heritage groups. The input of tourism interests has also been sought at a state, regional and local level.

Department of Natural Resources and Environment (NRE) and other Government agencies or representatives

The ECC has worked closely with a number of different NRE divisions in developing the draft recommendations in this report. In particular there has been considerable interaction with, and information provided by: Forests Service; Forestry Victoria; Minerals and Petroleum Victoria; and Parks Flora and Fauna Division. NRE regional staff have also been extensively consulted.

During regional visits, the ECC has discussed specific regional issues with several Members of Parliament and has offered briefings to others. Other State Government agencies consulted have included Aboriginal Affairs Victoria, regional catchment management authorities and Coliban Water. The ECC has had formal and informal contact with relevant Commonwealth agencies such as: the Department of Prime Minister and Cabinet; Environment Australia; Agriculture, Fisheries and Forests Australia; and the Department of Defence. In addition, the ECC has met with representatives from most of the local government authorities in the study area.

Aboriginal groups

The ECC has initiated preliminary consultation with Aboriginal groups, cultural heritage program officers and communities in the study area. The public consultation phase following release of this report will also involve consultation with representative groups such as the Mirimbiak Nations Aboriginal Corporation.

Other community groups

The ECC has also had informal contact with local community groups, Landcare groups, domestic firewood collectors, graziers, landholders with remnant box-ironbark, landholders with box-ironbark plantations, other farmer users, and a number of interested individuals.

2.2 Advisory Group

An Advisory Group was established by Council to provide technical input and advice associated with developing its recommendations. The ECC Chairman convenes Advisory Group meetings. The membership of the Advisory Group is listed in Appendix 5. The Advisory Group is an expertise-based group (not a representative group) and members include people from relevant industry sectors (such as mining, apiculture and timber), recreational users, rural communities, biological research, conservation and State Government agencies.

2.3 Further consultation following the Draft Report

The consultation process continues with the publication of these draft recommendations. The ECC is committed to continuing the consultation program, including consideration of written submissions and meetings with stakeholders. Over the next few months there will be a series of briefings and meetings with interested groups and individuals.

We are seeking written submissions on the draft recommendations in this report by 8 August 2000. Stakeholders are encouraged to make written submissions to the Council on the recommendations in this report.

CLOSING DATE FOR SUBMISSIONS:

Tuesday, 8 August 2000.

Framework for future uses of Box-Ironbark public land

The framework for future uses of Box-Ironbark public land

This part of the report sets out the context for the future of each major current use of Box-Ironbark public lands, in ten chapters:

- Aboriginal heritage, use and management
- nature conservation
- mining
- apiculture
- recreation
- tourism
- wood products
- eucalyptus oil production
- Commonwealth land, and
- other uses.

In each chapter, there is a brief description of the use, discussion of the major issues and proposed recommendations broadly applicable to Box-Ironbark public land.

Introductory notes

In recognition of their region-wide application, the recommendations in Part Two commence with the prefix 'R'.

Recommendations specific to particular areas of public land are included in Part Three of this report. For example, Chapter 5 Mining has recommendations which apply to mining and exploration wherever it occurs in the study area, whereas recommendations in Part Three, such as those in Chapter 13 (for national and state parks) and Chapter 16 (for reference areas), identify particular areas where specified limits on mining apply.

The material in this part is not intended to be a comprehensive account of each of the uses. Readers who require that level of information should consult the *ECC Resources and Issues Report (1997)*. Background material contained in this report is intended to establish the context for the recommendations at the end of each chapter.

Economic and employment data

Most chapters in Part Two also include information on the economics and employment associated with current uses. To facilitate comparison between industries, this information is presented as the number of full-time job equivalents and the annual dollar value of production 'at the stump' or 'at the farm gate'—that is, the dollar value to producers—and does not include other factors such as multiplier effects. However, comparison of industries using these figures needs to be made with caution; important information may not be reflected in the simplified figures. Accordingly, other information, which more fully characterises the social and economic significance specific to each industry is also provided where appropriate.

Unless otherwise stated, information on the economics and employment of each industry is derived from the social and economic assessment of the study area commissioned specifically for the Box-Ironbark investigation, and included in this report as Appendix 3.

Other information sources are referenced with numbers and short citations at the end of each chapter. Full citations are provided at the end of the report in the References section.

General recommendations for application across the study area

In addition to its significance for particular uses, public land also plays a vital role in meeting broader objectives which operate across entire landscapes and are important to the whole community. The following recommendations deal with issues that apply broadly across the study area and are therefore relevant to many land managers and other stakeholders. These issues are large, important and often inherently difficult to manage or resolve. All stakeholders, including public land managers, must integrate their efforts with those of other stakeholders to maximise both cost-effectiveness and likelihood of success.

Hazards

Fire, pest plants and animals, salinity, and soil loss are major potential hazards requiring management across the landscape, including on public land.

While major fires are infrequent in Box-Ironbark forests, the 1985 Maryborough fire and numerous smaller fires underline the necessity on all public land for appropriate fire protection and suppression measures. This applies to parks and reserves as well as state forests.

In the highly fragmented Box-Ironbark public land estate, pest plants and animals pose potentially severe

problems in land management. In such landscapes, cooperative arrangements with adjacent land holders, such as Good Neighbour programs, are most effective. Continuing research, and resources to implement control programs, are required.

Dryland salinity is a major and increasing problem in much of the study area, with small public land parcels in discharge areas at particular risk. Salinity associated with irrigation and water channels also threatens remnant Box-Ironbark vegetation. Soils in parts of the region are subject to sheet, tunnel and gully erosion.

RECOMMENDATION

R1 That the Government through NRE—and in partnership with other relevant agencies or groups such as the Country Fire Authority, local government, catchment management authorities, salinity management groups, Landcare groups, and other community groups—continue to provide and improve fire protection and suppression, pest plant and animal control, and programs to address salinity and soil erosion threats on and to public land, and to identify priority public land areas for particular landscape-scale action to ameliorate salinity and soil erosion.

Private land

Because around 85% of the Box-Ironbark study area is private land, many objectives which contribute to achieving balanced public land use, such as reversing biodiversity loss or increasing the value of timber production, are more likely to be achieved if supported by sympathetic management of private land where possible.

While the ECC cannot make recommendations applying directly to private land, it would be remiss not to acknowledge and support initiatives which foster sympathetic management of private land. Government can play a pivotal role in nurturing cooperative programs operating across a variety of land tenures and involving a diverse range of landholders and other stakeholders, particularly through improving communication and coordination between the stakeholders. In recent years, cooperative approaches such as management agreements and Good Neighbour programs have demonstrated the valuable role to be played by Government.

Protection and restoration of Box-Ironbark remnants on private land across the region, and programs such as Bushcare and the Land for Wildlife scheme are important components of biodiversity conservation. Effective programs to facilitate cooperation of landholders in retaining, protecting, and restoring remnants should be supported.

Indigenous revegetation, plantation establishment, and planting for farm forestry woodlots (indigenous or otherwise) on private land in the Box-Ironbark region can have several benefits, according to the intended purpose: alternative sources for wood products, habitat, salinity control and land care. In recent years, plantations have been established over large areas in other parts of Victoria, and parts of the study area dominated by private land have been identified as suitable for future large-scale plantations, generally to produce woodchips and other products not currently sourced from Box-Ironbark state forests. Planting for indigenous revegetation, plantations, and farm forestry enterprises should be encouraged through new and effective current programs.

RECOMMENDATION

R2 That the Government continue to encourage protection and restoration of indigenous Box-Ironbark vegetation, and planting for indigenous revegetation, plantations, and farm forestry woodlots on private land.

Research and new information

New information will continue to be obtained and new discoveries will be made. Monitoring of current activities may identify new management needs. Research and monitoring will be most valuable

when targeted to address issues which are most likely to lead directly to significant improvements in land management, such as research to identify the best way to restore the pre-1750 Box-Ironbark forest structure (see Chapter 4).

RECOMMENDATION

R3 That land managers continue effective research and monitoring programs, develop targeted new programs, and apply the results where appropriate.

Education and awareness

The public profile and appreciation of Box-Ironbark forests and woodlands have increased markedly in recent years, and there is no reason why they should not continue to increase. In particular, there is a clear need for education to improve public understanding of many aspects of the natural ecology, such as the size and abundance of mature trees before European settlement, and how they are affected by historical and continuing human use.

Awareness raising, promotion, interpretation, and education need not be limited to materials or services provided at feature sites, such as parks. For instance, NRE, community groups and some municipalities have provided posters, books, displays, courses, field days and talks to increase awareness and understanding of Box-Ironbark forests and woodlands in general. The Box-Ironbark Ecology Course organised each year by NRE provides a prime example of the form and content which such services and materials may take.

RECOMMENDATION

R4 That the Government support measures to increase awareness, appreciation, education, interpretation and promotion of Box-Ironbark forests and woodlands.

Implementation and management

The ECC stresses the importance of properly resourcing and implementing its recommendations, particularly for the major proposals.

Most public land in Victoria is managed by the Department of Natural Resources and Environment. New resources will be required where the intensity of management needed increases as a result of these recommendations.

In particular, the social and economic study commissioned for the investigation (see Appendix 3) reinforces the need to promote the proposed parks and reserves, and other Box-Ironbark resources and values, in order to achieve the anticipated economic benefits to the regional community, and to Victoria. That is, the long-term benefits of the recommendations ensure that resources invested in their implementation will be resources well spent.

RECOMMENDATION

R5 That the Government allocate adequate resources for the implementation of all recommendations in this report.

Where the Government agrees to the ECC's recommendations, land managers should manage the land in accordance with those recommendations until it is formally reserved. Boundaries of areas recommended for particular public land use categories have not been surveyed and are subject

to minor modifications that may be necessary. Many small parcels are proposed to be managed as new reserves, and the ECC recognises that the land managers will need to determine priorities for expenditure on implementation.

RECOMMENDATION

R6 That, upon Government agreement to recommendations, land be managed in accordance with those recommendations, and subsequent implementation of recommendations and land management allow flexibility for minor boundary adjustments and priorities for expenditure.

3 Aboriginal heritage, use and management

Aboriginal people in the Box-Ironbark study area are today largely concentrated in the Shepparton–Mooroopna, Echuca–Barmah, Ballarat, Bendigo and Maryborough areas, but Aboriginal association with the wider area dates back many thousands of years.

Skeletal remains from Kow Swamp, outside the study area but near Terrick Terrick, have been dated to 13 000 years before present. This date for occupation and use by Aboriginal people is probably applicable to the study area generally.

Strong Aboriginal associations with the area are demonstrated by hundreds of locations of archaeological, artistic and spiritual importance. Many places have retained their indigenous names. Eight main Aboriginal language groups, and at least 50 clans, fall wholly or partially within the study area. Current knowledge and use of box and ironbark species for making tools and other implements, and as food sources demonstrate a continuing association with the region. Historic and ethnographic records also support this by documenting aspects of Aboriginal life in the region after the arrival of Europeans.

Chapter 2 in the ECC's *Resources and Issues Report (1997)* describes Aboriginal association with the Box-Ironbark investigation area, outlining archaeological records, Aboriginal use of box and ironbark resources, resistance in the era of cultural contact with settlers, the post-contact era, the gold rushes, and Aboriginal re-settlement.

3.1 Native title

Aboriginal association with the investigation area is significant, and Aboriginal communities continue to assert their association with all of their ancestral areas. Aboriginal spiritual and cultural connection to the land and water is intrinsically connected to the natural environment.

The ECC understands that the exercise or enjoyment of native title rights and interests includes hunting, fishing, gathering, and cultural or spiritual activities.

Under the *Native Title Act 1993* Aboriginal people can claim native title on Crown lands and waters in their traditional lands. Several Aboriginal groups have lodged claims with the Commonwealth's National Native Title Tribunal related to land within the Box-Ironbark investigation area. These claims will be heard in due course.

In 1994, the Yorta Yorta people claimed native title to Crown land and waters in and along the Murray, Goulburn and Lower Ovens Rivers and other parcels of land in the Shepparton–Rochester–Echuca area. A decision in the Federal Court on this case determined that 'native title does not exist in relation to the areas of land and waters...' identified in the application. The judgement did not address the matter of extinguishment or co-existence of native title, and does not set precedents for other claims regarding extinguishment. The Yorta Yorta appealed against this decision and the appeal has been heard but not yet decided.

However, the existence of native title is not dependent on a claim being lodged. Native title holders (including claimants) expect to participate in decisions about the use, management, protection, exploitation and cultural interpretation of public lands and resources.

The *Native Title Act 1993* gives rise to the ability of native title holders to negotiate over matters which may affect their native title rights and interests before formally receiving recognition. The National Native Title Tribunal supports negotiated agreements.

The Victorian Government recently announced that an approach, of negotiation and mediation, rather than litigation, would be taken in relation to native title claims in Victoria. The intended outcome, Indigenous Land Use Agreements, would not

necessarily involve recognition of native title. Native title claimants have a 'right to negotiate' over matters which may affect their rights, for example, with mining companies regarding proposed exploration or mining programs. This does not require formal recognition of native title. Aboriginal people may 'use and enjoy' native title land, waters and resources, including biological resources. A recent High Court decision¹ effectively confirmed the right of traditional use by claimants.

In Victoria, the Mirimbiak Nations Aboriginal Corporation coordinates native title claims, and acts for native title holders and claimants in relation to matters that may affect their rights and interests in land.

Most of the recommendations in this report, if adopted by the Victorian Government, would modify permitted uses on Crown land, or change the emphasis of public land management. The ECC's final recommendations will not be implemented by land managers until Government consideration has been completed.

As part of the process of preparing the Final Report, the ECC will consult with Mirimbiak Nations Aboriginal Corporation and Aboriginal people to develop a recommended continuing consultation process. The recommended process would address Aboriginal interests, including native title issues, use and access decisions arising as a result of the implementation of the ECC's recommendations, and Aboriginal participation in land management.

3.2 Aboriginal archaeology

An Environment Australia data audit² carried out in 1996 reviewed the extent and results of various surveys of Aboriginal archaeological and historical places. The audit indicated that about 4 200 Aboriginal archaeological places were recorded in the wider Box-Ironbark investigation area. Of these, over 1 300 occur on Box-Ironbark public land.

Rock paintings are known from the Black Range near Stawell, and Mt Pilot. Rock shelters are found in the Kooyoora Range and at Terrick Terrick. Ceremonial stone alignments are located at Mt Franklin and at Mt Kooyoora. Remarkably well-preserved direction indicators are also known at Charlton.

Rock wells are found near Benalla, Mt Kooyoora, Maryborough, and in the Whroo Historic Reserve. Mounds are a predominant archaeological feature of central western Victoria.

Scarred trees, the most common archaeological type in Victoria, are found throughout the region, particularly along streams and around lakes and swamps. In the Kooyoora district there are several dozen scarred trees in the open forest south and east of Melville Caves. They have also been found throughout the open forest along the Ordovician ridges north-west of Kingower, and at least 17 have been recorded at Reedy Lake.

Other archaeological places recorded contain isolated artefacts, artefact scatters, burials, shell middens, fish traps, grinding rocks, hearths and quarries.

3.3 Aboriginal historic places

Aboriginal historic places are places dating from the period of initial contact between Aboriginal and other, primarily European, cultures in the early 19th century, and from the post-contact period. These places have been identified from historical records, oral history and surveys. Some 79 Aboriginal historic places have been recorded in Aboriginal Affairs Victoria's registry in the study area.³

They include places involving Aboriginal interactions with explorers and settlers, government protectorates and correspondents' depots, and mission stations and reserves, and other interactions. Recognition of the history of cultural contact, subsequent resistance and adjustment, and awareness of places reflecting that history, are important for understanding our shared past. Seven of the known places are within Box-Ironbark public land in the study area.

Many historic Aboriginal places in the Box-Ironbark area have no physical remains, though place names can often indicate the location of these events. Such places are significant because of their historical association and importance for local communities. They also provide an opportunity to inform all Australians about poorly documented aspects of their history.

3.4 Survey coverage

Survey coverage for Aboriginal cultural sites and places in the study area is incomplete. Environment Australia's data audit indicated that generally, the extent of survey coverage for Aboriginal places is limited.² In areas that have been systematically surveyed, the amount of ground actually covered is very small.² Even where there have been intensive surveys, 'not all sites will be known'.

Surveys carried out for specific development projects, Telstra cable installations or highway works have resulted in clustered or linear records of archaeological places. Intervening areas with similar land features may have no records simply because surveys have not been carried out.

Regarding survey coverage, the data audit report cautions that:

- records represent only small samples of the forests;
- the central and eastern sections of the study area have had little systematic research;
- visible features such as scarred trees and mounds are likely to be better represented than surface or buried features;
- disturbance of identified places correlates with activities such as timber harvesting and road construction.

Priority areas for new Aboriginal archaeological survey work, identified in the data audit include Chiltern Box-Ironbark National Park, Warby Range State Park, Killawarra Forest, Pyrenees Ranges, St Arnaud Range, Terrick Terrick National Park, and the Dunolly–Moliagul, Bealiba–Wehla, and Kingower Forests. Rushworth–Heathcote forests, forests around Bendigo and Castlemaine, and numerous other small forests have not been thoroughly surveyed.

For Aboriginal historic places, the Environment Australia audit report comments that the recorded places were identified in site-specific studies and miscellaneous records, but that none of the Box-Ironbark forest has been adequately assessed for Aboriginal historic places.

3.5 Regional Forest Agreement studies

The Box-Ironbark study area was previously included in the *West RFA* area. The data audit of Aboriginal studies mentioned above, and several European cultural heritage studies, were carried out in the Box-Ironbark study area as part of *West RFA* process, in cooperation with the ECC.

Existing Victorian and Commonwealth legislation requires the protection of all Aboriginal places. To complete the Register of the National Estate, Environment Australia wishes to address the gaps in the coverage of Aboriginal place surveys by identifying significant places or establishing a process for their continuing identification.

Aboriginal places include:

- archaeological sites—those dating from before contact with Europeans;
- historic sites—those Aboriginal places identified from records of the cultural contact and post-contact periods; and
- places that are important because of their traditional or contemporary social significance to Aboriginal people.

Following the formal decision to exclude most of the study area from the *West RFA*, Commonwealth funding was no longer available for Aboriginal place surveys, or for a wide program of consultation with the relevant communities.

For the *West RFA*, the parties agreed that a package of measures will be implemented by Victoria to ensure the appropriate management of Aboriginal heritage, developed in conjunction with local Aboriginal people.

The following points will guide development of the package:

- ensure there is an agreed framework for consultation with Aboriginal people on: forest management, incorporating adequate time to participate in the preparation of management plans; and development and implementation of protocols regarding management plans and activities;
- consult Aboriginal people in all cases when developing and implementing management plans for Aboriginal heritage sites and places;

- in consultation with Aboriginal people, develop and follow protocols to protect: the confidentiality of Aboriginal heritage information; and Aboriginal cultural heritage sites and places;
- in consultation with Aboriginal people, develop Aboriginal heritage sensitivity models, and protocols for their use;
- in consultation with Aboriginal people, develop appropriate cross-cultural training programs within the Victorian public sector to enhance understanding of Aboriginal cultural heritage; and
- in consultation with Aboriginal people, develop a strategic program for the sustained employment of indigenous people within the Victorian public sector.

3.6 Existing consultation and management

Early in the Box-Ironbark investigation it was judged that separate consultation between the ECC and Aboriginal communities, and between the RFA process participants and the same communities would be confusing. The preferable approach was to combine the consultation processes, and explain both the ECC Box-Ironbark study, and the RFA process, at the same meetings with Aboriginal communities.

Since the decision to exclude the Box-Ironbark study area from the *West RFA*, the ECC has consulted with several Aboriginal communities in the study area.

The identification, protection and management of Aboriginal places in Victoria is primarily the responsibility of Aboriginal Affairs Victoria (AAV). This responsibility is shared with relevant Aboriginal people. The appropriate Aboriginal people should be involved in the assessment of significance for Aboriginal historic places, and should participate in the conservation and management process. There are also issues of sensitivity and secrecy in regard to the location of some Aboriginal places.

Aboriginal Affairs Victoria is continuing the comprehensive and systematic study of Aboriginal contact and post-contact historic places in south-western Victoria.

The Heritage Services Branch of AAV has responsibility for the investigation, interpretation, protection and management of Aboriginal cultural and archaeological heritage. AAV maintains databases of known Aboriginal heritage places relating to the pre- and post-contact periods. This inventory is incomplete for much of the Box-Ironbark study area. AAV should be notified about the discovery of pre and post-contact Aboriginal places.

Aboriginal heritage places have protection under the Victorian *Archaeological and Aboriginal Relics Preservation Act 1972* and the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*. This protection applies whether or not the place has been identified and registered. Consent must be obtained prior to carrying out any potentially damaging activity on or near a registered Aboriginal place. It is also an offence to damage Aboriginal artefacts, or to excavate land for the purpose of finding artefacts, without prior consent from local Aboriginal community organisations.

Exploration and mining licence applications must be referred to AAV under the *Mineral Resources Development Act 1990*.

The *Native Title Act 1993* clearly gives rise to the ability of native title holders (including claimants) to negotiate over matters which may affect their rights and interests before formally receiving recognition. This right to negotiate is commonly asserted when, for example, mining companies seek to use natural resources. In such cases, native title holders have the right to negotiate at both the exploration and mining stages of projects.

Procedures of the *Native Title Act 1993* also allow for native title holders to be notified of any acts which may affect their native title interests. This gives rise to an opportunity for claimants to respond if they wish and participate in decisions affecting their rights and interests.

RECOMMENDATIONS

- R7** That planning and management relating to traditional interests and uses be based on recognition of and respect for the traditional relationship of Aboriginal people with the land.
- R8** (a) That there be ongoing consultation between the Victorian Government and Aboriginal groups and communities in relation to implementation of approved ECC recommendations on public land use and management, and access for traditional purposes.
- (b) That joint management between the Government and Aboriginal groups, for public land areas containing Aboriginal historic or archaeological places or other Aboriginal places, be investigated.
- R9** That existing consultative processes provided for under the *Native Title Act 1993* and other relevant legislation such as the *Mineral Resources and Development Act 1990* continue with the relevant Aboriginal groups and communities before the issue of any licences or permits which could affect Aboriginal interests.
- R10** That the relevant recommendations of the Royal Commission into Aboriginal Deaths in Custody⁴ be implemented through providing opportunities for increased employment and training opportunities for Aboriginal people, particularly as park rangers.

Information Sources

- ¹ Yanner vs Eaton case, High Court of Australia (1999).
- ² Marshall *et al.* (1996).
- ³ Aboriginal Affairs Victoria's Aboriginal Historical Places Program Database.
- ⁴ Commonwealth of Australia (1991).

4 Nature conservation

The loss of biodiversity is a significant concern for Australia.¹ Nature conservation aims to prevent biodiversity loss. In many cases, this necessitates reversal of the losses of recent decades.

Nature conservation can be achieved in many contexts and by many means, including both government and non-government endeavours. In public land use planning (as distinct from public land management), nature conservation is principally achieved by establishing a system of protected areas—a conservation reserve system, or simply ‘reserve system’—through the identification and designation of appropriate public land areas.

While the establishment of a reserve system is by no means all that is required, it is widely recognised, including by successive State and Commonwealth Governments, as central to the conservation of biodiversity.^{2,3,4} Insufficient representation of some ecosystems in the reserve system is one of the major threats to biodiversity in Australia.¹

The addition of appropriate public land is the highest priority in establishing the reserve system because other options are generally more costly and administratively complex.⁵

Public land is particularly important in regions such as the Box-Ironbark study area where it accounts for over 70% of remaining indigenous vegetation. Giving priority to public land in the selection of areas for nature conservation also demonstrates the commitment of the Government and the public to the reserve system, and encourages awareness among owners or managers of other land of high nature conservation value.

In addition, areas of special natural value are often popular for nature-based tourism and recreation on public land, which are best served within the reserve system.

Box 4.1 Biodiversity

Short for biological diversity, ‘biodiversity’ includes all organisms, species, and biological populations; their genetic variation; and all their complex assemblages of communities and ecosystems. It also refers to the interrelatedness of genes, species, and ecosystems and their interactions with the environment.²

Biodiversity is an essential element of life as we know it, providing humanity with food, shelter, medicine, clean air and water, fertile soils, recycling of organic matter, and emotional, psychological, and spiritual well-being. Biodiversity is also intrinsically valuable; humans have an important responsibility as stewards of the rest of the world’s living organisms.

Australia is a ‘megadiverse’ nation—one of 12 nations which collectively contain over 60% of the world’s biodiversity.⁶ Australia has the highest proportion of unique species among the megadiverse nations.⁶

Loss of biodiversity is now one of the world’s greatest problems. Many biologists believe that as a result of human activities, the global rate of species extinctions now rivals that of the five mass extinctions of the geological past, such as that which coincided with the extinction of dinosaurs 65 million years ago. They believe that if present trends continue, between one and two thirds of the world’s species will become extinct in the second half of the 21st century, and that it would take tens of millions of years of evolution for the number of species to again approach the current number.^{7,8} The flow-on effects of species loss are unknown.

4.1 Box-Ironbark biodiversity

Box-Ironbark forests and woodlands support a large and distinctive component of Australia's biodiversity. Excluding aquatic species, around 1 500 species of higher plants and 250 species of vertebrate animals have been recorded in the Box-Ironbark study area; the total number of lower plants (mosses, lichens, etc.) and invertebrates will be appreciably higher again.^{9,10} Many of these species are largely restricted to Box-Ironbark forests and woodlands. Some key elements of Box-Ironbark biodiversity are described in the following sections.

Ecological vegetation classes (EVCs)

The distribution of plants across the landscape varies according to environmental variables such as soil moisture, fertility and pH, slope and aspect, frequency of fire, and the occurrence of other species. Species with similar requirements tend to co-occur, leading to distinctive associations which, in Victoria, have been described as ecological vegetation classes (EVCs).

In 1997, the ECC's *Resources and Issues Report (1997)* identified 22 EVCs which collectively characterise Box-Ironbark forests and woodlands. Since then, the major focus of studies of Box-Ironbark vegetation has been determining and mapping the extent of each EVC prior to European settlement; the 'pre-1750 extent' of each EVC. Essentially, this involves deducing the nature and distribution of EVCs in areas that are now cleared. The pre-1750 extent of EVCs across the study area is shown in Map B (see back pocket of this report).

Appendix 2 and Appendix 6 list the 116 EVCs found in the study area prior to European settlement, and gives descriptions for some of the 73 Box-Ironbark EVCs. The substantially increased number of EVCs includes many that have been almost completely cleared and were not recognised in earlier studies. In addition, in many areas (especially extensively cleared areas) it has not been possible to accurately map boundaries between different EVCs. This problem has been overcome by mapping mosaics or complexes of more than one EVC in these areas (see Appendix 2 for definitions of 'mosaic' and 'complex' as they apply to EVCs). These 'new' mosaics and complexes make up a large number of the additional EVCs. The terms and methods associated with EVCs and their mapping are also explained in Appendix 2.

Appendix 6 summarises the key statistics on the occurrence of each EVC. By far the most extensive EVC prior to European settlement was Plains Grassy Woodland (976 000 ha), with other widespread EVCs including Grassy Woodland (528 000 ha) and Box-Ironbark Forest (408 000 ha). Although originally widespread, Plains Grassy Woodland and Grassy Woodland are now among the most depleted EVCs, with 1.7% and 7.9% of their original extent respectively remaining.

Threatened and declining species

Since the arrival of Europeans, Box-Ironbark forests and woodlands have been extensively cleared and fragmented for various purposes including agriculture and settlement, gold mining, and felled for a variety of wood products. This history has had a major impact on the region's biodiversity, which is now noted for its high proportion of threatened species, and others known to be in decline.

Loss of Box-Ironbark biodiversity is difficult to quantify with confidence because virtually no records were kept prior to the dramatic changes wrought by the gold rushes of the 1850s. Nonetheless, at least ten plant and animal species are known to have become extinct in the study area, and numerous others are known to have declined significantly, becoming locally extinct in many areas.^{9,10} At least 137 Box-Ironbark plant species and 50 fauna species are now classified as threatened or near-threatened; see Appendix 1 for a list of common names, scientific names and conservation status of all species named in this report.

Although difficult to demonstrate, it is clear that many species continue to decline. Perhaps the most notable of these declines is that of the regent honeyeater, which, even within the two years since publication of the ECC's *Resources and Issues Report (1997)* has continued to decline to the point where it is now rarely recorded in Victoria. Research is now revealing many other declining species (particularly birds) not just in Box-Ironbark forests and woodlands but across the wheat-sheep belt of south-eastern Australia,^{11,12} leading to predictions that Australia will lose half its terrestrial bird species by the end of the 21st century.¹³

Because of these declines, a key feature of Box-Ironbark nature conservation is the importance of

recovery for many species—a return, even partially, to former numbers and distribution. Indeed, small population size is in itself a threat for some species (malleefowl, for example), which are unlikely to survive without a significant increase in numbers.

Large old trees

One of the most distinctive features of Box-Ironbark ecosystems is the high proportion of animal species dependent upon large old eucalypts. Compared to small trees, large trees produce more reliable and abundant nectar and provide a greater variety of foraging sites, such as dead branches, peeling bark and fallen timber. Large trees generate a taller, more open and structurally more complex forest, and have more, and larger, hollows.¹⁰

Only large trees have hollows of sufficient size for some species such as larger possums and owls.

Large old trees were much more abundant prior to European settlement (see Box 4.2), and most species must have adapted over many thousands of years to environments dominated by large old eucalypts. Accordingly, large old trees are important for many, perhaps most, Box-Ironbark fauna species including at least six threatened species—brush-tailed phascogale, squirrel glider, swift parrot, powerful owl, barking owl, and regent honeyeater. The loss of large old trees is strongly implicated in the decline of these species and perhaps many others.¹⁰ Landscapes with relatively abundant large old trees are also likely to be important for many plant species.

Box 4.2 The original Box-Ironbark forests

The largest living Box-Ironbark trees in the study area are in excess of 135 cm dbh (diameter at breast height, measured over bark). These trees grow in diameter at around 0.35 cm per year,¹⁴ or about a centimetre every three years, making them at least 400 years old. If their growth rate slows as they age, they may be much older, given that few of the living large trees show signs of dying in the near future. As well as having large trunks, these trees are also taller, have wider crowns, more hollows, and produce more and larger fallen timber than younger trees.

Prior to European settlement—with little to threaten them once established—large trees such as these would generally have persisted for many decades and would have come to dominate most Box-Ironbark landscapes in terms of wood volume, and perhaps numerically as well. Competition for resources would have constrained the density of these large trees to the order of 30 per hectare,^{15,16} with the canopy foliage of the large trees generally not in contact with that of other trees. The spaces between the large trees probably provided the main opportunities for a relatively small number of small and medium-sized trees to establish from seedlings, and ultimately replace the large trees as they died. The only areas where large trees would not have been generally dominant are where factors such as poor soils limit tree size—where, for example, EVCs such as Broombush Mallee and Heathy Woodland occur.

The largest trees are now mostly restricted to small areas: usually along roadsides, public land water frontages, or on private land. They are very rare in state forest—the most extensive Box-Ironbark public land category—where 99.6% of trees are below 60 cm dbh,¹⁴ less than half the size of the largest trees. Clearing for agriculture and heavy cutting for wood or silvicultural treatment from the 1850s gold rushes until at least the 1960s removed nearly all large trees, systematically in many instances.

The large trees have been replaced by much smaller stems, growing at massively higher densities (an average of 500 stems per hectare¹⁴) leading to a very different forest structure (see photographs below). Some of these stems actually belong to the same individual trees which were previously the large trees dominating the forest. Multiple stems have grown on from the initial coppice regrowth generated when the original large trees were first cut.

In summary, the Box-Ironbark forests and woodlands which exist today are dominated by very high densities of small trees resulting from heavy cutting of the original forests which were dominated by large, wide-crowned, hollow-rich, and widely spaced trees. This very substantial change in forest structure and large tree abundance has significant ramifications for the biodiversity, landscape, timber production, and recreational values of Box-Ironbark forests and woodlands.



A forest with relatively intact structure; widely spaced, very large trees with abundant hollows and fallen timber.



A forest dominated by a high density of small stems.

The significance of large old trees is much greater than the usual measures of conservation significance, such as the diversity or scarcity of the species supported, or the habitat diversity provided in a landscape dominated by younger forests. Places with abundant large trees and intact forest structure are of particular value for their resemblance to the natural, or pre-European, state of Box-Ironbark forests and woodlands and hence their ecological integrity. That is, their ecological relationships are less likely to include artificial factors than those in more disturbed areas. As well as the intrinsic value in maintaining natural ecological relationships, such forests are of great practical value in providing a framework or target to guide the management of land for nature conservation, and to inform ecological research.

As well as their nature conservation values, places with relatively abundant large trees and intact forest structure have high cultural and aesthetic values. Their cultural values stem from their great age, which inspires a strong sense of spirituality and wonder, both of itself and by evoking the vast pristine Box-Ironbark forests of pre-European Australia. There is an intrinsic value in ecological integrity which is akin to less tangible values such as 'naturalness'. Together, their antiquity and similarity to undisturbed forests gives them considerable existence value; gratification in merely knowing that they exist. Similarly, places featuring numbers of large old trees provide landscape diversity, as well as having high scenic value in their own right, especially as a result of the open and diverse forest structure and the grandeur of the large trees.

Gullies

While the topography of Box-Ironbark forests and woodlands is mostly quite gentle, there are nonetheless recognisable drainage lines or gullies throughout the forests. The major drainage lines contain permanent rivers and streams. The more common, smaller gullies and depressions, however, rarely contain flowing water but their soil is moister, deeper and richer than that of nearby slopes. These differences may result in distinct EVCs, such as Creekline Grassy Woodland or Alluvial Terraces Herb-rich Woodland, but even within the same EVC differences in the flora and fauna are usually distinct.

Key differences in the flora and fauna include more species and individuals, higher reproductive rates, different mixes of species, and possibly higher levels of nectar production.¹⁰ Because of their higher moisture levels, gullies are often important refuges from drought and fire. They are often the last refuge of declining species¹⁰ and frequently have high densities of large old trees. Gullies are important for many threatened species, such as powerful and barking owls. Overall, gullies support a much higher proportion of Box-Ironbark biodiversity than the 2% of land that they occupy.

However, gullies have also been disproportionately disturbed. Because of their higher productivity they are more likely to have been cleared for agriculture and grazed by domestic stock, and are often more severely affected by weed invasion than adjacent slopes. They have also been targeted by shallow alluvial gold miners from the 1850s to the present, particularly in the forests of the Dunolly–Inglewood area.

Protection and management of gullies for nature conservation is an important priority for Box-Ironbark forests and woodlands.

Landscape fragmentation

In all parts of the study area, the majority of indigenous vegetation has been cleared, and the remaining vegetation is generally highly fragmented. However, the loss of indigenous vegetation to clearing varies greatly across the study area, with the areas most suitable for agriculture much more severely affected than others, leaving less than 10%—sometimes much less—remaining in many areas.

This high degree of fragmentation and loss of indigenous vegetation has severe impacts on biodiversity,¹⁰ increasing the imperative to conserve as much as possible of what remains. At the same time, however, the small and fragmented extent of public land in these landscapes greatly constrains options for nature conservation. In particular, the option of protecting values in relatively large consolidated parks and reserves is precluded. Consequently, the significance for biodiversity conservation of the potential role of freehold land, which often supports a high proportion of biodiversity in these areas, is greatly increased.

In many areas owners of adjacent freehold land are already involved in the management of significant public land areas, especially roadsides and water frontages. In addition, local communities have a keen interest in land management in general, and biodiversity conservation in particular, and for this reason alone are key stakeholders. Not surprisingly, the most successful nature conservation programs in highly fragmented landscapes have been led by local community groups, in coordination with other stakeholders in local land management. The work of local people near Nathalia in assisting the recovery of the nationally vulnerable superb parrot is an excellent example of the success of this approach.

In regional areas where many issues and stakeholders are involved, there is increasing recognition of the value of innovative approaches to land management problems by linking related conservation and land protection measures within catchments, and working with local communities.

4.2 The conservation reserve system

In the 1990s, a more sophisticated and systematic consideration of reserve systems arose from the recognition of their central role in biodiversity conservation. International thinking has been led by the World Conservation Union (IUCN),⁶ which has developed definitions and classifications for protected areas; that is, areas managed primarily for nature conservation.¹⁷

In terms of terrestrial reserve systems, developments in Australia have largely come under the auspices of the National Reserve System (NRS)¹⁸ and Regional Forest Agreement (RFA) processes, both of which have been strongly supported by all State and Commonwealth Governments since the inception of each process in 1992.

The RFA process (see Chapter 1 for a broader description) has focussed on specific forest and woodland ecosystems in designated forested regions. The last two Victorian RFAs were signed in March 2000. The NRS is less formal, covering terrestrial ecosystems other than those considered under the RFA process, with particular emphasis on adding poorly reserved environments to the national reserve system, using a bioregional approach.

A key product of the RFA process has been the development of nationally agreed criteria for the establishment of a forest reserve system for Australia, widely known as the JANIS criteria.⁴ Through successive RFAs, these criteria have been the benchmark for region-based assessment and establishment of forest reserve systems. The terms of reference for the Box-Ironbark investigation specify that the ECC is to consider these nationally agreed criteria.

Recognising that the reserve system should in the first instance be selected from public land, the JANIS criteria identify three public land components of the reserve system, in decreasing order of preference:

- (i) **dedicated reserves:** reserves established by legislation for conservation purposes and for which a parliamentary decision is required to revoke their status;

- (ii) **informal reserves:** areas reserved under other secure tenure or management arrangements, where it is not possible or practical to include conservation values in dedicated reserves; and
- (iii) **protection by prescription:** values protected by prescription where protection in reserves is impracticable because of the nature of the value.

In Victoria, as indicated in the terms of reference for the Box-Ironbark investigation, the second and third of these components are generally the responsibility of public land managers. Informal reserves, mostly Special Protection Zones, will result from forest management planning undertaken by NRE Forests Service in most Box-Ironbark state forests in the

study area after the completion of the ECC investigation. Other measures taken by NRE Forests Service, such as Special Management Zones and prescriptions for timber harvesting,¹⁹ give a level of protection to natural values and complement the reserve system, but are not included as part of the reserve system.

NRE Parks Flora and Fauna Division (through Parks Victoria) is responsible for management of nearly all dedicated reserves in Victoria. Table 4.1 below lists the major Box-Ironbark public land categories and identifies those which are generally included in the reserve system (in the RFA process, for example).

Table 4.1 Summary of reserve system status of public land use categories

Public land use category	Level of protection ¹	Management priority ²	Reserve system status
National park	high	high	✓
State park	high	high	✓
Reference area	high	high	✓
Nature conservation reserve	moderate	high	✓
Regional park	moderate	moderate	✓
Natural features reserves			
Wildlife reserves	low	low	✗
Public land water frontages	low	low	✗
Other natural features reserves	moderate	moderate	✓
Historic and cultural features reserve	moderate	low	✗
Community use areas	low	low	✗
Water production	moderate	low	✗
State forest	low	moderate	✗
Earth resources	low	low	✗
Services and utilities	low	low	✗
Commonwealth land	moderate	low	✗

¹ Formal constraints on major potentially threatening uses (timber harvesting, grazing, mining, hunting).

² Management priority given to biodiversity conservation.

✓ Generally included in the reserve system.

✗ Generally not included in the reserve system.

Note: Full explanations of levels of protection and management priority in relation to reserve system status are provided in Appendix 7. The ECC is not proposing to change the uses generally permitted in the various public land use categories. This table is applicable to current and proposed public land use categories.

In summary, the reserve system is composed of:

- national parks,
- state parks,
- regional parks,
- reference areas,
- nature conservation reserves, and
- natural features reserves other than public land water frontages and those wildlife reserves where hunting is allowed.

Dedicated reserve status of land in these categories is conferred by one of three Parliamentary Acts. National and state parks are scheduled and managed under the *National Parks Act 1975*, nature conservation reserves, regional parks, and natural features reserves are reserved and managed under the *Crown Land (Reserves) Act 1978*, and reference areas are proclaimed and managed under the *Reference Areas Act 1978*. The details of four exceptions—Beechworth Park, Reef Hills Park, Deep Lead Flora and Fauna Reserve and Sandhurst Reference Area—are provided in the relevant sections of Chapters 13, 14 and 16.

Across Victoria, many regional parks are available for timber harvesting or have nature conservation as a secondary objective. The ECC is proposing that timber harvesting be generally excluded from Box-Ironbark regional parks and, as a result, they are considered part of the reserve system in this report.

CAR – Comprehensive, adequate and representative

Recent thinking on reserve systems has recognised the importance of an ecological basis for designing reserve systems.¹⁸ Establishing reserve systems without a systematic ecological basis almost invariably leads to imbalances. Typically areas most intensely subject to human use, and consequently often in most need of protection, are poorly represented in reserve systems. This situation is well illustrated by the proportion of the Box-Ironbark study area currently in conservation reserves (3%), compared to Victoria as a whole (15%).²⁰

To address this problem, the JANIS criteria specifically focus on the establishment of a comprehensive, adequate and representative (CAR) reserve system. In terms of Box-Ironbark forests

and woodlands, these terms may be defined as follows (see JANIS 1997⁴ for full definitions):

Comprehensive: includes examples of the full range of ecosystems within each Victorian bioregion that contains Box-Ironbark forests and woodlands

Adequate: of sufficient size and number, and appropriate shape, to ensure the maintenance of ecological viability and integrity of biological populations, species and communities

Representative: areas selected for inclusion in reserves should reflect the diversity of the flora and fauna within each of the protected habitats and biological communities.

In short, the reserve system should contain examples of all types of ecosystems (comprehensive). For each ecosystem the examples should be of sufficient size to maintain the integrity of its biodiversity (adequate) and sufficiently large and widely distributed to cover the range of variation in the ecosystem (representative). The terms of reference for the Box-Ironbark investigation require the ECC to have regard to the nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system.

To provide a framework for the establishment of a CAR reserve system at the national scale, 80 terrestrial biogeographic regions have been identified and mapped across Australia.^{4,9} Subsequent work has refined these regions in Victoria to develop bioregions,²¹ five of which overlap with the study area—Goldfields, Victorian Riverina, Northern Inland Slopes, Wimmera, and Central Victorian Uplands (see Map 4.1 below).

Biodiversity criteria

To assist in calibrating reserve system protection of biodiversity, old growth and wilderness values, JANIS provides criteria for appropriate levels of representation of these values in a CAR reserve system. There is no Box-Ironbark wilderness, and only very small areas of old growth have been identified, although large old trees, and sites where they are abundant, are particularly important (as explained earlier in this section).

The JANIS biodiversity criteria (summarised in Appendix 7) specify appropriate minimum representation levels for ecosystems in each bioregion according to the status of each ecosystem. More threatened or depleted ecosystems require higher levels of reserve system representation. The most widely known JANIS biodiversity criterion is inclusion of 15% of the pre-1750 extent of each ecosystem in the reserve system. In Victoria, EVCs have generally been used as surrogates for ecosystems when establishing and assessing reserve systems.

When interpreting the JANIS biodiversity criteria for Box-Ironbark forests and woodlands, the ECC was conscious of two key points:

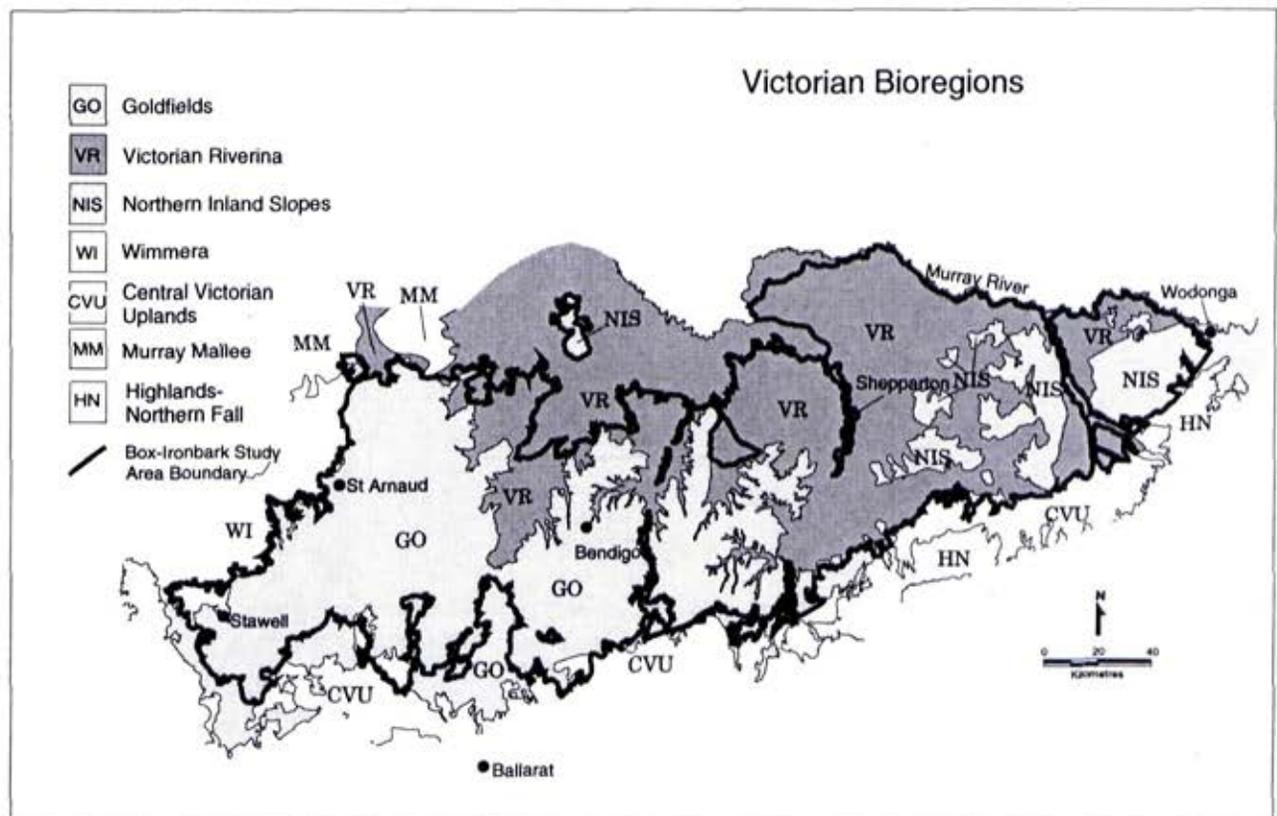
Flexibility: the need for flexibility in the application of the criteria, 'to ensure that the CAR

reserve system delivers optimal nature conservation outcomes as well as acceptable social and economic outcomes', is strongly emphasised in the explanation of the criteria and their application.⁴

Context: in the RFA process, the JANIS criteria have been applied to forest landscapes with a relatively large proportion of off-reserve areas supporting substantially intact indigenous vegetation, whereas indigenous vegetation has been cleared from 75% of the Box-Ironbark study area, and nearly all the remaining 25% has been substantially altered, and is highly fragmented.

The emphasis on flexibility has a similar effect to the requirement in the *Environment Conservation Council Act 1997* (and terms of reference for this investigation) to make recommendations for 'balanced' use and development of public land.

Map 4.1. Victorian bioregions in the Box-Ironbark study area



Box 4.3 CURRENT RESERVE SYSTEM

Representation of Key Values

The existing Box-Ironbark reserve system, with a total area of 96 476 ha, is composed of 15 national, state and regional parks, 11 reference areas, 35 nature conservation reserves, and numerous natural features reserves.

EVCs

Detailed statistics on the representation of EVCs in the existing Box-Ironbark reserve system are provided in Appendix 6. Fifty-nine out of 72 Box-Ironbark EVCs satisfy JANIS criteria for rare, endangered or vulnerable ecosystems. These criteria (summarised in Appendix 7) are based on the spatial extent of each EVC, so an EVC can be well represented in the reserve system but still classified as rare, for instance.

Representation of these 59 threatened EVCs in the existing reserve system is below the JANIS criteria. Representation of the 13 other EVCs in existing parks and reserves varies considerably. EVCs which occur on rocky hill tops not favoured for agriculture or timber production are well represented. For example, 60.7% of pre-1750 extent of Granitic Hills Woodland/Rocky Outcrop Shrubland/Herbland Mosaic is represented in reserves. In comparison, Box-Ironbark Forest, which is characterised by durable timber eucalypts, is poorly represented in reserves (4.4% of pre-1750 extent).

Of the 13 EVCs which are not rare, endangered or vulnerable, seven have less than 15% of their pre-1750 extent in the current reserve system.

Threatened species

Appendix 8 summarises the current reserve system representation (percentage of known locations in the reserve system) for a selection of key threatened species—those which are most dependent upon reserve system protection or are most threatened.

For fauna, estimates of representation vary from around 27% for the large and wide-ranging square-tailed kite and powerful owl, to 77% for the turquoise parrot which occurs predominantly in the north-east of the study area where the existing reserve system is most extensive.

For plant species, variations in representation percentages are much greater because many species are found only in a small number of populations, all of which may be within or outside the reserve system. For example, the only populations of large-fruit fireweed and long-tail greenhood are, respectively, entirely within and entirely outside the current reserve system.

Large old trees

Box-Ironbark public land has been comprehensively surveyed to identify sites with the greatest abundance of large old trees (greater than 60 cm dbh).^{22,23} These surveys identified 126 sites covering 26 279 ha, or 7% of the total public land estate. Of these sites, 17 (14% by number, 27% by area) are in the current reserve system. Nearly all the sites outside the reserve system are in state forest.

Gullies

The study area has also been comprehensively surveyed for 'fauna refuges', essentially gullies which are thought to be important for fauna in times of drought.^{23,24,25} Of the 255 sites identified in these studies, 49 (19% by number, 30% by area) are in the existing reserve system.

4.3 Community views

The importance of Box-Ironbark public lands for nature conservation is keenly and widely appreciated, particularly among those who live in the study area. Secure long-term protection for biodiversity in general, and threatened species and large trees in particular, is strongly supported. The main point of contention is how to protect natural values.

Many submissions contended that existing measures were adequate, or that improved management, with few or no changes to public land use, would suffice. However, a large number of submissions supported considerable additions to the reserve system, typically proposing adoption of JANIS targets, or even addition of all public land to the reserve system.

In areas where indigenous vegetation and public land are highly fragmented, many agencies and people have a role in nature conservation. The importance of proposing conservation initiatives, including changes in public land use, which work in unison with all stakeholders is widely recognised.

4.4 Achieving a balance

Recognising the importance of, and substantial community support for, Box-Ironbark biodiversity protection and the pivotal role which conservation reserves play in its conservation, the ECC is recommending a significant increase in the Box-Ironbark reserve system, to bring it to a level which reflects its significance and susceptibility to threats, and which is comparable with the extent of the reserve system in other regions of Victoria.

The proposed reserve system additions have been carefully chosen to maximise inclusion of those values which are most dependent on reserve status for their protection, and to minimise the constraints placed on other uses. Large areas of public land remain outside the proposed reserve system and are generally available for existing uses. To complement this expanded reserve system, the ECC is also recommending measures to improve management for nature conservation in the substantial areas of public lands that are proposed to remain outside the reserve system.

Ecological vegetation classes (EVCs)

The ECC is recommending that a Box-Ironbark reserve system be established which essentially meets the nationally agreed criteria for a comprehensive, adequate and representative reserve system (see Box 4.4).

Proposed representation levels for 11 of the 13 EVCs that are not vulnerable, rare or endangered, are greater than 15% of their pre-1750 extent. Proposed representation levels for the various vulnerable, rare or endangered EVCs vary widely, but many are poorly represented. Typically, each of these poorly represented EVCs occurs in a large number of widely scattered small patches, which are neither practical nor desirable as dedicated reserves. Some poorly represented EVCs occur in small, scattered pockets within large state forest blocks. Forest management zoning, to be undertaken after Government decision on ECC recommendations, will provide further opportunity for reserve system additions and potentially significant improvement in representation.

However, regardless of forest management planning, several of the most depleted EVCs will remain poorly represented in the reserve system. The occurrence of these EVCs on public land is now restricted to isolated small units of public land (mostly less than 20 ha), and mostly on the northern plains. Where these units contain natural values of high significance, the ECC is proposing that they be added to the reserve system as nature conservation reserves, or in one particularly significant and more consolidated area, as the Broken-Boosey State Park. Many of the remaining small units with native vegetation in reasonable condition are proposed as natural features reserves—the current category for many of them.

Nonetheless, many small blocks without high values other than the presence of threatened EVCs, often in relatively poor condition, remain outside the reserve system. There are several thousand such blocks. Adding them all to the reserve system, and attempting to manage them in an appropriate manner, would be much less practical, less cost-effective and less likely to succeed than the cooperative management arrangements with local stakeholders proposed below (see Recommendation R12).

Threatened species

A substantially increased reserve system is needed to arrest the decline and initiate the recovery of Box-Ironbark biodiversity, and threatened species in particular. However, it is recognised that 'reserve system' status places constraints on some users.

The keys to minimising potential conflict are:

- to give priority to those species which are most threatened and most dependent on reserve system protection;
- to match species as closely as possible to the most appropriate public land category for their conservation; and
- to select areas where values overlap.

For example, the superb parrot, which occurs at the southern limit of its distribution along roadsides near Nathalia, requires sensitive management and revegetation of these roadsides, rather than a change in land status. On the other hand, the pink-tailed worm-lizard occurs only in a single small population near Bendigo, where parts of its habitat are potentially threatened by surface mining and eucalyptus oil harvesting, and where active management of its habitat may be required. Changing the status of land where the pink-tailed worm-lizard occurs, to a category which protects it from these threats and provides impetus for improved habitat management is a high priority for its conservation.

The ECC is proposing to significantly increase reserve system protection for many threatened species for which reserve system protection is a high priority (see Appendix 8 for more detail).

Large old trees

The ECC's general vision for Box-Ironbark forests on public lands sees extensive landscapes dominated by conspicuously fewer, wider-spaced and much larger and older trees than is currently the case. This original forest structure would optimise biodiversity, landscape and timber production values. Relatively small volumes of selectively harvested large trees would then be available from state forests. Because the highest value timber is produced from large trees, small volumes have the potential to support a sawlog-focussed industry generating more employment and wealth than the existing timber industry (see Chapter 9 for further details).

Although restoration of the original forest structure will take many decades, this vision provides both the impetus to implement the actions required without delay, and the framework in which to do so.

Increasing the number of large old trees throughout Box-Ironbark public lands entails:

- protection of existing large old trees, particularly in places where they are most abundant;
- protection of medium-sized trees—the large old trees of the future; and
- thinning of areas with high stem densities to increase the growth rate of retained trees.

To this end, the proposed reserve system contains 70% of the total number, and 90% of the total area of sites, identified as containing high numbers of large old trees. Because of the need for a high level of long-term protection, many of the large old tree sites selected for incorporation into the reserve system are included in proposed state and national parks.

The ECC also proposes, in Chapter 15, that: identified large old tree sites proposed to remain in state forests be made informal reserves; no cutting of large trees 60 cm dbh or larger be permitted; and that nature conservation be an equal primary use with timber production throughout state forests (the largest single public land use category proposed).

Thinning is used as a silvicultural treatment in state forests to reduce the number of small diameter stems, and allow relatively few retained stems to grow more quickly, without competition stunting their growth. The primary objective of this management in state forest is, ultimately, to produce trees of sawlog size for harvest.

For habitat and landscape purposes, there is also a need in parks and reserves to maximise the number of large trees as quickly as possible, without compromising other considerations. This might be best achieved by removing some smaller diameter stems in those parts of parks and reserves where competition is significantly constraining the development of larger stems. Such 'ecological thinning' (as opposed to silvicultural treatment) should be driven only by ecological needs, not by commercial timber production needs, and managed at the discretion of the park or reserve manager.

It must be adequately researched, tested, and planned before being applied on a broad scale.

Thinning to meet ecological objectives could be quite different from silvicultural thinning. For instance, it may be preferable to kill small trees, by ringbarking or poisoning for example, rather than axe-thinning which leads to coppice regrowth and less effective suppression of competition. In addition, research is required in relation to other factors such as the appropriate balance between leaving wood on the ground as fauna habitat and

fire suppression requirements. Research to date has focussed on silvicultural objectives,^{26,27} and research to identify the most appropriate thinning regimes for ecological objectives is a high priority.

Other ecological management techniques could involve the use of fire, or injuring trees to stimulate hollow growth. Preparation of an ecological management strategy to coordinate research and implementation of these initiatives would greatly assist their effectiveness.

Box 4.4 PROPOSED RESERVE SYSTEM

Representation of Key Values

EVCs

The existing Box-Ironbark reserve system area is 96 476 hectares. As shown in Appendix 6, the ECC is proposing to enlarge this by 94 857 hectares, taking the total reserve system area to 191 333 hectares. This is almost double the size of the existing system.

For the main 11 EVCs that are neither vulnerable, endangered nor rare, proposed representation at the study area level varies from 16% of the pre-1750 extent for Box-Ironbark Forest to 68% for Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic. The proposed representation of these EVCs at the study area level is above that advocated in the JANIS biodiversity criteria.

Eight EVCs are vulnerable, with representation levels for those with more than 100 hectares on public land varying between 2% for Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic, and 12% for Alluvial Terraces Herb-rich Woodland. Of the remaining 51 rare or endangered EVCs, representation varies from zero for a number of generally very restricted EVCs to 57% for Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Mosaic. However, many of the rare or endangered EVCs have a high proportion of their public land extent (up to 100%) in the reserve system.

Threatened species

Appendix 8 summarises the proposed reserve system representation for a selection of key threatened species—those which are most dependent upon reserve system protection or are most threatened. Except for six species with a high proportion of locations on freehold land, all threatened species in Appendix 8 have proposed representation levels above 50%, whereas few species have current representation levels above 50%. Significantly higher reserve system representation is proposed for species dependent on large old trees, such as the brush-tailed phascogale, powerful owl, barking owl, and for the highly threatened pink-tailed worm-lizard, bald-tip beard-orchid, long-tail greenhood, lowly greenhood, tick indigo and whorled zieria.

Large old trees

The ECC is proposing that 89 of the 126 identified large old tree sites,^{22,23} be included in the reserve system. These sites cover 90% of the total area of large old tree sites, an increase of 63% on current representation. Over 90% of the sites outside the proposed reserve system are in state forest; the rest are in Puckapunyal military area.

Gullies

The proposed reserve system encompasses all or part of 154 of the 255 fauna refuge gullies identified in the study area,^{23,24,25} or 58% by area.

Gullies

As with many EVCs with small, fragmented distributions, gullies are not readily encompassed in large consolidated parks and reserves. In addition, gullies may be less threatened by some land uses than other areas, reducing the imperative for reserve system protection. For example, the fertile soils of gullies are essentially unaffected by timber harvesting, unlike future and existing landscapes of large old trees.

The ECC's proposed reserve system doubles the total area and triples the number of identified fauna refuge gullies^{23,24,25} represented in the reserve system.

Fragmented landscapes

The ECC has a limited role, and cannot make specific recommendations, pertaining to freehold land. At the same time, the importance of integrating freehold and public land management, and involving local communities in the management of public land, is keenly appreciated.^{28,29}

Accordingly, the ECC is proposing the establishment of 'Local Habitat Conservation Networks' to coordinate and facilitate communication between stakeholders with an interest in biodiversity conservation in appropriate parts of the Box-Ironbark study area. It is not the ECC's role to be prescriptive about the form that these networks might take; it is important that, from the very start, local stakeholders develop approaches which reflect their particular circumstances and aspirations. However, some suggestions as to the format of the proposed Local Habitat Conservation Networks is provided in Appendix 9. Much can also be learnt from protected area networks which have recently formed in other parts of south-eastern Australia.³⁰

The main prerequisites for appropriate areas are approximately equivalent distribution of significant biodiversity values on freehold and public land in the area, and a pre-existing interest in local biodiversity conservation in the local community. Good candidate areas may centre around:

- the proposed Wychitella Nature Conservation Reserve (see Recommendation D2);
- roadsides and other small remnants in the Picola district;

- clusters of significant roadsides and streamsides in the area broadly between Dookie and Euroa;
- the Chesney Vale Hills around the proposed Mt Meg Nature Conservation Reserve (see Recommendation D62);
- the Lurg Hills south of Wangaratta;
- the Boorhaman Plains between Rutherglen and Wangaratta; and
- areas adjacent to the proposed Broken–Boosey State Park (Recommendation B4) and nearby nature conservation reserves (Recommendations D51, D52, and D55-D61).

In some of these areas, there is already interest in cooperative conservation measures along the lines of the proposed Local Habitat Conservation Networks. Indeed, the Picola and District Superb Parrot Foraging Habitat Project could serve as a model for other networks. This project, involving over 20 local landholders, has been running for eight years, in which time over 40 000 trees have been planted in the area to assist recovery of the nationally vulnerable superb parrot. As with other similar successful networks, this project owes much of its success to the strong and consistent commitment of key individuals in the early years of the project. Consistent institutional support, from agencies such as public land managers and catchment management authorities, can be of great assistance in maintaining constancy in the critical initial stages.

Rather than attempt to establish Local Habitat Conservation Networks in all of these areas at the outset, the ECC is proposing a pilot Local Habitat Conservation Network for the area around the proposed Broken–Boosey State Park (Recommendation B4).

However, the consequences of failing to arrest and reverse the loss of biodiversity in these landscapes may be very serious, and action taken sooner rather than later will be more cost-effective and less likely to fail. Catchment management authorities, in partnership with public land managers, where appropriate, are ideally placed to identify appropriate locations, and provide the impetus for the establishment of networks operating at the landscape scale as part of their overall strategies for native vegetation management and biodiversity conservation. They have already undertaken many important initiatives to this end, particularly with the assistance of the Natural Heritage Trust.

RECOMMENDATIONS

Several recommendations to improve Box-Ironbark nature conservation apply to specific public land use categories and, accordingly, are formally documented elsewhere:

- the reserve system itself is proposed in a series of recommendations for individual national and state parks (in Chapter 13), regional parks, nature conservation reserves, and some historic and cultural features reserves (in Chapter 14), and reference areas and some natural features reserves (in Chapter 16);
- as part of a long-term vision to achieve a reserve system which more closely resembles pre-European forests, implementation of an ecological management strategy including ecological thinning in the reserve system is recommended in Chapters 13 and 14;
- incorporation in the reserve system of large old tree sites on Commonwealth land is recommended in Chapter 11; and
- incorporation of large old tree sites in informal reserves, retention of large old trees, and nature conservation as an equal primary use in state forest, are recommended in Chapter 15.

R11 The Department of Natural Resources and Environment initiate an ecological management strategy to achieve a reserve system that more closely resembles the pre-European forests, and specifies the nature of any ecological thinning, as defined above.

R12 The managers of the proposed Broken–Boosey State Park, together with the Goulburn Broken Catchment Management Authority, establish and support a pilot ‘Local Habitat Conservation Network’ to complement public land nature conservation in the Broken–Boosey Creeks system.

R13 The Goulburn Broken, North Central and North East Catchment Management Authorities, in partnership with appropriate public land managers, investigate and pursue opportunities to establish Local Habitat Conservation Networks at suitable locations in their regions.

Information Sources

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| <p>¹ State of the Environment Advisory Council (1996).</p> <p>² Commonwealth of Australia (1996).</p> <p>³ Figgis (1999).</p> <p>⁴ JANIS (1997).</p> <p>⁵ Young and Howard (1996).</p> <p>⁶ McNeely <i>et al.</i> (1990).</p> <p>⁷ Raven (1999).</p> <p>⁸ UNEP (1999).</p> <p>⁹ ECC (1997).</p> <p>¹⁰ Stothers (1999).</p> <p>¹¹ Robinson and Traill (1996).</p> <p>¹² Reid (1999).</p> <p>¹³ Recher (1999).</p> <p>¹⁴ DNRE (1998).</p> <p>¹⁵ Benson and Redpath (1997).</p> | <p>¹⁶ Newman (1961).</p> <p>¹⁷ IUCN (1994a).</p> <p>¹⁸ Commonwealth of Australia (1999).</p> <p>¹⁹ DNRE (1997).</p> <p>²⁰ Cresswell and Thomas (1997).</p> <p>²¹ Government of Victoria (1997a).</p> <p>²² Soderquist and Rowley (1996).</p> <p>²³ Holland and Cheers (1999).</p> <p>²⁴ Robinson and Rowley (1994).</p> <p>²⁵ Robinson and Rowley (1996).</p> <p>²⁶ Kellas <i>et al.</i> (1982).</p> <p>²⁷ Kellas <i>et al.</i> (1998).</p> <p>²⁸ Binning and Young (1997).</p> <p>²⁹ Young <i>et al.</i> (1996).</p> <p>³⁰ Thiele and Prober (in press).</p> |
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5 Mining

The 1851 discovery of gold around the study area transformed Victoria from an obscure, essentially pastoral colony into one of the wealthiest communities in the world.

Throughout the 1850s thousands of diggers arrived in the major and minor goldfields scattered through the forests of the inland hills. Most of the existing towns and settlements in the study area were established at this time, as well as several others which are now virtually deserted. Working alone or in small groups, the diggers used simple equipment to dig for and extract shallow gold nuggets; shovels, picks, buckets and ropes, tin pans, cradles and puddling machines were the order of the day.

As the shallow gold ran out, more sophisticated methods were required to mine and extract deep lead, reef, and finely disseminated shallow alluvial gold. Many diggers formed or worked for companies, and by 1878 quartz reef mining had surpassed shallow alluvial production. Company mining and advancing technology continued to dominate production into the early decades of the 20th century. By the 1950s, most of these mines had closed and gold production from the study area had all but ceased.

In the 1980s and 1990s interest was renewed in gold mining in the study area. New technologies for finding, extracting and processing gold improved the economics of mining and exploration and increased the chances of discovering new deposits. This renewed interest has focussed on the known or recognised goldfields; those that were discovered and mined in the first phase of mining (1850s-1950s). Nearly all the recent major mines and developments are in known goldfields; for example, Stawell, Fosterville, Tarnagulla, Bendigo, Amphitheatre and Maldon. The notable exception is the recently closed Nagambie mine.

5.1 Current mining operations

In 1996/97, 4 492 kg of gold was produced in the study area; that is, 95% of total Victorian production (see Appendix 3 for sources of

economic and production figures). This total includes gold mined from public and private land. Because many individual operations work across both public and freehold land, it is difficult to quantify the contribution of each. However, about 24% of the total area of all mining licences occupies public land, which is roughly the same as the proportion of public land in the inland hills generally, with the northern plains being of little interest for gold mining.

Although there is some overlap in the different types of mining operations, four basic divisions are readily apparent, as follows:

Underground mining involves tunnelling from a surface portal to extract reef or deep lead gold, frequently hundreds of metres below the surface. Currently there are two underground Box-Ironbark mines: at Stawell (which started as an open cut), and Bendigo (which is yet to commence production). Recently, underground mines at Maldon and Tarnagulla ceased production.

An important advantage of underground mining is the high value of production relative to the generally small area of surface disturbance. However, not all deposits can be mined underground. Compared to other methods, underground mining is relatively expensive and there is less certainty in predicting the amount of gold in underground deposits.

Open cut mines are surface pits typically less than 100 metres deep, 200 metres wide and 500 metres long. In the Box-Ironbark study area, two open cuts are currently producing gold—at Baileston (where digging has finished), and Fosterville. Recent open cuts at Costerfield and Nagambie have now ceased production.

Shallow alluvial mining focusses exclusively on gold-bearing gravels accumulated along current or ancient drainage lines. Individual operations are generally smaller and, in particular, much shallower than open cuts. There are several currently operational shallow alluvial mines in the study area, particularly in the area roughly bounded by Avoca, Wedderburn and Maldon.

Doze and detect mining involves surface-stripping with a bulldozer followed by intensive hand-held metal detecting to uncover nuggets. Operations are generally less than a metre in depth and five hectares in area. Numerous, short-term doze and detect operations may occur over the course of a year, but few are current at any one time and there are few operators in total. The main focus is the Dunolly–Wedderburn area.

By definition, a metal detector is used to extract gold in ‘doze and detect’ operations. In other types of mining, gold is generally extracted using cyanide-based techniques such as heap-leaching to extract finely disseminated gold, or gravity methods (without chemicals) to extract relatively coarse gold. Generally, the more sophisticated and expensive chemical methods are used in underground and larger open cut mines but there can be much overlap in the extraction techniques used in different types of mining.

Mining is the largest employer and generator of wealth from public land in the study area (figures provided below) but is dominated by a small number of mines. The largest ten producers account for all but a tiny proportion of production, and the underground mine at Stawell accounts for 54% of all Victorian production. Future production from the new underground mine at Bendigo and the expanded Fosterville open cut has the potential to rival current production levels of the Stawell mine, although significant ore extensions have recently been identified at Stawell.

The great variation in the amount of gold produced from individual mines puts estimates of future production in context. That is, exceptionally good or poor results from only one or two prospects could dramatically alter the overall value of production.

Although the study area represents the heart of the Victorian gold mining industry, not all parts of the

study area are of interest to miners. As well as the northern plains, there are relatively large areas of public land not currently subject to exploration licences and of little interest to miners in the St Arnaud Range, parts of the Rushworth–Heathcote forests, and much of the public land east of the Goulburn River.

Other minerals produced commercially in the study area are kaolin from pits near Axedale, feldspar from a recently opened quarry near Beechworth, and small amounts of diatomite from near Avoca. As indicated below, the total value of production of these minerals is much less than that of gold.

5.2 Administration

In terms of access for exploration and mining, the *Mineral Resources Development Act 1990* establishes three broad divisions of public land, as follows.

Exempt from exploration and mining. Four public land categories are exempt: reference areas, national parks, state parks, and wilderness parks. Exploration and mining are not permitted in these areas unless there is an authority or tenement in place at the time of declaration as a park or reference area to allow subsequent access.

Restricted Crown land requires the consent of the Minister for Environment and Conservation for any exploration or mining to proceed; includes nature conservation reserves, regional parks and natural features reserves.

Unrestricted Crown land does not require the Minister’s or land manager’s consent. In these cases the land manager (for example NRE Forests Service) is consulted on the application but the formal approval or otherwise rests with NRE Minerals and Petroleum Victoria. All other public land categories are unrestricted; state forests and various other reserves.

Some areas, in public land categories which are generally considered ‘restricted’, are scheduled under the *National Parks Act 1975*. There are three such areas in the Box-Ironbark study area: the existing Deep Lead Flora and Fauna Reserve, and Reef Hills and Beechworth Parks (both recommended as regional parks by the LCC). Applications for exploration and mining in these areas are subject to the provisions in Section 40 of the *National Parks Act 1975*.

Section 40 specifies an approval process requiring the consent of the Minister for Environment and Conservation, and tabling in both houses of Parliament for 14 days. This process allows full consideration of implications of mining on land with the highest conservation rating.

The following process applies to all mining, once the initial licence application has been approved.

Work plans

NRE has an agreed process to ensure that mining work plans, as required under the *Mineral Resources Development Act 1990*, in the north-west region (which includes most of the Box-Ironbark study area) are assessed on a whole of department basis. In summary, the process involves:

- early consultation with all NRE divisions which may have an interest in the mining proposal;
- an opportunity for input by interested NRE divisions on work plan requirements and conditions; and
- a dispute resolution mechanism, should divisions not be able to agree on whether or not a project is acceptable and under what conditions.

NRE is currently reviewing the north-west work plan process, for application statewide to both mining and extractive industry projects.

Planning permits

NRE is currently reviewing its processes for dealing with planning referrals and appeals for the mining and extractive industry. For planning referrals, the intention is that the work plan already endorsed by NRE will be the key document submitted by the permit applicant. As such, NRE's response as a referral authority would usually only be a reiteration of requirements established in its internal assessment of the work plan.

Environmental effects statements

NRE is currently reviewing its processes for mining and extractive industry projects going through the environmental effects statement (EES) process, with a view to formalising the approach which has been taken on recent EES projects.¹ This approach involves NRE's Minerals and Petroleum Victoria taking the lead role and in consultation with all

relevant divisions developing department submissions.

5.3 Economics and employment

Because many individual gold mines occur on or below both public and private land it is difficult to reliably quantify production attributable to public land. Overall, it is estimated that 24% of the total area under mining licence in 1996/97 was public land. The total value of gold production in the study area in that year was \$70 million; 24% of which is \$16.8 million. Estimated expenditure on exploration and mining development on Box-Ironbark public land in 1996/97—\$6.2 million—is also derived using the 24% ratio and is also likely to be conservative.

Employment due to exploration and mining for gold on public land has been estimated at 149 full-time job equivalents, again using the 24% ratio. In addition to exploration, large scale mining in particular generates relatively high rates of indirect employment and expenditure in local economies, especially in servicing machinery.

Total value of production and employment attributable to public land from minerals other than gold are less than \$4 million and 15 full-time job equivalents, although feldspar production at Beechworth is increasing.

In terms of both value of production and employment, mining is the most important industry utilising Box-Ironbark public land.

5.4 Industry trends

The outlook for total annual gold production in the study area is for an increase from around \$70 million at present to around \$160 million (from public and private land) in five years if the expectations of the three largest proposed mines are achieved. The proposed increase in production from large mines is balanced by recent closures of some medium-sized mines, as noted above.

These expectations are reflected in industry and government investment. Industry expenditure on exploration peaked in 1997 and has declined since, in line with national trends. Interest in Victoria has been sustained in part due to the recent availability of advanced geological and geophysical data

through NRE's Victorian Initiative for Minerals and Petroleum (VIMP).

Innovations in all aspects of mining—exploration, excavation of ore, extraction of gold from ore—continue to generate interest.

In recent years miners, including those active in the study area, have increasingly adopted new measures to improve environmental management, including:

- low impact exploration techniques such as tagging and avoiding significant vegetation, drilling from existing tracks, and using trays under machinery to prevent oil or fuel contamination of sites;
- procedures to minimise the impact of mining, such as removal of topsoil prior to mining (for replacement after mining), and assessment of vegetation and collection of seed prior to mining as a basis for post-mining indigenous revegetation;
- measures for high quality rehabilitation of sites after mining, such as topsoil storage and replacement post-mining, and species-rich revegetation with plants of local provenance; and
- compensation for habitat lost as a result of mining, through measures such as transfer of freehold land with indigenous vegetation to the Crown.

Low impact exploration techniques have been successfully employed in the Box-Ironbark study area at Deep Lead near Stawell in the late 1980s, and in what is now Chiltern Box-Ironbark National Park in the early 1990s. The procedures employed in these operations provide good examples of the standard which would be appropriate to apply to all exploration in the study area, given the importance of all native vegetation for the conservation of natural values.

Responsible miners now routinely incorporate the measures listed above into exploration, mining, and rehabilitation operations.

5.5 Issues

In the first century or so of Box-Ironbark gold mining, little attention was given to the effects of mining on environmental or other values, often leading to widespread and severe environmental

degradation. Some of this damage remains conspicuous today, and is even part of the interest of historic places such as Diamond Hill Historic Reserve (near Bendigo) and Eldorado Gold Dredge (near Beechworth). In recent years, the diverse and significant values of Box-Ironbark forests and woodlands have been more widely appreciated, and many modern miners have responded accordingly. Nonetheless, several contentious issues remain.

Loss of values

A major issue is the loss of key values in works areas where most or all native vegetation is removed, where major earthworks are undertaken, and where public access is excluded. These activities typically impact severely on biodiversity, historic, landscape and recreational values.

The impacts can be disproportionate to the area affected because some of the most productive areas for mining are key sites for many values—gullies for flora and fauna, hilltops for landscape and recreation, and old goldfields for historic features. Both historic and modern mining have adversely affected large old trees, natural deep soil profiles, and flora and fauna species with populations confined to small areas which happen to coincide with the more productive areas for alluvial gold.

Impacts can be permanent if, for example, historic or natural features are destroyed, or pits, tailings dams, earth heaps or walls are left—although in recent years, only pits have been permanently left, covering a relatively small total area.² Other impacts can be temporary, particularly when sites are comprehensively rehabilitated to a high standard, but some of the most important and depleted features, notably large old trees, will take very many decades to re-establish.

Where mining is permitted within the conservation reserve system (for example, Inglewood Flora Reserve and Nagambie Bushland Reserve in recent years), it would be expected that high standards would be achieved in amelioration of, or compensation for, impacts. In some cases, this has not occurred; for example, Inglewood Flora Reserve.

Cumulative area affected

The total area subject to mining at any one time is small; only 0.3% of Box-Ironbark public land was

disturbed by mining in one assessment undertaken in 1996.² However the cumulative effect of these comparatively small areas of disturbance, over the many decades required for Box-Ironbark eucalypts to mature, can result in more substantial disturbance in some areas. For example, in one area near Maryborough, 4% of public land was cleared in the ten years to 1994. While much of the currently evident disturbance results from historic mining, it is important to ensure that the mistakes of the past are not repeated in the current period of reinvigorated mining. Low impact exploration, careful location of mining activities, compensation for land disturbed, and high quality rehabilitation can significantly ameliorate this problem.

Undervaluation of public land

While some works can only be located on public land (necessitating the removal of native vegetation), particularly if that is where the gold occurs, in many cases there is nearby or adjoining cleared freehold land where works, particularly infrastructure, could be located. In the past, public land has often been preferred to private land simply because it is seen as being more readily available or of little value. Doze and detect mines are very rare on private land, for example. With greater recognition of the values of public land and the now greatly depleted indigenous vegetation of the study area, this approach is no longer appropriate.

When planning to take areas out of agricultural production, miners are required under the *Mineral Resources Development Act 1990* to provide a statement of economic significance to demonstrate that the venture is reasonably likely to be of net benefit, but no comparable test is required for forested public land. While public land values and economic values are less directly comparable, a comparison based on statements of economic and ecological significance would assist in clarifying the basis for decisions on the approval or otherwise of applications.

Establishing environmental standards (or codes of practice)

The commitment to, and quality of, environmental protection in exploration, mining and rehabilitation has improved significantly in recent years.^{3,4} Nonetheless, the standard of environmental protection in some operations has been well below that achieved by the most responsible operators. There are recent examples of poor practice and

forfeiture of bonds which were not adequate to cover subsequent rehabilitation, indicating that the conditions specified in at least some mining licences were below the current industry standard.⁵

A consistent and high standard, specified in all mining licence conditions, would also greatly assist in the establishment of research and monitoring programs to further improve environmental protection measures. Such work is particularly needed in relation to post-mining restoration of indigenous biodiversity, which is in its infancy in Box-Ironbark environments.^{6,7,8} A recent NRE assessment indicated that recent restoration programs in the study area had generally been successful in returning indigenous vegetation cover to sites, but less successful in controlling of weeds and effecting the return of biodiversity.²

5.6 Community views

The mining industry and others have emphasised a number of positive aspects of mining including its contribution to the Victorian economy, the relatively small area affected by mining at any one time, and the potential for increased production (including from areas not currently considered highly prospective) with improving technology. The importance of continued access to large areas of public land for exploration was strongly emphasised. Several examples of recent significant improvements in environmental management associated with exploration, mining and rehabilitation, were also highlighted.

In contrast, many submissions expressed concern about mining as the cause of permanent or long-term loss of key Box-Ironbark public land values, especially nature conservation and recreation values. Other points raised included:

- the slow recovery rates of Box-Ironbark eucalypts and their dependent fauna;
- several examples of poor or irresponsible practice;
- the cumulative area affected by mining, especially numerous small, short-lived operations; and
- the undervaluing of public land and consequent doubts about the net benefit of less profitable operations.

Most proposals to address these problems involved stricter application and/or tighter conditions on exploration, mining and rehabilitation, or exclusion of mining from large areas, typically through the creation of national and state parks.

5.7 Achieving a balance

Both mining and conservation of natural and cultural heritage, especially biodiversity conservation, in Box-Ironbark forests and woodlands are of great importance to Victoria and Victorians. A very high proportion of Box-Ironbark public land is of interest to miners, but contains significant conservation values which are susceptible to impacts resulting from mining.

In order to realise the wealth-generating potential of Box-Ironbark mining, access will be required to a large proportion of the study area, and particularly key areas such as known goldfields. In order for Box-Ironbark biodiversity to be maintained, and in the long term to recover, it will be necessary to ensure that some key areas are not disturbed, and to ensure that disturbance to native vegetation is minimised over the study area.

Strategically located state and national parks, which are exempt from mining, are the most appropriate mechanisms to protect key areas such as the habitat of the Bendigo pink-tailed worm-lizard population, and landscapes of large old trees. Parks can be sited in areas of least interest to miners, in particular away from known goldfields.

Over the vast majority of public land, mining should be permitted with environmental best practice measures (as already adopted by the most progressive miners) codified as the industry standard. Public land outside national and state parks, with significant natural, cultural or recreational values can be available for mining but afforded extra protection, scrutiny and appropriate management through nature conservation reserve, historic and cultural features reserve or regional park status, where mining is restricted but not exempt.

This approach will permit a vigorous world-class mining industry to operate in conjunction with a high level of protection for the region's significant natural, cultural and recreational values—featuring a comprehensive, adequate and representative reserve system.

PRINCIPLES

Because of the historical depletion and current diversity and significance of natural, cultural, and recreational values, high standards are required of exploration, mining and rehabilitation in Box-Ironbark forests and woodlands. These standards should be applied consistently to all mining operations, with the extent of the values potentially or actually lost being the main factor in variations. They should augment, rather than replace, existing environmental protection measures, such as controls for the retention of native vegetation under the *Planning and Environment Act 1987*.

General principles

Removal of native vegetation should be minimised.

As a planning principle, surface mining should not be precluded, but preference should be given to underground mining.

Low impact exploration

Key elements of low impact exploration are:

- (a) preliminary vegetation and fauna habitat assessment to identify and mark areas or sites to be avoided during exploration works;
- (b) drill sites located on or adjacent to existing tracks where possible;
- (c) trays or similar apparatus installed beneath machinery to protect ground and vegetation from oil or fuel leaks or spills;
- (d) foot traffic around works areas being confined to existing tracks or duckboards or similar structures being installed to protect vegetation and minimise soil compaction;
- (e) washing down earthmoving equipment prior to entering works area to minimise risks of introducing pollution and exotic organisms; and
- (f) after exploration, all introduced materials being removed, drill holes capped, and leaf litter spread over drill hole sites.

Mining

Key elements in minimising the impact of mining are:

- (a) a detailed flora survey as a basis for post-mining revegetation;
- (b) removal and storage of topsoil for replacement post-mining;
- (c) collection of indigenous vegetation seed from any areas to be cleared; and
- (d) compensation, both for temporary or permanent loss of native vegetation, or other natural, recreational or cultural heritage values, to be paid by the presentation of suitable equivalent private land to the Crown for addition to the Crown land estate (preferably near an existing conservation reserve to which it can be added), rehabilitation of nearby existing degraded areas, or by other appropriate means.

High quality rehabilitation

Key elements of high quality rehabilitation are:

- (a) replacement of topsoil retained prior to mining;
- (b) revegetation with local provenance indigenous plants—at least 70% of the pre-mining species-richness should be achieved;
- (c) replacement of fallen timber collected from vegetation removed prior to mining; and
- (d) subsequent weed and erosion control until restored vegetation is established and stabilised.

RECOMMENDATIONS

- R14** (a) The existing set of public land use categories and their classification under *the Mineral Resources Development Act 1990*, and existing provisions in the National Parks Act 1975 relating to mining in areas scheduled under that Act, be retained as the appropriate policy and legislative framework for the administration of mining on Box-Ironbark public land. In particular, reference areas, and national and state parks continue to be exempt from mining and exploration;
- except that for new national and state parks, or land added to existing national or state parks:
- (b) mining or exploration licences current at the time of Government approval of this recommendation be renewable at the discretion of the Minister for Environment and Conservation and after tabling in Parliament, until they lapse;
- and that:
- (c) mining licences may be granted within the area of such current exploration licences, at the discretion of the Minister for Environment and Conservation and after tabling in Parliament.
- R15** All works associated with exploration and mining be situated, where practicable, to minimise impacts on natural, cultural and recreational values, and especially to minimise removal of native vegetation.
- R16** All exploration licences issued over Box-Ironbark public lands include conditions to effect low impact exploration, in accordance with the principles outlined above. These licence conditions would be additional, rather than alternative to other conditions specified by the responsible authorities.
- R17** Proposals to clear vegetation on public land in the Box-Ironbark study area for mining should demonstrate that the benefit to the community will exceed the value of the natural, recreational and cultural heritage lost prior to approval.
- R18** All mining licences issued over Box-Ironbark public lands include conditions to effect high quality mining and rehabilitation, in accordance with the principles outlined above. These licence conditions would be additional, rather than alternative to other conditions specified by the responsible authorities.
- R19** Bonds should be adequate to provide for best practice rehabilitation, relevant departmental costs, and amelioration of any difficult chemicals resulting from mining or processing, such as arsenic or cyanide.

Information Sources

- ¹ Perseverance Exploration Pty Ltd (1996).
- ² NRE (1998b).
- ³ AMEEF (1999).
- ⁴ ANZMEC (1994).
- ⁵ Grollman *et al.* (1994).
- ⁷ Williams and Van Praagh (1997).
- ⁸ Sprague (1992).

6 Apiculture

Honey bees (Apis mellifera) were first successfully introduced into Australia in 1822. They became widespread throughout native forests by the middle of the 19th century, in hive-based and feral populations.

Prolifically flowering eucalypts producing large volumes of nectar are a distinctive feature of Box-Ironbark forests and woodlands, and commercial bee-keepers keenly seek hive sites on public land in the study area when eucalypt flowering is prolific. The study area is by far the most important region in Victoria for commercial apiculture. Large, old, wide-crowned trees are considered by bee-keepers to be more reliable sources of nectar than small trees. Yellow box is the most highly prized Box-Ironbark species and this species is generally excluded from timber harvesting.

Bee-keeping is a highly mobile industry with apiarists continually monitoring nectar flows and climatic conditions. The majority of honey production in south-eastern Australia occurs between September and April. Hives are typically moved between five to seven sites during a season, according to seasonal flowering, site availability, or to prepare bee colonies for orchard or other crop pollination.

Large producers in particular move throughout Victoria and even interstate, complicating estimates of production from particular regions, such as the Box-Ironbark study area (see Section 6.2 below). Nonetheless, there is reasonable consensus in the industry that around 60 to 70% of Victoria's production of honey and other products, such as beeswax, comes from the Box-Ironbark study area.

There are 328 annual permits (1.6 km radius), and 695 three month permits (0.8 km radius) current for bee sites on public land across the study area. Commercial operators use about half the public land sites; the remainder are used by small-scale bee-keepers. Permits are not issued over popular public use areas or reference areas and their surrounding buffers, which are primarily set aside for the maintenance of ecosystems in as natural a state as possible (see Chapter 16).

Some sites on private land are strategically positioned to utilise nectar produced from adjoining public land. The range of bees from private land sites sometimes overlaps with public land licensed sites. It is estimated that around 60% of Box-Ironbark honey is derived from hive sites on public land; about 40% of Victoria's total honey production.

6.1 Current products and production

Nectar from box and ironbark species consistently produces large quantities of premium quality honey. Increasingly, varietal honey is produced from favoured species, especially yellow box, grey box or red ironbark. Apiarists also produce and sell beeswax, pollen and queen bees, and some are paid by orchardists to enhance pollination of fruit trees. On average, around 1 750 to 2 000 tonnes of honey are produced annually from Box-Ironbark public land, although there is considerable variation between 'good' and 'bad' years.

6.2 Economics and employment

The value of Box-Ironbark apiculture is difficult to quantify because of the mobility of larger producers. However, if Box-Ironbark production represents 70% of Victorian production and 60% of that production is from public land, the annual value from public land of all products to producers would be about \$4.1 million (see Appendix 3 for sources of economic and production figures). The proportion of processing attributable to 'public land' honey amounts to a further \$4.4 million annually. Nearly all this processing occurs within the study area, mainly by Capilano Honey at Maryborough.

Total government revenue received from bee site licences within state forest in the Bendigo Forest Management Area during 1994/95 was \$44 968 (or around 1.1% of the \$4.1 million gross value of

public land production to bee-keepers in the study area).

In 1996/97, there were approximately 2 200 hive owners, registered and unregistered, in Victoria, with a total of around 115 000 hives. Apiculture is a part-time activity for the majority of honey producers. Those with 50 hives or less account for 76% of registered producers, but own and operate only 17% of registered hives. Bee-keepers report that typical commercial sites in the study area would be stocked with 120 hives, each yielding an average of 30 kilograms during a good honey flow.

It is estimated that 66 full-time job equivalents for producers can be attributed to production from public land sites. Processing of 'public land' honey generates a further 13 full-time job equivalents, nearly all of these within the study area. On these figures, apiculture is the third largest industry on Box-Ironbark public land, after mining and tourism.

Trends

The industry has had relatively stable production levels throughout the 1990s, despite rising prices. Average prices received for honey increased by 26% over the period 1991/92 to 1996/97¹.

6.3 Issues

Potential impacts

Honey bees and apiculture have the potential to affect nature conservation values in a number of ways. Both feral and managed bees are highly efficient consumers of nectar and pollen, and may compete with native nectar-feeding species, including indigenous bees and birds.² Honey bees can aggressively displace native pollinators or simply reduce their food resources. Such competition can disrupt the complex plant-pollinator systems which have evolved between native plants and animals over thousands of years. Many plants require particular foraging behaviours to facilitate pollination and these behaviours may not be a feature of honey bee foraging.²

Loss of indigenous pollinators is a serious threat to flowering plant species around the world and has the potential to disrupt Box-Ironbark forest and woodland ecology. Feral honey bees may also compete with indigenous fauna for tree hollows, which are generally scarce in the Box-Ironbark

forests and woodlands. There are documented accounts of feral honey bees displacing native fauna, including threatened species in some instances, from hollows and nest boxes.³

As exotic animals, honey bees may be considered intrinsically out of place in conservation reserves, regardless of the nature of their effects on indigenous flora and fauna.

Public land areas not intended to be available for apiculture, such as reference areas and buffers, areas of intensive recreational use, and some ecologically significant and sensitive areas may be accessed from hives on nearby private land. This problem is compounded by the fragmented nature of Box-Ironbark public land.

Research

Despite a significant body of research, technical obstacles have constrained assessment of the impact of honey bee foraging on native nectar-feeding species and plant pollination. Relatively little research has addressed competition for tree hollows in the study area.

The occurrence of feral colonies tends to be very patchy but ranges from very low numbers in dry areas to nearly one per hectare where there are suitable hollows and access to water, frequently provided by fire dams in Box-Ironbark forests and woodlands.⁴

Feral bee colonies generally 'appear to occupy only a small proportion of available hollows... For many plants, feral and managed honey bees were the most frequent floral visitors, and often consumed more than half the floral resources being produced... Numbers of native bees may decline following influxes of honey bees into an area but data on this relationship were equivocal'.⁴ Research shows differing responses of honeyeaters to influxes of honey bees.

A major review of the impact of honey bees in Australia⁴ recommended research into the effects of introduced bees on a wide diversity of native flora and flower-visiting fauna, and into feral honey bee population dynamics and methods of removal.

To date there is little evidence which unambiguously demonstrates that honey bees have a substantial negative impact on native flora and fauna.⁵

Their long-term presence and widespread distribution make research difficult. Nonetheless, honey bees are introduced species which compete for floral resources with native fauna, suggesting some caution should be applied in parks and nature conservation reserves.

Little practical or research effort has been directed to the destruction of feral honey bee hives, but potentially effective options exist.³ Given the indications of an existing problem with feral bees, the identification and implementation of an effective control program is likely to have substantial benefits for both nature conservation and licensed honey production.

6.4 Community views

Several submissions were received from bee-keepers supporting their industry, pointing out its economic value, and questioning perceived adverse research results. In particular, apiarists submitted that access for apiculture, existing water points and current licence arrangements should be retained.

A similar number of submissions specifically opposed aspects of bee-keeping on public land and adjoining private land, because of perceived threats to natural or recreational values.

Conservationists and apiculturists both supported increased control of feral honey bees and a halt to harvesting of large, wide-crowned trees.

6.5 Achieving a balance

It is proposed that, generally, Box-Ironbark public lands, except reference areas and their surrounding buffers, remain available for apiculture, subject to the specific measures below. Licensed bee sites in state forest and parks and reserves should also continue to be available.

Land managers should continue to have the power to cease access to sites where honey bees are causing problems, for example:

- important regent honeyeater and swift parrot sites;
- sites that regularly attract large concentrations of native nectarivores, especially if threatened species are represented in those concentrations;
- areas with threatened plants whose pollination is likely to be disrupted by bees; and
- recreation sites where bee stings may endanger public safety.

Benefits to apiarists as a result of the recommendations in this report include:

- an increase in the numbers of large and wide-crowned trees in state forest and parks and reserves; and
- a systematic program to control feral bees across all public land.

RECOMMENDATIONS

- R20** That apiculture continue in state forest and minor reserves, and subject to Recommendation R22 below, in national and state parks, and nature conservation reserves.
- R21** That apiculture continue to be excluded from reference areas and buffers.
- R22** That land managers have the power to temporarily or permanently exclude apiculture from localised areas within national or state parks or conservation reserves where research indicates the effects of nectar removal by managed bees are most likely to be deleterious to natural or recreational values.
- R23** That all managers of public land continue to have discretion to restrict access or otherwise regulate use of areas where management problems arise as a result of access by bee-keepers.
- R24** (a) That an ecosystem-wide program be established to reduce feral bee colonies, focussed initially on areas likely to be most deleteriously affected; and
(b) that feral bee distribution be monitored.
- R25** That the means to regulate apiarists placing hives on cleared private land next to forests or parks, particularly where they may affect sites with sensitive values, be investigated.

- R26** That the Department of Natural Resources and Environment initiate a research program to investigate:
- (a) feral bee population dynamics and methods of removal; and
 - (b) the effects of introduced bees on native flora and flower-visiting fauna and, if this research demonstrates that there are significant negative ecological effects, particularly on threatened species; and
 - (c) the option of a long term phase-out from national and state parks and key nature conservation reserves be considered.

Information Sources

¹ ABARE (1998).

² Schwarz and Hurst (1997).

³ Trainor (1995).

⁴ Paton (1996).

⁵ Gibbs and Muirhead (1998).

7 Recreation

Recreational activities are enjoyed in Box-Ironbark forests and woodlands by both day visitors and 'tourists' (visitors who travel from elsewhere to stay overnight in the area). For simplicity, the emphasis of this chapter is on the recreational activities themselves, whereas the emphasis of Chapter 8, Tourism is on commercial aspects of longer-term visitors.

Surveys indicate that people make at least 114 000 visits to Box-Ironbark public lands for recreation per year.¹ Some of the most characteristic features of Box-Ironbark forests and woodlands make them particularly suitable and popular for a diverse range of visitors. For example, Box-Ironbark public lands are highly fragmented, with few areas remote from a private land boundary or sealed roads. More than 100 000 people live close to the forests, including several towns adjacent to, or almost surrounded by forest, most notably the large towns of Castlemaine, Bendigo and Maryborough.

Box-Ironbark forests and woodlands are open, safe, rarely have adverse weather or steep terrain, and are readily accessible year-round with extensive networks of good all-weather gravel tracks.

The forests also have several features of particular interest for some visitors: remarkable diversity and abundance of flora and fauna; ongoing prospects of gold nuggets; and historic landscapes and relics.² Bendigo residents, for instance, can go prospecting, bird watching, fossicking, orienteering, cycling, bushwalking, picnicking, car rallying, horse riding, visit historic sites, see wildflower displays, or just go for a simple walk or drive in the bush, all within an easy 15 minute drive from home.

Not surprisingly, the majority of visits are by locals; travelling times of less than one hour to visit a forest are much more common than longer trips. Box-Ironbark forests are of intense local importance to those who live nearby, and the forests are a key component of the lifestyle that has drawn many people to live in the study area.¹

Box-Ironbark forests and woodlands tend to lack a single focus or centre. Their openness and accessibility make them key areas for dispersed activities such as distance running, trail and mountain bike riding, horse riding, cycling, and simply walking in the forest. Gold prospectors, orienteers, car rally enthusiasts and naturalists in particular see Box-Ironbark forests as of statewide and even national significance.¹

Kooyoora and Warby Ranges State Parks, parks around Bendigo, and increasingly, Chiltern Box-Ironbark National Park are strong recreation nodes, attracting many visitors. Recreation trail development around Bendigo and Castlemaine appears to have increased use of the public land by those living right in the towns.

7.1 Recreational activities

Nature study

Box-Ironbark public lands are renowned for rich wildflower displays in spring and early summer, and for the variety and abundance of bird life. Field naturalists' clubs are active in all the larger towns in the region, and conduct regular excursions, along with special purpose activities such as mammal surveys or bird counts. Schools and universities conduct regular excursions in the forests. Generalist and special interest field naturalist groups, such as bird watchers, from outside the region also make regular trips to Box-Ironbark forests and woodlands.³

Nature study may be a part of other recreation activities. Most field naturalists are interested in the public land as a whole, including remnant vegetation on roadside verges and on private land.

Fossicking and prospecting

Prospecting is the use of a metal detector, hand tool, pan or simple sluice to search for gold or other metallic minerals, and requires a miner's right or mining licence under the *Mineral Resources Development Act 1990*. Fossicking is the use of these tools to search for relics or gemstones.

Through much of the study area, prospecting for gold or fossicking for relics at past mining sites remains an important recreational activity. Around Dunolly, Wedderburn and Tamagulla, searching for gold is the main recreation. A number of businesses offer fossicking tours, and sell or hire detectors, maps and guidebooks.²

Generally, gold prospecting with metal detectors is a relatively low impact activity. Hand tools are used to dig up gold or metal pieces found. As a condition of their miner's right, prospectors are required to fill in any holes dug and to repair any other damage caused.

Results of a Prospectors and Miners' Association of Victoria survey indicate that 89% of respondents prospect in the 'Golden Triangle', bounded by Dunolly, Inglewood and Wedderburn. Of the 596 prospectors surveyed, 62% were hobbyists; 31% part-time, and 7% full-time prospectors. The average number of trips per year was 19. Gold found was normally kept rather than sold. Prospecting is seen mainly as an opportunity to get into the bush for health, recreation and holidays.

Fossicking and prospecting are attractive activities for a wide cross-section of the public, and many submissions highlighted its popularity among retired people. The chance of finding gold is important, but camping in the bush, relaxation, and 'getting away' are also important.

Purchase of a miner's right (\$18 for 2 years) entitles the holder to search, provided no damage is done to native trees or shrubs, Aboriginal places or objects, or archaeological sites. Prospecting and fossicking are not permitted in national parks, in areas gazetted under the *Heritage Act 1995* as heritage and archaeological places, in reference areas and in other specifically excluded areas. Prospecting is permitted in designated areas in state parks.



Prospecting with a metal detector is a popular recreational activity on Box-Ironbark public land

Bushwalking

Visitor surveys indicate that Box-Ironbark forests are used relatively little for bushwalking at present, with availability of water in summer a restraint.¹ However there is potential for rewarding overnight walks in the St Arnaud Range, Mt Pilot Range, Bendigo area, Rushworth Forest, Pyrenees Range, and the forests stretching from Tamagulla past Dunolly and Wehla to Kingower and Inglewood. Many of the smaller public land blocks offer day walk opportunities, along the numerous tracks or gentle ridges.

Orienteering

Orienteering is a sport combining cross-country running or walking and map-reading. Rogaining is similar, but includes an overnight component. Orienteering events range from local competitions attracting around 30 to 40 participants, to national and international meetings attracting over 1 000 participants and lasting several days. One or two local events are held in Box-Ironbark public lands each month, along with four or five State events annually. Orienteers make around 4 000 visits to public land in the study area each year.¹

Orienteers seek areas of moderate steepness, relatively open forest, and complex features. Box-Ironbark forests around Castlemaine, Bendigo, Heathcote, and Beechworth are of importance to orienteering because of their topographic suitability, proximity to Melbourne, relatively open landscapes, and their complexity due to past mining activity, or granite boulders and outcrops.

While orienteering may damage rare or delicate plants, potential conflicts can usually be readily overcome with careful management.

Car touring and car rallies

Car touring is highly popular in these very accessible public lands. Box-Ironbark forests and woodlands are ever-present on the hills framing many highways and other major car touring routes, and contribute greatly to the scenic appeal of these routes. Car rallies currently make frequent use of parts of Rushworth State Forest, and other smaller forests, with the approval of NRE.

Heritage appreciation

Heritage values are another key feature of the study area, particularly relating to Aboriginal, mining, timber industry and settlement history.² With interpretation and education, use for heritage recreation will almost certainly increase in future. Archaeological relics, whether Aboriginal or from post-settlement times, are protected under existing legislation.

Trail bike riding

The extent of damage from off-track use is generally limited, but may be more severe in steep or erodible areas close to population centres. Damage is expected to reduce with education and provision of purpose-built venues.

Firewood collection

Some collectors consider this to be a recreational activity. Some areas now available will become unavailable as a result of recommendations in this report. In state forest areas, firewood collection will continue. Improved supervision and regulation is necessary, along with an education campaign to discourage illegal or inappropriate collection.

7.2 Recreation trends

A gradual increase in recreation and some additional opportunities for Box-Ironbark forest recreational users are expected. Many current activities will increase, with interpretation of the new parks and reserves, and increasing awareness of these forests in the urban centres in the region, and in Melbourne.

Recreational demand may change relatively quickly.¹ This was the case with mountain bike and metal detector use. There has been an increase in metal detecting activity in recent years but this may reduce if the rate of gold discovery declines or increase if, for example, improved detectors become available. Trail bike activity has reduced in recent years.

Population growth, particularly around Bendigo, Benalla and Wodonga, together with an ageing population suggest an increasing role of Box-Ironbark forests as sites for local, relatively informal, low cost recreation.

7.3 Issues

Numerous recreational activities in Box-Ironbark forests are, by their nature, dispersed. This makes provision of facilities more difficult. Car rallies and orienteering events must be conducted in areas which have not been used for some time. Prospectors are generally not interested in searching the same areas over and over. Individuals living throughout the Box-Ironbark forest areas have local, rather than centralised, places where they run, walk the dog, ride horses or study the birds and plants.

Recreational nature study may have localised, generally minor adverse environmental effects; for example, trampling of vegetation or disturbance to nesting birds. Trampling by enthusiasts and illegal collection of orchids and other plants is a major threat to some rare species. Further development of nature or heritage-based tourism in Box-Ironbark forests may lead to particular pressures on vulnerable sites, or to disturbance of plants and animals.

Trail bike riding, when it occurs off formed tracks, damages vegetation and soil and has been a chronic localised problem, concentrated around centres of population, and in parts of steeper areas

such as the Pyrenees. Riding registered trail bikes on formed tracks is a legitimate recreational activity. Steep tracks may suffer erosion in wheel ruts, and some are seasonally closed to all vehicles. Most problems arise from illegal off-road riding, and may be rectified with education, enforcement and other management strategies, such as the provision of special areas. Increasingly mountain bike riders use the same areas and can cause similar damage although generally at a lower level.

Weed invasion sometimes associated with horse droppings appears not to be an issue on the relatively hard dry tracks of the Box-Ironbark public lands. There are few instances of horse riders failing to stay on the tracks.

Fossicking and prospecting can have impacts on environmental and heritage values. While most fossickers and prospectors are responsible, some metal detector operators fail to fill in dug holes, although the overall impact is relatively small in view of the number of prospectors and fossickers.

Other problems such as vehicles driving or parking off roads occur on occasion with fossickers as with other recreational users. Some prospectors rake the ground clear of leaf-litter and sticks, and sometimes drag a chain behind them to mark where they have been. Even though the litter is sometimes raked back, ground habitat is disturbed, and smaller plants damaged in the process.

Prospectors and fossickers often focus on old alluvial workings along drainage lines, which are of particular importance for nature conservation (see Chapter 4). Historic sites may also be damaged by fossickers and prospectors, who sometimes focus on the remains of puddlers or around the foundations of old buildings. Inadequate marking of sites where fossicking is not permitted can lead to accidental or deliberate transgressions occurring. Rare instances of illegal use of machinery such as bob-cats have occurred.

Education, reinforcement of the need for responsible operation through voluntary codes and newsletters prepared by groups such as the Prospectors and Miners Association of Victoria can assist with these concerns.

Proximity of towns to the forests results in illegal rubbish dumping and unlicensed removal of stone

or firewood. Smashed bottles and vandalism are evident at some sites.

Recreational impacts may change over time. While the impacts of some activities may be satisfactorily managed by providing specific zones for certain activities (such as areas for four-wheel driver training) or designating areas for different levels of protection, problems may remain. The numerous small areas with significant historical, cultural, or natural values are difficult to signpost. Informing users of the location of such sites is hard as users may come from different directions and may use various maps or guides.

7.4 Community views

A significant number of submissions focussed directly on recreation and tourism, many on specific areas. Several of these were in favour of conservation-based nature tourism and heritage-based tourism. Other submissions called for retention of public access to all Box-Ironbark forests for all present recreation activities.

Many submissions supported new parks and reserves, often with specific local or regional proposals highlighted. These submissions often have a recreation perspective; that is, the authors visit these areas and want them protected. Recreational aspects such as wildflower and scenery appreciation, and activities such as walking and riding, are highlighted in these submissions, rather than a purely conservation viewpoint.

7.5 Achieving a balance

Recreation is a component of appropriate use of most public land use categories, except reference areas, and areas set aside for services and utilities and earth resources. Contrary to the view expressed in many submissions, national and state parks are not 'locked up' with recreation excluded. Such parks are available for a range of recreation activities based around the mainly natural settings of the parks. Parks Victoria visitor statistics illustrate the large numbers of people travelling to parks and reserves for these forms of recreation.^{4,5}

Regional parks are primarily intended for recreation in natural settings but significant conservation and other values are also protected. The proposals in this report retain and endorse existing regional parks at the popular

Mt Alexander Regional Park; expand the park system with large additions to Ararat Hills and around Bendigo, incorporating Eaglehawk and One Tree Hill Regional Parks; and add new regional parks at Heathcote and St Arnaud.

Driving (including four-wheel driving) and riding (including bicycles, trail bikes, and horses) are permitted on roads and formed tracks in national and state parks, other parks and reserves, and state forests, except where tracks are seasonally

closed. Off-road driving and riding is not permitted in any public land except in specially designated areas. Camping, picnicking and barbecues are encouraged in appropriate areas in parks and state forests.

In general, current policy regarding appropriate activities in parks and reserves will be maintained. As a result, some activities now permitted in state forests would not be permitted to continue if these areas are reclassified as new parks.

RECOMMENDATIONS

Recreation

R27 That Box-Ironbark public lands be used for a range of recreation activities appropriate to the land use category, for community enjoyment and appreciation.

Prospecting

R28 That prospecting be generally permitted on public land, with the following exceptions:

- (a) permanent exclusion from areas where evidence suggests it may adversely affect significant natural or historic values, as specified in management plans; and
- (b) exclusion from national parks and reference areas.

R29 That prospecting be allowed in state parks specified in Chapter 13, in accordance with Note 1 below.

R30 That 'raking' as a prospecting aid not be permitted on public land.

R31 That land managers monitor areas favoured by prospectors, and respond appropriately if excessive damage to historical, natural or landscape values, is occurring.

R32 That the prospecting community be supported in developing a code of conduct to address in particular the issue of unfilled holes, and minimising damage to sensitive vegetation.

Orienteering

R33 That orienteering and rogaining be permitted at the land manager's discretion in all land use categories except:

- reference areas;
- domestic water storage areas; and
- nature conservation, or other, reserves where sensitive natural features are vulnerable to disturbance.

Car rallies

R34 That car rallies be permitted on formed tracks at the land manager's discretion in state forests.

Trail bikes

R35 That land managers endeavour to provide some dedicated areas for off-road trail bike riding where significant demand exists.

R36 That otherwise, trail bike riding be restricted to formed tracks as per current practice.

Education

R37 That the land managers develop educational programs to encourage:

- (a) increased use of Box-Ironbark public land for recreation; and
- (b) responsible use of Box-Ironbark public land.

Note 1: Metal detecting should be permitted in designated zones, located to avoid significant park values, notably threatened small ground-dwelling animals and plants, which may be damaged as a result of fossicking or prospecting, while providing discretion for park managers, particularly in gaining compliance. These zones should be developed as part of the standard management plan process, consulting with representatives of prospectors who use the respective park areas. This variation is not intended to affect current arrangements for metal detecting in existing state parks in the study area or elsewhere in Victoria.

Information Sources

- 1 Brookes (1997).
- 2 Stone and Dunnett (1993).
- 3 Calder et al. (1994).
- 4 Read Sturgess Associates (1999).
- 5 Read Sturgess Associates and Henshall Hansen Pollock Associates (1995).

8 Tourism

Tourism on Box-Ironbark public lands is essentially driven by the same recreational activities described for day visitors in Chapter 7. Tourism Victoria defines tourists as those who have travelled at least 50 km for a day trip or overnight stay. Tourists therefore bring added commercial benefits to the region in the form of expenditure on accommodation, meals and other activities. While Chapter 7 focussed on the recreational activities themselves, this chapter concentrates on commercial uses associated with these activities.

Characteristic aspects of the Box-Ironbark forests and woodlands are its distinctive and diverse vegetation and fauna, eucalypt nectar quality, gentle topography, dryness, public land fragmentation, accessibility and history of intensive use. These factors give this area its identity, and its value for tourism.

Box-Ironbark public land does not have many spectacular destinations, but the forests provide the setting for many tourist visits to the region, and almost every block has features of interest to tourists. Most areas of forest have abundant bird species, for both guided beginners and expert bird watching. Many blocks have seasonally impressive wildflowers including a wide variety of orchids, which are ideally appreciated by a guided visit. Basic spotlighting trips would readily be rewarded by relatively common fauna, with the surprise appearance of a rare or threatened species always a possibility. The 'hit or miss' nature of such activities is part of their appeal. Guided or expert trips particularly to areas with large old trees and gullies, would increase the success-rate of spotlighting. In other areas, individual very large trees are attractions in themselves.

Some areas have an array of significant historic features, while many other blocks are scattered with historic features. There are numerous vantage points, some with scenic lookouts, such as Mt Pilot, the Warby Ranges, Mt Black, One Tree Hill near Bendigo, Melville Caves, Mt Korong, Mt Tarrengower, and the St Arnaud Range.

Relatively large tracts of forest are suitable for several days walk. Car-based camping is an established and popular activity (for example, Reedy Creek near Beechworth, Lake Eppalock, Kooyooora State Park, Teddington Reservoirs); while adjoining water bodies are popular for water-based recreation or scenery. Accessible water storage areas include Eppalock, Waranga, Cairn Curran, Lake Nagambie, Mokoan, Laanecoorie, Teddington, Lonsdale, and potentially, Crusoe.

Tourist drives (for example, the Goldfields touring route, Sunraysia Highway) travel through Box-Ironbark forests. The public lands are very accessible with good local bitumen or gravel roads into the forest and major roads from Melbourne and other large centres. Major and secondary highways and several large towns are close to the Box-Ironbark forests and the forests are nearly always a highly visible feature of the landscape.

The region is within easy driving distance of Melbourne, and weekend tours to the region are now popular. It is well suited to overnight trips, and is only slightly affected by seasonal conditions. An element of people's pleasure in car touring to this region is the scenic backdrop of forested hilltops, with semi-cleared land winding up the tributary valleys. Forest scenery provides the setting for historic gold towns such as Maldon and Beechworth.

National and state parks facilitate rather than restrict access to public land areas. In fact, national, state and other parks in Victoria have approximately 14 million visitors per year,¹ while state forests have around 3 million visitors per year.² These visitors provide flow-on benefits to local communities through local expenditure and organised tours.

8.1 Economics and employment

Tourists to Box-Ironbark parks and reserves account for at least 214 000 visit days per annum. Total income to the area from tourism is estimated to be \$8 million. Direct expenditure on tourism to public land in the study area generates an estimated 90 full-time equivalent jobs.³

Prospecting is an important component of tourism on public land in the study area, and generates a significant proportion of tourism expenditure (perhaps as much as 20% of the total visitor expenditure) in towns in the area, particularly Dunolly, Inglewood, Maryborough, St Arnaud, and Wedderburn.

8.2 Tourism promotion

In the Box-Ironbark study area, tourism has generally been managed by local tourism boards or associations, often in conjunction with local shires and Tourism Victoria. Tourism Victoria has included the Box-Ironbark region in several of its car touring promotions—the Goldfields, Midland, Murray Valley, Capital and Country, and Great Victorian tours. However these promotions do not generally feature public land values. Tourism Victoria's website does feature Bendigo Bushland Trail and Woolshed Falls Historic Walk (Beechworth).

The principal tourism attractions of the study area include urban centres; historic and cultural attractions; wineries; parks and reserves on public land that attract recreational use; ecotourism; the lure of gold; bird watching; and rock art in some areas. Despite good access to the forests, the visitor rate to public land is still relatively low but could be substantially increased with identification of local destinations, interpretative material and marketing.

Major tourism proposals involving Box-Ironbark public land include:

- the Diggings project—heritage trails around Castlemaine, Maldon and Chewton;
- Bendigo Steam World and Heritage Railway, on V-Line and restored track linking Maryborough, Maldon, Bendigo and Echuca;
- Dunolly historic village project;
- Whroo interpretative centre, near Rushworth;
- Legends Trail; and
- Bushrangers National Hall of Fame (Benalla area).

In the ECC's proposals, key sites that have the potential to be marketed and increase tourism are the:

- Mt Pilot addition to Chiltern National Park;
- St Arnaud Range National Park;
- Greater Bendigo Regional Park; and
- Wehla addition to Kooyooora State Park (large old trees).

An LCC report in 1997⁴ concluded that a promising future for tourism was indicated by the increasing number of initiatives to actively attract tourists to the public land, and a similar increase in cooperative endeavours between shires, tourism organisations, and land managers. It remains questionable, however, whether such recreation activities are sustainable, and whether income from recreation and tourism activities can contribute to the conservation, and perhaps restoration, of the forests.

Tourism is essentially recreational travel. Tourists may visit forests deliberately, by chance having travelled to an area for other reasons, or may pass through forests on the way elsewhere. On public land, some features are seasonal, such as wildflowers, while others are year-round, such as historical sites and prospecting. Numerous public land features are site-specific, and could be included in tourist routes developed for other purposes, such as winery tours and conferences.

Box 8.1 The Chiltern experience — A case study

Despite formal quantitative evidence, it is clear, anecdotally, that the declaration of Chiltern Box-Ironbark National Park in 1997 has increased visits to the park and to Chiltern.

There are many people who travel through the region for other reasons: such as visiting wineries; travelling the Hume Highway; and going to Beechworth or other historic towns for the weekend or an event (such as the Wangaratta Jazz Festival). Quite a few of these travellers turn off and stop in Chiltern, and many drive through the park. It is difficult to determine exact numbers, as there are approximately ten park access points.

Users of the national park include:

- bird watchers (including international visitors using internet information on recent sightings)
- wildflower enthusiasts
- field naturalists
- bushwalkers
- mountain bikers
- orienteering groups
- rogaining groups
- school environmental education groups
- regional and local people for recreation/picnics
- tourists driving through on their way elsewhere.

Economic impact is difficult to assess as it is necessary to consider those that come and stay to visit the national park, watch birds and bushwalk (or other activities) and also the day visitors. Visitors spend money on accommodation, meals, petrol, camp sites and food supplies. Chiltern residents interviewed did not necessarily attribute additional employment to the declaration of the national park, however business had increased at some shops, and all could see the benefits of visitors to the town. No businesses had closed during that time. Therefore, it would be fair to say that some proportion of employment is due to new tourists who come to visit the park.

No person interviewed was negative about the park or its establishment. In most cases, interviewees expressed how positive the national park was for the town. Some commented that because people come to visit the park to watch birds or bushwalk, the locals have learnt more about their own environment and its values and are using it more. This applies to other residents from the surrounding region; for example, people who live in Wodonga, Beechworth, Rutherglen, Wangaratta and Yackandandah.

While some forest areas may be tourism attractions in their own right, the role of the Box-Ironbark forests in tourism is less developed and more low-key. These forests receive little marketing compared to more spectacular areas, such as the Alpine area or the Grampians. It is worth noting however, that some travellers do not think of themselves as tourists, and prefer to visit places which are not seen as 'tourist traps'. For such individuals low-key development may be an attraction in itself.

It is not clear to what extent regional tourism visitor figures, derived from surveys of accommodation providers and visitor centres, overlap with visitor figures for forest areas. In some of the smaller towns prospectors make up both the largest group seeking accommodation and the largest group visiting public land. In the larger towns, it appears that many tourists have limited access to information on forest visits; a large proportion of tourism in Box-Ironbark regions (for example tourism in Bendigo), may be unrelated to public land.

On the other hand, many visitors to public land either do not stay overnight, or camp in the forest, in each case not contributing to tourism accommodation figures.

Designation as a park and subsequent marketing, does, as a general principle, tend to significantly increase visits to public land. Marketing could aim at achieving extra nights from many business visitors, and getting highway travellers to visit again and appreciate Box-Ironbark forests.

Prospecting tours to the Box-Ironbark area are popular, and now provide a major component of caravan park clientele in some areas. With marketing, additional prospectors could perhaps utilise and increase motel beds.



The Maldon tourist railway is a popular attraction which combines two quintessential Box-Ironbark themes: gold rush era history and a leisurely journey through scenic open forests.

8.3 Industry trends

The Australian tourism industry has shown sustained growth, and is an important source of employment. Various estimates attribute around 5% of all employment directly to tourism. In the period 1985-94 annual employment growth in tourism of around 5% exceeded overall employment growth of 1.8%.³

According to the Australian Tourist Commission,⁵ there is an increasing proportion of tourists with a greater awareness of ecological issues. Such tourists often have a preference for outdoor activities and seek experiences in touch with nature. However, tourism growth has not been uniform across the country. In Victoria the rate of growth in hotel and motel rooms sold from 1991 to 1994 was the second lowest of all states (12% over the 3 years), and occupancy rates remained well below the levels achieved in the 1980s.

The easternmost Box-Ironbark forests such as the Chiltern-Beechworth forests are close to areas which attract relatively high numbers of tourists, or through which large numbers of tourists pass. Further west, however, Box-Ironbark forests and woodlands are in areas which attract only a small proportion of Victoria's tourism dollars. Accommodation takings in the region bounded by Bendigo, Castlemaine, Maryborough and St Arnaud amount to approximately 3% of the Victorian total.

A range of factors including economic conditions, marketing, and facilities or programs developed for tourism, will determine the future of tourism in Box-Ironbark forests and woodlands. The role of public land in future tourism will also depend on several factors, including how it is managed for recreation and the development of cooperative arrangements between shires, tourism organisations and public land managers.

Positive examples of such arrangements include the Bendigo Bushland Trail and the Castlemaine Diggings Project. In the long to medium term, the condition of the forests themselves will be crucial. Important factors may include the diversity and abundance of understorey flora, control of erosion and litter, whether sufficient gold for prospecting remains, the visual and natural appearance of the forests and, particularly, the sizes and numbers of larger trees in the forests.

There is a worldwide trend towards tourism that contributes to environmental sustainability. The future attraction of the Box-Ironbark forests and woodlands for tourism, as distinct from local recreation, may depend on how restoration of the forests proceeds, and to what extent such restoration is underwritten by income from tourism.

Domestic tourism is expected to experience modest but real growth, that is, to grow slightly faster than the population. Such growth will depend on better marketing of existing tourism products and the development of new attractions, including national and state parks.

8.4 Community views

Many submissions supported tourism development, particularly new approaches based on the unique character of particular areas, such as nature-based or ecotourism. Tourism was seen by many as a favourable alternative public land use to extractive

industries like timber harvesting and mining, which might be better moved to private land. Such developments allow Box-Ironbark forests to be seen as a generator of employment and economic benefit. The need for careful planning of tourism developments was, however, acknowledged.

Other submissions supported particular proposals to promote tourism, such as sealing the Graytown–Rushworth Road.

8.5 Achieving a balance

In line with increasing tourism, particularly nature and heritage-based tourism, the ECC's proposals seek to increase the Box-Ironbark park and reserve system. The park and reserve system provides a focus for gradually increasing tourism to this fascinating and accessible area. This is expected to increase regional employment in tourism and related services, without having a major impact on existing industries using the forest.

At the same time, the importance of tourism based on prospecting, and its dependence on continued access to key areas, has been a significant factor in the development of this system of parks and reserves.

It is important that a range of visitor sites are developed and promoted, to avoid over-use of specific places.

If adopted, the proposals in this report will:

- raise the status of several key areas of public land, assisting tourism promotion;
- increase public land tourism in Box-Ironbark forests and woodlands; and
- generally retain access for prospectors to popular areas.

RECOMMENDATIONS

- R38** That Tourism Victoria, NRE, Parks Victoria, regional tourism boards and local government develop coordinated programs to increase public land tourism in Box-Ironbark forests and woodlands.
- R39** That land managers explore opportunities to assist tourism promotion in the recommended new parks and reserves, and in state forests.
- R40** That the specific strengths of the Box-Ironbark study area, such as gold, flora and fauna, and heritage, be used in tourism promotions.

Information Sources

- ¹ Read Sturgess Associates (1999).
- ² Read Sturgess Associates and Henshall Hansen Pollock Associates (1995).
- ³ Essential Economics and Read Sturgess Associates (1998).
- ⁴ Brookes (1997).
- ⁵ Australian Tourist Commission (1995).

9 Wood products

Box-Ironbark forests are an important source of regional and local timber for a variety of uses, from high quality sawn timbers to firewood. This chapter outlines wood production matters, while forest management is discussed further in Chapter 15.

Box and ironbark woods have various properties distinguishing them from products from taller, faster-growing forests along the Great Dividing Range. Their density makes them high quality firewood. Their durability makes them resistant to insect (particularly termite) and fungal attack and therefore highly favoured for farm fencing and other in-ground uses. The strong colour, grain and often interesting figure of kiln-dried box and ironbark timbers make them sought after for furniture manufacture.

In the past box and ironbark timber was sought for:^{1,2}

- heavy construction timbers for bridges and pier piles;
- railway sleepers, particularly during the expansion of railway lines 100 years ago, and the later peak in 1960/61;
- farm fence posts, with peak production in 1953/54;
- firewood, particularly during the 1940s and early 1950s; and
- small volumes of electricity, telephone and farm shed poles.

All those markets have declined and substitutes have become widely available. Firewood had a resurgence in the 1980s and 1990s with the development of wood-burning slow combustion heaters.

9.1 Current products

The highest value timber products from Box-Ironbark forests, in terms of contribution to the economy per cubic metre, are sawlogs. NRE Forests Service's long-term goal in Box-Ironbark forests is to optimise sawlog supplies and maximise value-added products. This strategy has the added advantage of allowing stands to reach a greater level of maturity than the current forests.

The estimates in Table 9.1 below are based on prices at the firewood, post or sleeper-cutter's yard; effectively a wholesale price. The royalties for different products are:

- sawlogs \$41 per cubic metre
- sleepers \$38.70 per cubic metre
- posts \$32.76 per cubic metre (average for various fencing products), and
- firewood \$10.30 per cubic metre.

Sawn timber

The Rushworth Mill holds the main sawlog licence, cutting 730 cubic metres of the 800 cubic metres total cut in the Box-Ironbark study area. Main species harvested are grey box and red ironbark. About 40% of its output is kiln-dried, dressed and shaped for furniture, flooring and trims. Most of the remainder is used for outdoor furniture and electric fence droppers.

Sawlog harvesting and milling is only a small industry at present, accounting for about 2% of the total cut by volume, 15% by value, and 21% of full-time equivalent jobs.³ As well as the favourable value-adding at the mill in kiln-dried sawn products, this wood can be used for much higher value purposes such as furniture. Sleepers and sawlogs are cut from the same size and class of sawlog. Some 600 cubic metres per year of sawlog wood was cut for sleepers on average over the period 1986/87 to 1996/97.⁴

Grey box, yellow box, red box, red and mugga ironbarks, and yellow gum produce high quality timbers with decorative grain and a range of colours. These timbers saw, dry, dress and polish well. They are valuable for furniture, mouldings and other value-added products.

Fencing timber

Sawn (split) posts, strainer (large round) posts, smaller diameter round posts (treated), and minor products such as rails, powerline or shed poles are mainly cut by licensed commercial cutters. Cutters often take firewood timber from the heads of post trees; otherwise it is made available for domestic wood collectors.

Firewood

Firewood is by far the largest timber product by gross volume, and also the largest by total dollar value (see Table 9.1). Licensed commercial cutters take a set amount by chainsaw in the bush, or by carting cut lengths to a sawbench. Commercial cutters take about 70% of the harvest. Domestic cutters have a permit either to collect their own requirements from already felled trees or are authorised to cut small trees in designated areas. They take about 30% of the total volume cut.

In general, firewood is cut from relatively small diameter trees and thinned stems; sound, larger dimension trees are cut for sawlogs or fencing products. NRE Forests Service intends that current firewood harvesting be managed as a thinning strategy, to encourage growth in retained stems.

As a general principle, and provided the market is available, all timber should be sold for the highest value product for which it is suitable; milled sawlog timber is first, then value-added post log products, then firewood. Commercial firewood cutting occupies numerous part-time workers and thus contributes to a wide spectrum of households.

Current production

Table 9.1 Approximate value of annual timber production from the Box-Ironbark study area

Source: Stage 1 Social & Economic study³

	Sawlogs	Sleepers	Fencing	Firewood	Totals
Total production in cubic metres (m ³)	815 m ³	600 m ³	5 930 m ³	38 730 m ³	46 075 m ³
Value of production	\$0.4 M	\$0.077 M	\$0.69 M	\$2.13 M	\$3.4 M
Value/ m ³ produced	\$496	\$129	\$117	\$55	\$74 (ave.)
Jobs - total full and part time	12	2	13	>100	>127
Jobs - full time equivalents (FTE)	12	0.75	11	34	58
Jobs/000 m ³ produced	14.7	1.25	1.9	0.88	-



Cutting a grey box log to size for fence posts.

The North Central Farm Forestry Network, in conjunction with NRE, supports new box and ironbark timber plantations on farms. Agroforestry plantations can provide substitutes for small dimension box and ironbark forest products such as fence posts and firewood, and possibly sawlogs from species such as sugar gum. As well as timber products, these farm plantations can have other benefits such as lowering water tables to reduce salinity, creating windbreaks, and shelter belts for animals, and general beautification of properties. The Network also promotes marketing of high-value wood products including kiln-dried timber from dead paddock trees. Such moves reinforce value-adding and marketing efforts for Box-Ironbark timber.

9.2 Industry trends

Sawlogs

The value of sawlogs can be substantially increased with the use of humidity-controlled drying kilns, and dressing sawn wood for finished products such as furniture, mouldings and flooring. The Rushworth sawmill has significantly increased employment and profitability through value-adding. While about 40% of the 730 cubic metres timber allocation is dried at present, capacity has recently been doubled with the addition of further kilns. This is a small, specialist industry, with a growing but limited Australian market. Some potential also exists for exporting finished products.

Sleepers, poles and heavy construction timbers

Most of the markets for these products are now met by alternative materials.⁴ V-Line had been purchasing fewer box sleepers and was using more concrete and river red gum sleepers. However the recent purchaser of V-Line's freight lines, Freight Australia, has indicated a continuing interest in Box-Ironbark sleepers. Whenever sections of metropolitan railway track are being renewed, concrete sleepers are increasingly being used.

Fencing

The demand for Box-Ironbark posts has declined over the past decade. Similar products are available from outside the region, including round posts from plantations and agroforestry. Alternatives include concrete products, copper-chrome-arsenic treated pine posts, creosoted hardwood posts, steel star posts, galvanised steel end assemblies, and electric fencing. Several post cutters mentioned the reduced demand for Box-Ironbark posts due largely to the lower prices for treated pine, steel and electric fence alternatives. Some post cutters are diversifying into value-added sawn products, utilising their post log allocation. Cutters at Inglewood, Rushworth, and Talbot are sawing post logs into small dimension products such as stakes, pegs and droppers.

Firewood

About 70% of Box-Ironbark forest firewood is consumed within the study area, and 30% sold in Melbourne. The demand is not expected to change

in the short term. Australian Standards for wood-heating appliance emissions are being implemented progressively and newer appliances require less fuel. This may marginally reduce demand in the medium term, although this may be counterbalanced by population increases.

About 2 to 5% of Victoria's firewood comes from Box-Ironbark public forests.⁵ While Melbourne consumption could readily shift to similar quality and price firewood from elsewhere, local users will maintain a strong demand for Box-Ironbark firewood. If local supplies became more scarce, consumers within the study area would have to obtain firewood from outside the region. River red gum from NSW is the main product used in Melbourne's controlled combustion heaters, but it would probably be more expensive than local timber for use in the Box-Ironbark region. Relatively local substitutes are necessary to replace local consumption. Quantities of less dense timber are available from other forests in western Victoria.

If firewood collection was reduced, or excluded from some areas of public land, an immediate effect might be to increase firewood collection on private land, and hence the pressure on private land habitat could be increased if no other actions were taken. With a continued shift to highest value products, firewood will increasingly be from thinnings, branch wood, and small diameter trunk sections which are not suitable for sawn products. The Box-Ironbark Timber Assessment⁶ (BITA) records an average of 499 and up to 780 tree stems per hectare in state forests, suggesting that thinning will produce substantial volumes of firewood.

The Australian Woodheating Association is funding a pilot project to explore the supply, suitability and economics of firewood from species other than box, ironbark and river red gum, i.e. 'light' or 'common' timber. Light timbers such as mountain ash and messmate are less dense but have the same relative heat per kilogram of air-dry wood as grey box, which is seen as 'the best' firewood.

For Victoria as a whole, alternative supplies of firewood are available from outside the study area. NRE Forests Service has large volumes of residual wood resources from available state forests, in western, central and eastern Victorian forests. In the medium term, firewood supplies from outside the region are expected to increase due to the growth in

plantations supplying a range of wood products, and of farm forestry.

In the Box-Ironbark area some 1.8 million hectares of private land, around Benalla and Shepparton, including irrigated land, has been identified as broadly 'suitable for private forestry'. Main products from new plantations in this area would be paper pulp and sawlogs, with additional roundwood available, potentially for posts and firewood.

Many towns in the study area are now connected to gas pipelines, with Ararat and Stawell recently added. The provision of gas allows the opportunity to replace wood heating with gas.

9.3 Issues

Recent research has identified significant potential health problems resulting from wood smoke in certain urban areas and rural towns. In response, the Australian Standard for Woodheaters (AS4013) was recently tightened. Demand for firewood in Melbourne may reduce as new air pollution restrictions are imposed. In the United States, burning of reconstituted wood fibre for heating rather than sawn or split wood is now required in some states, in response to air pollution and resource use concerns.

Several issues are linked to domestic firewood collection. Removal of fallen timber and standing dead timber for domestic use reduces important fauna habitat. Regulation and control over location of domestic operations, retention of habitat trees, safety and volume taken are difficult to achieve. There has been a reduction in the proportion of wood taken by domestic collectors in recent years relative to the commercial cut.

Resource sustainability

A concern in many submissions was that forest harvesting must be 'sustainable', that is, the wood resource should not be harvested at a rate faster than it is growing. Estimations of sustainable harvesting can be made, for most study area forest, from the NRE Forests Service's BITA data. The BITA study area is effectively Bendigo FMA plus the Pyrenees. Modelling with this data allows estimation of the expected annual available timber volume from the current land base, and from proposed changes to the land base. NRE Forests

Service's model⁵ (see Appendix 11) uses a multi-age class spreadsheet approach.

The forest management areas affected by the Box-Ironbark investigation were outlined and illustrated in the ECC's *Resources and Issues Report (1997)*. Bendigo FMA is dominant, accounting for 91.3% of the total state forest area. The sustainable yield from a forest management area is the rate of annual timber harvest that can be sustained over the long term.

Sawlogs

Some 3 896 cubic metres of sawlogs (including sleeper logs) are estimated to be available each year from the currently available forest in the BITA study area, according to the yield modelling. This volume excludes defective wood, allows for tree mortality, and assumes trees 60 cm diameter and above are excluded from harvesting (which is an effect of current forest management).

The current legislated sustainable yield of sawlogs for the Bendigo FMA is 800 cubic metres net per year. Across the whole Box-Ironbark study area, about 815 cubic metres of sawlogs are cut each year, and another 600 cubic metres of sleepers.

According to the BITA and subsequent modelling by NRE Forests Service, there is an additional sawlog resource, over and above that presently cut, which could be sustainably harvested from the currently available state forest. Recommendations in this report reduce the available area of state forest however, and also reduce the size of this potential resource.

Firewood

NRE Forests Service has estimated annual available firewood volume from the current land base to be 74 000 cubic metres per year from the BITA study area. Cuts in the last 12 years have averaged 38 730 cubic metres per year from the whole study area. The estimate is for firewood produced from the residue of sawlog operations, and from thinning, in high and moderate productivity forests. There is an additional, although not large, resource available from low productivity forests.

Fencing

The annual available fencing volume from the BITA study area is 13 770 cubic metres per year, from the current land base. Cuts in the last 12 years from the whole study area have averaged only 5 930 cubic

metres. NRE Forests Service expects that this timber will increasingly be directed to sawn products rather than used for fencing.

Sleepers

Sleepers are cut from sawlog trees. A sleeper (2.7 m x 25 cm x 13 cm) includes about 0.08 cubic metres of timber. At a conversion rate of 4.5 sleepers per cubic metre of sawlog, the efficiency (net product volume/gross log volume) of sleeper cutting over recent years has been about 36%. In coupes proposed for sleeper cutting in the next few years, the small log size means a conversion rate of only three sleepers per cubic metre can be achieved (24% efficiency). As sleepers and sawlogs come from the same timber resource, a sawlog committed to sleeper cutting is a log lost to value-added sawn and kiln-dried timber.

9.4 Community views

Large numbers of submissions commented on forest management, and these ranged from strong support for the *status quo* to total opposition to timber harvesting. Chapter 15 outlines proposals regarding forest management. Chapter 17 outlines the ECC's response to relevant proposals in submissions.

Many submissions in support of the present timber industry proposed that access to timber should be maintained and no further restrictions placed on timber harvesting. A large number of form letters were received supporting the maintenance of the *status quo* in forests in Rushworth. Other submissions supported the continuation of multiple-use forests.

In contrast, many other submissions called for the protection of Box-Ironbark forests and woodlands and the removal of activities 'detrimental to conservation' from the forests. There were particular calls to reduce harvesting from state forests, including increased restrictions on harvesting, and establishment of plantations and agro-forestry.

Detailed matters relating to the economics of native forest harvesting were raised in at least one submission.

9.5 Achieving a balance

The following recommendations provide the basis for the ECC's approach to timber production from the Box-Ironbark forests. These recommendations have been developed to ensure that a comprehensive, adequate and representative reserve system is created which will protect important natural values while minimising the impact on current uses of the forest. NRE Forests Service's modelling of future timber yields indicates that the reserve system should have little impact on currently harvested volumes across the area as a whole.

For Bendigo FMA forests in the study area, the model⁵ estimates that the reduced area of state forest proposed in this report would permit production of:

- sawlogs 2 030 cubic metres net
- fencing timbers 7 970 cubic metres
- firewood 42 670 cubic metres.

However after application of subsequent provisions in forest management planning carried out by NRE, these volumes would be likely to be further reduced.

According to the BITA report,⁴ average harvested volumes from Bendigo FMA over the 12 years to 1997/98 were:

- sawlogs 700 cubic metres/yr
- sleepers 600 cubic metres/yr
(from sawlog wood)
- fencing timbers 5 700 cubic metres/yr
- firewood 36 700 cubic metres/yr.

The modelled available volume includes only high and moderate productivity sites. Some firewood is also produced from low productivity forests. Additional firewood resources and some round posts are likely to become available from ecological thinning in parks and reserves.

Progressive phase-out of sleeper cutting from Box-Ironbark forests is recommended. This size and quality of wood should be redirected into higher value sawlogs which can largely be converted into kiln dried products. The fixed dimensions of sleepers mean that there is much wastage from a sawlog-sized tree. Sawing the same timber into dried boards makes more efficient use of logs, and adds more value.

Alternatives include river red gum and concrete sleepers. Concrete sleepers are initially more expensive, but are considered to last longer. The ECC supports the move towards using alternative sleepers.

The ECC recommends that the volume of posts produced also be reduced, if necessary. Post-size timber should be used for sawn products; an increasing trend. More trees classed as post-sized should be retained in the forest to grow into large trees. Smaller thinning stems should be used as round posts (treated if necessary) rather than splitting larger logs into posts.

There is likely to be a reduced output from state forests in localised areas, because of proposed reductions in available forest, and management planning. Alternative supplies of less dense wood are available from other forest types; ecological thinning of parks and reserves will produce additional firewood, as will plantations (box and ironbark or sugar gum woodlots) on farms. Demand may reduce locally as more households convert to gas.

9.6 Likely social and economic effects

The likely implications for state forest users are discussed in the social and economic study report (see Appendix 3). In brief, the main economic impact of the ECC's proposals would be a loss in future growth in available wood, rather than reductions in current harvesting levels for most products.

Box-Ironbark sleeper cutting would cease under the proposal to utilise all sawlog-size logs for sawn timber rather than sleepers. While the modelling indicates fencing and firewood resources can be maintained, cutters will need to travel further to get access to resources where available, and some commercial firewood and post cutters could be displaced in certain centres.

Domestic firewood supply in parts of the region could be reduced, especially larger dimension wood. Firewood will continue to be available from forest thinning, potentially including ecological thinning where appropriate.

Associated with the Regional Forest Agreement (RFA) process within RFA regions, the Commonwealth may provide funding under the Forest Industry Structural Adjustment Package (FISAP) to promote development in the native forest timber industry, and assist businesses and employees in the industry who are directly and adversely affected by the outcomes of the RFA processes. The ECC has been advised that Box-Ironbark industries are able to participate in the Industry Development Assistance component of the program.

The ECC considers that comparable treatment should apply for timber industries inside and outside the Box-Ironbark study area. If there is a need for industry adjustment arising from implementation of the ECC's recommendations, it would be appropriate for the State Government to undertake such adjustment, according to principles similar to those applied in RFA regions.

RECOMMENDATIONS

- R41** That sawlogs be the primary wood product, and that value-added kiln-drying be encouraged.
- R42** That sleeper cutting be phased out of Box-Ironbark forests, with timber used instead for sawlogs.
- R43** That commercial fencing production be reduced where necessary, with the use of substitutes encouraged.
- R44**
 - (a) That use of less dense firewood from other forest areas in western Victoria and timber from plantations be encouraged;
 - (b) that controlled thinning of dense coppicing and regrowth in state forests be applied to improve the growth rate of retained larger trees, and to produce firewood in commercial operations;
 - (c) that ecological thinning in parks and reserves, where required for management, and subject to appropriate research, be applied to improve the growth rate of retained larger trees (see note below); and
 - (d) that domestic firewood collection be subject to strict controls to reduce theft of wood and avoid cutting of habitat trees, and that forest managers reduce domestic firewood collection in areas with sensitive biological values.

R45 That comparable treatment regarding industry structural adjustment should apply for timber industries inside and outside the Box-Ironbark study area and Regional Forest Agreement areas.

R46 That an industry plan be prepared which includes a long-term program to encourage Box-Ironbark plantations for sawlogs on private land.

Note: The objective of ecological thinning is to improve the habitat conditions in parks and reserves by increasing the numbers of large trees. Where it occurs thinning will produce wood as a by-product, which can provide a firewood resource.

Information Sources

¹ Newman (1961).

² Forests Commission, Victoria Annual Reports (various dates).

³ Essential Economics and Read Sturgess Associates (1998).

⁴ NRE (1998a).

⁵ NRE (1999)

10 Eucalyptus oil production

Eucalyptus oil production is often described as the first 'truly Australian' industry. In the Box-Ironbark study area it began after the 19th century gold rushes, when disused boilers and cheap labour for hand-cutting eucalypt foliage were readily available.

Production progressively focussed on areas of blue mallee, essentially in the same districts where harvesting now occurs. Many of the current producers are third and fourth generation descendants of the early producers. These historical associations, and the historical sites and relics associated with eucalyptus oil production, are an important feature of the current industry and are the basis of tourism associated with the industry.

10.1 Harvesting and management

Blue mallee is preferred for eucalyptus oil harvesting because it has the highest cineole content of Victorian eucalypt species. Cineole is the major active pharmaceutical component of eucalyptus oil. Public land harvesting is now done mechanically—chopping all vegetation to within a few centimetres of the ground across harvest plots of around 100 ha, every two to three years, by which time the eucalypts have usually regrown to 1 to 1.5 metres.

Harvesting generally targets areas where blue mallee is most abundant, but other less suitable species are often present, in varying degrees, usually green mallee but sometimes other species, including non-eucalypt species. All harvest areas are vegetated with Broombush Mallee EVC.

Public land harvesting is administered by NRE Forests Service. Seven producers hold licences covering around 12 000 ha in total, near Inglewood, Bendigo, Wedderburn, St Arnaud and Rushworth; however, only around 2 500 ha (20%) of this is actually cut (approximately 800 ha per annum). The percentage of each licence area harvested, however, varies greatly, from about 8% to 100%.

Producers extract oil from the harvested foliage using simple steam distillation. Spent leaf is used to fuel boilers or is sold as 'eucy' mulch for gardens.

Recently, a new producer in the study area has established a fully planned blue mallee plantation on formerly cleared private land, with very favourable initial results. Some public land producers also harvest from naturally-occurring patches of mallee (as opposed to plantations) on private land.

10.2 Economics and employment

Oil producers are mainly family operations. The primary use of Victorian eucalyptus oil is in pharmaceuticals. One producer sells direct to the public only, in tandem with heritage-based tours of the distillery. The largest Victorian buyer of eucalyptus oil is a vertically-integrated company based in Melbourne making pharmaceutical products from the oil. The company also imports oil from China for this purpose.

Currently, the economic value of public land eucalyptus oil production is around \$125 000 per annum to producers, directly generating 5 to 10 full-time job equivalents. The industry generates relatively little indirect employment and capital investment is small.¹

Approximately \$20 000 per annum is paid to the Government in royalties from public land eucalyptus oil production.

10.3 Industry trends

Victorian eucalyptus oil production has declined from around 70 000 kg per annum in the 1950s to around 20 000 kg per annum presently. Market share has mostly been lost to China, which currently accounts for around 90% of global production. Victoria supplies less than 1% of the total world production of around 3 000 tonnes per year.¹

In recent years, a large-scale farm forestry program in the Western Australian wheatbelt has resulted in

the establishment of blue mallee plantations to control salinity and produce large volumes of eucalyptus oil, predominantly for the industrial solvent export market. Plantings to date could produce in the order of 30 times the current Victorian production, and by 2020, production is planned to be about 20 times higher again. The quality and consistency of oil produced from public land in Victoria is compromised by the presence of other species and less efficient distilleries. The Western Australian oil will be of higher and more consistent quality than that produced from public land in Victoria, and due to economies of scale, production costs are likely to be considerably lower than for Victorian oil.

The experience of the new producer, who utilises a modern distillery and blue mallee plantations exclusively, has been that he is able to generate significantly greater returns than public land producers by selling to niche markets. These markets are potentially quite significant and could absorb increased volumes.

10.4 Issues

Biodiversity values

Public land eucalyptus oil harvesting is a significant threat to many biodiversity values. The following species are particularly affected:

Pink-tailed worm-lizard is endangered in Victoria and nationally. About half of the Victorian population occurs in Broombush Mallee in the Whipstick–Kamarooka area, where around 300 ha of public land is harvested for eucalyptus oil. Further expansion of eucalyptus oil harvesting would destroy areas known to be habitat for the pink-tailed worm-lizard and adjacent to recorded populations.²

Malleefowl are vulnerable in Victoria and nationally. They were formerly widespread in Box-Ironbark forests and woodlands but are now restricted (in Box-Ironbark) to Broombush Mallee near Wedderburn. The current area of available habitat is too small for the population to survive in the long term. Around 300 ha of this forest near Wedderburn has been harvested for eucalyptus leaf, and recovery of malleefowl will require larger patches of intact Broombush Mallee in areas away from Wedderburn (especially Inglewood and Bendigo).³

Whipstick westringia is a slender shrub which is endangered in Victoria and nationally. Apart from a very small population in the Little Desert, this species occurs only in Broombush Mallee adjacent to Whipstick–Kamarooka harvesting areas (including some formerly harvested areas). It may occur in current harvesting areas and harvesting is likely to jeopardise the species long-term persistence within and adjacent to harvesting areas. Harvesting also reduces availability of suitable sites for re-introduction.⁴

Long-tail greenhood is an endangered orchid in Victoria and rare nationally. In Victoria it is found in a single small population in and adjacent to a eucalyptus oil harvesting area. Eucalyptus oil harvesting is the main current threat to this species in Victoria.^{5,6,7}

Fifteen other threatened species occur in Broombush Mallee, to varying extents, as do numerous non-threatened species (including many species not found elsewhere in the study area). Eucalyptus oil harvesting suppresses the natural biodiversity of Broombush Mallee, effectively reducing a complex community to a monoculture.

Eucalyptus oil harvesting essentially represents a single use of public land. Cut areas have little value for recreational users, apiculture, or nature conservation. Soil compaction and erosion and weed invasion is evident at several eucalyptus oil harvesting sites.^{4,5,6} The royalty returned to the public, approximately \$20 000 royalty per year for a total area of around 2 500 ha harvested on a 3 year cycle, does not appear to be commensurate with such a single use.

The extent to which environmental values re-establish after exclusion of harvesting is unclear, but is likely to be variable. Malleefowl, for example, may find formerly harvested areas suitable for dispersing and possibly foraging within five years, but it may be many more years before there is sufficient soil and litter to allow the construction of nesting mounds.

10.5 Community views

There is significant community support to phase out or close public land eucalyptus oil harvesting, and add the areas currently set aside for harvesting to the conservation reserve system. However, the

public land oil producers argue for continued access to current harvest areas.

10.6 Achieving a balance

The most optimistic long-term view is that eucalyptus oil production, based on public land harvesting, will remain as a minor industry with historical and tourism value. The industry is, however, continually under threat from cheap overseas oil and high quality oil from local and interstate plantations. The availability of public land at minimal charge for eucalyptus oil harvesting is a significant disincentive to existing producers shifting to more efficient, higher-value production based on appropriately planned freehold plantations.

The most plausible long-term future for the Victorian eucalyptus oil industry is as a producer of high quality oil for the highest value pharmaceutical

use from freehold plantations. Such an industry has the potential to be considerably larger and more profitable than the existing industry.

Several existing public land producers should be able to move to more profitable production based on freehold plantations, and retain their traditional associations with eucalyptus oil production, and hence tourism based on this association. Such an industry would allow currently harvested public land areas to return in time to their natural state and be available for a wide range of uses, including protection and recovery of the distinctive and significant flora and fauna which depend upon Broombush Mallee vegetation.

Several areas are recommended below for removal from eucalyptus oil harvesting. These are priority areas that form important links between existing conservation reserves, or are important for key species.

RECOMMENDATIONS

- R47** That eucalyptus oil harvesting be excluded from specific currently available areas near Wedderburn, Bendigo, and Rushworth, and incorporated into Wychitella Nature Conservation Reserve (Recommendation D3), Whipstick–Kamarooka State Park (B2), and Whroo Nature Conservation Reserve (D4) respectively, as indicated on Map A (see back pocket of this report).
- R48** That sites in state forest at St Arnaud, Wedderburn, Inglewood, West Brenanah, Glenalbyn, Bendigo Whipstick and Rushworth, where eucalyptus oil harvesting has occurred since 1995 inclusive, be identified, zoned, and used to:
- produce eucalyptus oil;
 - provide opportunities for fossicking and prospecting;
- and that
- drainage lines and an appropriate buffer strip not be harvested.
- R49** That within the areas previously available for oil production, sites not harvested for eucalyptus oil harvesting since 1994 be identified, zoned and used to:
- conserve biodiversity, particularly threatened species and species which (in the study area) are dependent on Broombush Mallee EVC;
 - produce honey;
 - provide opportunities for fossicking and prospecting;
 - provide opportunities for open-space recreation and education;
- and that
- these areas remain or become state forest under the provisions of the *Forests Act 1958*, and be managed by NRE Forests Service.
- R50** Where areas are retained for eucalyptus oil production in the long term, greater tenure of licences should be granted to encourage investment.

Information Sources

- ¹ Essential Economics and Read Sturgess Associates (1998).
- ² Scientific Advisory Committee, Flora and Fauna Guarantee (1996).
- ³ Benshemesh (1994).
- ⁴ Davies and Riley (1993).
- ⁵ Scientific Advisory Committee, Flora and Fauna Guarantee (1991).
- ⁶ Backhouse and Jeanes (1995).
- ⁷ Gary Backhouse, NRE, pers. comm.

11 Commonwealth land

There are three major blocks of Commonwealth land in the Box-Ironbark study area. Longlea lies east of Bendigo. Puckapunyal is north-west and Mangalore north-east of Seymour. The Commonwealth has agreed to include Puckapunyal, Longlea and Mangalore in the Box-Ironbark investigation.

11.1 Puckapunyal and Graytown areas

The 44 000 ha Puckapunyal Military Area (PMA), including the Graytown Proof & Experimental Establishment, exists to maintain the capability of the Australian Defence Force; it is one of the Defence Force's busiest ranges. The Army carries out frequent military training exercises with live artillery firing. In public land use terms, military training is the approved primary land use of this area. This area 'will be used for the foreseeable future as a military training area, continuing the present challenge of managing the Puckapunyal Military Area so that this use can be sustained without compromising either operations or important environmental values'.¹

The Department of Defence states that appropriate environmental management 'involves the conservation and management of key ecosystems such as forests and woodlands... as well as the protection of rare and endangered species.'² In principle, Defence-controlled areas are managed for sustainable use. Environmental management plans guide and implement Defence's 'commitment to sound and effective environmental stewardship'.²

The Puckapunyal Military Area Environmental Management Strategy¹ provides for 'effective and responsible management which seeks to protect significant environmental areas... while providing for the ongoing military use of the area'. This strategy gives the commitment to 'maintain the ecological diversity of the PMA, consistent with the sustainable use of the area for military activities'.

The native vegetation of the Puckapunyal–Graytown Range is in good condition, except for those areas fully cleared for agricultural pursuits prior to Defence use. Current management effectively provides for nature conservation in most areas with indigenous vegetation. Continued use of the range for military training should not prevent, or be constrained by, management of key areas for nature conservation. The range's current condition suggests that military training and conservation can satisfactorily co-exist.

The Puckapunyal–Graytown Range has a number of features of relatively high nature conservation value, including examples of several highly depleted EVCs, and habitat for certain threatened species. The Department of Defence recognises that Puckapunyal–Graytown Range has some places of 'conservation worthiness'. The Department commissioned a flora and fauna survey of the range,³ resulting in identification of:

- two nationally threatened plant species;
- twelve state significance plant species;
- four state significance plant communities;
- records of two nationally significant birds; and
- thirteen state significance bird species.

The Environmental Management Strategy was part of an overall Environmental Management Plan for the Puckapunyal Military Area.⁴ Among other things, the plan aims at avoiding impacts in significant areas, minimising other impacts, and rehabilitating disturbed areas.

Specifically 'no-go' and 'no-impact' zones are identified to protect sensitive areas. As defined by the Defence Department, the:

- **'no-go'** areas are fenced and signed to exclude all vehicles. These areas may not be targeted for any direct firing. Activities are restricted to foot movement that does not involve digging or vegetation disturbance; and
- **'no-impact'** areas are mostly not fenced and generally do not exclude vehicle movement. These areas must not be subject to targeting or direct firing from explosive rounds.

11.2 Longlea

Longlea was formerly a magazine area for the storage of bulk high explosives, propellants and chemicals. The land has been under Commonwealth control since 1941 and, apart from the munitions storage buildings and roads, the forest community is intact. The primary public land value at Longlea is this little-disturbed Box-Ironbark forest. The trees are notably larger in diameter than in Box-Ironbark forests that have been subject to harvesting and culling. Basal area of wood in many parts is unusually high, at around 20 to 24 square metres per hectare. Under Commonwealth Government tenure, the ECC proposes that the majority of Longlea remain substantially as at present, and be managed for nature conservation.

Use of the existing road network by Australian Defence Industries (ADI) for testing the Bushmaster and other vehicles is compatible with management of the forest for nature conservation. A lease between the Australian Defence Industries and the Commonwealth Government is about to be formalised. Among other things, this is expected to provide for appropriate nature conservation management of the forested areas in accordance with a management plan to be prepared. Development of the management plan will include a flora and fauna survey to clarify the natural values of Longlea.

To ensure safety during vehicle testing, Longlea could remain fenced and closed to public access. Construction of limited special testing sites could take place in the existing cleared areas. Open public access for recreation would not be permitted, but by arrangement with the lessees, access for educational, research and nature study groups should be facilitated.

Around five hectares located in the cleared land adjoining Atlas Road is proposed to be developed as a multi-user depot for Bendigo cadet brigades and other users. Other proposed and future users would need to retain ready access from Atlas Road. Potential use of part of the road network for a community driving school is a matter to be resolved between ADI, the Commonwealth and the proponents. If such use is agreed, it should be limited to a level that does not reduce nature conservation values, and tenure that does not extend beyond the ADI lease period.

Acquisition by the Victorian Government

The Minister for State and Regional Development has indicated that the Victorian Government will acquire Longlea from the Commonwealth. Discussions between the Commonwealth and Victorian Governments, to resolve this matter, are continuing. Once transferred to Victoria, the land will become public land under the *Environment Conservation Council Act 1997*.

The status of the former munitions storage buildings, and to what extent they are to be demolished and hazardous materials removed by the Commonwealth, needs to be determined. Before demolition, a heritage survey should be carried out to determine if any of the structures should be retained for heritage purposes.

At the end of the lease, or when the area is no longer required by ADI for vehicle testing, the majority of the forested land should be included with the adjoining Greater Bendigo Regional Park (Recommendation C1).

11.3 Mangalore

Mangalore has relatively minor areas of native vegetation. Further investigation of this area will be carried out prior to the Final Report.

11.4 Proposals for Commonwealth land

The Puckapunyal Military Area is Commonwealth land, hence it is not 'public land' as defined under the *Environment Conservation Council Act 1997*. Accordingly, the ECC cannot make formal recommendations for this land. The following proposals are put forward in order to include these significant government land blocks in an overview of Box-Ironbark public land use for the region.

Dangerous unexploded ordnance is common across the cleared parts of the Puckapunyal and Graytown Ranges. Training, involving firing, continues year-round. It would therefore not be feasible to permit public access to the range.

According to the particular environmental values and their sensitivity to disturbance, application of zoning may either limit access to foot only, or may permit appropriate military training but not disturbance. Constructed creek crossings (in accordance with current procedures) would be necessary to provide access for tracked vehicles between cleared areas. Normal training would continue in the extensively cleared areas.

The flora and fauna survey report includes some of the following locations.

Proposed 'no-go' zones include:

- the 'areas of greatest ecological significance' identified in the flora and fauna survey report;³
- areas with large old trees such as the stand of red ironbarks north of Jacksons Hill;
- areas with regeneration of depleted tree species such as buloke; and
- relatively intact occurrences in Puckapunyal and Graytown of the following highly depleted EVCs: Grassy Woodland; Plains Grassy Woodland; Creepline Grassy Woodland; Plains Grassy Woodland/Gilgai Wetland Mosaic; Alluvial Terraces Herb-rich Woodland; and Valley Grassy Forest.

Proposed 'no-impact' zones include:

- remaining forest and woodland areas in West Range;
- remaining forest and woodland areas in Graytown Proof & Experimental Establishment;
- areas of more than four hectares with intact native vegetation in East Range; and
- regenerating native vegetation.

Roads required for access and training would be excluded from the zones.

Current environmental management practices, including tree-planting, fencing significant remnants and regrowth against disturbance, soil conservation actions, and pest plant and animal control, should be continued. Re-establishment of vegetation should be with indigenous species utilising seed of local provenance.

Remaining significant historical features, including relics of the Majors Creek railway line, European settlement and mining, should be protected as part of range management. Archaeological features should be identified and protected in accordance with conventional practice. These areas would not be open to the public. However reasonable access to the Range should be available by arrangement for flora, fauna and historical researchers.

LAND USE PROPOSALS

- R51** (a) That the Puckapunyal Military Area and Graytown Proof & Experimental Establishment:
- (i) continue to be used to provide military training and testing; and
 - (ii) maintain 'no go' and 'no impact' zones listed above to conserve and protect communities of indigenous animals and plants, and for military training, as appropriate.
- (b) That the Department of Defence:
- (i) use indigenous species of local provenance where possible when areas are being rehabilitated or otherwise planted;
 - (ii) not permit harvesting of forest products; and
 - (iii) exclude grazing from the 'no go' and 'no impact' areas as far as practical.
- R52** That 508 ha at Longlea be used to:
- (a) conserve and protect communities of indigenous animals and plants;
 - (b) provide for special vehicle testing on the existing road network and existing cleared areas; and that:
 - (c) harvesting of forest products and grazing not be permitted;
 - (d) flora and fauna and heritage surveys be carried out to assist management; and
 - (e) when no longer required for vehicle testing or other approved military training purposes, and after the Victorian Government has acquired Longlea, the fence be removed and the firebreak revegetated, and the area be reserved and added to the Greater Bendigo Regional Park.
- R53** That five hectares at Longlea be retained by the Commonwealth Government and used as a multi-user depot.
- R54** That 87 ha adjoining Longlea (outside the security fence):
- (a) be managed and used as a natural features reserve bushland area; but that:
 - (b) as per R52(e), when Longlea is no longer required for vehicle testing or other approved military training purposes, and after the Victorian Government has acquired Longlea, this area be reserved and added to the Greater Bendigo Regional Park.

Note: Commonwealth land is shown as P1 on Map A and Map D.

Information Sources

¹ Department of Defence (undated, c.1998).

² Department of Defence (1998).

³ Australian Army (1996).

⁴ Department of Defence (unpublished, c.1998).

12 Other uses

Having dealt with the major uses of Box-Ironbark forests and woodlands in previous chapters, this chapter will cover the other significant uses of public land in the region.

Smaller, but significant, land uses in the area include extractive industries such as quarrying for gravel, clay and rock. Water production and distribution is an important activity in Box-Ironbark forests. Grazing also occurs on a small scale on some public land. Each of these issues was described in the ECC's *Resources and Issues Report (1997)*.

12.1 Range of uses

Extractive industries

'Stone' is defined broadly to include many extractive industry products such as gravels, most clays, sand, soil and earth, and various types of rock—notably granite and hornfels in the Box-Ironbark study area.

Several types of commercial operations are substantial contributors to the regional economy, for example: quarrying granite, hornfels, sedimentary rock, slate, sand, gravel, clay, and clay shale. Numerous operations also occur on freehold land, particularly on the northern plains.

Only eight companies with work authorities under the *Extractive Industries Development Act 1995* operate on public land in the study area (see Table 12.1 below).

Main products are construction materials such as crushed rock and sand for concrete and other purposes, gravel for road construction, clay for bricks and ceramics, and dimension stone.

The materials extracted include the following:

- **hornfels, granite and quartzite**—hard rock materials are used for crushed rock, or dimension stone (granite). They have numerous potential sources of varying quality;

- **Palaeozoic sedimentary sandstones and shales** are widespread but relatively soft materials which provide road sub-base, some low-grade slate, and residual clay and clay-shales; and
- **sand** is widely available from ancestral stream channels on the northern plains, dune deposits, and granite colluvium.

As cost of transport is a significant proportion of the cost of production, quarries tend to be located near the point of consumption.

The level of quarry production is largely determined by population growth and major projects, such as new or upgraded roads. Plans to upgrade the Calder, Goulburn Valley and Midland Highways over the next 10 to 20 years indicate at least maintenance of demand.

Water production and distribution

Relatively little water is harvested from the Box-Ironbark study area for water supply, but large volumes are stored and distributed.

Major water storages include Lakes Lonsdale, Cairn Curran, Eppalock and Mokoan, Tullaroop Reservoir and Waranga Basin. Water is distributed from the Goulburn system via channels from Lake Nagambie, both for irrigation, and stock and domestic supply to the Mallee.

Lakes Eppalock, Cairn Curran, Laanecoorie and Nagambie have some catchment in the Box-Ironbark area. Other large water bodies such as Waranga Basin, Lake Mokoan and Lake Lonsdale store water channelled from outside the Box-Ironbark area. Large volumes are moved in channels and natural watercourses, for irrigation and stock and domestic supply needs.

Table 12.1 Quarry production in the study area – public and private land (1995/96)

Type	Number of quarries	Production (tonnes)	Value \$M
Hard rock	8	292 000	2.1
Clay and clay-shale	2	-	-
Sand and gravel	5	42 425	0.3
Dimension stone	5	2 328	0.45
Total	20	336 753	2.85

Restructuring of local water supply administration over recent years, and concerns over water quality in some small township supplies, has seen the replacement of several obsolete storage and supply sources with high quality piped-supplies. This means that some former installations, usually on public land, are no longer required.

Grazing

Small areas of Box-Ironbark vegetation are grazed. Little public land grazing is carried out on the inland hills blocks, but on the northern plains many public land water frontage reserves, and small blocks of public land, are grazed. The total grazed area is small, and each individual grazed parcel is small, but these do provide economic value to particular farmers.

12.2 Issues

Extractive materials

Some high-grade sites are located in public land blocks primarily used for conservation or recreation, for example Skeleton Hill Quarry at Chiltern, and the Mt Alexander quarries. Issues include noise, dust, and the potential for expansion. A shallow brick clay pit in the Wellsford State Forest is providing a valuable resource for production of local and exported bricks. The company wishes to obtain access to further resources. Expansion in this forest would require clearing of Box-Ironbark vegetation.

More general concerns relate to the need for rationalisation of numerous small extraction operations, to reduce the level of disturbance decisions on quarry siting and operating standards. The ECC's recommendations are in Chapter 16, Section L.

Water supply and distribution

The future of public land surplus to water-authority requirements is probably the most significant issue. For example, parts of Coliban Water's Bendigo catchments (Big Hill/Crusoe and Sandhurst) as well as several outlying small water storages, may no longer be required. Refer to Recommendations C1 in Chapter 14 and I1 in Chapter 16 for the ECC's proposals.

Public land use and management also affects water quality or quantity in sensitive parts of catchment areas. Water distribution may affect public land management, particularly through seepage and salinisation associated with channels and the use of natural waterways to transmit large flows for irrigation supply, for example Goulburn River, Broken River and Broken Creek.

Grazing

The most depleted EVCs are those on the northern plains. Chapter 4 describes the status of these vegetation types. In this context, public land water frontage reserves and isolated small blocks that have remnant plains vegetation, are of great importance.

As these frontage reserves and small blocks are not used for timber harvesting or mining, the main current use that affects their condition is grazing. The ECC's recommendations for northern plains frontage reserves and small block areas that are subject to grazing are: Black Dog Creek frontage reserve (part of Recommendation A1); Broken-Boosey State Park (B4); and nature conservation reserves D51, D52, D56, D58 and D59.

Recommendations for public land categories

13 National and state parks

National and state parks are relatively large areas of land with outstanding natural or cultural values, set aside primarily to conserve those values in largely natural settings. Typically a national or state park will display a range of exceptional values. Conversely, nature conservation reserves or historic areas typically protect a narrower range of values, such as a smaller number of threatened species or historic sites.

As a result of their outstanding features, national and state parks are also important and popular places which provide unrivalled opportunities for enjoyment, education, recreation and inspiration in natural environments. However, protection of cultural and natural values, particularly biodiversity, remains the primary role of national and state parks.

13.1 The role of national and state parks

National and state parks provide the highest level of protection for natural and cultural features such as flora and fauna, landscapes, archaeological and historic sites. Accordingly, harvesting of forest products, grazing by domestic stock, and hunting and firearms are generally not permitted, and national and state parks are exempt from exploration and mining under the *Mineral Resources Development Act 1990*.

Many other activities are permitted in national and state parks. Visitor rates are very high and a wide range of recreational and other activities are undertaken: orienteering and rogaining; visiting historic sites; nature observation and bird watching; sightseeing; picnicking and barbeques; car touring; bike riding; bushwalking and camping; fishing; bee-keeping at designated sites; environmental education; and research.

With such a large number of uses and valuable features to protect, astute planning and zoning in parks is essential to minimise disharmony between potentially conflicting priorities.

Facilities, including interpretative services and facilities, should be provided to encourage visitors and enhance their experiences. At the same time, facilities and activities need to be confined to sites

of appropriate size and location to minimise their effect on sensitive values and other uses.

Another important element of national and state park status, in addition to the high level of protection from evident threats, is the imperative for active conservation management. This is particularly important for the conservation of Box-Ironbark biodiversity. Many threatened and declining species will only survive in the long term if their populations are able to recover. Merely halting current and ongoing declines will not be enough, as explained in Chapter 4.

This pro-active management is most apparent in the requirement for management plans to be prepared for all state and national parks. This requirement has been met for all existing Box-Ironbark national and state parks. The only other areas for which site-specific management plans have been published are Wychitella Flora and Fauna Reserve, Maldon Historic Reserve, and Reef Hills Regional Park. Forest management plans, covering extensive areas of state forest more generally, have been prepared for some forest management areas that overlap with the study area (see Chapter 15).

As well as formal protection, national or state park status raises the public profile and appreciation of the values being protected. Many national and state parks have 'Friends groups', for example. Community involvement in decisions affecting the use and management of public land is generally highly desirable, and considerably enhances the prospects of appropriate protection of key values.

An important dimension of the high level of protection provided in parks is the duration of that

protection. In decades to come, national and state parks will support the best examples of values that need long-term protection from disturbance. As indicated in Chapter 4, long periods secure from disturbance are a critical requirement for the recovery of Box-Ironbark biodiversity and landscapes, most particularly, the re-establishment of the original Box-Ironbark forest structure dominated by large old trees.

National and state parks, therefore, are vitally important in providing a legacy for future generations. Protection is required, not just from current threats, but also from unforeseen future threats. Recent proposals to harvest large volumes of wood from extensive areas of Box-Ironbark forests in New South Wales for charcoal, to produce silicon, as a fuel for power plants, and for carbon trading, provide a particularly relevant example of previously unforeseen threats.

13.2 Park management

All the areas subject to recommendations in this chapter are to be added to Schedule 2 of the *National Parks Act 1975*, and managed by Parks Victoria, under policy direction from the NRE Parks, Flora and Fauna Division.

13.3 Community views

State and, in particular, national parks draw strong reactions from the community. For many people, national parks are special places held in the highest esteem, and they receive great comfort not only from visiting national parks, but knowing they exist. Many people proposed relatively large areas as state and national parks, invoking the importance of long-term, high level protection and potential for increased tourism.

For others, the exclusion of some uses from national and state parks represents lost economic potential and excessively rigid constraints on access; 'locked up in national parks' being a common expression.

Prospectors, in particular, were of the view that the impacts of their activities did not justify blanket exclusion of prospecting from national parks. Many also felt that, although the LCC recommended prospecting be permitted in many state parks in the Box-Ironbark study area, subsequent park management planning had excluded prospecting

from large areas of some state parks with little justification or consultation.

There is considerable divergence of opinion over the extent to which park status leads to increases in tourism numbers, with some park supporters providing quantitative evidence to support their case.

13.4 Achieving a balance

There is evidence that national parks generally attract more visitors, especially tourists and other long distance visitors, than other public land categories. In Box-Ironbark forests and woodlands, this difference is amplified by the very low current visitor levels in public land blocks which are not national parks. Of course, parks must contain substantial areas of outstanding value and interest to the public. Visitor numbers do not simply increase because any patch of forest has been declared a park.

In every major ecosystem, there should be at least some areas of reasonable size where a high level of long-term protection from major disturbance and threatening processes is guaranteed. Currently, there are only two small Box-Ironbark national parks, and the proportion of the study area in state parks is also low. The ECC's aim, in identifying new state and national parks, is to select significant-sized areas demanding high quality, long-term protection and avoid areas of most interest to excluded users.

Protection through national or state park status is most appropriate for features which are rare, difficult to replace, and susceptible to activities generally excluded from national and state parks but not other public land categories. Examples include large old trees and populations of threatened species adversely affected by extensive soil disturbance, such as orchids and small reptiles.

The ECC's proposed national and state parks are generally located to include special features, often the best or only examples of some values, for which the highest level of protection is required. At the same time, the parks largely avoid areas of most interest to those uses which are not permitted. For example, no recognised goldfield is included in a proposed national or state park, and metal detecting is excluded only from national parks which are in areas of minimal interest to prospectors.

Two major national parks: the new St Arnaud Range National Park, and the significantly expanded Chiltern-Pilot National Park; are recommended as large areas of outstanding natural value, to complement the existing Terrick Terrick National Park. These recommendations would increase the total area of Box-Ironbark national parks from the existing 8 090 ha to 39 122 ha.

The ECC is also recommending three new state parks: Mt Black, Broken-Boosey, and Reef Hills; and extensions to four existing state parks: Kooyoora, Paddys Ranges, Whipstick-Kamarooka and Warby Range. The existing Kara Kara State Park is recommended as part of the new St Arnaud Range National Park. The net recommended change in state park area is from the existing 26 305 ha to 47 332 ha.

A National parks

National parks are extensive, nationally significant areas with a diversity of outstanding natural values and land types. They generally display the highest quality examples of their values, and unique combinations of features. They provide the highest level of protection to extensive natural areas and their biodiversity, and hence exceptional opportunities for enjoyment, education, recreation and inspiration in natural settings. Because of these attributes, national park status, more so than any other form of land tenure, is generally strongly attractive to visitors, particularly visitors from outside the region.

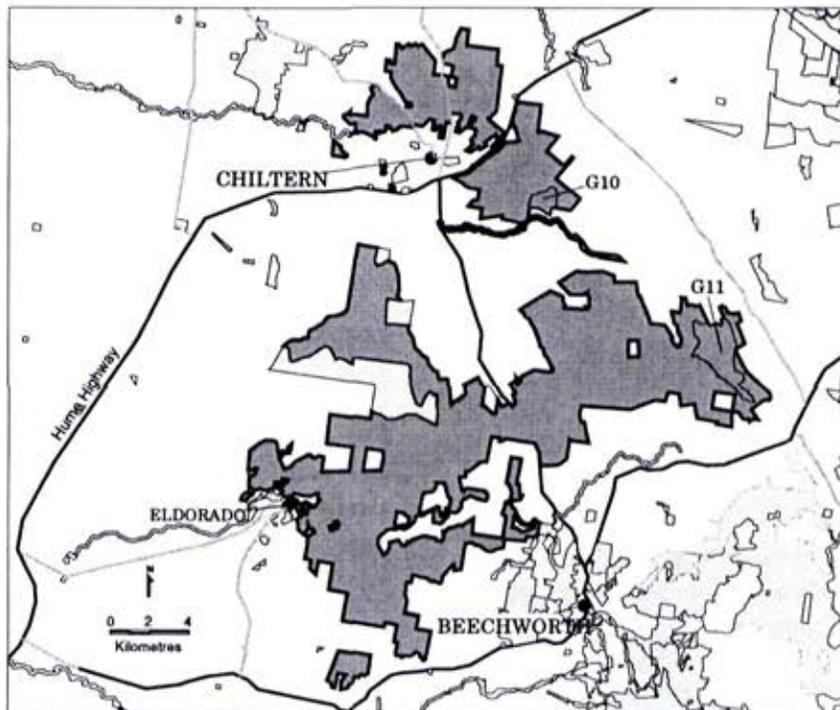
As well as the recommendations below, which apply to all existing and proposed national parks and additions, specific recommendations may apply to individual parks or areas.

GENERAL RECOMMENDATIONS FOR NATIONAL PARKS

- A** That the national parks shown on Map A (numbered A1 to A3)
- (a) be used to:
 - (i) conserve and protect biodiversity and natural processes;
 - (ii) protect significant historic sites and places;
 - (iii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage; and
 - (iv) protect natural landscapes;
 - and that:
 - (b) the following activities generally be permitted:
 - (i) apiculture on licensed sites, and subject to the outcome of research into the ecological impacts of this industry, and park management requirements;
 - (ii) bushwalking, car touring, mountain and trail bike riding on formed roads, picnicking and camping;
 - (iii) nature observation, bird watching and visiting historic features;
 - (iv) orienteering and rogaining; and
 - (v) research, subject to permit;
 - and that:
 - (c) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
 - and that:
 - (d) the following activities not be permitted:
 - (i) harvesting of forest products including eucalyptus oil, grazing by domestic stock, hunting and the use or possession of firearms;
 - (ii) exploration and mining, other than continuation of operations within existing licences, as approved; and
 - (iii) metal detecting, prospecting, fossicking, and gold panning;
 - and that:
 - (e) they be included on a schedule to the *National Parks Act 1975*, and managed by the Department of Natural Resources and Environment.

Notes: 1. Exceptions to the above general recommendations are noted in the recommendations for specific parks, where relevant.
2. Should ecological thinning (recommendation (c) above) require removal of wood from parks, that wood may be sold.

A1 Chiltern–Pilot National Park



The proposed Chiltern–Pilot National Park is one of the most important sites for nature conservation in Victoria, supporting an extraordinary number of threatened and non-threatened species. Its impressive biodiversity, landscape and historical values, and important Aboriginal art sites are attracting an increasing proportion of north-east Victoria's expanding tourism and recreational visitor market.

Benefits of the park

Biodiversity conservation

Chiltern–Pilot National Park will provide protected habitat for the most intact Box-Ironbark fauna assemblage in Victoria. The park will play a pivotal role in the recovery of many threatened Box-Ironbark plant and animal populations.

Heritage protection

The park's suite of Aboriginal, gold era and Kelly Gang sites and relics are compellingly evocative of the region's absorbing history. Protecting these sites in their original landscape will highlight their heritage significance.

Recreation and tourism

Chiltern–Pilot National Park will be a popular and much loved destination for visitors seeking a diverse range of attractions and activities, including

low-key car touring, nature and heritage-based recreation, orienteering, camping and, along Reedy Creek, prospecting for gemstones.

Location

The park encompasses the low hills surrounding Chiltern, and much of the striking Mt Pilot Range running east-west between Chiltern and Beechworth. The park straddles both the Hume Highway and the main Chiltern–Beechworth Road.

The total area of the proposed Chiltern–Pilot National Park is 21 742 ha, comprising: the existing Chiltern Box-Ironbark National Park (4 320 ha, including Reference Area G10); Mt Pilot Multi-purpose Park (14 083 ha, including Reference Area G11); part of Barambogie State Forest (2 497 ha) and Beechworth Historic Park (52 ha); Barambogie Education Area (597 ha); Black Dog Creek Streamside Reserve (64 ha) and public land water frontage (129 ha).

Community views

The values of the proposed Chiltern–Pilot National Park are widely appreciated, both locally and by visitors from other parts of Victoria, and the addition of the Mt Pilot Range to the existing national park is strongly supported in submissions which mention the area specifically.

Environmental values

Biodiversity

The area has the highest number of mammal, bird, and reptile species recorded at any Box-Ironbark site. It is the most important site in Victoria for nine threatened species: squirrel glider, regent honeyeater, swift parrot, painted honeyeater, barking owl, turquoise parrot, Deane's wattle, Warby swamp gum, and a recently discovered new orchid species. It is also the most important site in the study area for three threatened species: square-tailed kite, bandy bandy snake, and yellow hyacinth-orchid (see Appendix 1 for conservation status of threatened species).

The park contains significant representation of nine EVCs, particularly Valley Grassy Forest, Box-Ironbark Forest, Grassy Woodland, and Grassy Dry Forest.

Cultural heritage

There are several important Aboriginal sites, including the Yeddonba art site where interpretation and facilities have been provided for visitors.

There are numerous pioneer and gold era sites and relics, including well known features such as the Magenta Mine and a pioneer cemetery near Chiltern, the Kelly Caves, and the famous Gold Dredge near Eldorado. Chiltern–Pilot National Park is contiguous with Beechworth Regional Park (see C9 on Map A).



Cock's Gold Dredge near Eldorado

Landscape

This area has an extraordinary diversity of landscapes and EVCs, from the Riverina plain, through low sedimentary hills, to the distinctive ridgeline of the Mt Pilot Range. There are many fine views across the surrounding countryside, most particularly from the summit of Mt Pilot. The impressive granite boulder peaks and deeply dissected valleys of this range include the Woolshed Valley along Reedy Creek and the spectacular Woolshed Falls.

Current and future uses

Apiculture

There are 18 permanent and 19 temporary bee sites distributed through the proposed park area. No change is proposed to existing access for apiculture. Land managers will retain discretion over the location and use of specific sites.

Defence training

The Department of Defence uses parts of the Mt Pilot Range section of the proposed park for generally low-key training exercises (such as camping and cross-terrain navigation on foot) around 30 times a year on average, amounting to around 4 000 visitor days per annum.

Low-key defence training may continue, subject to the land manager's discretion. Those parts of Barambogie State Forest in which most current defence activities occur remain available for more intensive activities, subject to the land manager's discretion.

Gemstone fossicking

Reedy Creek is a popular site for gemstone prospecting and attracts tourists to accommodation in Eldorado while others use dispersed camp sites along the creek. Reedy Creek and a 100 metre wide strip along each bank will remain available for gemstone fossicking.

Mining

Two applications for mining licences, with a total area of nine hectares, within the proposed Chiltern–Pilot National Park, are currently under consideration by the Department of Natural Resources and Environment. Three exploration

licences cover 40% of the proposed park, including virtually all of the existing national park.

Much of the existing Chiltern Box-Ironbark National Park has high prospectivity for gold. Reedy Creek Valley has moderate prospectivity for gold, tin and tungsten.

The current exploration licences and, if approved, mining licences covering the park addition will be renewable subject to Government approval (as is currently the case with exploration licences in the existing national park), but no new exploration licences will be issued over the park area. Any future mining arising from these licences would be subject to Government decision and in accordance with existing provisions in the *National Parks Act 1975*.

Recreation and tourism

The existing Chiltern Box-Ironbark National Park receives between 10 000 and 15 000 visitors per year, with numbers thought to be increasing (see Chapter 8). Vehicle and foot access throughout the proposed park is good, and it is popular for low-key car touring, picnicking, cycling, horse riding, bushwalking, camping, orienteering and roving, and nature and heritage-based touring.

Several registered commercial operators of nature-based tours visit the hills surrounding Chiltern and the area features in international books on bird watching locations. Currently, the Friends of Chiltern Box-Ironbark National Park frequently host outings which, as well as enhancing enjoyment of the park's values, assist in park management, for example, with weed control.

The proposed park's cultural heritage and scenic landscape attractions such as the Yeddonba Aboriginal art site, Mt Pilot summit, Eldorado Gold Dredge and Magenta Mine near Chiltern, form part of a network of similar sites often visited by tourists to the region. The creation of the new Chiltern-Pilot National Park will significantly encourage and promote the area as a destination for nature and heritage-based tourism and recreation, and complement established attractions for visitors.

Prospecting

Other than for some gold along Reedy Creek, the area of the proposed national park addition is of relatively little interest to gold prospectors.

Reedy Creek and a 100 metre wide strip along each bank will remain available for gold prospecting.

Stone extraction

Within the proposed Chiltern-Pilot National Park, there is one application for an extractive industry work authority currently with the Department of Natural Resources and Environment.

There is a current work authority for the quarry at Skeleton Hill in the existing Chiltern Box-Ironbark National Park (operating by consent under Section 40 of the *National Parks Act 1975*). Current arrangements for the operation of the existing quarry will continue, with the current work authority being renewable subject to government approval. If approved, the other work authority would be similarly renewable.

No new work authorities will be granted in the park area.

Timber harvesting

Currently there is no commercial timber harvesting in any part of the proposed park area, the last area formerly available having been excluded by the *North East Regional Forest Agreement*.

Domestic permits are issued for the collection of fallen timber from several areas totalling approximately 3 000 ha, in the Barambogie and Mt Pilot Range section of the proposed park. Approximately 400 cubic metres per annum is removed under these permits.

Opportunities for domestic firewood collection remain in the area retained in Barambogie State Forest and in extensive areas of state forest to the south-east of Beechworth. In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4). Domestic firewood collection will not be allowed in the proposed Chiltern-Pilot National Park.

Grazing

Grazing licences are current along the Black Dog Creek frontage south of the existing national park. Grazing by domestic stock will not be allowed in the proposed park.

Management issues

Facilities

Basic visitor facilities, such as toilets, require development to meet current and future visitor levels in the Mt Pilot Range.

Community involvement

The work of the Friends of Chiltern Box-Ironbark National Park has greatly assisted management of the existing national park. The group should be encouraged and supported to extend activity into the Mt Pilot area.

Firewood

Continued control of illegal firewood cutting will be required.

Prospecting and fossicking

In order to improve water quality (especially to reduce sedimentation) along Reedy Creek, previously uncontrolled gravel extraction has been eliminated and prospecting along Reedy Creek is now more carefully managed.

Careful management of prospecting and fossicking is an ongoing requirement, and dispersed camping along Reedy Creek requires improved management to ensure water quality and other sensitive environmental values are not degraded.

Water catchments

Some of the catchment of the Barambogic Reservoir, which supplies Chiltern, is contained in the proposed park, as are catchments of creeks from which water is drawn to supply Springhurst. Management of activities in these catchments should ensure adequate protection of the water and catchments.

Weed control

In recent years, considerable progress has been made in the control of a number of weeds, most notably St John's wort and prickly pear in the Mt Pilot Range. Continuing control will be a major management priority.

The old cork oak plantation at the corner of Mt Barambogic and East Triangle Roads should be retained for its historic interest since it appears unlikely to be a source of weed invasion. All other existing sample plots, and small plantations of various non-indigenous trees scattered throughout the Mt Pilot Range section of the proposed park, should be removed and revegetated with local provenance indigenous plants.

RECOMMENDATIONS

- A1**
- (a) The Chiltern–Pilot National Park area of 21 742 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88;
 - (b) that gemstone fossicking and gold prospecting, with hand tools only, be permitted in a zone extending 100 metres from each bank of, and including, Reedy Creek; and
 - (c) that protection of the water and catchments of the Barambogic Reservoir and the creeks which supply water to Springhurst be maintained.

Information Sources

Backhouse and Jeanes (1995).

Commonwealth of Australia and Government of Victoria (1999).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Parks Victoria (1998a).

Stone (1985).

Thomas and Thomas (1996).

Wheatley (1998).

A2 St Arnaud Range National Park



The proposed St Arnaud Range National Park contains the most intact large area of Box-Ironbark vegetation and landscapes in Victoria. The long north-south range has the greatest abundance of large old trees of any Box-Ironbark forest, and presents the visitor with the best remaining opportunity to experience a sense of what these forest landscapes were like before the gold rushes.

Benefits of the park

Intact landscape protection

St Arnaud Range National Park will protect the largest, most intact Box-Ironbark landscape in Victoria, characterised by deeply dissected ranges with high scenic values, diverse landscapes and vegetation types. An abundance of large old trees produces a forest structure more reminiscent of original Box-Ironbark landscapes than any other remaining in Victoria.

Biodiversity conservation

The large area of relatively intact forest structure supports an ecosystem of high ecological integrity. It is a highly significant site for species requiring such areas, such as the powerful owl and brush-tailed phascogale. The proposed park will provide a high level of long-term protection for this habitat structure and its attendant species. Such continuity of protection is required to provide a stronghold for these species and to safeguard against potential threats, for the many decades which are required, to preserve and enhance Box-Ironbark biodiversity values.

Recreation and tourism

Greater recognition of the diverse range of features offered by the St Arnaud Range National Park will attract significantly more visitors to the park area and the region generally. The park is easily accessed from several main roads and is close to St Arnaud and popular wineries in the Moonambel area. Increasingly, visitors will be attracted to the park to visit historic sites, go bushwalking, picnicking, camping, car touring, bird watching and nature touring, and to experience the natural and remote landscapes with large trees and impressive views.

Location

The proposed park straddles the southern two-thirds of the St Arnaud Range, south of St Arnaud. The main access to the park is from the Sunraysia Highway to the east.

The proposed new 13 526 ha St Arnaud Range National Park encompasses the existing Kara Kara State Park (3 948 ha), Mt Separation Reference Area (G1; 188 ha) and 9 390 ha of St Arnaud Range State Forest.

Community views

There is both support and opposition for the creation of a national park near St Arnaud.

Park supporters generally propose inclusion of the entire St Arnaud Range in a park, and argue that a national park would increase tourism to the area and protect its key values, particularly its landscapes of large old trees and related values.

Park opponents argue that national park status will reduce domestic firewood availability, particularly for St Arnaud residents, and exclude prospectors, thereby reducing tourism in the area.

Environmental values

Landscape

Dominated by the prominent north–south ridge, the southern half of the St Arnaud Range contains landscapes which are unique in the study area for their high scenic quality, remoteness, and diversity. The landscape ranges from deeply dissected hills in the south to the gentle hills and broader valleys of the northern part of the park, and is reflected in a consequent diversity of vegetation types.

Principally as a result of its remoteness, large old trees are relatively abundant in the park, both individually and in the high proportion of the park containing large old tree sites. The forest has fewer, more widely-spaced trees, and more fallen timber than any other large area in the study area. This landscape is of value because of its uniqueness, but particularly because it is the most reminiscent Victorian example of the original Box-Ironbark forest structure (see Chapter 4).

Biodiversity

The proposed park is the most important site in the study area for powerful owl (four territories) and peppermint box, and is probably similarly important for brush-tailed phascogale—the large contiguous area of high quality habitat could make this the most viable population in Victoria. Other threatened species (see Appendix 1 for status) include swift parrot, green leek-orchid, buloke mistletoe, and outcrop guinea-flower.

Significant contribution to the representation of four EVCs will be provided by the proposed park, particularly for Valley Grassy Forest and Low Rises Grassy Woodland/Alluvial Terraces Herb-rich

Woodland Mosaic. It will also protect the largest extent in the study area of *Northern Foothills* Heathy Dry Forest and *Northern Foothills* Grassy Dry Forest floristic communities. The proposed park is also notable for its diversity of plant species and vegetation types.

The park has the highest concentration of large old tree sites in the study area. Thirteen sites, with a total area of 3 643 ha, cover over 25% of the total park area.

Cultural heritage

Scattered through the southern part of the St Arnaud Range are numerous gold era sites and relics; many located in isolated bush settings are strongly evocative of the daily lives of the early miners and bush workers and the environment in which they lived and worked.

Significant sites include charcoal pits along Teal Track and along Barkly Track, Carapooee West Boys' Camp, and many features such as puddlers, batteries, mines, water races, and diggings left from the old mining days.

Current and future uses

Apiculture

There are 19 permanent and 15 temporary bee sites distributed through the proposed park area. No change to existing access for apiculture is proposed. Land managers will retain discretion over location and use of specific sites.

Mining

There is one mining licence current over four hectares of the proposed St Arnaud Range National Park, with relatively small production recorded.

Three current exploration licences cover, in total, less than 100 ha (currently state forest) of the proposed park area.

The most prospective areas of the St Arnaud Range, the St Arnaud, Stuart Mill and Redbank goldfields, are outside the proposed park (see St Arnaud Regional Park C4, nature conservation reserves D15–D17, and St Arnaud–Pyrenees State Forest F4).

The mining licence and the existing exploration licences covering the park will be renewable subject to Government approval, but no new exploration licences will be issued over the park area. Any future mining arising from the existing licences in the proposed Park would be subject to Government decision and in accordance with existing provisions in the *National Parks Act 1975*.

Prospecting

The area of the proposed St Arnaud Range National Park is of moderate interest to prospectors. Nearby areas of similar size and greater interest to prospectors will remain available in the Redbank, Stuart Mill and St Arnaud Goldfields (see regional park C4, nature conservation reserves D15–D17, and state forest F4).

Prospecting will be excluded from the proposed park.

Recreation and tourism

Compared to many other parts of the study area, the St Arnaud Range receives relatively few visitors. Its main attractions are its scenic and remote landscapes, bushwalks, natural setting, and historic features. The Teddington Reservoir is a noted picnicking, fishing and camping site. The existing Kara Kara State Park receives approximately 7 000 visitors per year.

The main ridge line through the park is a natural route for walkers. It is one of few Box-Ironbark areas where it is possible to walk for many kilometres while being more than a kilometre from the forest boundary or main roads. There is considerable potential to increase visitor use of the area, and the establishment of a national park of substantial size should heighten its profile as one of the premier Box-Ironbark settings for those activities favoured by its relatively remote, natural and diverse landscapes, particularly bushwalking and car touring.

Timber harvesting

The net currently available forest area covered by the proposed St Arnaud Range National Park is 6 439 ha, which is 5.1% of the total area currently available for timber harvesting.

The net available forest includes high and medium productivity forest, and excludes an estimate for areas protected under forest management prescriptions.

Nearly 10 000 ha of forest is generally available for timber harvesting in St Arnaud Range State Forest to the north and the Pyrenees to the south (see Recommendation F4 in Chapter 15). Commercial timber harvesting will not be allowed in St Arnaud Range National Park.

Approximately 460 cubic metres of domestic firewood are removed from St Arnaud Range National Park.

Opportunities for domestic firewood collection remain in more than 3 000 ha of St Arnaud Range State Forest immediately south of St Arnaud (see F4). In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4).

Domestic firewood collection will not be allowed in the proposed St Arnaud Range National Park.

Management issues

Promotion

The park's diverse range of features has the potential to attract considerably more visitors than is currently the case. Prerequisite to any significant expansion in visitor numbers will be increased promotion of the park's features, where appropriate, improved access to and interpretation of these features, and development of associated facilities such as toilets and picnic areas. Preparation of a strategy to guide the expansion of visitor capacity and numbers may be desirable.

Water catchments

Most of the catchments of the Redbank and Teddington Reservoirs are contained in the proposed park. These reservoirs provide some water to nearby residents, and management of activities in these catchments should ensure adequate protection of the water and catchments.

RECOMMENDATIONS

- A2** (a) That the St Arnaud Range National Park area of 13 526 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88; and
- (b) that protection of the water and catchments of the Redbank and Teddington Reservoirs be maintained.

Information Sources

Bannear (1997).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Holland and Cheers (1999).

LCC (1997).

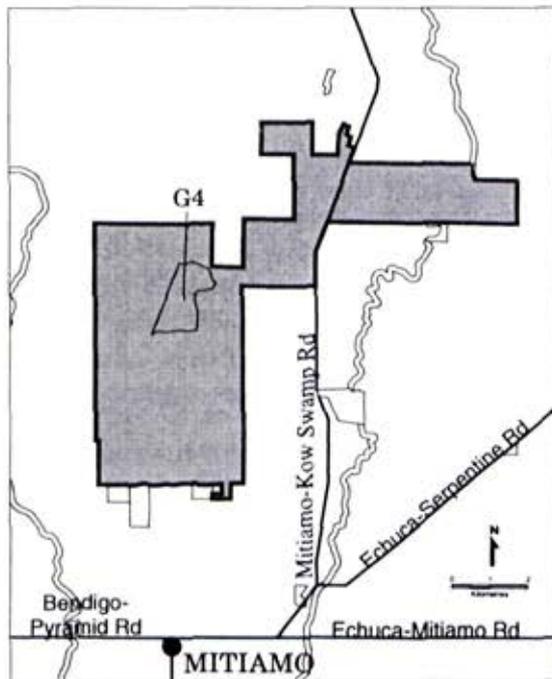
Parks Victoria (1996).

Stone (1999a).

Stone (1999b).

Stone (1999c).

A3 Terrick Terrick National Park



Benefits of the park

The proposed enlarged Terrick Terrick National Park contains one of the largest, most intact tracts of indigenous northern plains vegetation in Victoria. It is particularly important for representation of Grassy Woodland and Plains Grassland EVCs, and at least 35 plant or animal species threatened in Victoria.

Location

The proposed park covers 3 854 ha, comprising the existing Terrick Terrick National Park (3 770 ha) including the 100 ha Reference Area G4, adjacent Bendigo Creek public land water frontage (43 ha), Terrick Terrick Flora Reserve (26 ha), uncommitted land (11 ha) and unused road (4 ha).

Environmental values

Biodiversity

The existing Terrick Terrick National Park includes the most significant remaining area of the once extensive native grasslands of northern Victoria; 1 277 ha of former freehold land recently purchased and added to the park to protect its unique values. Similarly, grassy woodlands of the park include the largest white cypress pine woodland in Victoria and support many rare or threatened woodland species such as buloke mistletoe, woolly cloak-fern, bush stone-curlew, barking owl and grey-crowned babbler.

Landscape

The indigenous vegetation is also a key component of the scenic values of the park, adding to the imposing views and landscape contrast provided by the isolated granite peaks rising above the vast northern plains. The proposed park is perhaps the only place where the sequence from rocky hilltops, through park-like grassy woodlands and diverse native grasslands, to riparian woodland, remains more or less as it was when famously surveyed from Pyramid Hill, a few kilometres to the north, by Major Mitchell in 1836.

Cultural heritage

The proposed park contains several Aboriginal archaeological sites and historical sites, including sites of former grazing activities, a theme which is rarely represented on public land, such as the Regal's and Davies' homestead sites in the recently acquired former freehold area.

Current and future uses

Grazing

Grazing by domestic stock is generally not appropriate in national parks, particularly in areas of high biological significance. However, following advice from grassland ecologists, low-intensity, ecologically-sensitive sheep grazing has been maintained in the highly significant former freehold grassland areas, until more is known about the potential consequences of cessation of grazing.

RECOMMENDATIONS

- A3** (a) That the Terrick Terrick National Park area of 3 854 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88; and
- (b) that low intensity sheep grazing of some grassland areas but not woodland areas, where necessary for biodiversity conservation, continue at the land manager's discretion.

Note: Regal's and Davies' homesteads demonstrate farm dwellings typical of this area; their historical significance should be assessed and appropriate action taken.

Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Parks Victoria (1997b).

B State parks

Although similar to national parks in most respects, state parks are generally less extensive, particularly in terms of natural landscapes and settings, and support less diverse values and landscapes. As a result, while generally very popular sites for recreation and tourism, their lower profile typically attracts fewer visitors seeking the stature conveyed by national park status. At the statewide level, metal detecting is generally not permitted in state parks, but most existing Box-Ironbark state parks do have zones where metal detecting is permitted, in recognition of the importance of Box-Ironbark public lands for this popular recreation.

As well as the recommendations below, which apply to all existing and proposed state parks and additions, specific recommendations may apply to individual parks or areas.

GENERAL RECOMMENDATIONS FOR STATE PARKS

B That the state parks shown on Map A (numbered B1 to B7):

(a) be used to:

- (i) conserve and protect biodiversity and natural processes;
- (ii) protect significant historic sites and places;
- (iii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage; and
- (iv) protect natural landscapes;

and that:

(b) the following activities generally be permitted:

- (i) apiculture on licensed sites, and subject to the outcome of research into the ecological impacts of this industry, and park management requirements;
- (ii) bushwalking, car touring, mountain and trail bike riding on formed roads, picnicking and camping;
- (iii) nature observation, bird watching and visiting historic features;
- (iv) orienteering and rogaining; and
- (v) research, subject to permit;

and that:

- (c) (i) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees; and
- (ii) except for parks where specifically excluded, metal detecting (prospecting) be permitted in designated zones defined in park management plans (see Note 2 below);

and that:

(d) the following activities not be permitted:

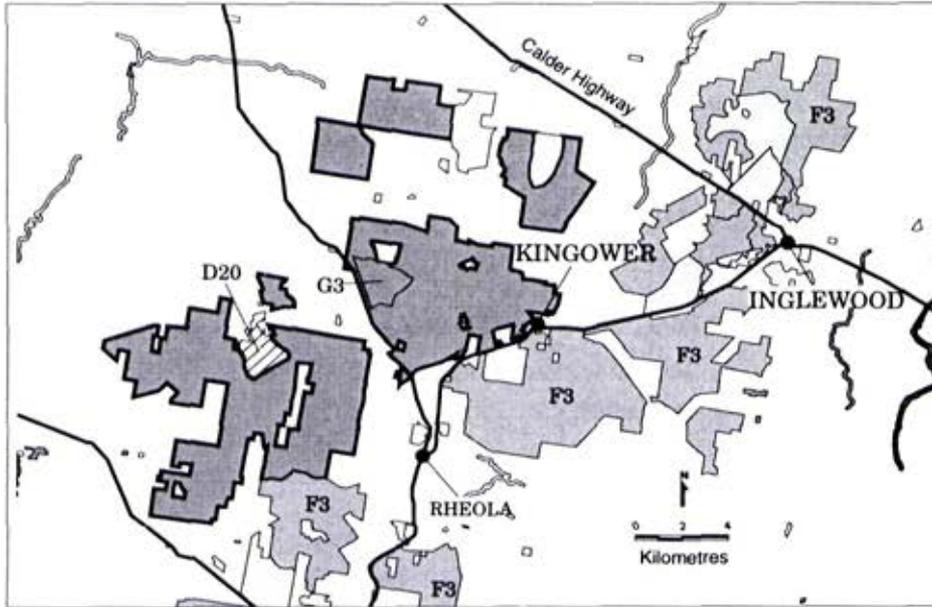
- (i) harvesting of forest products including eucalyptus oil, grazing by domestic stock, hunting and the use or possession of firearms; and
- (ii) exploration and mining, other than continuation of operations within existing licences, as approved;

and that:

- (e) they be included on a schedule to the *National Parks Act 1975*, and managed by the Department of Natural Resources and Environment.

- Notes: 1. Exceptions to the above general recommendations are noted in the recommendations for specific parks, where relevant.
2. Metal detecting should be permitted in designated zones, located to avoid significant park values, notably threatened small ground-dwelling animals and plants, which may be damaged as a result of fossicking or prospecting, while providing discretion for park managers, particularly in gaining compliance. These zones should be developed as part of the standard management plan process, consulting with representatives of prospectors who use the respective park areas. This variation is not intended to affect current arrangements for metal detecting in existing state parks in the study area or elsewhere in Victoria.
3. Should ecological thinning (recommendation (c), above) require removal of wood from parks, that wood may be sold.

B1 Kooyoora State Park



The proposed Kooyoora State Park contains significant examples of a broad range of key Box-Ironbark natural values: many extensive large old tree sites; contrasting landscapes featuring major granitic, metamorphic and sedimentary formations; a consequent diversity of vegetation types; outstanding scenic values with impressive views of adjacent and distant hills and plains; and numerous threatened species.

Benefits of the park

Protection of large old trees

Kooyoora State Park will encompass some of the most extensive consolidated large old tree sites in the study area. Protection of these trees will ensure that, in the long term, the park will contain extensive landscapes of large, widely-spaced trees reminiscent of the natural vegetation structure of Box-Ironbark forests, and of great importance for biodiversity conservation. Eighteen threatened species occur in the park, many of them dependent on large trees.

Diversity of characteristic landscapes

The proposed park will provide an important representative sample of a diversity of landscapes and vegetation types in a relatively small area. Many of these landscapes are among the best examples of their type, in particular Hillcrest Herb-rich Woodland on the metamorphic aureole of Mt Brenanah ridge, Granitic Hills Herb-rich Woodland on the granitic plateau, Rocky Outcrop Shrubland/Herbland Mosaic on the granite peaks

of Mt Kooyoora, and Box-Ironbark Forest on the low Ordovician hills around Wehla.

Recreation and tourism

The expansion of the existing Kooyoora State Park will encourage many of the large and increasing number of visitors to venture into the diverse landscapes of the proposed additions, and provide scope for continuing increases in the park's popularity.

Location

The proposed park straddles the hills at the northern end of the Bealiba Range. It covers 11 646 ha, comprised of the existing Kooyoora State Park (3 606 ha including 325 ha Reference Area G3), West Brenanah and Glenalbyn State Forests (1 340 ha and 990 ha), part of Wehla State Forest (5 480 ha), and Wehla North Nature Conservation Reserve (230 ha).

West Brenanah and Glenalbyn eucalyptus oil production areas are not included, and the Wehla goldfield is proposed as Wehla Nature Conservation

Reserve (see D20), which encompasses the existing Wehla Historic Area.

Community views

There is strong support for some expansion of the existing Kooyoora State Park, with many submissions proposing national park status. Submissions from prospectors focussed on the much more prospective Kingower and Inglewood areas nearby, but argued for retention of current access to all areas.

Environmental values

Large old tree sites

The proposed park contains 15 large old tree sites, with a total area of 3 591 ha. The Wehla area, in particular, contains some of the best representative examples of Box-Ironbark Forest EVC large old tree sites.

Biodiversity

Eighteen threatened species occur in the proposed park, including at least five nationally threatened species (see Appendix 1 for conservation status): Audas' spider-orchid (one of only three known sites), Williamson's wattle, crimson spider-orchid, swift parrot (four key sites), and powerful owl.

The proposed park makes a significant contribution to representation of seven EVCs, particularly Granitic Hills Herb-rich Woodland and Hillcrest Herb-rich Woodland. It also includes some of the most extensive areas of *Northern Goldfields* Box-Ironbark floristic community and Metamorphic Slopes Shrubby Woodland in the study area.

Scenic landscapes

The proposed park additions add the metamorphic Brenanah ridge, and the low ironbark-dominated Wehla hills to the granite plateau of the existing state park. The high scenic quality of each of these elements, in the numerous rocky outcrops, or the impressive views from Mt Brenanah, Mt Kooyoora and Melville Caves, for example, is heightened by the contrasting landscapes and corresponding vegetation types.

The landscape elements are sufficiently close to allow walkers and other visitors to readily appreciate the contrasts, yet sufficiently extensive to maintain the sense of tranquillity in the park's generally

natural semi-remote setting. Melville Caves are named after the bushranger Captain Melville, who used them as a hideaway and lookout during the 1850s, adding extra interest to the view from the nearby summit.

Cultural heritage

Many Aboriginal cultural sites have been found within the existing Kooyoora State Park, including rock wells, rock shelters and archaeological artefacts.

Historic mining relics and places in the park include the White Swan Crystal Mine, Chilean Mill remains, Ochre Mine, mudbrick hut and outbuildings, and Kingower cemetery.

Geology

Melville Caves and Mt Kooyoora provide some of the best Victorian examples of caves formed between large granite boulders.

Current and future uses

Apiculture

There are eight permanent and 24 temporary bee sites distributed through the proposed park. No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Mining

There is one current mining licence in the area of the proposed Kooyoora State Park, and four current exploration licences cover 55% of the area of the proposed park.

The most prospective section in the northern part of the Bealiba Range, the Wehla goldfield, is outside the park in the proposed Wehla Nature Conservation Reserve (see D20).

The mining licence and existing exploration licences covering the park will be renewable subject to Government approval, but no new exploration licences will be issued over the park area. Any future mining arising from these licences would be subject to Government decision and in accordance with existing provisions in the *National Parks Act 1975*.

Prospecting

The area of the proposed Kooyooora State Park is of moderate interest to prospectors, particularly the eastern part of the existing state park, parts of the current Wehla State Forest, and the north-western parts of the West Brenanah and Glenalbyn blocks.

Metal detecting will be allowed in designated zones in the proposed Kooyooora State Park, in accordance with the general recommendations for state parks.

Extensive nearby areas of very high prospector interest: Rheola to Moliagul, and Kingower to Inglewood, are outside the park, as is the Wehla goldfield.

Recreation and tourism

The existing Kooyooora State Park is one of the best known and most visited Box-Ironbark parks, receiving approximately 38 000 visitors per year, despite its distance from major population centres.

Popular activities include bushwalking, picnicking, sightseeing, competitive orienteering, rock climbing, nature observation, prospecting, and cycling. Some of these activities have been offered by commercial operators.

The proposed Kooyooora State Park will provide increased scope for many of the recreation and tourism activities currently occurring in the existing park. The proximity of the expanded park to the Calder Highway, and in particular the proximity of the proposed West Brenanah and Glenalbyn additions, provides opportunities to encourage more visitors, including long distance motorists using the highway, to enjoy the park's attractions without compromising the generally natural, semi-remote setting.

The park will make a major contribution to the range of visitor attractions in the district, complementing the historic features of Moliagul and Inglewood, and some increasingly popular wineries, for example.

Timber harvesting

The net available forest area covered by the proposed Kooyooora State Park is 5 874 ha; 4.6% of the total area currently available for timber harvesting.

Commercial timber harvesting will not be allowed in Kooyooora State Park. Extensive areas of state forest are generally available for timber harvesting in Bealiba State Forest to the south of the proposed park and the Kingower State Forest to the south-east (see F3).

Approximately 486 cubic metres per annum of domestic firewood is removed from the proposed Kooyooora State Park area.

There are large areas of state forest remaining around Rheola, Kingower and Dunolly where domestic firewood will still be available (see F3). In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4). Domestic firewood collection will not be allowed in the proposed Kooyooora State Park.

Management issues

Visitor numbers

Despite relatively little promotion, visitor numbers in the existing state park are already high and increasing. With an appropriate increase in promotion to attract potential visitors, and because it is larger and more prominent, has more features, and is closer to the Calder Highway, further increases are likely in the proposed park.

While such an increase in popularity is certainly desirable, careful management will be required to accommodate the extra visitors while protecting the park's values.

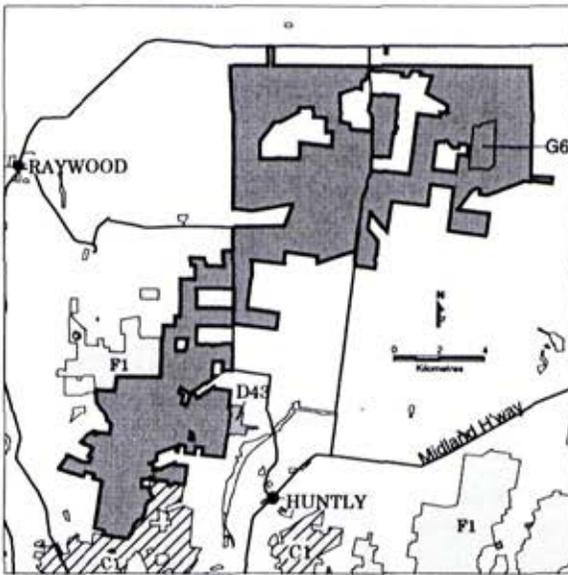
RECOMMENDATIONS

- B1** That the Kooyooora State Park area of 11 646 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

Information Sources

- Backhouse and Jeanes (1995).
Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.
Holland and Cheers (1999).
National Parks Service (1996b).
Stone (1988).
Stone (1996b).
Venn (1992).

B2 Whipstick–Kamarooka State Park



The proposed Whipstick–Kamarooka State Park will consolidate protection for over 20 threatened species which occur in the variety of habitats contained in this relatively small area. Its high recreation and tourism values, as a result of its proximity to Bendigo, will be enhanced by the consolidation of existing parks.

Benefits of the park

Biodiversity conservation

In a relatively small area, the Whipstick–Kamarooka State Park will protect over 20 threatened species, including three species for which the area represents the most important site in Victoria: pink-tailed worm-lizard, Whipstick westringia (a small shrub), and Kamarooka mallee.

The proposed park includes some of the highest quality Box-Ironbark Forest EVC in the Bendigo area, approximately 40% of the total extent of Broombush Mallee EVC in the proposed reserve system, and one of the largest blocks of Grassy Woodland EVC in Victoria.

Recreation and tourism

Whipstick–Kamarooka State Park will continue to increase in importance as a site for recreation and tourism, readily accessible from nearby Bendigo.

Location

The proposed Whipstick–Kamarooka State Park links and consolidates the existing Whipstick and Kamarooka State Parks, extending north-east from Eaglehawk to about 12 kilometres west of Elmore.

The total area of the proposed park is 12 150 ha, encompassing the existing Whipstick and Kamarooka State Parks (2 303 ha and 7 273 ha,

including Kamarooka Reference Area G6), uncommitted land (1 702 ha), eucalyptus oil production area (775 ha), recently purchased former freehold (94 ha), and flora reserve (3 ha).

Community views

Many people support expansion, or national park status, or both, for Whipstick and Kamarooka State Parks, including those proposing a Greater Bendigo National Park.

Prospectors, particularly those living locally, are keen for their access to the Whipstick public lands to be maintained. Eucalyptus oil producers in this area want to continue public land harvesting in their current cutting areas.

Environmental values

Biodiversity

The proposed Whipstick–Kamarooka State Park and Greater Bendigo Regional Park (see C1) and their immediate surroundings support the only Victorian population of the pink-tailed worm-lizard. The Whipstick–Kamarooka State Park also contains the larger of the two known populations of Whipstick westringia, is the most important site for Kamarooka mallee, and includes key sites for swift parrot and brush-tailed phascogale.

Twenty other threatened species have been recorded in the proposed Whipstick–Kamarooka State Park, as have an unusually high number of bird species.

The proposed Whipstick–Kamarooka State Park has many large areas of high botanical diversity. Of particular note are patches of high understorey diversity where wildflower displays in spring are spectacular. The proposed park makes a significant contribution to the representation of three EVCs, particularly Box–Ironbark Forest and Grassy Woodland, as well as containing 40% of Broombush Mallee EVC in the proposed reserve system.

Current and future uses

Apiculture

There are one permanent and 31 temporary bee sites distributed through the proposed Whipstick–Kamarooka State Park. No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Mining

Two exploration licences cover 100% of the area proposed to be added to the existing state parks.

The existing exploration licences covering the park will be renewable subject to Government approval, but no new exploration licences will be issued over the park area. Any future mining arising from these licences would be subject to Government decision and in accordance with existing provisions in the *National Parks Act 1975*. The highly prospective Bendigo goldfield is south of the proposed Whipstick–Kamarooka State Park, and is mostly in the proposed Greater Bendigo Regional Park (see C1), where mining would generally be allowed.

Prospecting

Whipstick–Kamarooka State Park is generally of high interest for prospectors, particularly because of its proximity to Bendigo.

Metal detecting will be allowed in designated zones in the proposed Whipstick–Kamarooka State Park, in accordance with the general recommendations for state parks.

Recreation and tourism

Abundant natural values and diverse landscapes close to Bendigo represent a recreational resource of significant value for Bendigo residents and visitors who enjoy bushwalking, orienteering, prospecting,

picnicking, camping, bike riding, and nature study in the proposed park area. The existing Whipstick and Kamarooka State Parks currently receive approximately 25 500 and 9 000 visitors per year respectively.

Areas currently harvested for eucalyptus oil have very little recreational value, and adding them to the park and allowing them to revegetate is likely to increase the recreational value of the area.

Eucalyptus oil production

Two licensees harvest eucalyptus oil over approximately 250 ha of the area between the existing Whipstick and Kamarooka State Parks, which is proposed to be included in Whipstick–Kamarooka State Park.

Approximately 150 ha currently used for eucalyptus oil production will remain available in state forest immediately to the west of the proposed addition linking the existing state parks. Eucalyptus oil harvesting will not be permitted in the proposed Whipstick–Kamarooka State Park.

Timber harvesting

The net available forest area covered by the proposed Whipstick–Kamarooka State Park is 439 ha, which is 0.4% of the total area currently available for timber harvesting. Commercial timber harvesting will not be allowed in the Whipstick–Kamarooka State Park. Over 10 000 ha of forest is generally available for timber harvesting in various areas surrounding Bendigo, retained as state forest (see Chapter 15).

Little, if any, domestic firewood is collected in the proposed park. Most of the area not already in the existing state parks is dominated by mallee eucalypts which are not favoured as firewood. For local residents, opportunities for domestic firewood collection remain in over 10 000 ha retained as state forest in various areas surrounding Bendigo. In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4).

RECOMMENDATION

- B2** That the Whipstick–Kamarooka State Park area of 12 150 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

Information Sources

CFL (1989).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Davies (1992).

Davies and Riley (1993).

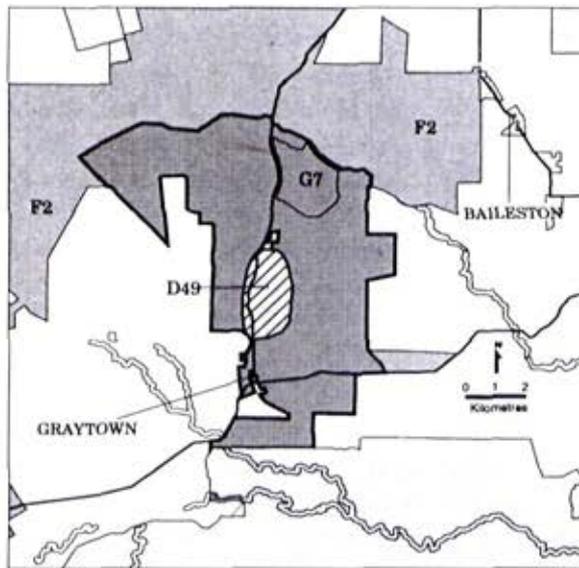
Holland and Cheers (1999).

National Parks Service (1996a).

Scientific Advisory Committee, Flora and Fauna Guarantee (1996).

Stone (1996a).

B3 Mt Black State Park



The proposed Mt Black State Park is important for its environmental, recreational and historic values. It supports eight threatened species including scented bush pea, squirrel glider and swift parrot. It also includes a concentration of high value large old tree sites and fauna refuges. Recreational opportunities include exploring gold rush and war era historic features at Graytown as well as highly accessible areas that offer solitude in a bush setting.

Benefits of the park

Biodiversity

Mt Black State Park will protect eight threatened species, including a key site for the swift parrot. A large number of bird species have been recorded in the park.

Mt Black State Park encompasses some of the largest consolidated large old tree sites in the study area. Protection of these trees will ensure that, in the long term, the park will contain extensive landscapes of large, widely-spaced trees reminiscent of the natural vegetation structure of Box-Ironbark forests, and of great importance for biodiversity conservation.

It contains several EVCs including an extensive high quality example of the vulnerable Creeklane Grassy Woodland along Spring Creek overlapping with one of the largest fauna refuges in the study area.

Recreation and tourism

Mt Black State Park is unusual in that, despite being highly accessible by road and relatively close to Melbourne and tourist centres such as Nagambie, it offers solitude in a natural setting only a short walk from the car.

Because of its accessibility, high species-richness and importance for several threatened species, the park is a favoured site of bird watchers.

The gold rush town of Graytown and evidence of a prisoner-of-war camp are situated within the park and provide opportunities for historical interpretative walks.

Location

The proposed park encompasses most of the south-east (Graytown) section of the extensive Rushworth–Heathcote State Forests, and includes the summit and slopes of Mt Black down to Spring Creek near its junction with Majors Creek.

Mt Black State Park covers 5 418 ha, derived from the existing Mt Black Reference Area (G7; 380 ha), Graytown Historic Reserve (41 ha), 1 337 ha of the Mt Black Flora Reserve, and 3 660 ha of Rushworth State Forest.

Community views

Numerous letters and submissions, particularly from Rushworth, opposed the establishment of a national park in state forests between Rushworth and Heathcote, proposing that current access for resource extraction, recreational users and timber harvesting be maintained. However, many others proposed establishment of a national park to protect natural values in all or part of this forest, emphasising its suitability for a national park as the largest contiguous Box-Ironbark forest in Victoria.

Environmental values

Biodiversity

Eight threatened species have been recorded in the proposed Mt Black State Park, including scented bush pea, squirrel glider, powerful owl, and swift parrot (Appendix 1 lists threatened species and their conservation status). In addition, the total number of bird species recorded in the area is unusually high.

Mt Black State Park makes a significant contribution to representation of Box-Ironbark Forest and Creepline Grassy Woodland EVCs.

Four large old tree sites, with a total area of 1 204 ha, are contained in Mt Black State Park. The predominant tree species at these sites are red ironbark, grey box and yellow box.

Cultural heritage

The historic gold rush town of Graytown, which once attracted tens of thousands of diggers, is evidenced by its remaining streets, building foundations, and cemetery.

Regionally significant relics of a Second World War prisoner-of-war camp are located within the area of the former township at Graytown, adjacent to the Heathcote–Nagambie Road.

Current and future uses

Recreation and tourism

Mt Black State Park is easily accessible by road and provides opportunities to experience solitude in a natural setting a short walk from the car. It has many natural values such as large trees and a high number of bird species. Its historical values include the gold rush town of Graytown and a Second World War prisoner-of-war camp. The park therefore lends itself to visits through its accessibility for bird watching, wildlife, wildflowers and historical interpretative walks.

Prospecting

The area of the proposed Mt Black State Park is of low to moderate interest to prospectors. Metal detecting will be allowed in designated zones in the proposed Mt Black State Park, in accordance with the general recommendations for state parks.

Apiculture

There are two permanent and nine temporary bee sites distributed through the proposed park area.

No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Mining

There are no mines operating in the area of the proposed Mt Black State Park. Approximately two-thirds of the proposed park is covered by a current exploration licence.

Existing exploration licences covering the park will be renewable subject to Government approval, but no new exploration licences will be issued over the park area. Any future mining arising from these licences would be subject to Government decision and in accordance with existing provisions in the *National Parks Act 1975*. The most prospective section is outside the park in the proposed Spring Creek Nature Conservation Reserve (see D49).

Timber harvesting

The net available forest area covered by the proposed Mt Black State Park is 3 660 ha; 2.9% of the total area currently available for timber harvesting. Extensive areas of state forest are generally available for timber harvesting in the adjacent Rushworth–Heathcote State Forests (see F2). Commercial timber harvesting will not be allowed in Mt Black State Park.

Approximately 1 227 cubic metres per annum are currently removed as domestic firewood under permit from the Mt Black State Park area. Large parts of the Rushworth–Heathcote State Forests (see F2) remain generally available for domestic firewood collection. In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4). Domestic firewood collection will not be allowed in the proposed Mt Black State Park.

RECOMMENDATION

- B3** That the Mt Black State Park area of 5 418 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

Information Sources

Bannear (1997).

Butler (1997).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Holland and Cheers (1999).

B4 Broken–Boosey State Park

The proposed Broken–Boosey State Park is shown in detail in Map C (see report back pocket).

When Major Mitchell crossed Victoria in 1836, he spent days on end travelling through grey box-dominated grassy woodlands which, at that time, covered over a million hectares of the vast Riverina plain of northern Victoria. Now, the largest patches of that vegetation can be walked across in minutes. Less than 2% remains, most of it with few if any indigenous herbs, grasses and shrubs, and with an even smaller percentage protected in conservation reserves. In this context, the Broken–Boosey State Park represents not only a large and very significant addition to the reserve system, but also a concrete turning point in European attitudes and actions towards these tiny remnants and their conservation and management.

Benefits of the park

Biodiversity conservation

As the only remaining substantial occurrence of high quality native vegetation on the northern plains, Broken–Boosey State Park will protect over 30 threatened species, including two plants not recorded anywhere else in Victoria. The park will also be pivotal in arresting and reversing the decline of many more species for which the park is of great importance at the regional level.

Landscape

In a landscape which retains few distinctively Australian features, Broken–Boosey State Park stands as an immensely important example of characteristic natural vegetation and landscapes. It provides a unique contiguous corridor along the natural gradient of land systems and vegetation types from mesic herb-rich woodlands in the east to semi-arid riverine woodlands in the west.

Cultural heritage

Although not systematically assessed, the proposed park is known to contain over 150 Aboriginal scar trees, and has great potential significance for its cultural heritage values.

Land and water protection

Creation of the Broken–Boosey State Park will represent the culmination a number of initiatives undertaken during recent years by local stakeholders to protect stream banks, water quality and various natural values along these creeks.

Location

The proposed park covers the most ecologically intact and significant areas of public land along the

Broken, Boosey and Nine Mile Creeks from near Picola in the west upstream to near Lake Rowan in the east. There are 14 discrete blocks in the proposed park, although many of the breaks between blocks are less than a kilometre.

Broken–Boosey State Park is 3 067 ha in area, derived from: 808 ha in four existing wildlife reserves; 691 ha in numerous mostly small bushland reserves; streamside reserves and other small parcels; 100 ha of uncommitted land; and approximately 1 468 ha of public land water frontage.

Nearby nature conservation reserves D51, D52, and D55–61, and natural features reserve H99 complement nature conservation in Broken–Boosey State Park (see Map C).

Community views

All submissions that named the Broken–Boosey Creeks public land proposed establishment of a state park. More generally, there is strong support for a high level of protection and restoration of the best examples of highly depleted vegetation types and landscapes, especially on the northern plains.

There is also strong general support for measures which will assist improved land and water protection, such as lower ground water tables, reduced stream bank erosion, and improved in-stream water quality.

Environmental values

Biodiversity

The proposed park is the only known site in Victoria for spiny-fruit saltbush and coolibah grass (see Appendix 1 for conservation status of threatened species). Among the 36 other threatened

species recorded (not including numerous aquatic species) are bush stone-curlew, red-chested button-quail, barking owl, grey-crowned babbler, small scurf-pea, tough scurf-pea, pepper grass, mallee golden wattle and narrow-leaf sida.

Being the only substantial area of largely intact native vegetation in the eastern half of the northern plains, Broken–Boosey State Park is the stronghold for most native flora and fauna species in the region, including many species that are declining, such as red-capped robin and diamond firetail. The park is particularly important for species dependent on mature woodland, such as the crested shrike-tit, tree martin, brown tree creeper and tree goanna.

The park contributes significantly to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic, Pine Box Woodland/Riverina Plains Grassy Woodland Mosaic, Plains Grassy Woodland, Pine Box Woodland, Sand Ridge Woodland, and Creekline Grassy Woodland EVCs. For all but the last of these, the park contains the largest public land examples in the study area.

Landscape

The band of indigenous vegetation that lines these creeks is, in many areas, the only distinctively Australian element in the landscape. Stretching over 100 km (in a straight line), it provides the only contiguous cross-section along the natural gradient of land systems and vegetation types from mesic herb-rich woodlands at the foot of the Warby Ranges in the east, to semi-arid riverine woodlands near the Murray River in the west. Contiguous public land water frontages connect the proposed park to Barmah Forest and the Warby Range.

Cultural heritage

Around 150 scar trees have been recorded within the area of the proposed state park. This abundance indicates a high level of use by Aboriginal people, and suggests that systematic assessment would be likely to detect further sites and may result in the recognition of the area as a highly significant site for indigenous cultural heritage.

Land and water protection

In recent years, a number of programs have been undertaken to improve land protection, water quality, biodiversity conservation and protection of other natural values associated with the Broken–

Boosey Creeks system. For example, the Goulburn Broken Catchment Management Authority and Parks Victoria have managed programs to install fish ladders in the creek, fence water frontages and reduce grazing. Creation of the proposed state park will be another important step in improving land, water and biodiversity conservation in this region.



Over 150 Aboriginal scar trees have been recorded in the proposed Broken–Boosey State Park

Current and future uses

Apiculture

There is one permanent bee site in the proposed park area. No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Grazing

Sixty-one licences for grazing are current over 602 ha of the proposed park (20% of total park area).

In recent years, the area of Broken–Boosey water frontage grazed by domestic stock has been greatly reduced in order to protect stream banks, water quality and natural values. Grazing will not be permitted in the proposed Broken–Boosey State Park.

In places where public land is not currently fenced from adjacent freehold land, new fencing will be required to prevent stock grazing in the proposed park. Because water frontage protection has a variety of benefits, funds for fencing may be available from catchment-wide conservation and land and water protection programs, as has been the case with recent new fencing along the creeks.

Other uses

No current exploration or mining licences overlap with the Broken–Boosey State Park. No new licences will be issued over the park area.

The area proposed as Broken–Boosey State Park currently receives few visitors because it is fragmented into a number of rarely signposted units in different public land use categories.

While the size and shape of the proposed park limits its suitability for many recreational activities, creation of the park would encourage more visitors than the current very low number. While most of the proposed park is within 50 metres of cleared freehold land, long contiguous sections of natural woodland occur. In addition, with development of appropriate materials and facilities, the proposed park has great potential for interpretation and education, particularly in improving awareness and understanding of the vegetation of the northern plains, before it was almost completely replaced with farmland. The frontages of the Broken, Boosey and Nine Mile Creeks are of no interest to prospectors. Soil disturbance should be minimised in the highly significant riparian zones of these creeks. Metal detecting will not be permitted in the proposed Broken–Boosey State Park.

Management issues

Water flows

As a result of its use as a channel for irrigation water, the naturally ephemeral Broken Creek is now perennial, typically carrying significant volumes of water. Ultimately, the current flow regime is likely to lead to the replacement of some of the existing plains vegetation on the adjacent public land, mostly Plains Grassy Woodland/Gilgai Wetland Mosaic EVC, dominated by grey box, with vegetation more tolerant of waterlogging, probably dominated by river red gum, for example.

Park managers should closely monitor changes in soil moisture and vegetation at locations distributed through the proposed park, and investigate the seasonality of high water flows along the creek and opportunities to significantly reduce, at least occasionally, the volume of water flowing through the creeks.

Weed invasion

In terms of nature conservation, the proposed park contains the very highest quality (including least weedy) public frontages of the Broken and Boosey Creeks. As a result, weed invasion following removal of grazing by domestic stock is likely to be generally minor, but nonetheless requires monitoring and control where appropriate.

Co-operative management

The total length of the Broken–Boosey State Park boundary with freehold land is very large relative to the size of the park. In addition, while the park and nearby nature conservation reserves contain much of the high quality native vegetation in the region, a sizeable part of the total area of such vegetation is on freehold land. For these reasons, nature conservation in the region will be most effective if park managers, freehold land owners, and other interested stakeholders, work in cooperation. This issue is discussed at length in Chapter 4, culminating in Recommendation R9 for the establishment of a Local Habitat Conservation Network for the Broken–Boosey region.

RECOMMENDATIONS

- B4** (a) That the Broken–Boosey State Park area of 3 067 ha shown on Map A and Map D be used in accordance with the general recommendations for state parks on page 97; and
- (b) that metal detecting not be permitted.

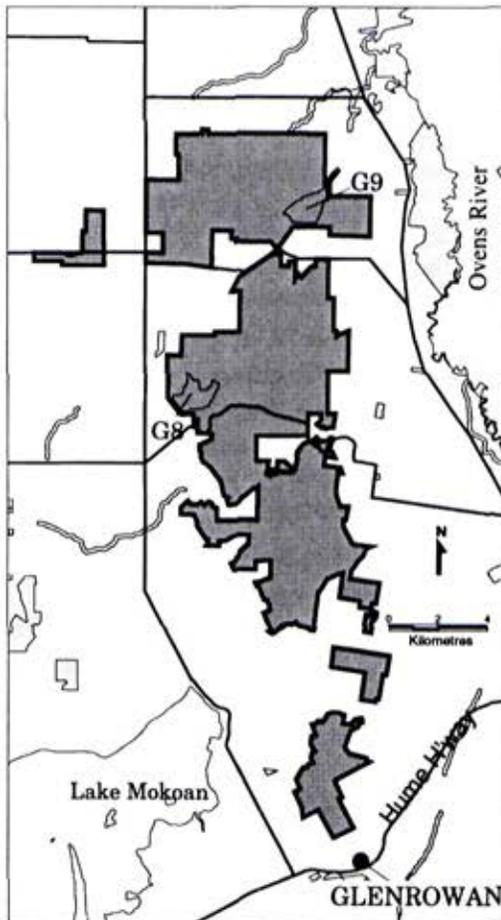
Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Robinson and Mann (1996a).

Robinson and Mann (1996b).

B5 Warby Range State Park



The existing Warby Range State Park protects the impressive landscape, biodiversity, and recreation values of the granite hills immediately north of Glenrowan. The proposed addition of Killawarra forest to the park will add the very significant, and distinctively different, values of the ironbark-dominated forests on the low sedimentary hills to the north. Management primarily for nature conservation will provide secure long-term protection for these values.

Benefits of the park

Biodiversity conservation

Warby Range State Park will provide protected habitat for a diverse range of plants and animals, including many threatened species, and species at the edge of their geographic range. It will also ensure the long-term maintenance of a substantial habitat corridor of high quality vegetation from the Great Dividing Range to the Murray River.

Recreation and tourism

The expansion of the existing Warby Range State Park will increase the park's popularity by encouraging more visitors to venture into the diverse landscapes of the expanded park.

Diversity of landscapes

The park will incorporate a diversity of landscapes and vegetation types, ranging from the panoramic

granite hills of the Warby Range to the undulating Box-Ironbark slopes of Killawarra and Boweya.

Community views

There is very strong support for the addition of both Killawarra and Boweya to the existing Warby Range State Park. Many submissions proposed national park status, while others argued for the inclusion of nearby river red gum forests associated with the Ovens River.

Location

The proposed park extends from the steep and rocky granite hills heading north from the Hume Highway at Glenrowan (the existing state park) to the lower and more gentle sandstone hills, as the northern edge of the ranges gives way to the plains of the Riverina.

Warby Range State Park will cover 11 084 ha, encompassing the existing Warby Range State Park (7 600 ha, including 170 ha reference area G8), Killawarra State Forest (2 944 ha, including 141 ha reference area G9), 279 ha education area, and 261 ha Boweya Flora Reserve.

Environmental values

Biodiversity

The proposed park will protect habitat for several threatened plant and animal species, notably Warby swamp gum, narrow goodenia, western silver wattle, northern sandalwood, Dookie daisy, turquoise parrot, swift parrot, painted honeyeater (particularly in Killawarra), squirrel glider and carpet python.

Killawarra forest is of particular importance as one of the few places in Victoria where the regent honeyeater has been recorded regularly, including breeding, in recent years. Fourteen other threatened species have been recorded in the area of the proposed park, and Killawarra in particular is well known as an area of high bird species-richness. See Appendix 1 for the conservation status of threatened species.

An exceptional number of reptile species has been recorded in both the existing state park and Killawarra forest, as has an exceptional number of bird species in the existing state park.

Vegetation within the proposed park is of national significance due to its diversity of species and habitats and its outstanding wildflower displays. The proposed park makes a significant contribution to representation of eight EVCs, particularly Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic, *North-eastern Hills* Box-Ironbark Forest, Valley Grassy Forest, and Grassy Woodland.

Landscape

This park is dominated by a prominent range of high scenic quality, providing spectacular views of the surrounding and distant countryside including the Australian Alps and the Ovens, King and Murray River valleys. Lower and more gentle hills in the north of the park provide landscape and habitat diversity. Scenic waterfalls can be found in the park when ephemeral streams flow during the wetter months.

Cultural heritage

The proposed park contains several important Aboriginal sites including rock wells and at least one scar tree.

Relics of early European settlement, including a water race and weirs on the 'Taminick Run', are also contained within the proposed park.

Current and future uses

Apiculture

There are 11 permanent and seven temporary bee sites in the proposed park. No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Recreation and tourism

The existing Warby Range State Park is relatively well known, receiving approximately 26 000 visitors per year. In addition, the existing Killawarra State Forest is one of the most popular Box-Ironbark state forests. Most visitors come from nearby Wangaratta. Popular activities include bushwalking, picnicking, sightseeing, cycling, camping, orienteering, and nature study.

The proposed Warby Range State Park will provide increased scope for many of the recreation and tourism activities currently occurring in the existing park, particularly given its close proximity to the regional centres of Wangaratta and Benalla, and the Hume Freeway.

Mining

There are no current mining or exploration licences covering any part of the proposed Warby Range State Park. No new licences will be issued over the proposed park.

Timber harvesting

The net available forest area in the Killawarra forest addition to the Warby Range State Park is 2 102 ha; 1.7% of the total area currently available for timber harvesting.

The main commercial product, posts and other fencing materials, will be available from other Box-Ironbark forests to the west, and substitute products. Commercial timber harvesting will not be allowed in the proposed Warby Range State Park.

Approximately 1 000 cubic metres per annum are removed from the existing Killawarra forest as domestic firewood under permit. There are nearby areas of state forest along the Ovens and Murray Rivers where domestic firewood will still be available. In addition, some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4).

Domestic firewood collection will not be allowed in the proposed Warby Range State Park.

Other uses

Metal detecting is not permitted in the existing Warby Range State Park, and Killawarra forest is of little interest to prospectors. Metal detecting will not be permitted in the proposed Warby Range State Park.

RECOMMENDATIONS

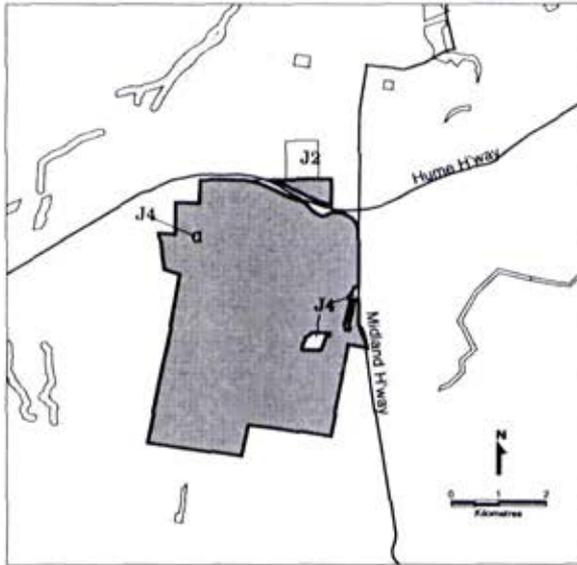
- B5** (a) That the Warby Range State Park area of 11 084 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97; and
- (b) that metal detecting not be permitted.

Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Parks Victoria (1998b).

B6 Reef Hills State Park



Benefits of the park

Biodiversity conservation

The proposed Reef Hills State Park will improve protection of flora and fauna of national significance, with a large number of threatened species and significant vegetation communities.

Recreation and tourism

The proposed park is the only large area of public land close to Benalla, providing local residents with recreation opportunities in a readily accessible natural setting. The change of status is likely to result in increased visitors to the park, as its natural values become more widely known.

Location

Incorporating low hills of sedimentary rocks, after which the park is named, Reef Hills State Park straddles the Hume Highway about five kilometres south of Benalla.

The proposed Reef Hills State Park covers 2013 ha, the existing 2040 ha Reef Hills Regional Park, excluding 27 ha in shooting ranges and immediate environs (see J4). Most of the existing safety buffers around the shooting ranges are proposed to be included in the state park, with existing restrictions on access maintained by zoning within the state park. Currently, Reef Hills Regional Park is scheduled and managed under the *National Parks Act 1975* as 'Reef Hills Park'.

Regional parks are usually scheduled and managed under the *Crown Land (Reserves) Act 1978*.

Community views

For a relatively small area, Reef Hills was mentioned specifically in a large number of submissions, most proposing that it be made a state park. Users of the shooting ranges proposed that the existing access arrangements be maintained, including restrictions on general access, for safety. Some submissions noted possible adverse impacts on natural values as a result of overgrazing by kangaroos.

Environmental values

Biodiversity

The area of the proposed park provides habitat for several threatened plant and animal species, notably purple diuris, narrow goodenia, clover glycine, swift parrot, turquoise parrot, regent honeyeater, painted honeyeater, bush stone-curlew, powerful owl, squirrel glider and brush-tailed phascogale.

The park contributes significantly to representation of Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic (100% of public land extent of this EVC is in the park), *North-eastern Hills Box-Ironbark Forest*, Heathy Dry Forest, and Plains Grassy Woodland/Gilgai Wetland Mosaic EVCs.

The park includes a 30 ha large old tree site dominated by red box trees.

Current and future uses

Apiculture

There are four bee sites distributed through the proposed park area. No change to existing access for apiculture is proposed; land managers will retain discretion over location and use of specific sites.

Mining

There are no current exploration or mining licences overlapping with the proposed Reef Hills State Park. Because the existing regional park is listed on Schedule 3 of the *National Parks Act 1975*, applications for mining or exploration would currently be subject to Section 40 of that Act (see Chapter 5 for further explanation). No new licences will be issued within the proposed park.

Domestic firewood collection

There has been no systematic domestic firewood collection in the existing Reef Hills Regional Park for several years.

Some domestic firewood may be produced from the proposed park in the early stages of an ecological management strategy (see Recommendation R11 and Chapter 4); otherwise domestic firewood collection will not be allowed in Reef Hills State Park.

Recreation and tourism

The existing Reef Hills Regional Park is used mostly by Benalla residents for activities such as bushwalking, picnicking, trail bike riding, nature study and camping. The shooting ranges are regularly used, particularly on weekends.

The proposed Reef Hills State Park will provide increased scope for these and other activities, particularly given its proximity to Benalla and the Hume Freeway.

Prospecting

The area of the proposed Reef Hills State Park is of relatively little interest to prospectors. Metal detecting will be allowed in designated zones in the proposed Reef Hills State Park, in accordance with the general recommendations for state parks.

Management issues

Kangaroo grazing

The existing and potential impact of kangaroo grazing on the natural values in the park requires assessment, monitoring and, if necessary, a program to prevent or reverse any adverse impacts.

RECOMMENDATIONS

- B6** (a) That the Reef Hills State Park area of 2 013 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97; and that
- (b) should the current use as shooting ranges of any of the three adjacent areas lapse, they be rehabilitated and added to the state park.

Information Sources

CFL (1987).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

B7 Paddys Ranges State Park

The proposed Paddys Ranges State Park covers 1 954 ha, incorporating the existing 1 675 ha Paddys Ranges State Park, and 279 ha of the adjacent Paddys Ranges State Forest.

Paddys Ranges State Park is well known for its striking wildflower displays and diverse avifauna (over 100 species recorded). The park provides habitat for several threatened species, notably swift parrot, painted honeyeater, crimson spider-orchid, and brush-tailed phascogale.

The proposed addition to the existing Paddys Ranges State Park is an important key site for swift parrot. It is also important for representation of good examples of *Western Goldfields* Box-Ironbark floristic community, and several historic mining sites have been identified in the park.

The existing state park, located close to Maryborough, is a popular destination for walking, bird watching, prospecting, sightseeing, car touring, and camping, receiving approximately 7 000 visitors in 1995/96.

The net available forest area covered by the proposed addition to Paddys Ranges State Park is 197 ha, which is 0.2% of the total area currently available for timber harvesting.

Extensive areas of state forest are generally available for timber harvesting in surrounding areas. Commercial timber harvesting will not be allowed in Paddys Ranges State Park.

RECOMMENDATIONS

- B7** That the Paddys Ranges State Park area of 1954 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Parks Victoria (1997a).

14 Regional parks, nature conservation reserves, and historic and cultural features reserves

Regional parks and reserves for nature conservation and historic and cultural features designate public land for particular uses. General recommendations for each of the three categories are made in this chapter, as well as information and recommendations for specific parks and reserves.

C Regional parks

A regional park is an area of public land, readily accessible from urban centres or a major tourist route, set aside primarily to provide recreation for large numbers of people in natural or semi-natural surroundings. Regional parks are generally of at least 1 000 ha, and are managed by Parks Victoria, under policy direction from the NRE Parks, Flora and Fauna Division.

Regional parks are developed for informal recreation. This could include vehicle and walking tracks, riding trails, viewing platforms, picnic and barbecue facilities, fireplaces, toilets, and interpretation material. These parks do not include sportsgrounds with constructed arenas, or sites exclusively used for one recreation activity. Such recreation areas are described in Section J, Community Use Areas in Chapter 16.

The fragmentation of Box–Ironbark public land, and its closeness to many towns, establishes the setting for everyday forest use for ‘local recreation’; for walking, riding, running, and exercising the dog. Some existing regional parks are intensively used; for example, One Tree Hill at Bendigo had around 1 000 visitors per day in spring 1996. Regional park managers provide appropriate facilities for such users.

Along with most public land carrying Box–Ironbark vegetation, regional parks have significant value for nature conservation as habitat, as well as historic or recreation values in particular areas.

Park management plans will be prepared to guide land managers. These plans identify zones with different management needs, locations for facilities, and areas with specific environmental or heritage values requiring protection and necessary management actions.

Other uses

In relation to mining, these parks are recommended to be ‘restricted Crown land’ under the *Mineral Resources Development Act 1990*. In brief, the parks may be used for mineral exploration and mining, subject to the approval of the Minister for Environment and Conservation. Major mining proposals may require an environment effects statement. Refer to Chapter 5 for a full explanation.

Apiculture and prospecting (with a metal detector) can generally continue, subject to management plan provisions. Bee sites should be located away from recreation nodes. Grazing is not permitted in these parks.

Felling of dead trees for firewood and collection of fallen wood from the ground reduce habitat, and are not permitted. Other timber products are similarly not available. Some domestic firewood may be produced from the proposed parks as a by-product of ecological thinning (see Chapter 4).

Additional public land

Eaglehawk and One Tree Hill Regional Parks at Bendigo are to be included, with some township land at Bendigo, in the Greater Bendigo Regional Park. New regional parks are recommended at St

Arnaud, Castlemaine and Heathcote. Ararat Regional Park is to gain a substantial addition, and Maryborough gains a small addition. The ECC endorses the existing regional parks at Mt Alexander and Hepburn. Reef Hills Regional Park at Benalla is now recommended as a state park.

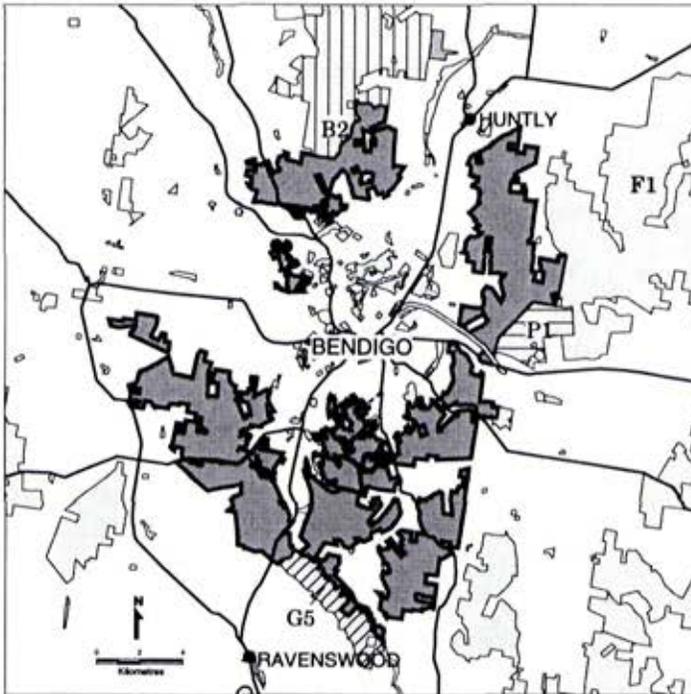
Several of these public land areas were never considered by the Land Conservation Council as they were in cities or towns, and therefore excluded from consideration under the relevant legislation.

GENERAL RECOMMENDATIONS FOR REGIONAL PARKS

- C That regional parks shown on Map A (numbered C2 to C9)
- (a) be used:
 - (i) for informal recreation associated with the enjoyment of natural surroundings by large numbers of people;
 - (ii) to conserve indigenous flora and fauna, and natural features;
 - (iii) to protect features of historical or cultural significance;
 - (iv) for apiculture and recreational prospecting, where consistent with (i), (ii) and (iii) above, and subject to the approval of the land manager;
 - (b) not be available for timber harvesting or grazing;
 - (c) be subject to a management plan with zoning to protect biodiversity and significant features;
and that:
 - (d) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
and that:
 - (e) regional parks be reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment, except where otherwise specified.

C1 Greater Bendigo Regional Park

An enlargement of the Bendigo area showing proposals around the township, including parts of the Greater Bendigo Regional Park, is provided as Map D (see report back pocket).



The residents of Bendigo are fortunate to live in a large modern rural city which is surrounded closely on all sides by extensive Box–Ironbark forests. The proposed Greater Bendigo Regional Park, together with the Whipstick–Kamarooka State Park (see B2), make Bendigo a ‘city within a park’. This location has large areas of indigenous vegetation, which provides a key part of the visitor experience, for example seasonal wildflower displays. Not many cities have the good fortune and responsibility associated with being surrounded by forest which is important for the (global) survival of some threatened species, such as the pink-tailed worm-lizard and Audas’ spider-orchid. The many historical features and associations with gold mining reinforce that this town was built on the proceeds of gold from the forests.

Benefits of the park

Biodiversity conservation

The proposed Greater Bendigo Regional Park is an area of very high flora and fauna conservation values. It will protect populations of the pink-tailed worm-lizard and Audas’ spider-orchid, both of which are nationally endangered. It will also protect habitat for 15 other threatened flora and fauna species.

Recreation, tourism and heritage

The Greater Bendigo Regional Park will stimulate awareness and appreciation of the diverse range of features offered by bushland in and around Bendigo. Parts of the park are already popular with locals for activities such as bushwalking, horse riding, nature observation, cycling, picnicking and camping.

Increasingly, the park will become popular with ‘heritage tourists’ due to its array of significant sites, many of which are linked by trails and roads that allow easy access. Spectacular wildflower displays and the opportunity to enjoy passive recreational activities in a natural setting will also attract tourists.

Location

The proposed Greater Bendigo Regional Park surrounds Bendigo on all sides, effectively creating a ‘city within a park’. It incorporates many parcels of public land for which coordinated management is a high priority.

The proposed park covers 11 928 ha encompassing: the existing Eaglehawk and One Tree Hill Regional Parks (833 ha and 1 090 ha respectively); parts of the existing Wellsford, Mandurang, Mandurang South and Marong State Forests (2 616 ha, 1 100 ha, 1 280 ha, and 2 200 ha respectively); Spring Gully and Crusoe-Big Hill Water Production areas (1 358 ha total); Sandhurst Reference Area (see G5) and Water Production Area (690 ha); Diamond Hill Historic Area (396 ha); and several nature conservation reserves, bushland reserves, township and other small parcels (364 ha total). Commonwealth land at Longlea (see P1) abuts the eastern boundary.

Community views

There is local support for establishment of a 'Greater Bendigo National Park', comprising most or all of the public land around Bendigo. However, the mining industry is keen to maintain access to the most likely productive areas for gold exploration, especially goldfields which historically have been the most productive and were some of the richest in the world. Public land close to Bendigo is also immensely popular for a wide range of recreational issues, including some which reflect its near urban setting, such as horse riding and exercising dogs.

Environmental values

Biodiversity

The area of the proposed park and immediately adjoining public land supports populations of 17 threatened species, including: pink-tailed worm-lizard (only known Victorian population); Audas' spider-orchid (one of three known sites); swift parrot; and brush-tailed phascogale.

The park makes a significant contribution to representation of five EVCs, particularly Box–Ironbark Forest, and Heathy Dry Forest.

Despite a history of disturbance, sections of forest within the park retain a remarkable diversity of plant species, particularly within the understorey. In winter and spring these plants create a spectacular wildflower display, setting the forests ablaze with colour.

Cultural heritage

The proposed park contains several significant historical sites:

- features of old mines such as the Moon and New Moon groups, Lightning Hill group, Virginia Hill group, and Prince of Wales group around Eaglehawk;
- New Carshalton Co. and Spargoe's Pyrites Works in West Bendigo;
- Glasgow and Golconda group, numerous mine sites in the Spring Gully and Diamond Hill areas; and
- many historic water supply features of the Coliban channel system and Bendigo water supply storages.

Geological features

A graptolite fossil locality of state significance is located at Spring Gully.

Current and future uses

Apiculture

There are nine permanent and 18 temporary bee sites distributed through the proposed Bendigo Regional Park area. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

Historically, the Bendigo goldfields were some of the richest in the world, sparking the great gold rush of the 1850s. The area still has high prospectivity for gold and consequently there are eight mining licences within the area of the proposed Greater Bendigo Regional Park. One of these mines, operated by Bendigo Mining NL, has the potential to become the largest modern gold mine in Victoria. In addition, six exploration licences collectively cover 100% of the proposed park area.

Mining and exploration will be allowed in the proposed Greater Bendigo Regional Park, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Extractive industries

There are two extractive industry work authorities within the area of the proposed Greater Bendigo Regional Park. Extractive industries will be allowed, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 12, and the *Extractive Industries Development Act 1995*.

Prospecting

Parts of the proposed Greater Bendigo Regional Park, notably the existing Mandurang and Marong State Forests, are of moderate to high interest for prospectors. No change to existing access for prospecting is proposed. Land managers will retain discretion over the location and use of specific sites through management planning.

Recreation and tourism

Abundant natural and historical values close to Bendigo provide outstanding recreational opportunities. Popular activities include bushwalking, orienteering, prospecting, picnicking, bicycle riding, and nature study.

Heritage-based tourism will become increasingly popular with the establishment of the park.

Timber harvesting

The net current state forest area covered by the proposed Greater Bendigo Regional Park is 5 266 ha. This is 4.2% of the total area currently available for timber harvesting.

Commercial timber harvesting will not be allowed in Greater Bendigo Regional Park. Although the park is a significant size, over 10 000 ha of nearby state forest (F1) will be retained for timber harvesting (see Chapter 15).

Domestic firewood collection will not be allowed in the park. Firewood permits have been issued for the collection of fallen timber from several areas, in the Wellsford and Lockwood State Forests. Approximately 1 000 cubic metres per annum was removed under these permits.

Some domestic firewood may be produced from the proposed park as a by-product of ecological thinning (see Chapter 4). For local residents, opportunities for domestic firewood collection remain in over 10 000 ha retained as state forest adjacent to the proposed park.

Water production

Sandhurst, Spring Gully, Crusoe and Number 7 Reservoirs lie within the park but are designated for water production, as parts of Coliban Water's Bendigo water supply system. Sandhurst and Spring Gully Reservoirs are now the core of that system, and while their immediate catchments contribute valuable habitat to the park, they should continue to be unavailable for public access. The park managers and Coliban Water should jointly prepare a management plan for these catchments according to agreed principles for management.

Coliban Water is currently reviewing its system, and the management of any dams not required in future. Crusoe and Number 7 Reservoirs may not be

required. Crusoe in particular has high potential for passive water-based recreation. Crusoe Reservoir and its immediate surrounds could be managed separately from the regional park as a community recreation and tourism focus point, and the City of Greater Bendigo has expressed interest in such use. Alternatively, Crusoe and Number 7 Reservoirs may be required by Coliban Water for future system augmentation, in which case recreational use of the storage would be inappropriate. These matters should be resolved before the ECC's Final Report.

Crusoe and Number 7 Reservoirs also have significant historical features associated with outlets, spillways and early water treatment works, which should be protected. Measures to ensure safety of these dam walls should aim at maintaining the highest practical safe water level.

Management issues

As with other areas to be managed as parks or reserves close to towns, this park has several management needs: interpretative signs and establishment of appropriate facilities at suitable sites; track management; and control of a minor rubbish dumping problem.

RECOMMENDATIONS

- C1** That the Greater Bendigo Regional Park area of 11 928 ha shown on Map A:
- (a) be used to:
 - (i) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage;
 - (ii) conserve and protect biodiversity and natural processes;
 - (iii) protect significant historic sites and places;
 - (b) generally permit the following activities:
 - (i) apiculture on traditionally licensed sites, subject to park management requirements;

- (ii) bushwalking, car touring, trail bike riding on formed roads, picnicking and camping;
- (iii) nature observation, bird watching and visiting historic features;
- (iv) orienteering and roganing;
- (v) other recreational activities in accordance with a management plan; and
- (vi) research, subject to permit;

and that:

- (c) in accordance with the ecological management strategy proposed in Recommendation R11 in Chapter 4, dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- (d) harvesting of forest products, grazing by domestic stock, hunting and the use of firearms not be permitted; and
- (e) One Tree Hill and Mandurang South blocks not be available for surface mining;
- (f) the park managers and Coliban Water jointly prepare a management plan for the Sandhurst and Spring Gully catchments according to agreed principles for management;
- (g) if not required for future system augmentation, Crusoe Reservoir and its immediate surrounds be managed as a community recreation and tourism focus point; and
- (h) the park be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment.

Note: If not required for future system augmentation, measures to ensure the safety of Crusoe and No. 7 Reservoirs should aim to maintain the highest practical safe water level, and protect historic features.

Information Sources

Bannear (1993).

CFL (1989). Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Davies (1992).

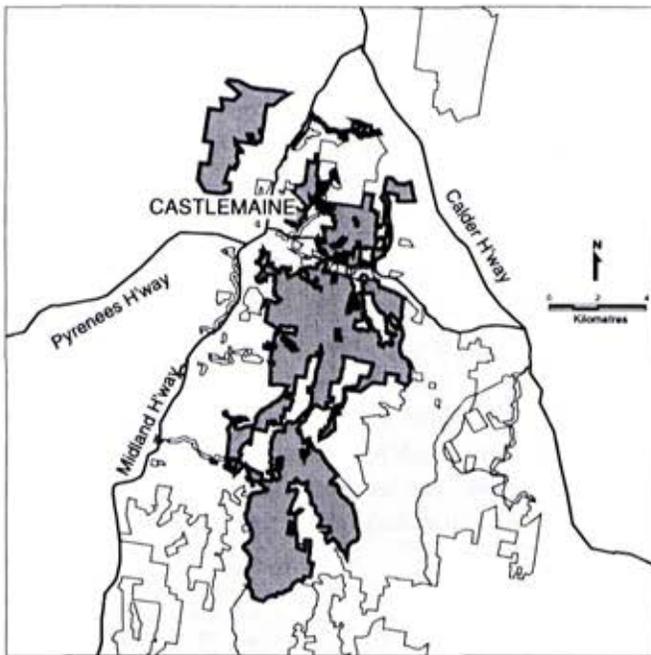
Davies and Riley (1993).

National Parks Service (1996).

Scientific Advisory Committee, Flora and Fauna Guarantee (1996). Stone (1996a).

Stone (1996b).

C2 Castlemaine Regional Park



The proposed Castlemaine Regional Park has heritage and environmental significance, and considerable recreational potential. The park provides opportunities for viewing and learning about historical sites from the gold rush era, and high natural values including habitat for seven threatened species. Opportunities for local recreation are many, such as picnics, bird watching, wildflower viewing, day walks and enjoying Expedition Pass Reservoir.

Benefits of the park

Biodiversity conservation

The park will protect habitat for three threatened fauna species, and four threatened flora species.

Heritage protection

This reserve includes much of the Castlemaine goldfield, known as 'one of the richest alluvial centres in the world' until the 1930s. The 1850s gold rushes led to the establishment of Castlemaine, Chewton, and Fryerstown, and contributed to the development of the new State of Victoria.

Many authentic gold era remnants offer a broad experience of gold mining historical themes: including shallow alluvial diggings, water races, quartz mining sites, sluiced gullies, crushing and treatment plant relics. Historical water supply features from the Coliban system are also present.

Recreation and tourism

Castlemaine Regional Park will be increasingly popular with 'heritage tourists', with its array of significant sites, walking and driving trails, interpretation and guidebook. The 'Diggings Heritage Project' based around Castlemaine and Maldon will develop a single tourism package for the region.

The park provides a range of features including Expedition Pass Reservoir, habitat for threatened fauna, bird watching, wildflower displays, walking opportunities, scenic Kalimna Park, the popular Vaughan Mineral Springs reserve, and views from several vantage points.

Location

The park has a total area of 5 992 ha. It comprises Castlemaine State Forest (2 067 ha), the Castlemaine–Chewton Historic Area (3 594 ha) around Chewton and south to Sebastopol Creek, Castlemaine township land (167 ha), Faraday Education Area (42 ha), Expedition Pass Reservoir (34 ha), Golden Point Water Production Area (5 ha), and Vaughan Mineral Springs Reserve (83 ha).

Community views

There is support for a national, state or regional park in the Castlemaine–Maldon area. There is also support for retaining and upgrading the Castlemaine Historic Area. The Diggings Heritage Project is supported by the Shire of Mt Alexander.

Tourist potential would be increased with interpretation of natural features such as wildflowers.

Some submissions held the view that management of forests around Castlemaine should be primarily for nature conservation, and that a single reserve system should be used.

Environmental values

Biodiversity

The proposed park supports four threatened fauna species: swift parrot, grey-crowned babbler, brush-tailed phascogale, and painted honeyeater.

There are six threatened flora species: sharp midge-orchid, crimson spider-orchid, veined spider-orchid, purple eyebright, lanky buttons, and Fryerstown grevillea.

Large old tree sites

The proposed park contains two large old tree sites totalling 30 hectares.

Cultural heritage

The proposed park contains numerous highly significant mining sites:

- Specimen Gully, where the first recorded Victorian gold was claimed to have been found in July 1851;
- Garfield–Sailors Gully network, with the Garfield waterwheel abutments and Golden Point water race;
- Eureka–Poverty Gully network, around The Monk; the Spring Gully group;
- Red Hill–Loddon water race group;
- Butchers Gully and Sailors Gully–Tubal Caine groups, Vaughan;
- parts of the Golden Gully group, Mosquito Company, Cattles Reef whim shaft, and Perseverance Company sites at Fryerstown; and
- mining era cemeteries at Deadmans Gully, Golden Point; Cemetery Reef Gully, Chewton; Pennyweight Flat, Castlemaine; Deadmans Gully, Fryerstown; and Vaughan Chinese Cemetery.

The important Major Mitchell campsite cairn, Expedition Pass and Golden Point Reservoirs, Crocodile Reservoir, the Welsh Village, and other settlement sites associated with mining are also included. The significant Wattle Gully group at

Chewton, mined on and off since the gold rushes, is included in the reserve.

In 1996 the Castlemaine–Chewton goldfield was selected to represent gold rush sites associated with the central goldfields of Victoria, under the World Heritage cultural theme: ‘European expansion of the eighteenth and nineteenth centuries’. This proposal has not proceeded to the preparation of a nomination.

Current and future uses

Apiculture

There are five permanent and 16 temporary bee sites distributed through the proposed regional park area. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

There is one mine operating in the area of the proposed Castlemaine Regional Park, and two exploration licences cover 100% of the proposed park area. The Wattle Gully Mine at Chewton, now operating as a tourist mine, is within the historic area. Duketon Goldfields NL operates a carbon-in-pulp treatment plant here, and is continuing to explore the area.

Mining and exploration will be allowed in the proposed Castlemaine Regional Park, subject to approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Recreation and tourism

Castlemaine Regional Park offers a wide range of local recreational opportunities for the Castlemaine community. It has many significant historical sites offering heritage tourism opportunities, and natural values lending themselves to bird watching, wildflower walks, and viewing nocturnal wildlife.

The Vaughan Mineral Springs Reserve is popular with visitors, and the park also offers scenic views from several vantage points.

Timber harvesting

The net available productive forest area covered by the proposed Castlemaine Regional Park is 500 ha. This is 0.4% of the total area currently available for

timber harvesting. The historic area (3 594 ha) currently provides for limited post and some firewood production, but it was not included in productive forest area calculations.

The Fryers, Upper Loddon and Muckleford State Forests remain available for timber production. Commercial timber harvesting will not be permitted in Castlemaine Regional Park.

Approximately 300 cubic metres of fallen timber per annum was removed for domestic firewood. Domestic firewood collection will not be allowed in future. Some domestic firewood may be produced from the proposed park as a by-product of ecological thinning (see Chapter 4). Locally, opportunities for domestic firewood collection remain in Fryers, Upper Loddon and Muckleford State Forests.

Management issues

Tourism development should focus on the Wattle Gully area, the Spring Gully network of sites and the Eureka Reef group.

RECOMMENDATIONS

- C2** (a) That the Castlemaine Regional Park of 5 992 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116; and
- (b) certain locations within the park be managed by the Shire of Mount Alexander, by arrangement with the park managers.

- Notes 1. ECC is aware of the need for a waste transfer station near Castlemaine. This should preferably be sited outside the regional park.
2. Measures to ensure safety of the Crocodile Reservoir should aim at maintaining the highest practical safe water level.

Information Sources

Bannear (1993).

Butler (1997).

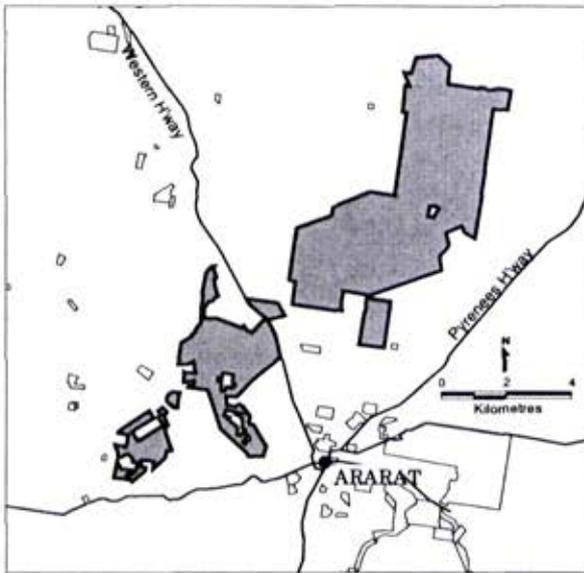
Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Holland and Cheers (1999).

Soderquist and Rowley (1995).

Willman (1995).

C3 Ararat Regional Park



The proposed Ararat Regional Park has both recreational and environmental significance. The park provides scenic views as it lies on a low ridge of the Great Dividing Range. It offers opportunities for local recreation such as picnics, bird watching, wildflower viewing and half day walks. The park also supports the threatened powerful owl.

Benefits of the park

Biodiversity conservation

The proposed park will protect: large old tree sites; two threatened species, powerful owl and buloke; and two threatened EVCs, Alluvial Terraces Herb-rich Woodland and Grassy Woodland.

Recreation and tourism

Ararat Regional Park will provide a range of scenic views including both forested and rural settings, gently sloping forests with large old trees, and picnic sites.

Location

Total area of the proposed Ararat Regional Park is 3 671 ha, comprising the existing Ararat Hills Regional Park (1 000 ha) to the east of Ararat, plus Dunneworthy State Forest (2 550 ha), and uncommitted Crown land (121 ha) to the north of Ararat .

Community views

There is support for the establishment of a state park in the Ararat area. Some specifically supported establishment of a state park at Dunneworthy. There is also support for a south-east Wimmera state park, incorporating remnant forests and woodlands from Ararat and Avoca through to Stawell and Tottington.

Environmental values

Biodiversity

Ararat Regional Park will contribute significantly to representation of four EVCs, notably Grassy Woodland, and Alluvial Terraces Herb-rich Woodland (one of the largest patches in the study area).

The proposed park supports powerful owl, and buloke. See Appendix 1 for the conservation status of threatened species.

Large old tree sites

The proposed park contains three large old tree sites, predominantly of yellow gum, totalling 644 ha.

Current and future uses

Apiculture

There are three permanent and two temporary bee sites in the proposed regional park. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

There are three exploration licences covering 90% of the area of the proposed Ararat Regional Park.

Mining and exploration will be allowed in the proposed Ararat Regional Park, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Recreation and tourism

The proposed park has three established picnic areas, two lookouts and several other accessible high points. Large yellow gum and yellow box trees are features of the park and there is the potential for half-day walks.

Timber harvesting

The net available productive forest area covered by the proposed Ararat Regional Park is 2 003 ha. This is 1.6% of the total area currently available for timber harvesting. Annual harvest in Dunneworthy State Forest has averaged 12 cubic metres for fencing timbers for each of the past five years. Commercial timber harvesting will not be permitted in Ararat Regional Park.

The *West Regional Forest Agreement* proposed that most of this area be a Special Protection Zone, and that special management would apply to the remainder.

Domestic firewood permits were issued for the collection of fallen timber from the Dunneworthy Forest. Approximately 410 cubic metres each year was removed under these permits. Domestic firewood collection will not be allowed in future. Some domestic firewood may be produced from the proposed park as a by-product of ecological thinning (see Chapter 4). Locally, opportunities for domestic firewood collection remain in the Pyrenees and Mt Cole State Forests.

Management issues

Ecological thinning

Parts of the Dunneworthy forest area are characterised by dense stands of relatively small trees. Intense competition may be preventing individual trees from reaching their normal mature stature and the area should be a high priority for ecological thinning.

RECOMMENDATIONS

- C3** (a) That the Ararat Regional Park of 3 671 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116; and
- (b) that the park managers implement ecological thinning (see Recommendation R11 in Chapter 4) where necessary as a priority in the Dunneworthy block, and allow the wood resource removed in such thinning operations to be available for domestic firewood.

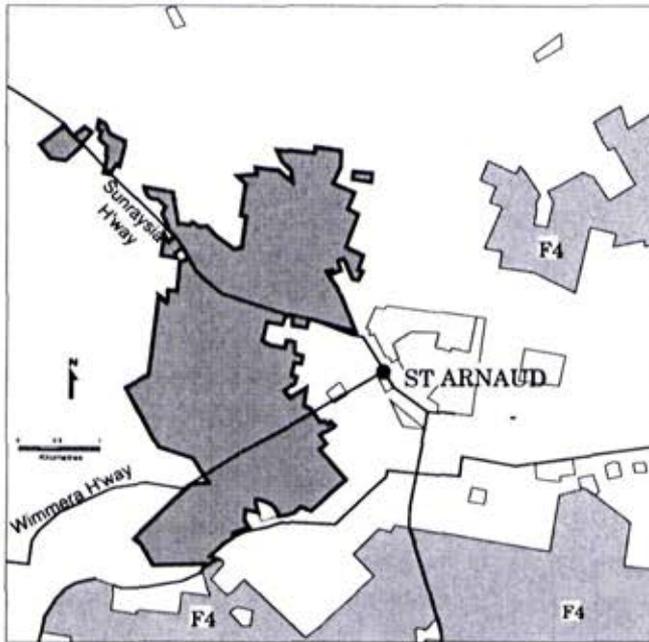
Information Sources

Commonwealth of Australia and State of Victoria (2000).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Holland and Cheers (1999).

C4 St Arnaud Regional Park



The St Arnaud community now enjoys features of the proposed St Arnaud Regional Park: the outlook over the town; picnics at View Point; numerous walking and riding tracks; the forest setting; historic mining sites and Bakery Hill settlement; and the old reservoir. Creation of a regional park will see coordinated planning and management, improved facilities, and consistent information services that will establish the park identity, and increase visitor use and appreciation of the distinctive Box–Ironbark forests.

Benefits of the park

Biodiversity conservation

The proposed St Arnaud Regional Park supports one threatened fauna species, and one threatened plant species.

Recreation and tourism

View Point provides scenic views of St Arnaud township and surrounding countryside. The proposed park is important for local recreation, field naturalist studies, historic site appreciation and prospecting. The old town reservoir provides scope for aquatic activities such as canoeing.

Location

The proposed park, with a total area of 929 ha, comprises four township blocks around St Arnaud including the View Point and Bell Rock areas, a bushland reserve and two small historic and cultural features reserves.

Community views

One submission proposed that Bell Rock, north of St Arnaud, and View Point, on township land to the west of the town, be protected in reserves.

There was opposition to constraints on prospecting in this area.

Environmental values

Biodiversity

St Arnaud Regional Park will provide habitat for threatened species including swift parrot, and cane spear grass.

The park has a notable stand of grass trees at View Point, and a good population of sticky boronia at Bell Rock.

Cultural heritage

The proposed park contains several significant historic mining sites:

- Bell Rock Company;
- New Bendigo Company, St Arnaud Gold Mining Company, Brownings Luck Company, and several nearby mines;
- New Bendigo diggings and settlement, Chinese village, and school site; and
- Kershaw's charcoal site.

Current and future uses

Apiculture

There is one permanent site and two temporary bee sites distributed in the proposed regional park area. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

Two exploration licences cover the entire proposed St Arnaud Regional Park. Mining and exploration will be allowed in the proposed St Arnaud Regional Park, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Prospecting

St Arnaud Regional Park and its immediate surroundings contain the most significant gold diggings in the St Arnaud region. These diggings are of moderate to high interest to prospectors. The area of the proposed park will remain available for prospecting.

Recreation and tourism

The local community and visitors currently use the scenic lookout at View Point, and picnic spots. The area is also used for bushwalking, cycling, horse riding, nature observation, and picnicking.

Timber harvesting

The net available productive forest area covered by the proposed St Arnaud Regional Park is 81 ha. This is 0.1% of the total area currently available for timber harvesting. Commercial timber harvesting will not be permitted in St Arnaud Regional Park.

Approximately 400 cubic metres per annum was removed for domestic firewood under permit. Domestic firewood collection will not be allowed in future. Some domestic firewood may be produced from the proposed park as a by-product of ecological thinning (see Chapter 4). Locally, timber can be obtained from Moolerr (North St Arnaud Range) Forest (see F4).

Management issues

As with other areas to be managed as parks or reserves close to towns, this park has several management needs: interpretative signs, and establishment of appropriate facilities at suitable sites; track management; and control of a minor rubbish dumping problem.

RECOMMENDATION

- C4** That the St Arnaud Regional Park of 929 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116.

Information Sources

Bannear (1994).

Bannear (1997).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Stone (1999c).

C5 Heathcote Regional Park



The proposed Heathcote Regional Park has both recreational and environmental significance. The area provides scenic views from the ridges flanking Heathcote township. Opportunities for local recreation include picnics, bird watching, wildflower viewing and half-day walks. The proposed park has records of eight threatened flora and fauna species.

Benefits of the park

Biodiversity conservation

The proposed park will protect four threatened flora species and habitat for four threatened fauna species including the brush-tailed phascogale and powerful owl.

Recreation and tourism

The proposed park will offer local recreational opportunities for the Heathcote township. It has natural, scenic and historical values and numerous tracks that enable enjoyable walks, picnics, bird watching, wildflower viewing and riding.

Location

The proposed park has a total area of 3 803 ha, consisting of Argyle State Forest (2 885 ha), McIvor Range Scenic Reserve, Pink Cliffs Scenic and Geological Reserves (800 ha) and Heathcote township land (118 ha).

Community views

Submissions included a proposal to establish Heathcote–Argyle State Forest as a state or national park, in combination with McIvor Range and other public land. Heathcote–Eppalock forests were also proposed as a state park. In contrast, other

submissions largely supporting the timber industry, voiced their opposition to national or state parks.

Environmental values

Biodiversity

The proposed park supports three threatened fauna species: swift parrot, powerful owl, and brush-tailed phascogale; and four threatened flora species: rising star guinea-flower, Ausfeld's wattle, maroon leek-orchid, and purple eyebright.

Heathcote Regional Park contains a diverse range of EVCs, including significant representation of Grassy Woodland EVC.

Landscape and geological features

Scenic ridges are located on both sides of Heathcote township. Various Cambrian greenstone belt exposures of state significance are located 1.5 km south of Heathcote.

Cultural heritage

The proposed park encompasses several historic mining sites, the fine stone masonry and brick vaulting of the Powder Magazine, and the water channel tunnel in the Argyle State Forest.

Current and future uses

Apiculture

There are five permanent and seven temporary bee sites distributed through the proposed park area. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

There are three mines operating in the area of the proposed Heathcote Regional Park, and two exploration licences covering 35% of the proposed park area. Mining and exploration will be allowed in the proposed Heathcote Regional Park, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Recreation and tourism

Heathcote Regional Park will offer a wide range of local recreational opportunities for the Heathcote community. It has natural values lending itself to: bird watching; wildflower walks; viewing nocturnal wildlife; and scenic views, particularly from the ridges on both sides of Heathcote township.

Timber harvesting

The net available productive forest area covered by the proposed Heathcote Regional Park is 2 167 ha. This is 1.7% of the total area currently available for timber harvesting. Commercial timber harvesting

will not be permitted in Heathcote Regional Park. Locally, timber can be obtained from Rushworth–Heathcote Forest.

Approximately 325 cubic metres per annum was removed for domestic firewood under permit. Domestic firewood collection will not be allowed. Some domestic firewood may be produced from the proposed park as a by-product of ecological thinning (see Chapter 4). Locally, timber can be obtained from Rushworth–Heathcote Forest.

Management issues

As with other areas to be managed as parks or reserves close to towns, this park has several management needs: interpretative signs and establishment of appropriate facilities at suitable sites, track management, and control of a minor rubbish dumping problem.

RECOMMENDATION

- C5** That the Heathcote Regional Park of 3 803 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116.

Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Heathcote Forest Ecotourism Project (undated).

Stone (1994).

Existing regional parks and minor changes

C6 Maryborough Regional Park

Situated between the Paddys Ranges State Park and Maryborough township, this park is noted for its impressive wildflowers and avifauna, and has developed tracks for local informal recreation.

An addition of 226 ha is recommended, which increases the size of the park to 524 ha. The addition consists of Crown land adjoining the existing park in the former town of Maryborough. The proposed addition is contiguous with the existing park. It provides Pyrenees Highway frontage and access to the park. The forest is substantially intact with low levels of weed invasion or other disturbance. A popular picnic area beside the Goldfields Reservoir, on Shire of Central Goldfields land, should be managed as part of the park extension. This township land was not included in forest productive area calculations for timber.

RECOMMENDATION

C6 That the area of 226 ha shown on Map A be added to the Maryborough Regional Park and used in accordance with the general recommendations for regional parks on page 116.

C7 Mt Alexander Regional Park

New studies since publication of the ECC's *Resources and Issues Report (1997)* have identified vegetation types and large old tree sites at Mt Alexander.

Most of the slopes carry a distinct community of Granitic Hills Woodland EVC, otherwise found in the north-east at Warby Range and Mt Pilot. Around Mt Alexander this EVC's former extent has been substantially cleared. It is dominated by manna gum, messmate, long-leaf box, river red gum and yellow box trees.

Mt Alexander is the only known site for the nationally endangered plant, southern shepherd's purse. The whole of Mt Alexander, except for the pine plantation, has been identified as a high quality large old tree site, the third largest in the study area. Historic features of significance include a former

silkworm farm, and a Valonia oak plantation, established to produce acorn tannin for hides.

RECOMMENDATION

C7 That the 1 240 ha Mt Alexander Regional Park:

- (a) be used in accordance with the general recommendations for regional parks on page 116; and
- (b) be managed in consideration of new information on EVCs and large old trees.

C8 Hepburn Regional Park

This park is mainly located around Daylesford, outside the Box–Ironbark study area. A small area (59 ha) of this park at Mt Franklin is within the Box–Ironbark boundary. This area is of state social and historical significance as an early natural beauty and recreation spot. No change is proposed to its status or uses.

RECOMMENDATION

C8 That the Hepburn Regional Park of 59 ha be used in accordance with the general recommendations for regional parks on page 116.

C9 Beechworth Regional Park

This park is mainly located around Beechworth, with some sections occurring outside the Box–Ironbark study area. An area of 1 078 ha is within the Box–Ironbark boundary. Currently Beechworth Park is scheduled and managed under the *National Parks Act 1975*, and is known and signposted as Beechworth Historic Park. About 52 ha of this park, around Woolshed Falls, is recommended for inclusion in the Chiltern–Pilot National Park.

The park contains several EVCs representing a diverse range of vegetation and habitat types, including Valley Grassy Forest and Granitic Hills

Woodland/Rocky Outcrop Shrubland/Herbland Mosaic.

It also provides habitat for nine threatened flora and fauna species including:

- brush-tailed phascogale;
- square-tailed kite;
- barking owl;
- turquoise parrot;
- bandy bandy;
- Dookie daisy;
- hairy hop-bush;
- delicate love-grass; and
- yellow hyacinth-orchid.

Beechworth Regional Park incorporates a small section of Reedy Creek and is contiguous with the proposed Chiltern–Pilot National Park.

RECOMMENDATION

- C9** That the Beechworth Regional Park of 1 078 ha shown on Map A be retained on Schedule 3 of the *National Parks Act 1975*, and otherwise be managed in accordance with the general recommendations for regional parks on page 116.

Former Regional Parks

The **Reef Hills Regional Park** at Benalla is now recommended as a state park (see Chapter 13, B6).

Eaglehawk Regional Park at Bendigo is to be included in the Greater Bendigo Regional Park (see Chapter 14, C1).

One Tree Hill Regional Park at Bendigo is to be included in the Greater Bendigo Regional Park (see Chapter 14, C1).

D Nature conservation reserves

Outstanding natural values make some public lands highly significant for their botanical or wildlife populations and habitats, or both. The reserves below contain examples of indigenous vegetation with considerable floristic or habitat value in a natural or relatively natural state. The primary land use of the areas identified below is for nature conservation. They are set aside to conserve:

- locations with plant species that may be rare or threatened; and/or
- plant associations or communities that are of particular conservation significance; and/or
- valuable habitat for populations of significant indigenous fauna.

Nature conservation reserves differ from parks in that they are not primarily used for recreation. Together with the existing and recommended new parks, these reserves make up the core of the protected areas system. They are recommended to be securely reserved, and managed primarily to conserve and protect indigenous plant or animal species, communities or habitats. They vary in size; some are small, focussing on a plant population, but most aim to represent communities or EVCs. Public appreciation and education about their values is encouraged, but they are not set aside primarily for recreation, as is the case with parks.

The values of the nature conservation reserves vary, but include:

- occurrences of individual rare or threatened plant species;
- representative, diverse or intact examples of particular communities;
- limit-of-range sites;
- remnants of largely modified land systems;
- places with recorded presence of rare or threatened fauna, or diverse faunal assemblages; and
- representative examples of habitat.

Chapter 4, Nature Conservation, outlined the crucial need for indigenous plant and animal conservation across the study area. The recommendations in this chapter will contribute to the conservation of many of our most threatened plants and animals. Plant and animal species listed in the descriptions below are of conservation significance and are generally threatened (see Appendix 1).

Previous Land Conservation Council investigations recommended establishment of some 33 flora or flora and fauna reserves across the study area. Many of those are proposed to be confirmed by converting them to nature conservation reserves. The status, objectives of management, and permitted uses of flora and fauna reserves and nature conservation reserves, are similar. Several former wildlife reserves that have been classified as 'game refuges' are also now recommended as nature conservation reserves.

Grazing, harvesting of forest products, hunting and the use of firearms would not be permitted in these areas. Regarding the forest resource that will become unavailable, the area of high and medium productivity forest included in each reserve is expressed below as a percentage of the net high and medium productivity forest area currently available for timber harvesting. Outside Bendigo FMA, 'merchantable' forest is used instead of high and medium productivity forest.

Nature conservation reserves are commonly small and have sensitive values. Collection of fallen wood from the ground reduces habitat and is not appropriate. However, from the larger reserves, following appropriate research, some domestic firewood may be produced as a by-product of ecological thinning.

As with regional parks, these reserves are recommended to be 'restricted Crown land' in relation to mining under the *Mineral Resources Development Act 1990*. Mineral exploration and mining may therefore be permitted, subject to the approval of the Minister for Environment and Conservation. Major mining proposals may require an environment effects statement.

GENERAL RECOMMENDATIONS FOR NATURE CONSERVATION RESERVES

- D** That nature conservation reserves shown on Map A (numbered D1 to D64) be used to:
- (a) conserve and protect species, communities or habitats of indigenous animals and plants;
 - (b) provide for educational and scientific study if consistent with (a) above, and in ways that minimally affect the area;
 - (c) provide for passive recreation such as nature study and picnicking, where consistent with (a) above or as otherwise specified;
- and that:
- (d) minimum impact exploration for minerals be permitted with the approval of the Minister for Environment and Conservation, except in the existing Deep Lead Flora and Fauna Reserve;
 - (e) mining be subject to Government decision on individual proposals;
 - (f) recreational prospecting be permitted except:
 - (i) in areas where it may adversely affect significant natural values, and
 - (ii) where specified for specific reserves below;
 - (g) grazing, harvesting of forest products, hunting and the use of firearms not be permitted;
 - (h) apiculture be permitted except where specified, and subject to:
 - (i) the outcome of research into the ecological impacts of this industry, and
 - (ii) management requirements;
 - (i) in accordance with the ecological management strategy proposed in Recommendation R11 (see Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- and:
- (j) unless otherwise specified, they be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment.

D1 Existing nature conservation reserves

Nineteen of the existing flora reserves and flora and fauna reserves are proposed to be retained, but designated as nature conservation reserves. They will be used for effectively the same purposes as previously.

RECOMMENDATIONS

- D1** That the existing flora and fauna reserves, and flora reserves described below and listed in Appendix 10 be re-designated as nature conservation reserves, and used in accordance with the general recommendations for nature conservation reserves above.

Flora and fauna reserves

Mt Bolangum (2 930 ha)
Mt Hope (106 ha)

Flora reserves

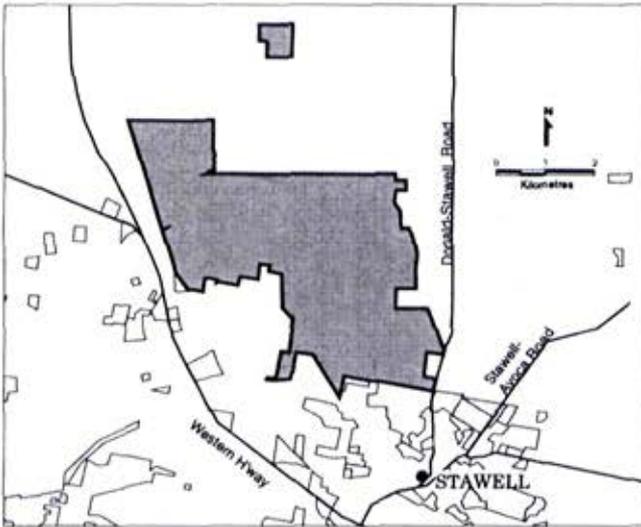
Alex Chisholm (16 ha)
Big Hill (62 ha)

Costerfield (10 ha)
Dalyenong West (16 ha)
Dohertys Pine (Rochester West) (10 ha)
Gobarup (300 ha)
Gowar (120 ha)
Gowar South (23 ha)
Gowangardie (2 ha)
Hard Hills (15 ha)
Inglewood (1200 ha)
Mangalore (70 ha)
Metcalf (300 ha)
Runnymede (240 ha)
Upotipotpon (5 ha)
Walmer (13 ha)
Walmer South (15 ha)

D2–D64 Proposed new or enlarged nature conservation reserves

Proposed new or enlarged nature conservation reserves are described below. Full descriptions are provided of three major reserves, with short descriptions of the others.

D2 Deep Lead Nature Conservation Reserve



Although modest in size (1 823 ha), the proposed Deep Lead Nature Conservation Reserve is one of the most important sites for nature conservation in Victoria. It supports at least 21 threatened species, including three plant species not found anywhere else.

Benefits of the reserve

Biodiversity conservation

Deep Lead Nature Conservation Reserve will significantly improve protection of the outstanding biological diversity of this compact area; most notably the exceptional number of threatened and non-threatened plant species, especially orchids which are highly susceptible to disturbance.

Location

Deep Lead Nature Conservation Reserve includes the main block of public land north of Stawell, extending north from within the township boundary, together with the small isolated Germania Mine block a few kilometres further north again. The reserve covers 1 823 ha, comprising the existing Deep Lead Flora and Fauna Reserve (1 120 ha), The Ironbarks Hardwood Production Area (390 ha), Deep Lead Education Area (260 ha), Germania Mine Bushland Reserve (33 ha), and the Three Jacks Sanctuary (20 ha). The existing Deep Lead Flora and Fauna Reserve is scheduled and managed under the *National Parks Act 1975*.

Community views

Many submissions mentioned the Deep Lead area, including 'The Ironbarks', and highlighted its flora and fauna values.

Some submissions proposed state park status for Deep Lead and The Ironbarks alone, or their inclusion in a more extensive park.

Environmental values

Biodiversity

The flora of this reserve is of exceptional species-richness, particularly in orchid species, partially reflecting the unusual overlap of environmental characteristics near the junction of the Greater Grampians, Goldfields and Wimmera bioregions (see Map 4.1 in Chapter 4).

The proposed reserve is a significant site for the:

- tawny spider-orchid (only known site);
- Pomonal leek-orchid (only known site);
- grass-lily *Caesia* sp. aff. *calliantha* (undescribed, only known site);
- Audas' spider-orchid (one of three known sites); and
- squirrel glider (the most important site for the small isolated Stawell area population).

At least 16 other threatened species, including at least six nationally threatened species, are also found in the area.

The reserve will make a significant contribution to the representation of:

- Alluvial Terraces Herb-rich Woodland;
- Heathy Woodland; and
- Sedge-rich Woodland (largest and highest quality patch in the study area).

It contains the largest and highest quality example of Box–Ironbark Forest EVC in the Wimmera bioregion, and at the western extent of its range.

Cultural heritage

Named for its succession of deep lead mines, the proposed reserve contains several historic mining and related sites, including the relatively undisturbed and intact alluvial mining landscape of the Four Post Diggings site, and the Darlington and Germania Mine sites.

Current and future uses

Apiculture

There are two permanent and one temporary bee sites distributed through the proposed nature conservation reserve area. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

Mining

There are no mines operating in the area of the proposed Deep Lead Nature Conservation Reserve. However, Victoria's largest gold mine, the Stawell Gold Mines underground mine, is a short distance to the south, and the mine's line of reef extends under the proposed reserve. Both the existing Deep Lead Flora and Fauna Reserve, and the new area proposed for nature conservation reserve are covered by a current exploration licence.

Mining and exploration will be allowed in areas proposed for addition to the existing Deep Lead Flora and Fauna Reserve, in accordance with recommendations in Chapter 5, and subject to approval by the Minister for Environment and Conservation, in accordance with the *Mineral Resources Development Act 1990*. The existing Flora and Fauna Reserve is listed on Schedule 4 of the *National Parks Act 1975*, and mining and exploration there will continue to be subject to Section 40 of that Act.

Prospecting

The Deep Lead area is of some interest to prospectors because of its gold history, but the proportion of shallow alluvial gold found in the area is low relative to other more favoured Box–Ironbark goldfields. Prospecting is a significant threat to populations of threatened orchids and other herbaceous plants at Deep Lead Nature Conservation Reserve, and will not be permitted.

Partial exclusion of prospecting from specific parts of the proposed reserve would not be feasible in this case. Compliance with partial exclusion would be difficult for the land manager to achieve and unlike other parts of the study area, rare herbs are widespread at Deep Lead and continue to be discovered in new locations. In addition, recovery of some species will require weed-free undisturbed sites into which they can expand.

Prospecting will be allowed in other Box–Ironbark public land blocks near Stawell.

Timber harvesting

'The Ironbarks' has 346 ha of productive forest. However, under a Flora and Fauna Guarantee Action Statement for Audas' spider-orchid, timber-harvesting is prohibited. Former township land at Stawell, the nearby Glynwylln State Forest and part of Illawarra State Forest remain available for commercial timber harvesting.

Domestic firewood permits were issued for the collection of small volumes of fallen timber for 'pensioner firewood' only. Domestic firewood collection will no longer be allowed. Some domestic firewood may be produced from the proposed reserve as a by-product of ecological thinning (see Chapter 4).

The *West Regional Forest Agreement* identifies this area as a Special Protection Zone. Locally, opportunities for domestic firewood collection remain in former Stawell township land, and Glynwylln and Illawarra State Forests.

Recreation

Adjoining Stawell and the Western Highway, the proposed Deep Lead Nature Conservation Reserve is currently a moderately popular destination for passive and active bush recreation, including tourism and recreation associated with its significant nature conservation values, which are well known to field naturalists.

Management issues

Tracks

Minor tracks render areas unsuitable for orchids and also increase off-road vehicle movements which can destroy orchid sites. Redundant minor tracks should be permanently closed and rehabilitated where necessary. Public use of other minor tracks should be minimised, and continued effort is required to minimise all off-road vehicle movements.

Firewood collection

Illegal firewood collection and associated damage by vehicles is a significant threat to orchid populations. Sustained ranger presence and active management is required to restrict illegal firewood collection to the current low level.

Orchid viewing

The diversity of orchids at Deep Lead attracts many orchid fanciers, particularly in spring, requiring careful management to prevent trampling of sites.

Orchid poaching

Conspicuous ranger presence and constant vigilance are required to prevent illegal collection of rare orchids.

RECOMMENDATIONS

- D2 (a) That prospecting not be permitted in Deep Lead Nature Conservation Reserve;
- (b) that the existing Deep Lead Flora and Fauna Reserve remain reserved under Schedule 4 of the *National Parks Act 1975*; and
- (c) that other parts of the proposed Deep Lead Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

Information Sources

Backhouse and Jeanes (1995).

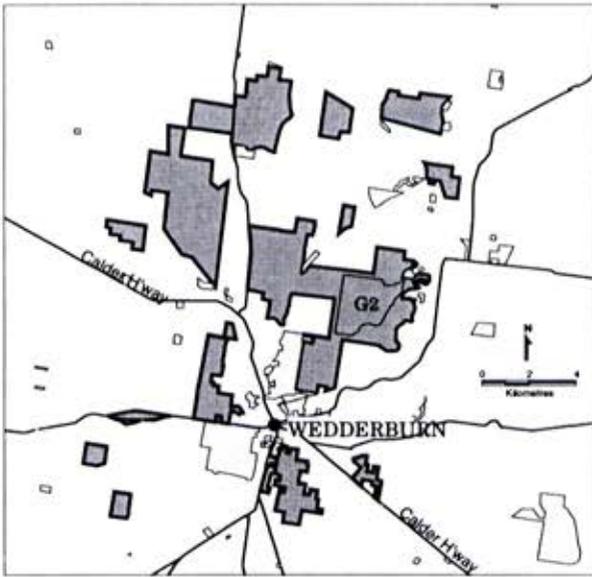
Commonwealth of Australia and State of Victoria (2000).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Hills and Boekel (1996).

Venn (1992).

D3 Wychitella Nature Conservation Reserve



The proposed Wychitella Nature Conservation Reserve encompasses one of the most significant areas of Box–Ironbark mallee in Victoria with diverse and unusual flora and fauna communities, including the only remaining population of malleefowl in the study area and at least 12 other threatened species.

Benefits of the reserve

Biodiversity conservation

Wychitella Nature Conservation Reserve will secure protection of habitat for the only remaining population of malleefowl in the study area. The reserve will also protect the distinctive flora and fauna of the Wedderburn mallee block, including another 12 threatened species and unusually rich communities of mallee eucalypts, birds and reptiles.

Recreation and tourism

The proposed additions to the existing reserve will continue as one of the most popular destinations in Victoria for prospecting, as well as remaining popular for bird watching and picnicking.

Location

The proposed reserve surrounds the town of Wedderburn, extending north to Wychitella. It consists of 6 280 ha, comprising Wychitella Flora and Fauna Reserve (3 470 ha), Wedderburn Eucalyptus Oil Production Area (1 904 ha), bushland reserves (454 ha), The Granites Scenic Reserve (330 ha), Mt Egbert Education Area (90 ha), and public land water frontages (32 ha).

Community views

Most submissions which specifically mentioned the Wedderburn area supported the establishment of a

state or national park, or expansion of the existing flora and fauna reserve.

The eucalyptus oil harvesting licensees proposed that existing areas used for eucalyptus oil harvesting be retained.

Prospectors, and the local businesses they support, are keen to retain existing access to one of the most favoured prospecting areas in Victoria.

Environmental values

Biodiversity

The proposed Wychitella Nature Conservation Reserve contains flora and fauna assemblages of biogeographic significance, including the co-occurrence of four mallee tree species, a large number of reptile species, and the most diverse suite of mallee-dependent bird species in the study area. This area contains 13 threatened species including:

- malleefowl (the only population in the study area; formerly widespread);
- Kamarooka mallee;
- dainty phebalium;
- cane spear-grass;
- sweet quandong;
- sikh's whiskers (orchid); and
- woodland blind snake.

Wychitella Nature Conservation Reserve will contribute significantly to representation of four EVCs, notably:

- Grassy Woodland;
- Low Rises Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic; and
- Broombush Mallee (35% of the extent of this EVC is in the conservation reserve system).

Recreation and tourism

This is one of the most favoured prospecting areas in Victoria, with prospecting tourism making a very significant contribution to the local economy. The proposed reserve is well suited for low-key and nature-based recreation as it surrounds the town of Wedderburn, and contains scenic features at Mt Egbert (The Granites), diverse flora and fauna, several historic features such as the former Government battery, and established picnic areas.

Current and future uses

Apiculture

There are 27 temporary and one permanent bee sites distributed through the proposed reserve. No change to existing access for apiculture is proposed. Land managers will retain discretion over the location and use of specific sites.

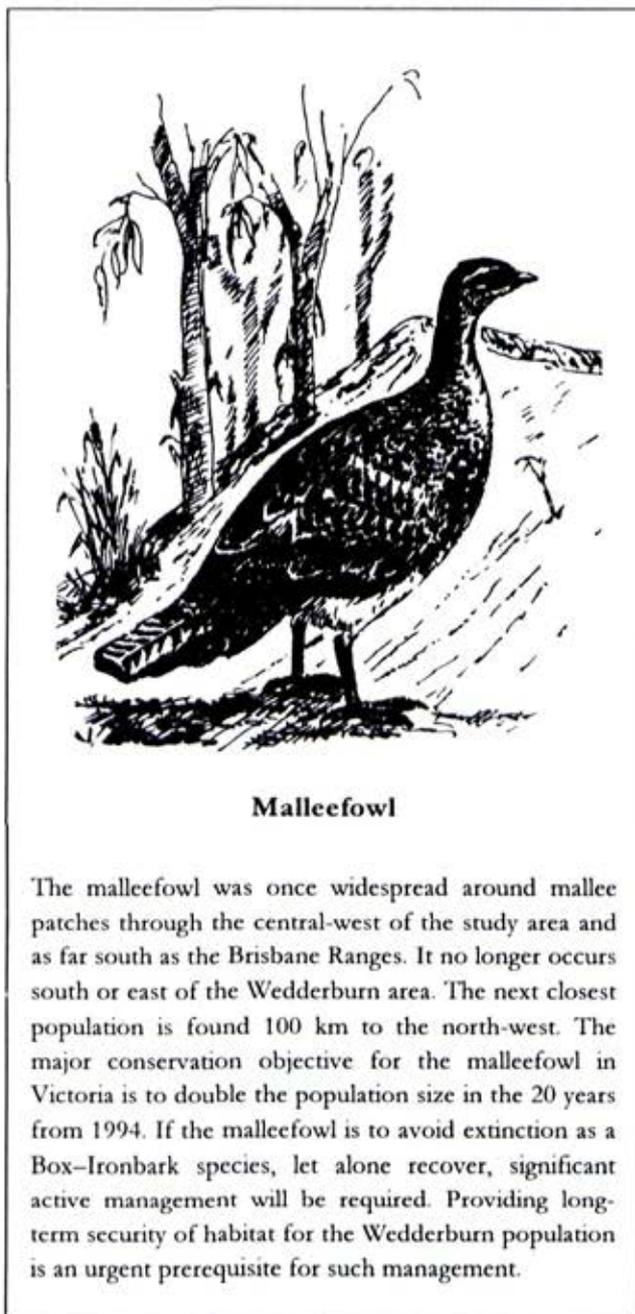
Eucalyptus oil harvesting

Currently, eucalyptus oil harvesting occurs over approximately 140 ha in the Wedderburn Eucalyptus Oil Production Area (1 904 ha).

As detailed in Chapter 10, eucalyptus oil harvesting is a significant threat to the existence and ultimate recovery of threatened and other species in this area. In particular malleefowl populations require large contiguous areas of suitable habitat. Eucalyptus oil harvesting will not be permitted in the Wychitella Nature Conservation Reserve.

Grazing

About half the 32 ha of public land water frontage to be included in the reserve is currently licensed for grazing. Grazing by domestic stock will not be allowed.



Malleefowl

The malleefowl was once widespread around mallee patches through the central-west of the study area and as far south as the Brisbane Ranges. It no longer occurs south or east of the Wedderburn area. The next closest population is found 100 km to the north-west. The major conservation objective for the malleefowl in Victoria is to double the population size in the 20 years from 1994. If the malleefowl is to avoid extinction as a Box-ironbark species, let alone recover, significant active management will be required. Providing long-term security of habitat for the Wedderburn population is an urgent prerequisite for such management.

Mining

There are two mines operating in the area of the proposed Wychitella Nature Conservation Reserve, and three exploration licences cover around 40% of the proposed reserve area. Mining and exploration will be allowed in the proposed Wychitella Nature Conservation Reserve, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Prospecting

The Wedderburn public lands are a key site for prospectors, attracting several thousand visitors per year. Access for prospectors to the additional reserve areas is proposed to continue, with land managers retaining discretion over the location and use of specific sites.

Timber harvesting

Most of the Wedderburn forests recommended for addition to the reserve consist of Broombush Mallee EVC, and are unproductive for wood products. However, 418 ha of productive forest is included; 0.3% of the total area currently available for harvesting.

The main forest area at Wedderburn with Box-Ironbark Forest EVC (total area 393 ha) and another 470 ha with mallee and Box-Ironbark species, remains available for wood production and domestic firewood. Kingower and Moliagul State Forests remain available for commercial timber harvesting and domestic firewood collection.

Management issues

Adjacent freehold land

Although the proposed Wychitella Nature Conservation Reserve is fragmented, the public land blocks are largely linked by freehold land with substantially intact native vegetation. Management for nature conservation in the proposed reserve would be enhanced by cooperative arrangements with adjacent private landholders (as proposed in Chapter 4).

Feral pests

Red foxes and feral cats prey upon malleefowl and their eggs, as well as other native fauna, while rabbits damage soil and vegetation. Continuing control of these introduced species is a high priority in the proposed reserve.

Erosion

Some tracks within the proposed reserve are severely eroded leading to habitat degradation.

RECOMMENDATIONS

D3 That:

- (a) prospecting be generally permitted in the additions to Wychitella Nature Conservation Reserve;
- (b) the existing Wychitella Flora and Fauna Reserve remain reserved as at present; and
- (c) other parts of the proposed Wychitella Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

Information Sources

Benshemesh (1994).

CFL (1988).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

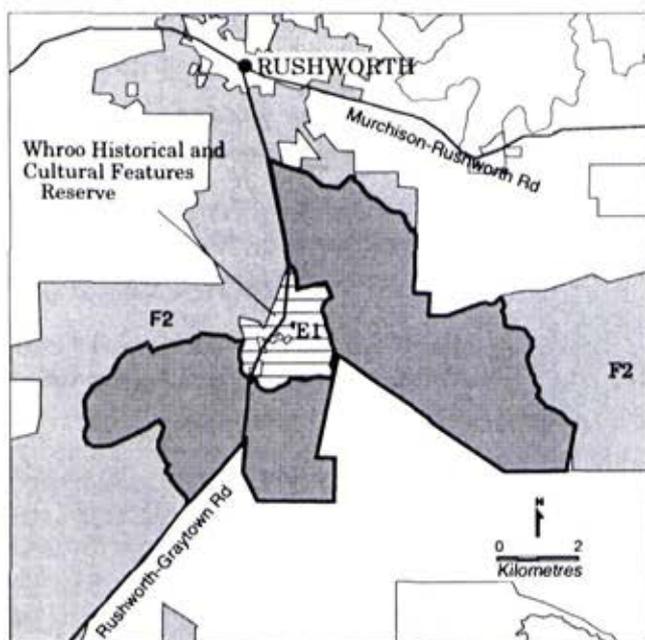
Gell (1985).

Simpson *et al.* (1988).

Stone (1979).

Stone (1997).

D4 Whroo Nature Conservation Reserve



The proposed Whroo Nature Conservation Reserve supports a range of threatened flora and fauna species. The co-occurrence of four threatened orchids is of particular interest. It is of national significance as it is a key site for swift parrot and supports three other threatened fauna species and six threatened flora species.

Benefits of the reserve

Biodiversity conservation

Whroo Nature Conservation Reserve will protect ten threatened species, including a rare co-occurrence of four threatened greenhood orchids, Kamarooka mallee, swift parrot, bush stone-curlew, grey-crowned babbler and squirrel glider.

Recreation and tourism

The proposed reserve will be popular with prospectors and offers bird watching opportunities.

Location

The 3 896 ha of Rushworth State Forest surrounding Whroo Historic Area (E1) is to become Whroo Nature Conservation Reserve.

Community views

While some submissions supported establishment of a national park in the Rushworth-Heathcote State Forest (F2), many others opposed the designation of the whole Rushworth-Heathcote State Forest as a national park.

Support was expressed for the establishment of a Whroo-Costerfield national park or nature conservation reserve. One submission requested that the sign-posted evidence of Aboriginal

occupation at Whroo should be maintained as a tourist attraction.

Environmental values

Biodiversity

Flora and fauna assemblages of significance include the co-occurrence of:

- four threatened greenhood orchid species;
- Kamarooka mallee;
- swift parrot;
- squirrel glider;
- grey-crowned babbler; and
- bush stone-curlew.

The proposed reserve contains two large old tree sites, totalling 175 ha, predominantly containing grey box and yellow gum.

Current and future uses

Apiculture

There are five permanent and three temporary bee sites distributed through the proposed nature conservation reserve area. No change to existing access for apiculture is proposed. Land managers

will retain discretion over the location and use of specific sites.

Eucalyptus oil harvesting

Currently, eucalyptus oil harvesting occurs over approximately 70 ha of the Rushworth State Forest (F2) surrounding Whroo Historic Area. Forty hectares to the west of Whroo Historic Area (E1) will still be available for eucalyptus oil harvesting.

As detailed in Chapter 10, eucalyptus oil harvesting represents a significant threat to the existence and ultimate recovery of threatened and other species within the proposed Whroo Nature Conservation Reserve. Harvesting will not be permitted within the proposed reserve.

Mining

There are no mines operating in the area of the proposed Whroo Nature Conservation Reserve. Mining and exploration will be allowed in the proposed Whroo Nature Conservation Reserve, subject to the approval of the Minister for Environment and Conservation, and in accordance with recommendations in Chapter 5, and the *Mineral Resources Development Act 1990*.

Prospecting

The Whroo public lands are visited by many prospectors. No change to existing access for prospectors is proposed. Land managers will retain discretion over the location and use of specific sites.

Timber harvesting

The net available productive forest area covered by the proposed Whroo Nature Conservation Reserve is 2 770 ha. This is 2.2% of the total net forest area currently available for timber harvesting. Commercial timber harvesting will not be permitted in Whroo Nature Conservation Reserve. Very large areas in the adjacent Rushworth State Forest (F2) remain available for commercial timber harvesting.

Approximately 420 cubic metres of domestic firewood per annum was collected. Domestic firewood collection will no longer be allowed. Some domestic firewood may be produced from the proposed reserve as a by-product of ecological thinning (see Chapter 4). Locally, opportunities for domestic firewood collection remain in extensive areas of Rushworth State Forest.

RECOMMENDATIONS

- D4** That the proposed Whroo Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

Information Sources

Backhouse and Jeanes (1995).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Stone (1987)

D5–D64 Other proposed nature conservation reserves

D5 Lonsdale

This 737 ha block north-west of Stawell incorporates existing uncommitted land (state forest) characterised by high quality, species-rich, open grassy woodland with large, widely-spaced yellow box and river red gum trees. It provides habitat for several threatened species, notably rising star guinea-flower, hairy tails, corkscrew spear-grass, squirrel glider, barking owl, swift parrot, painted honeyeater and bush stone-curlew. It contributes to representation of *Western Goldfields* Heathy Woodland, Plains Grassy Woodland and Grassy Woodland EVCs.

NRE Forests Service described Lonsdale as a 'community forest'—commercial operations were excluded, although domestic firewood collection was allowed under permit. The net available productive forest area covered by the proposed Lonsdale Nature Conservation Reserve is 413 ha. This is 0.3% of the total net productive forest area currently available for timber harvesting. The *West Regional Forest Agreement* identifies Lonsdale as a Special Protection Zone.

D6 Illawarra

This 580 ha block is part of a hardwood production block (state forest) west of Stawell. River red gum, yellow box and yellow gum trees dominate the overstorey. It includes two large old tree sites and one fauna refuge site, and provides habitat for swift parrots. It contributes to representation of Sedge-rich Woodland and Plains Grassy Woodland EVCs.

The net available productive forest area covered by the proposed Illawarra Nature Conservation Reserve is approximately 410 ha. This is 0.3% of the total net productive forest area currently available for timber harvesting. The *West Regional Forest Agreement* identifies the eastern part of Illawarra as a Special Protection Zone. The western part of Illawarra State Forest, and Glynwylln State Forest, remain available for timber harvesting.

D7 Jallukar

This 1 165 ha block west of Ararat, now hardwood production (state forest), is characterised by high-quality, species-rich, open woodland with large yellow gum, yellow box and river red gum trees. A

large old tree site occupies the entire block and the site provides habitat for threatened species, notably corkscrew spear-grass and barking owl. It contributes to representation of Plains Grassy Woodland, Heathy Woodland, Alluvial Terraces Herb-rich Woodland and Creekline Grassy Woodland EVCs.

NRE Forests Service described Jallukar as a 'community forest', being a local domestic firewood source. The net available productive forest area is 292 ha. This is 0.2% of the total net productive forest area currently available for timber harvesting. The western part of Illawarra State Forest, and other small local forests, remain available for timber harvesting. The *West Regional Forest Agreement* identifies Jallukar as a Special Protection Zone.

D8 Morrl Morrl

This 1 991 ha block incorporates the existing Morrl Morrl Flora Reserve (191 ha) and hardwood production (1 800 ha state forest) north-west of Navarre. The predominant trees are grey box, red ironbark, yellow box and yellow gum. A large old tree site occupies almost the entire block and the site provides habitat for threatened species, notably spreading eutaxia, veined spider-orchid, powerful owl, barking owl and swift parrot. It contributes to representation of several vegetation communities, including Grassy Woodland, *Western Goldfields* Heathy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

NRE Forests Service described the Morrl Morrl block as a 'community forest'. It was previously a domestic firewood source for Stawell, but commercial firewood operations are excluded. The net available productive forest area covered by the proposed Morrl Morrl Nature Conservation Reserve is 1 206 ha. This is 0.95% of the total net productive forest area currently available for timber harvesting. The *West Regional Forest Agreement* identifies Morrl Morrl as a Special Protection Zone.

D9 Joel Joel

This 260 ha block east of Stawell incorporates the existing Joel Joel Bushland Reserve (247 ha) and a road reserve on its southern boundary (3 ha). It is characterised by open forest with many mature grey

box trees and provides habitat for threatened species, notably buloke, swift parrot and powerful owl. It contributes to representation of various vegetation communities, including Grassy Woodland EVC.

D10 Navarre

This 4 ha block west of Navarre contains a scattering of large yellow gum trees and is characterised by diverse, high quality vegetation. It incorporates an area of uncatagorised public land and provides habitat for threatened species, notably spreading eutaxia and buloke. It contributes to representation of Grassy Woodland EVC.

D11 Big Tottington

This 2 120 ha block is in a hardwood production area (state forest) north of Navarre, with high quality vegetation and grey box, yellow box and yellow gum the predominant trees. It incorporates two large old tree sites and two fauna refuges, and provides habitat for threatened species, notably swamp diuris and swift parrot. It contributes to representation of several vegetation communities, including Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVC.

The net available productive forest area covered by the proposed Big Tottington Nature Conservation Reserve is 1 383 ha. This is 1.1% of the total net productive forest area currently available for timber harvesting.

D12 Little Tottington

Little Tottington is a 480 ha block in hardwood production area (state forest) north of Navarre, containing one fauna refuge. It provides habitat for threatened species, notably swift parrot. It contributes to representation of several vegetation communities, including Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

The net available productive forest area covered by the proposed Little Tottington Nature Conservation Reserve is 364 ha. This is 0.3% of the total net productive forest area currently available for timber harvesting.

D13 Landsborough Hill

This 1 044 ha block north of Landsborough incorporates hardwood production area (state forest) with yellow box, long-leaf box, red stringybark and red box being the predominant trees. It includes two large old tree sites and two fauna refuges and provides habitat for powerful owl and swift parrot. It contributes to representation of several vegetation communities in the reserve system.

The net available productive forest area covered by the proposed Landsborough Hill Nature Conservation Reserve is 795 ha. This is 0.6% of the total net productive forest area currently available for timber harvesting. The *West Regional Forest Agreement* identifies this area as a Special Protection Zone.

D14 Landsborough

This 3 157 ha block, with large yellow box, red stringybark, long-leaf box and red box trees, includes the existing 1 831 ha Landsborough Flora and Fauna Reserve and 1 326 ha of hardwood production (state forest). It incorporates five large old tree sites and provides habitat for the powerful owl. It contributes to representation of several vegetation communities, including Valley Grassy Forest/Slopes Box Grassy Woodland Complex and Alluvial Terraces Herb-rich Woodland EVCs.

The net available productive forest area covered by the proposed Landsborough Nature Conservation Reserve is approximately 1 090 ha. This is 0.9% of the total net productive forest area currently available for timber harvesting.

D15 Stoney Creek

Stoney Creek is a 1 600 ha block in hardwood production area (state forest) south of St Arnaud, with yellow gum, yellow box and grey box the predominant trees. It includes one large old tree site and four fauna refuges and provides habitat for threatened species, notably swift parrot, powerful owl and square-tailed kite. It contributes to representation of several vegetation communities, including Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

The net available productive forest area covered by the proposed Stoney Creek Nature Conservation Reserve is 1 035 ha. This is 0.8% of the total net productive forest area currently available for timber harvesting.

D16 Stuart Mill

Stuart Mill is a 2 480 ha block in state forest south of St Arnaud. It includes two large old tree sites and two fauna refuges. It provides habitat for threatened species, notably swift parrot, powerful owl and squirrel glider. It contributes to representation of several vegetation communities, including Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

Significant historical features are the puddler at Carapooee West, and Swanton's battery and cyanide vats, which are to be protected.

The net available productive forest area covered by the proposed Stuart Mill Nature Conservation Reserve is 1 417 ha. This is 1.1% of the total net productive forest area currently available for timber harvesting.

D17 Redbank

Redbank is a 1 193 ha block in uncommitted land (state forest) north-west of Avoca. It includes two large old tree sites and provides habitat for the threatened broad-lip leek-orchid. It contributes to representation of several vegetation communities, including Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic and Valley Grassy Forest EVCs.

The net available productive forest area covered by the proposed Redbank Nature Conservation Reserve is 945 ha. This is 0.7% of the total net productive forest area currently available for timber harvesting.

D18 Dalyenong

This 2 570 ha block with large grey box and yellow gum trees, incorporates the existing Dalyenong Flora Reserve (1 450 ha) and 1 120 ha of hardwood production area (state forest), west of Bealiba. A large old tree site occupies almost the entire addition and two fauna refuges are also present. It provides habitat for threatened species, notably swift parrot, barking owl and woodland blind snake. It contributes to representation of several

vegetation communities, including Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

The net available productive forest area covered by the proposed Dalyenong Nature Conservation Reserve is 1 015 ha. This is 0.8% of the total net productive forest area currently available for timber harvesting. Several small sugar gum plantations are present. These may be harvested in the future, and should be revegetated with indigenous species using seed of local provenance.

D19 Tunstalls

Tunstalls is a 1 640 ha block in hardwood production area (state forest) north of Bealiba. It includes one large old tree site and two fauna refuges and provides habitat for the swift parrot. It contributes to representation of several vegetation communities, including Grassy Woodland EVC.

The net available productive forest area covered by the proposed Tunstalls Nature Conservation Reserve is 1 388 ha. This is 1.1% of the total net productive forest area currently available for timber harvesting.

D20 Wehla

This 312 ha block incorporates the Wehla Historic Reserve (62 ha) and 250 ha of hardwood production area (state forest). It includes two fauna refuges and provides habitat for the swift parrot. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland EVC.

The net available productive forest area covered by the proposed Wehla Nature Conservation Reserve is 83 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D21 Moliagul

Moliagul is a 530 ha block that incorporates existing state forest. It includes two large old tree sites and one fauna refuge and provides habitat for the swift parrot. It contributes to representation of several vegetation communities.

The net available productive forest area covered by the proposed Moliagul Nature Conservation Reserve is 404 ha. This is 0.3% of the total net productive forest area currently available for timber harvesting.

D22 Lexton

This is a 243 ha block in a hardwood production area (state forest), north of Lexton. It has large yellow box, long-leaf box, grey box and river red gum trees. A large old tree site occupies the entire block and three fauna refuges are also present. It contributes to representation of several vegetation communities, including Creekline Grassy Woodland and Alluvial Terraces Herb-rich Woodland EVCs.

The net available productive forest area covered by the proposed Lexton Nature Conservation Reserve is 60 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D23 Bung Bong

Bung Bong is a 420 ha block in hardwood production (state forest) area, east of Avoca. It provides habitat for the threatened weak daisy, and contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland EVC.

The net available productive forest area covered by the proposed Bung Bong Nature Conservation Reserve is 168 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D24 Talbot

This block is a 174 ha in a hardwood production area (state forest), south-west of Maryborough. It is characterised by species-rich vegetation and large old eucalypts. It includes one fauna refuge and provides habitat for threatened species, notably trailing hop-bush and clover glycine. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland and Creekline Grassy Woodland EVCs.

The net available productive forest area covered by the proposed Talbot Nature Conservation Reserve is 118 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D25 Caralulup

Caralulup is a 1 400 ha block in uncommitted land (state forest), south of Maryborough. It includes two large old tree sites and two fauna refuges. It provides habitat for the brush-tailed phascogale and contributes to representation of several vegetation

communities, including Alluvial Terraces Herb-rich Woodland, Grassy Woodland and Creekline Grassy Woodland EVCs.

The net available productive forest area covered by the proposed Caralulup Nature Conservation Reserve is 757 ha. This is 0.6% of the total net productive forest area currently available for timber harvesting.

D26 Dunach

This 494 ha block is in a hardwood production area (state forest), south of Maryborough. It includes one fauna refuge, and provides habitat for several threatened species, notably sharp midge-orchid, scented bush-pea, square-tailed kite, painted honeyeater, swift parrot and brush-tailed phascogale. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland and Grassy Woodland EVCs.

The net available productive forest area covered by the proposed Dunach Nature Conservation Reserve is 150 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D27 Timor

Timor is a 735 ha block in hardwood production area (state forest) north of Maryborough. It has a species-rich understorey and one fauna refuge and provides habitat for threatened species, notably Williamson's wattle and leafy templetonia. It contributes to representation of several vegetation communities, including Grassy Woodland EVC.

The net available productive forest area covered by the proposed Timor Nature Conservation Reserve is 539 ha. This is 0.4% of the total net productive forest area currently available for timber harvesting.

D28 Havelock

This 1 779 ha block is in a hardwood production area (state forest), north of Maryborough. It has a species-rich understorey, and includes one large old tree site and four fauna refuge sites while providing habitat for threatened species, notably small milkwort, spreading eutaxia, leafy templetonia and swift parrot. It contributes to representation of several vegetation communities, including Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

The net available productive forest area covered by the proposed Havelock Nature Conservation Reserve is 1 545 ha. This is 1.2% of the total net productive forest area currently available for timber harvesting.

D29 Waanyarra

Waanyarra is a 6 307 ha block that contains high quality vegetation. It incorporates the existing Tarnagulla Flora Reserve (1 150 ha), hardwood production area (state forest) (5 010 ha), and township land (145 ha). It includes four fauna refuge sites and provides habitat for threatened species, notably shrubby dampiera, cane spear-grass, dainty phebalium, swamp diuris, swift parrot, powerful owl and woodland blind snake. It contributes to representation of several vegetation communities, including *Northern Goldfields* Heathy Woodland, Grassy Woodland and Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic EVCs.

The net available productive forest area covered by the proposed Waanyarra Nature Conservation Reserve is 3 948 ha. This is 3.1% of the total net productive forest area currently available for timber harvesting.

D30 Mount Korong

This 465 ha block east of Wedderburn incorporates the existing Mount Korong Scenic Reserve and is characterised by steep, rocky granite hills that provide diverse reptile habitat. The site also provides habitat for threatened species, notably Deane's wattle, inland pomaderris and turquoise parrot.

D31 Mysia

This 4 ha site north-east of Wedderburn incorporates existing uncategorised public land and represents a significant remnant of Northern Plains Grassland EVC. It provides habitat for threatened species, notably pale spike-sedge, hairy tails, long eryngium, Rohrlach's bluebush, bottle bluebush and dwarf bluebush. It contributes to representation of Plains Grassy Woodland EVC.

D32 Bells Swamp

This 10 ha site incorporates the Bells Swamp Wildlife Reserve, near Eastville. It supports good stands of river red gum. It contributes to representation of Plains Grassy Woodland EVC.

D33 Leichardt

This 33 ha site incorporates the existing Bullock Creek Streamside Reserve north-west of Bendigo, and is characterised by grassy woodland and riparian vegetation in good condition. It contributes to representation of Plains Grassy Woodland EVC.

D34 Wilsons Hill

This 21 ha site incorporates the existing Wilsons Hill Bushland Reserve near Marong, and provides habitat for threatened species, notably cane spear-grass and leafy templetonia. It contributes to representation of various vegetation communities, including Grassy Woodland EVC.

D35 Shelbourne

Shelbourne is a 840 ha block in a hardwood production area (state forest) west of Bendigo. It is a key site for the brush-tailed phascogale, and also contains key areas of habitat for the swift parrot and contributes to representation of several vegetation communities.

The net available productive forest area covered by the proposed Shelbourne Nature Conservation Reserve is 712 ha. This is 0.6% of the total net productive forest area currently available for timber harvesting.

D36 Muckleford

Muckleford is a 543 ha block in hardwood production area (state forest), south of Maldon. It includes three fauna refuge sites, and provides habitat for several threatened species, notably weak daisy, crimson spider-orchid, swift parrot and brush-tailed phascogale. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland.

The net available productive forest area covered by the proposed Muckleford Nature Conservation Reserve is 397 ha. This is 0.3% of the total net productive forest area currently available for timber harvesting.

D37 Upper Loddon

This 1 130 ha block includes the existing 820 ha Upper Loddon Flora Reserve and 310 ha of state forest. A large old tree site with yellow box trees occupies the entire additional area, and the site provides habitat for the threatened scented bush-pea. It contributes to representation of several vegetation communities, including Valley Grassy Forest EVC.

The net available productive forest area covered by the proposed Upper Loddon Nature Conservation Reserve is 70 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D38 Fryers Ridge

This 2 149 ha block near Taradale incorporates the existing Fryers Ridge Flora Reserve (1 427 ha), 586 ha of hardwood production area (state forest), and 136 ha beside the adjoining aqueduct. The addition has two large old tree sites, and provides habitat for several threatened species, notably clover glycine, dwarf geebung, broad-lip leek-orchid, maroon spider-orchid, naked beard-orchid, Fryerstown grevillea and creeping grevillea. It contributes to representation of several vegetation communities, including Valley Grassy Forest EVC.

The net available productive forest area covered by the proposed Fryers Ridge Nature Conservation Reserve is 65 ha. This is 0.05% of the total net productive forest area currently available for timber harvesting.

D39 Taradale

This 191 ha block incorporates the existing Taradale Bushland Reserve (191 ha). It provides habitat for several threatened species, notably naked beard-orchid, crimson spider-orchid, Fryerstown grevillea and tall wallaby-grass. It contributes to representation of several vegetation communities.

D40 Pilchers Bridge

This 2 270 ha block incorporates the existing Pilchers Bridge Flora and Fauna Reserve (620 ha) and 1 650 ha of uncommitted land (state forest), south-east of Bendigo. It includes one large old tree site and seven fauna refuges and provides habitat for several threatened species, notably powerful owl, bush stone-curlew, swift parrot (key site) and brush-tailed phascogale. It contributes to representation of several

vegetation communities, including Valley Grassy Forest and Creekline Grassy Woodland EVCs.

The net available productive forest area covered by the proposed Pilchers Bridge Nature Conservation Reserve is 853 ha. This is 0.7% of the total net productive forest area currently available for timber harvesting.

D41 Salomon Gully

This 20 ha site in Bendigo incorporates the existing Salomon Gully Flora Reserve (19 ha) and a small parcel of township land (1 ha). It contains a diverse and relatively intact understorey and provides habitat for Ausfeld's wattle.

D42 Jackass Flat

The existing Jackass Flat Flora Reserve (54 ha) has been extended with several parcels of township land (17 ha in total) to create this 71 ha site in Bendigo. It contributes to representation of various vegetation communities, including Grassy Woodland and Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic EVCs.

D43 Whipstick

Eighty-three hectares of former freehold land was recently presented to the Crown as compensation for public land lost to mining near Fosterville. This block is recommended as a nature conservation reserve abutting the existing Whipstick State Park. The block contains populations of grey-crowned babbler and Williamson's wattle.

D44 Mt Sugarloaf

This 840 ha block is in hardwood production area (state forest) east of Bendigo. It has species-rich vegetation and widely-spaced large trees. It includes one fauna refuge and provides habitat for several threatened species, notably buloke, clover glycine and brush-tailed phascogale. It also includes a prominent strike ridge in Ordovician sandstone of regional significance. It contributes to representation of several vegetation communities, including Heathy Woodland EVC.

The net available productive forest area covered by the proposed Mt Sugarloaf Nature Conservation Reserve is 546 ha. This is 0.4% of the total net productive forest area currently available for timber harvesting.

D45 Eppalock

Eppalock is a 160 ha block in a hardwood production area (state forest) south of Axedale. It has large yellow box, grey box and river red gum trees. It includes two fauna refuges and a large old tree site occupies almost the entire block. It provides habitat for several threatened species, notably Ausfeld's wattle and brush-tailed phascogale. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland and Creekline Grassy Woodland.

The net available productive forest area covered by the proposed Eppalock Nature Conservation Reserve is 128 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D46 Crosbie

This 1 640 ha block incorporates hardwood production and uncommitted land (state forest), north of Heathcote. It includes five large old tree sites and three fauna refuges. It provides habitat for several threatened species, notably Ausfeld's wattle, swift parrot, regent honeyeater, grey-crowned babbler, powerful owl and the westernmost extent of the squirrel glider population which extends north-east into New South Wales. It contributes to representation of several vegetation communities, including Grassy Woodland and Alluvial Terraces Herb-rich Woodland EVCs.

The net available productive forest area covered by the proposed Crosbie Nature Conservation Reserve is 1 265 ha. This is 1.0% of the total net productive forest area currently available for timber harvesting.

D47 Mt Ida

This 4 657 ha block contains high quality vegetation, incorporating the existing Mt Ida Flora Reserve (1 070 ha) and 3 587 ha of hardwood production (state forest), north of Heathcote. The eastern addition has two large old tree sites and six fauna refuges. It provides habitat for a number of threatened species, notably Ausfeld's wattle, rising star guinea-flower, velvet daisy-bush, crimson spider-orchid, purple eyebright, clover glycine, scented bush-pea, swift parrot, powerful owl and brush-tailed phascogale. It contributes to representation of several vegetation communities, including Alluvial Terraces Herb-rich Woodland

and Creekline Grassy Woodland. A northern addition was purchased in 1996.

The net available productive forest area covered by the proposed Mt Ida Nature Conservation Reserve is 1 995 ha. This is 1.6% of the total net productive forest area currently available for timber harvesting.

D48 Tooborac

Tooborac is a 330 ha block of state forest, north of Pyalong. It includes one large old tree site and two fauna refuges. It provides habitat for the powerful owl and contributes to representation of several vegetation communities.

The net available productive forest area covered by the proposed Tooborac Nature Conservation Reserve is 75 ha. This is 0.06% of the total net productive forest area currently available for timber harvesting.

D49 Spring Creek

Spring Creek is a 401 ha site that incorporates part of the existing Mt Black Flora Reserve (58 ha) and 343 ha of Rushworth-Heathcote state forest, west of Nagambie. It includes one large old tree site and one fauna refuge and provides habitat for several threatened species, notably powerful owl, brush-tailed phascogale and squirrel glider. It contributes to representation of several vegetation communities, including Creekline Grassy Woodland EVC.

The net available productive forest area covered by the proposed Spring Creek Nature Conservation Reserve is 137 ha. This is 0.1% of the total net productive forest area currently available for timber harvesting.

D50 Murchison-Girgarre Disused Railway

This 111 ha site incorporates part of the disused rail reserve between Murchison and Girgarre. It contains vegetation of high conservation significance and fauna refuges are found within parts of the site. It provides habitat for threatened species, notably grey-crowned babbler, pale spike-sedge, spurred spear-grass, corkscrew spear-grass and Ausfeld's wattle. It contributes to representation of various vegetation communities, including Plains Grassy Woodland, Grassy Woodland, Gravelly-Sediment Broombush Mallee/Box-Ironbark Forest Mosaic, and Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland/ Gilgai Wetland Mosaic EVCs.

D51 Nathalia

This 35 ha site along the Broken Creek at Nathalia contains mature trees and a wide tree cover in some sections. It incorporates an existing streamside reserve (22 ha) and an area of public land water frontage (13 ha), and includes both yellow box woodland and old white cypress-pine woodland with good quality understorey. It supports regionally significant plant species and provides potential habitat for the superb parrot. It contributes to representation of Pine Box Woodland/Riverina Plains Grassy Woodland Mosaic EVC.

D52 Numurkah

This 35 ha site along the Broken Creek near Numurkah has mature trees, a wide frontage and historical values. It incorporates the existing Numurkah Rifle Range (3 ha) and an area of public land water frontage (32 ha), and contains a mostly native groundcover. It provides habitat for spreading eutaxia and other regionally threatened plant species and contributes to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic EVC.

D53 Gum Swamp

This 16 ha shallow wetland with river red gums, incorporates the existing Gum Swamp Wildlife Reserve north of Euroa. It contributes to representation of several EVCs, including Plains Grassy Woodland in the reserve system.

D54 Shire Dam Swamp

The existing Shire Dam Swamp Wildlife Reserve, north-west of Violet Town is recommended as a nature conservation reserve. This 25 ha shallow swamp contains river red gum and grey box trees. It contributes to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic EVC in the reserve system.

D55 Dookie–Katamatite Disused Railway

This 70 ha site incorporates part of the disused rail reserve between Dookie and Katamatite. It contains vegetation of high conservation significance and provides habitat for several threatened species, notably western silver wattle, white cypress-pine, buloke, bottle bluebush, smooth minuria, Australian millet, straw wallaby-grass and small burr-grass. It

contributes to representation of various vegetation communities, including Plains Grassy Woodland, Plains Grassy Woodland/Gilgai Wetland Mosaic, and Grassy Woodland EVCs.

D56 Wattville

This 39 ha site along the Nine Mile Creek north-east of Dookie, has a wide water frontage, mature trees and mostly native groundcover. It incorporates an area of public land water frontage and provides a rare example of a natural creek system. It provides habitat for several threatened species, notably white cypress-pine, spurred spear-grass and swift parrot. It is an important historical site and contributes to representation of Plains Grassy Woodland and Creekline Grassy Woodland EVCs in the reserve system.

D57 Youarang West

This 16 ha site along the Broken Creek south-east of Katamatite is characterised by old woodland mature trees, a wide frontage and mostly native groundcover. It incorporates an area of public land water frontage and provides habitat for water-ribbons and other regionally significant plant species. It contributes to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic and Creekline Grassy Woodland EVCs in the reserve system.

D58 Youarang

Youarang is a 28 ha site along the Broken Creek west of Tungamah, with a wide frontage, mature trees and mostly native groundcover. It incorporates an area of public land water frontage and provides habitat for threatened species, notably southern cane-grass, spurred spear-grass and spreading eutaxia. It also supports regionally significant plants, provides potential habitat for the bush stone-curlew and is an important historical site. It contributes to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic and Creekline Grassy Woodland EVCs in the reserve system.

D59 Waggarandall

Waggarandall is a 37 ha site along the Broken Creek south-west of Tungamah, characterised by old-growth woodland, mature trees, a wide frontage and mostly native groundcover. It incorporates an area of public land water frontage and provides habitat for threatened species, notably buloke and leafy templetonia. It contributes to representation of Plains Grassy Woodland and Creekline Grassy Woodland EVCs in the reserve system.

D60 Tharanbegga

Tharanbegga is a 6 ha block north of Tungamah incorporating an existing stone reserve. It has diverse vegetation and contributes to representation of Grassy Woodland EVC. It also has inter-bedded Ordovician marine sediments that display a variety of faults, folds, and other structural features.

D61 Tungamah

The 36 ha site east of Tungamah incorporates road reserves and an area of public land water frontage. It provides habitat for many threatened species, notably pale spike-sedge, spurred spear-grass, rye beetle-grass, pepper grass, long eryngium, woolly buttons, smooth minuria, bluish raspwort, plains leek-orchid, buloke, leafy templetonia, barking owl, and grey-crowned babbler. It contributes to representation of Plains Grassy Woodland/Gilgai Wetland Mosaic EVC in the reserve system.

D62 Mt Meg

Mt Meg consists of eight existing bushland reserves, which with the existing Mt Meg Flora Reserve form the proposed Mt Meg Nature Conservation Reserve (total area 440 ha). An Aboriginal rock well is known in one of the blocks. Nine threatened species have been recorded in these blocks, including narrow goodenia, umbrella grass, scaly greenhood, northern sandalwood, bush stone-curlew, and carpet python, for which this area is one of the most important sites in Victoria. Although these public land blocks are scattered, there is much native vegetation on freehold land linking them. This district, known as the Chesney Vale Hills, may be well-suited as a location for a Local Habitat Conservation Network (see Recommendation R13 in Chapter 4).

D63 Cookinburra

This 88 ha block west of Wodonga incorporates the existing Indigo Upper Bushland Reserve and supports a large population of the vulnerable smooth Darling-pea. It contributes to representation of several vegetation communities, including Grassy Woodland EVC.

D64 Fell Timber Creek

This 144 ha block west of Wodonga incorporates land previously owned by the Albury–Wodonga Development Council and recently handed over to the Victorian Government. The whole reserve is 245 ha; part is outside the study area. It contains steep hills with rock exposures and a high-quality ground flora. The vulnerable smooth Darling-pea is present, as are various vegetation communities, including Grassy Woodland and Valley Grassy Forest EVCs. This area is managed as part of the McFarlanes Hill unit in the Albury–Wodonga regional parklands.

RECOMMENDATIONS

D5–D64 That the proposed reserves listed and described above be used in accordance with the general recommendations for nature conservation reserves on page 133.

Information Sources

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

Holland and Cheers (1999).

Lumsden *et al.* (1997).

Muir (1997).

Soderquist and Rowley (1995).

E Historic and cultural features reserves

The Box–Ironbark public lands have a rich and interesting history. After a long Aboriginal history, the area was settled, and much was cleared, by European colonists. Many uses or activities have affected the landscape: gold rushes and continued reef mining; timber harvesting for firewood; mine timbers, sleepers and fencing; apiculture; eucalyptus oil and charcoal production; water supply; roads and railways. More recently, issues of soil erosion and conservation, military training, nature conservation and tourism have had an impact on the area.

Locations with obvious connections to historical activities or events, such as relics or even just recorded associations, allow visitors to understand and appreciate past land uses, and gain a different perspective on current activities. Several studies have been carried out to identify, and systematically assess, the significance of historic places across the Box–Ironbark landscape.

The following recommendations designate the areas that are:

- most significant;
- represent a major historic theme; or
- provide the opportunity for education about historic activities and events.

These areas are recommended as historic and cultural features reserves, recognising that their primary land use is to protect historic features, and extend public knowledge.

Other historic features are contained in parks, other reserves and state forest. Such places should be recognised when managed primarily for other purposes.

Certain significant features have been specifically identified in the detailed descriptions of those sites.

As with the regional parks, these recommended reserves are to be ‘restricted Crown land’ in relation to mining, under the *Mineral Resources Development Act 1990*. Mineral exploration and mining may be permitted, subject to the approval of the Minister for Environment and Conservation. Major mining proposals would require an environment effects statement.

The LCC recommended nine historic areas and 36 historic reserves in its various earlier investigations covering the Box–Ironbark area, including 12 proposed reserves in the *Historic Places South-western Victoria Special Investigation*. Additional material about relevant sites has recently been collected in these areas for this investigation. These recommendations are based on those of the south-western Victoria investigation.

Historic mining sites which provide the physical traces of the 1850s gold rush are fragmented and relatively few. Much of the gold rush landscape has been transformed or obliterated either by natural events, or by settlement, forest operations, and/or subsequent phases of gold mining. Gold-bearing quartz reefs have been repeatedly reworked (some extensively), while extensive areas of the most fruitful alluvial tracts have been removed by hydraulic sluicing. The recommendations below include significant mining sites, with features from the initial gold rushes, later stages of mining, and secondary processing of the ore.

GENERAL RECOMMENDATIONS FOR HISTORIC AND CULTURAL FEATURES RESERVES

That the historic and cultural features reserves (see Note 1 below) shown on Map A (numbered E1–E31) be used:

- (a) primarily, to protect places with highly significant historical values, including remnant historical features such as buildings, structures, relics or other artefacts;
- (b) (i) where compatible with protecting the above values, to conserve indigenous flora and fauna, and
(ii) where appropriate in the context of present use and management, to provide opportunities for recreation and education;
- (c) to provide protection for, where present:
 - (i) cultural values, including aesthetic and social values, and
 - (ii) scenic landscape and natural values;

and that:

- (d) minimum impact exploration be permitted with the approval of the Minister for Environment and Conservation (see Note 2 below);
- (e) mining be subject to Government decision on individual proposals (see Note 2 below);
- (f) prospecting be permitted except in areas where it may adversely affect significant historical values;
- (g) timber harvesting not be permitted;
- (h) the re-use of buildings, including for community uses, be permitted where appropriate, with any modifications subject to the approval of the land manager;
- (i) conservation management plans or conservation and action strategies for the historic features be prepared by the land manager;
- (j) the areas referred to in recommendations E1 to E18 be permanently reserved under the *Crown Land (Reserves) Act 1978*, and be managed by the Department of Natural Resources and Environment;

and that:

- (k) the areas referred to in recommendations E19 to E31 be identified as historic and cultural features management zones in state forest, and be managed by the Department of Natural Resources and Environment.

Notes:

1. The reserves consist either of the relevant Crown parcel alone, or in broad acre public land, the area of the features to be protected plus the area within 100 m (for areas of state significance) or 50 m (for areas of regional significance) of the features.
2. In relation to exploration and mining proposals, provisions for a buffer around specific features, principles for consideration of particular proposals, and where appropriate, compensation, are to be determined by the land managers.
3. The ECC is aware of a proposal for Bendigo Regional Institute of TAFE to carry out a management planning project using several historic mining sites around Bendigo, considering issues such as renewed mining, protection of historic features, promotion and interpretation, visitor use and management, safety, fire and pest plant control, and future use and ownership, within the framework of the ECC's proposed uses.

E1 Existing historic and cultural features reserves

Thirty-three existing historic areas and reserves are proposed to be retained, but designated as historic and cultural features reserves. They will be used for effectively the same purposes as previously. These areas are to be reviewed before the ECC's Final Report.

RECOMMENDATION

E1 That the existing historic and cultural features reserves, historic areas and historic reserves described below and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves above.

Historic and cultural features reserves

- Hand in Hand Cyanide Works, Deep Lead (8 ha)
- Leviathan Cyanide Works, Stawell (5 ha)
- North Magdala Co. Mine, Stawell (0.2 ha)
- Moonlight/Magdala Mine, Stawell (3 ha)
- Oriental Co. Mine, Stawell (1 ha)
- Three Jacks Co. Mine, Stawell (1 ha)
- Great Western Lead Mine, Great Western (5 ha)
- Long Gully Shallow Lead, Armstrong (11 ha)
- Lloyd's whip shaft and mud-brick structure, Stuart Mill (13 ha)
- Bell Rock Co. Mine, St Arnaud (3 ha)

Historic areas

- Percydale (1 272 ha)
- Moliagul (1 010 ha)
- Maldon (2 520 ha)
- Whroo (490 ha)

Historic reserves

- Glendhu, south of Landsborough (40 ha)
- Landsborough (16 ha)
- Lower Homebush, north-east of Avoca (1 ha)

- Nine Mile, west of Wedderburn (12 ha)
- Tipperary Hill, north-west of Maryborough (5 ha)
- Timor, north of Maryborough (7 ha)
- Bristol Hill, Maryborough (26 ha)
- Majorca, south-east of Maryborough (16 ha)
- Kong Meng, north of Majorca (20 ha)
- Goldsborough, north-west of Dunolly (7 ha)
- McIntyre, north of Moliagul (38 ha)
- Rheola Hill, Rheola (72 ha)
- Gooseberry Hill, east of Dunolly (1 ha)
- Wild Dog Diggings, east of Dunolly (24 ha)
- Wanalta Weir, west of Rushworth (5 ha)
- Bailieston, north-west of Nagambie (158 ha)

Note: the northern parcel has been revoked.

- Murchison Water Water trust pump, south of Murchison (1 ha)
- Boxwood, east of Dookie (52 ha)
- Chiltern Valley Extended Mine, west of Chiltern (10 ha)

Notes:

1. The former Fosterville historic reserve is proposed to become state forest. The most significant historic features present were archaeologically recorded before being removed for the Fosterville open cut mine.
2. Big Hill at Stawell is proposed to be mined as an extension of Stawell Gold Mines' operation. The implications of this proposal have been considered in detail in preparation of an environment effects statement (EES). The EES is under consideration by the Minister for Planning. The ECC has no objection to the dismantling of several historical monuments on Big Hill for later re-erection.

E2–E18 Proposed historic and cultural features reserves

E2 Alma Lead Cyanide Works

This site at Timor, testifies two main periods of cyaniding, from approximately 1897 to World War One and from circa 1937 to the mid 1950s. The site consists of large raised sand dumps with four, poorly preserved 7 m diameter cyanide vat depressions and some small concrete mounting beds.

E3 Janevale Monier Bridge

This bridge, constructed over the Loddon River at Laanecoorie in 1911, was one of the earliest concrete bridges in Victoria. It is of national significance as a rare and early example of reinforced concrete technology. The bridge is associated with the pioneering concrete firm Monier, and the innovative engineer Sir John Monash. The braced concrete trestles demonstrate a transition from earlier arched concrete bridges to modern beam and pylon construction.

E4 Pickpocket Diggings

These diggings at Strangways, south of Newstead, feature relatively undisturbed cement workings with remains of an extensive, shallow open-cut. Several collapsed adits and large dumps of washed gravel and pebbles are present. A Chinese water race lies around the hill above the open-cut.

E5 South Frederick the Great

This mine at Sebastian, failed to prove remunerative and survived a relatively short time from 1935 to 1938. Features at the site include: a capped shaft still surrounded by its mullock paddock; concrete foundations of a 10-head battery; and a circular concrete pad, probably a stand for a gas-producer cylinder. The latter documents important technology in the construction and use of gas-producers for mining in the 1930s.

E6 Deborah Company

Deborah Company at Golden Square, Bendigo features remnants of well preserved mining artefacts including: a winding engine and steel poppet-head with tubular legs; a workshop with engine blocks; and a 20-head battery containing concrete machinery footings, floors and engine beds.

The intact chimney stack adds further interest. The mine is capped and is not used commercially, however Bendigo Mining NL has plans to re-open the mine in 2001, to a depth of 600 m.

E7 North Deborah

North Deborah at Bendigo contains well preserved mine foundations, including a winding engine site with poppet-head, over a shaft covered by a metal grille, three concrete winding engine beds, and an intact 9 m high circular chimney stack built with hand made bricks. The mine operated commercially from 1937 to 1945. Although the mine is uncapped, it is used by Bendigo Mining NL for ventilation and de-watering of Central Deborah mine.

E8 Central Deborah Tourist Mine

This tourist mine at Golden Square, Bendigo, operated commercially from 1939 to 1954, yet now acts as a tourist attraction, managed by the Bendigo Trust. It consists of a winding engine site with well preserved and restored features including a winder, air compressor foundations, portions of ore bin, sections of mine buildings, an air receiver and boiler, and a poppet-head. Parts of the mine measure 300 m in depth.

E9 Victoria Hill

Victoria Hill at West Bendigo contains features representing several stages of gold mining, including Ballerstedts which has long narrow open-cut remains from one of Bendigo's premier mines in the late 1850s/60s, and Lansells 180, containing well preserved late 19th century mine foundations. Victoria Hill has been interpreted and is managed as a historic reserve. In addition, the adjoining area containing a poppet-head and Central Nell Gwynne Mine relics is included.

E10 Royal George Company

Royal George Company mine site at Sparrowhawk consists of a concrete winding engine bed with protruding mounting bolts, foundations of a chimney stack, and a collapsed shaft with scattered bricks and remnants of a baling pond. A mullock heap 30 m long and 8 m high extends from the shaft.

E11 Pearl, Pearl East and Stanfield Mine Workings

The six lines of the Pearl Shaft's mullock heap are a Bendigo landmark. Machinery sites from different mining periods and a large battery site are present. Well preserved brick and concrete footings, a shaft and mullock heaps mark the Pearl East mine site on the Sheepshead Reef. The Stanfield Mine site has well preserved engine beds, boiler setting, chimney base, shaft collar, poppet-leg pads and mullock heaps, and represents mining in the 1930s.

E12 Comet Shaft, KK Shaft, and Comet Diggings

Comet Hill reef workings and mine at Bendigo, dating from the 1850s/60s until 1913, demonstrate a sequence of mining over time, with remains of winding engine beds, a filled shaft, mullock heap, and an open-cut present. The KK Shaft has the remains of an H-shaped brick engine bed with protruding bolts, and a tailings dump.

E13 Johnson's Nos. 1 & 2 Mines and Golden Age Mine, Garden Gully

The Johnson's Nos. 1 & 2 mines represent one of Bendigo's main mines from the 1870s, with the winding engine beds demonstrating three phases of use from 1870 to the 1920s. The site has remains of a powder magazine, other buildings, a dam, and mullock heap. The Golden Age Mine has well preserved winding engine beds, a stone wall, mullock heaps, and there are fragmentary remains of the Princess Dagmar Mine.

E14 Chinese Diggings

The Chinese Diggings site at White Hills, Bendigo was worked from 1852 to the 1930s. Numerous well preserved round and rectangular shafts remain of the sinkings through the hard cemented white alluvial gravels here. This site contains most of the remaining shafts near Bendigo associated with Chinese miners.

E15 Woodbrook Road Bridge

The Woodbrook Road Bridge crosses the Melbourne to Echuca railway, north of Harcourt. This was the venue in 1859/60 for a strike against the use of indentured German masons at rates that undercut locally established conditions and pay.

The use of local granite for the Woodbrook Bridge led directly to the development of the Harcourt quarrying industry.

E16 Dysart Military Siding

This complex near Seymour reflects parts of Australian military operation during Second World War storage of supplies on a main transport line linked to other military bases; and disembarkation of men in transit. The complex is of state significance, and consists of three gabled, timber-framed, corrugated iron-clad stores with timber platforms and other associated features. It may be the only all-storage facility to survive, and its siting evokes the Second World War era.

Note: The ECC is investigating the tenure of this land.

E17 Echuca & Waranga Trust Irrigation Pump & Channel

The United Echuca & Waranga Water Trust was formed in 1881. The Trust's surviving pump structure, at the junction of Stuart Murray Channel and Goulburn River, is of state significance for its role in early irrigation. It is the oldest known irrigation pump housing in Victoria, and is rare for its age and type. It is also one of the first major designs of the noted engineer Stuart Murray. This site consists of a brick shaft 13.7 m deep with timbered water tunnel, sluice gate and concrete engine and boiler bases.

E18 Day's Mill

Day's Mill, south of Murchison, is probably the best preserved and most complete example of a stone flour mill from the 19th century, operating from the 1860s to the late 1890s. The site also contains a wide range of domestic and farm buildings and artefacts, assembled by one family over three generations. These provide a record of farming and flour milling as well as rural life in Victoria.

RECOMMENDATIONS

E2–E18 That the proposed reserves described above and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves on page 152.

E19–E31 Historic and cultural features zones in state forest

Zoning in forest management planning is required to protect the following historic and cultural features, generally of state significance, which occur within state forests.

E19 Wet Patch Lead

Wet Patch Lead in the Pyrenees Ranges, contains puddling machine hut sites, and associated dams and dumps of gravel. At the head of the gully are well preserved original shallow alluvial workings.

E20 Three Grain Gully

Three Grain Gully at Moliagul is one of the sites in the area between Moliagul and Dunolly which, after gold was discovered in 1855, became known as Inkerman diggings. They were rushed for gold several times over the years. The first Inkerman Rush in July 1855, was associated with Three Grain Gully. The remains of alluvial workings consist of a wide band of sinkings and mounds stretching for about 2.5 km. The sinkings are well-defined, intense, and located in a distinct band. A cemetery was established next to the site. The earliest marked grave in the cemetery is dated May 1859.

E21 Bet Bet Lead

This site was worked periodically between 1854 and early in the 20th-century. The site has a rare puddler, the only one of its design found in the central Victorian goldfields.

E22 Almedia Reef

Almedia Reef at Dunolly contains the remains of 22 stone structures ranging from surface mounds to fireplaces. It also contains dumps of 19th century rubbish from settlements associated with mining. Remnants of reef workings, including open-cutting, several shafts (filled in) and small mullock heaps, are also present.

E23 Wild Duck Lead Diggings

Wild Duck Lead Diggings at Dunolly contain an unusually well preserved puddler. The outer mound of the puddler is approximately 3.5 m wide and is raised about one metre above ground level. The puddler is in good condition, with the edges of the inner mound and puddling trench still precisely cut. This immaculate appearance suggests that it has

been used during the 20th century, probably during the 1930s. This puddler is important for estimating the age of more weathered and older, mid-late 19th century puddlers.

E24 Possum Gully Cement Workings

Possum Gully Cement Workings at Amherst contain a variety of relics documenting alluvial mining operations. These include a long stretch of cement lead workings along the gully, with some distinct shaft sinkings through the cement cap, open-cutting and tunnelling. The site also contains puddling dams connected with the cemented lead workings, and a weathered puddler on a well preserved site.

E25 White Horse Gully

This gully at Maryborough is an interesting reference point for studying the evolution of shallow alluvial mining. The site has an embankment marking the interface between 'new' and 'old' alluvial mining landscapes. To the north is a bare rehabilitated gully, recently extensively strip-mined, and to the south is an old, extensively surfaced or puddled gully.

E26 Battery Dam Eucalyptus Distilling Site

This distilling site at Maryborough contains features that document a sequence of uses through time, including alluvial gold mining (puddling machine site), quartz gold processing (battery site), distillation of eucalyptus oil (four distillation vats and condensing pits of an unusual construction), two large water dams, and a house site. The ruins of Thomas Rice's house have been identified by the local community as a significant cultural site. The name Thomas Rice is synonymous with the discovery of gold in Maryborough. The nature and condition of the battery, distillery and puddling sites suggest they date from early-mid twentieth century.

E27 North German Gully

This site at Majorca contains three weathered puddlers. The largest, 20ft in diameter, is the least weathered and has a pronounced inner mound and deep puddling trench with sheer sides. This site illustrates the continuity of puddling, and how certain gullies and dams tended to be favoured puddling locations.

E28 Gardners Gully

Gardners Gully at Muckleford features a puddler, a bank of washed gravel and remains of a single-roomed mud brick house. The 19th century weathered puddler is 22ft wide and adjoins a massive bank of washed gravel. This bank, presumably an accumulation from a succession of puddlers, measures 50 m long, 20 m wide and stands 2 m high.

E29 Green Gully

Green Gully at Muckleford contains rare remnants from shallow reef and four partly bulldozed mullock paddocks with numerous shallow shafts, and alluvial sinking artefacts.

E30 Welcome Reef Mine Site

This site, at Redcastle, was the richest in the area. It retains considerable integrity and the ability to illustrate operations of a late 19th century gold mine. It contains a shaft and flattened mullock paddock, remains of a blacksmith's shed with a stone forge, a poppet-head leg, battery stumps, stone floor and footings, arrangement of bedlogs and iron bolts for a stone boiler setting, and a stack base from the former boiler house.

E31 Poverty Diggings

Poverty Diggings at White Hills, Rushworth, contains the remains of two puddling machines. One, protected by a swamp, is quite well preserved but would be in better condition if reeds were cleared. There is also a large embankment of washed gravel surrounding the puddler, possibly indicating the scale of operation of puddling.

RECOMMENDATIONS

E19–E31 That the proposed zones described above and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves on page 152.

E32 Other historic sites in state forest

Various other historic features occur within state forests. Those of regional significance should be protected by zoning in forest management planning, or prescriptions during forest operations.

RECOMMENDATION

E32 That the historic sites in state forests listed in Chapter 15 be protected by zoning in forest management planning or prescriptions during forest operations.

Information Sources

- Bannear (1993a-g).
- Bannear (1994a-b).
- Bannear (1995).
- Bannear (1997).
- Butler (1997).
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15 State forests and forest management

Box-Ironbark forests are now fragmented remnants of a once more or less continuous forest ecosystem. Forest clearing for agriculture, gold rushes, timber harvesting and other uses, have considerably reduced the original extent of the forests.

Over the last 150 years, huge volumes of Box-Ironbark timber were consumed for mining timbers, firewood and charcoal production. The cut of large trees for railway sleepers was also immense, peaking in the 1890s with a resurgence in the 1960s. Because so little remains, it is imperative that the forests are managed to protect their nature conservation values. This report recognises this need by providing for substantial areas of new parks and reserves across the Box-Ironbark study area.

Forest management, particularly in state forests where timber harvesting and other uses continue, is also an important component of nature conservation in the Box-Ironbark study area.

The current forests have a high number of relatively small trees. The ECC's vision is for the development of a healthy forest comprising more open stands with a substantially greater relative density of large trees (i.e. larger than 60 cm diameter) than the average of 2.1 per hectare currently present.

This chapter discusses forest management and biodiversity conservation in state forests (see Chapter 9 for matters related to timber production and the Glossary for an explanation of technical forestry terms).

The recommendations in this report reduce the area of state forest available for wood production. However a new forest management model developed by NRE Forests Service¹ has demonstrated that these forests have been cut in recent years at a rate that is below the sustainable yield level. This model has been developed using the Box-Ironbark Timber Assessment² (BITA) which provides detailed data on standing timber, growth, species, origin, stocking, potential products, productivity, habitat characteristics and forest

management. With increased production from the remaining state forests, the reductions in area due to the park and reserve proposals in this report should have a relatively minor impact on the current timber industry.

Chapter 9 discussed the characteristics of Box-Ironbark timbers, and the potential for value-adding through kiln drying, producing magnificent high grade products such as furniture wood. The ECC was keen at the outset of this investigation to at least maintain the Box-Ironbark sawlog industry, with the expectation that a high percentage of the output would be kiln-dried. The recommendations in this report provide for a potential increase in sawlog harvesting, with as much as possible directed to kiln-dried value-added uses.

After providing areas necessary for biodiversity conservation, current demands can be met but there will be limited flexibility for expansion. In the longer term, plantations on private land will be needed to supply small dimension products such as fencing and firewood. While the ECC cannot make recommendations for private land, it strongly supports moves by other organisations to encourage private plantations of Box-Ironbark species.

15.1 Forest management planning and zoning

The NRE Forests Service will carry out forest management area (FMA) planning for the Bendigo and Horsham regions following completion of the ECC's Final Report and Government consideration of the recommendations. This will include preparation of detailed zoning for the remaining state forest area, and amending prescriptions as necessary.

The zoning will identify Special Protection Zones (SPZs) and Special Management Zones (SMZs).

These zones will protect additional areas representing particular ecological vegetation classes (EVCs), habitat for threatened fauna, sites with threatened plant species, and places of recreational or scenic values, as appropriate. Steep slopes, stream buffers and proposed wildlife corridors between areas of retained habitat will also be designated.

The planning process will take into account the pattern of public land use established under these recommendations, the requirements of the *Flora and Fauna Guarantee Act 1988*, policy directions in the *National Forest Policy Statement*³ and Victoria's *Biodiversity Strategy*,⁴ and the Commonwealth's national forest reserve criteria.⁵

The FMA plans will outline the detailed basis for forest utilisation and management. Subsequently, wood utilisation plans and coupe plans will identify specific areas designated for harvesting, and localised features for protection.

The *Code of Forest Practices for Timber Production (Revision No. 2)*⁶ aims at ensuring timber production which:

- promotes an internationally competitive industry;
- is compatible with the conservation of the wide range of environmental values associated with the forests; and
- promotes ecologically sustainable management of native forests.

The revised Code was adopted by the Victorian Parliament in 1997, under the *Conservation, Forests and Lands Act 1987*. It sets out requirements for:

- establishing and tending forests, including regeneration, use of local species and seed sources;
- timber harvesting, including coupe plans, wood utilisation plans, and protection through prescriptions of flora and fauna, water quality, landscape values and soil stability; and
- road construction and drainage.

The Code is implemented through FMA plans, wood utilisation plans, and coupe plans, and prescriptions.

Prescriptions

Forest management prescriptions provide a framework for harvesting operations, including protection of defined types and numbers of hollow-bearing or other habitat trees. These prescriptions aim to integrate wildlife conservation with wood production requirements.

Current prescriptions⁷ have been progressively improved over time and those in the recent Bendigo FMA are comprehensive and detailed. The prescriptions require that, on average, at least two large (greater than 60 cm diameter) trees, two medium trees (40 to 60 cm), and two small trees (20 to 40 cm) per hectare be retained across each coupe harvested. All trees greater than 80 cm diameter are fully protected. Tree diameter is measured at breast height, and includes bark.

The BITA shows that, on average, there are only 2.1 trees per hectare larger than 60 cm diameter remaining in the forest (see Table 15.1 below). Under the current prescriptions, NRE Forests Service has indicated that, effectively, all trees larger than 60 cm diameter are excluded from harvesting and all trees larger than 80 cm are absolutely protected. Most hollow-bearing trees are not suitable for commercial purposes and are retained for their habitat value. These protective prescriptions have been developed in the light of both existing management objectives and the present structure of the forest.

It is important that these prescriptions remain flexible so that they can be adapted and refined as new information becomes available or as management objectives change. Different approaches need to be developed and adopted as new scientific findings about wildlife behaviour and forest ecology, silviculture, harvesting techniques, and new modelling techniques are developed. Administrative and regulatory changes may also require changes in the nature or content of prescriptions.

The need for flexibility means it is not appropriate for this report to make detailed recommendations about the content of prescriptions. However, the recommendations in this chapter provide a durable framework for development of prescriptions in the future.

15.2 Biodiversity conservation in state forest

Effects of past uses

The Box-Ironbark forested public land of the inland hills has been extensively disturbed since the 1850s. Large scale and uncontrolled cutting was associated with the gold rushes. Later utilisation, by heavy cutting for sleepers and firewood, and by forest silviculture, was much more regulated.

The forests today are characterised by a large number of 30 to 50 cm diameter trees which originated after gold rush cutting during the 1850s to early 1900s, and subsequent cutting. Most stems are less than 20 cm diameter.

Silvicultural operations conducted by the Victorian Forests Commission from the early 20th century aimed to thin regenerating forest stands to promote sawlog growth, returning the damaged post-gold rush forests to a productive state. Vigorous trees of good form were retained but less vigorous trees with poor form, including large old hollow-bearing trees and important faunal food trees that were non-commercial, were progressively removed

during this century by ringbarking and felling. Only in recent years have specific provisions been made for the retention of habitat trees in silviculture and harvesting.

The net effect of the gold rush cutting and subsequent silvicultural operations is that the largest gold rush origin trees are generally of good form, having been specifically retained for sawlog production. Hollow-bearing trees of any size are rare because of the impact of the gold rushes and because they have been selected against, in subsequent culling operations.

Tree hollows

There is ample evidence of the importance of hollow-bearing trees for wildlife species that use hollows for nesting and roosting (refer to Chapter 4). Given the rarity of these trees in the landscape, it is important that existing large trees and those with hollows receive high levels of protection, and that there is recruitment of smaller trees to become large trees in the future. Better understanding of processes initiating and promoting formation of hollows in this forest type is important for future management of this wildlife resource.

Table 15.1 Average number of tree stems per hectare and basal area in each size class

	Tree size class				Total
	< 20 cm	20-40 cm	40-60 cm	> 60 cm	
<i>Number of stems per ha</i>	392	91	13.5	2.1	499
Average basal area (square metres per hectare)	3.88	5.48	2.33	0.86	12.5

Tree size classes: dbhob. Source: BITA report and BITA data from NRE Forests Service, for Bendigo FMA.

Table 15.2 Number of hollows per hectare by hollow type in each size class

Hollow type and size	Canopy hollows Tree size class					Base hollows
	< 20 cm	20-40 cm	40-60 cm	> 60 cm	<i>Total</i>	
2-5 cm	0.2	1.2	0.6	0.5	2.6	5.1
5-20 cm	0.2	1.3	2.0	1.9	5.4	9.2
>20cm	0	0.1	0.2	0.4	0.7	1.8
Total	0.4	2.6	2.8	2.8	8.7	16.1

Tree size classes: dbhob. Source: BITA Report, Bendigo FMA (replaces BITA Report Table 5.7 following data reanalysis).

Table 15.3 Mean number of hollows per tree by canopy hollow size, and the presence of base hollows, for the eight main tree species

Species	Tree size class dbhob	Canopy hollows			Base hollows
		Small and medium	Large and very large	Total	Total
Grey box	1-20	0.0	0.0	0.0	0.1
	20-40	0.0	0.0	0.0	0.1
	40-60	0.2	0.1	0.4	0.2
	60-80	0.8	0.7	1.5	0.2
	80-100	1.3	1.3	2.6	0.4
	> 100	2.4	3.7	6.0	0.5
Red ironbark	1-20	0.0	0.0	0.0	0.0
	20-40	0.0	0.0	0.0	0.0
	40-60	0.0	0.0	0.0	0.1
	60-80	0.2	0.3	0.4	0.2
	80-100	1.6	1.1	2.7	0.2
	> 100	3.4	4.1	7.4	0.0
Yellow box	1-20	0.0	0.0	0.0	0.1
	20-40	0.0	0.0	0.1	0.1
	40-60	0.3	0.1	0.3	0.1
	60-80	0.6	0.4	1.0	0.2
	80-100	2.3	1.7	3.9	0.2
	> 100	3.3	2.5	5.7	0.1
Yellow gum	1-20	0.0	0.0	0.0	0.0
	20-40	0.0	0.0	0.0	0.0
	40-60	0.1	0.0	0.1	0.1
	60-80	0.7	0.3	0.9	0.1
	80-100	1.4	0.7	2.0	0.3
	> 100	0.3	2.0	2.3	0.1
Long-leaf box	1-20	0.0	0.0	0.0	0.0
	20-40	0.0	0.1	0.1	0.0
	40-60	0.2	0.5	0.7	0.1
	60-80	0.1	0.9	1.0	0.0
	80-100	0.6	1.8	2.4	0.1
	> 100	0.8	2.4	3.2	0.2
Red box	1-20	0.0	0.0	0.0	0.0
	20-40	0.1	0.0	0.1	0.1
	40-60	0.7	0.3	1.0	0.2
	60-80	1.8	1.3	3.1	0.5
	80-100	1.1	0.8	1.9	0.4
	> 100	1.3	2.6	3.8	1.3
Red stringybark	1-20	0.0	0.0	0.0	0.0
	20-40	0.0	0.0	0.1	0.0
	40-60	0.3	0.1	0.4	0.1
	60-80	0.5	0.6	1.2	0.2
	80-100	0.4	1.0	1.4	0.1
	> 100	0.3	1.6	1.8	1.8
Blue gum	1-20	0.0	0.0	0.0	0.0
	20-40	0.0	0.0	0.0	0.0
	40-60	0.0	0.0	0.0	0.0
	60-80	0.1	0.1	0.3	0.1
	80-100	1.2	0.6	1.8	0.1
	> 100	1.6	0.6	2.3	0.3

Source: Tree Hollows in the Box-Ironbark Forest, Bendigo FMA.⁸ Numbers are rounded.

Large old trees

'Old growth forest', as defined in most other Victorian forests, is virtually absent from Box-Ironbark forests, because of their history of clearing and heavy use in the gold rushes, followed by intensive selective harvesting. However individual large Box-Ironbark trees exist that are over 400 years old. Large old trees, those greater than 60 cm diameter, pre-date the gold rushes (assuming average annual growth rates of 3.5 mm diameter increment²). These rare trees have escaped subsequent cycles of harvesting or silviculture because they were too big, non-commercial, or located in areas remote from major townships.

There is strong research evidence that large trees, whether they bear hollows or not, are relatively more important for wildlife than smaller trees. Larger trees contribute to a more open forest structure, produce more nectar than small trees, and provide a greater surface area for foraging and nesting (see Chapter 4). Large trees also contribute to the recreation value of sites, for their scenic appeal and symbolism of the original forest structure.

Large old tree sites

Changes to the forest, from being dominated by large trees to comprising mostly young trees, probably contribute to the decline of many animals dependent on large trees for their survival. Those areas still containing a reasonable number of large old trees are now likely to be important areas of wildlife habitat.

Large old tree sites (previously known as mature tree sites) were identified during systematic field studies of Box-Ironbark public land, conducted for NRE Forests Service⁹ and the ECC.¹⁰ Some 108 sites were identified. The studies applied criteria relating to the size and abundance of trees that are larger than average. These sites reflect places with more tree hollows, large crowns and other features valuable for fauna, and include some of the few remaining individual trees larger than 80 cm diameter.

Large yellow box trees

Yellow box constitutes only 3% of total basal area across the Bendigo FMA² and yet 13.2% of the total area of large old tree sites in Bendigo state forests was dominated by yellow box.⁹ In other Box-

Ironbark forests, yellow box has been found to be dominant or co-dominant on 85% of the total area of large old tree sites nominated.¹⁰

The preservation of large yellow box trees is due to their exclusion from harvesting since the 1920s, because of their value for apiculture. Yellow box commonly grows on valley sites with deeper soils and more moisture, in Valley Grassy Forest EVC, where growth rates are faster. However large yellow box trees also occur on some rocky ridges, in Hillcrest Herb-rich Woodland EVC sites.

Gullies

Gullies are important for plants and animals. These areas carry vigorous, more diverse vegetation and are typically low-lying with relatively moist, deep soils associated with broad flat-bottomed drainage lines. Gullies often retained the only high quality forest, after settlers cleared the highest quality land in valleys and the plains for agriculture. Other remaining forest and woodland areas are generally on higher ground with poor, shallow soils.

Recent research^{11,12} has found that moist gully areas within Box-Ironbark forests contain both a greater diversity and relative abundance of birds than adjacent slopes and ridges. Arboreal possums and small mammals such as yellow-footed antechinus have also been found to be more common in gullies than in other areas. Hollow-using birds also appear to preferentially occupy gullies. Nectar-feeding species concentrate in gullies, rather than on ridges. Despite their importance as habitat areas, moist drainage lines are uncommon and occupy a relatively small area within the Box-Ironbark study area.

Three studies^{10,13,14} identified fauna refuges within Box-Ironbark forests, based on moist gullies. Such refuges are a small proportion of drainage line total extent in the forest, however they represent areas with better habitat characteristics. Timber harvesting in such areas would probably modify key habitat elements: by removing larger trees; allowing more sunlight on the ground; disturbing the understorey; and reducing the value for fauna.

Buffer strips along streams

Under current prescriptions, buffer or filter strips are rarely applied to Box-Ironbark forest drainage lines, on the basis that they are generally ephemeral,

only carrying flowing water for short periods after the local catchment is wet. As outlined above, however, moist soil in drainage lines can provide favourable habitat conditions, without necessarily carrying flowing water. The short duration flows are often 'flash' responses to heavy rainfall and any disturbed soil present may be eroded. Many Box-Ironbark soil types are erodible. Varying degrees of gully erosion have already occurred in many drainage lines from past uses. The present prescriptions specify buffer strips of at least 10 m each side of those gullies with sides at least 50 cm high, however other drainage lines may also require such buffer strips.

Forest Structure

Original distribution of large trees

Several papers based on historical accounts suggest that pre-settlement Box-Ironbark forests in many areas carried from 20 to 30 large trees per hectare.^{15,16} This estimate is consistent with the calculation that a fully stocked site (20 square metres per hectare basal area²) could carry approximately 30 large trees per hectare since the average basal area for large trees (over 60 cm) was 0.409 square metres per tree from the BITA study.²

Current structure

The forest structure has been highly altered since pre-European settlement times, with an average now of almost 500 stems per hectare, most being less than 25 cm diameter. Subdivisions within the forest management areas, called working circles (see Figure 15.1 below), have been assessed to illustrate the distribution of tree sizes in current forests. Figure 15.2 shows the present distribution of basal area by tree size class for each working circle in the BITA study area.

Virtually all areas are highly modified. The Castlemaine and St Arnaud working circles are probably the most and least altered areas respectively. In Castlemaine, the total basal area is dominated (79%) by small trees 10 to 25 cm diameter. Trees over 45 cm diameter only account for 8% of basal area. There are on average 776 stems per hectare present (see Table 15.4). In contrast, in St Arnaud, there are about equal proportions by basal area of small, medium (30 to 40 cm diameter), and larger trees. Trees over 45 cm diameter account for 32% of basal area. There are on average 229 stems per hectare, still far higher than the number originally present.

Figure 15.1 - Working circles in Bendigo FMA

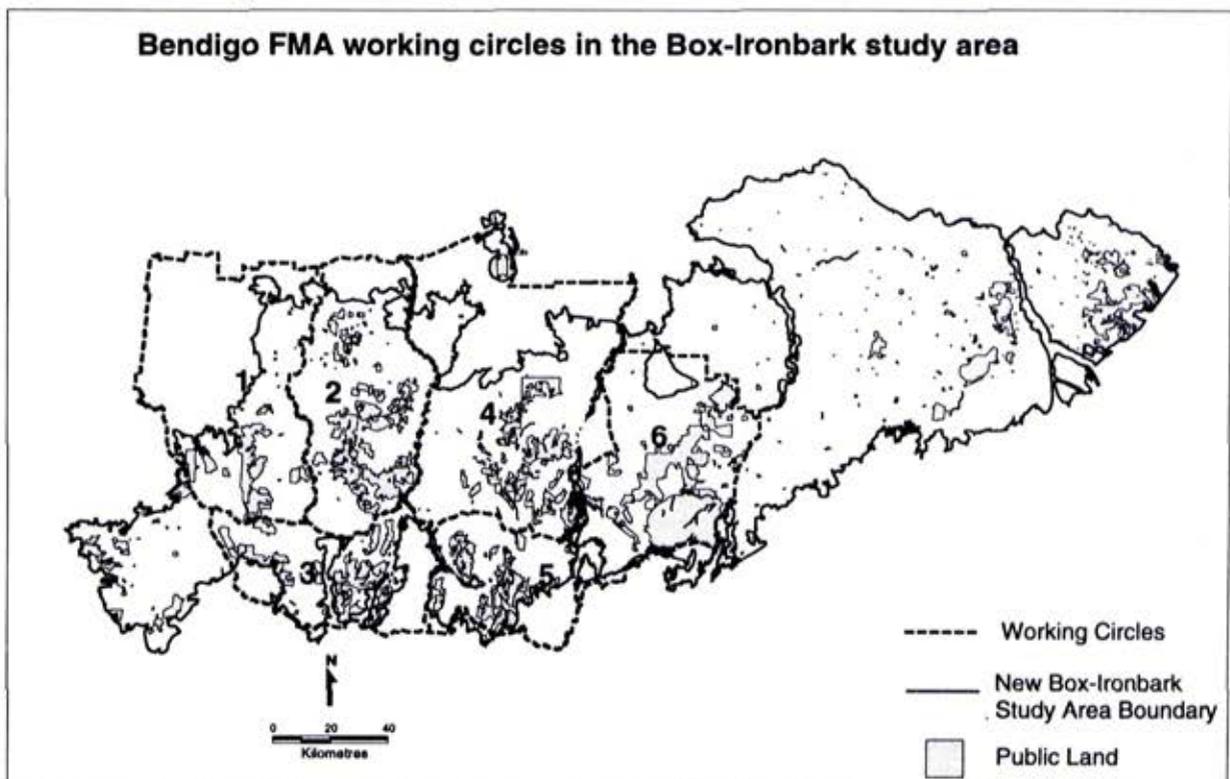


Figure 15.2 – Basal area by tree diameter in each working circle in the BITA study area

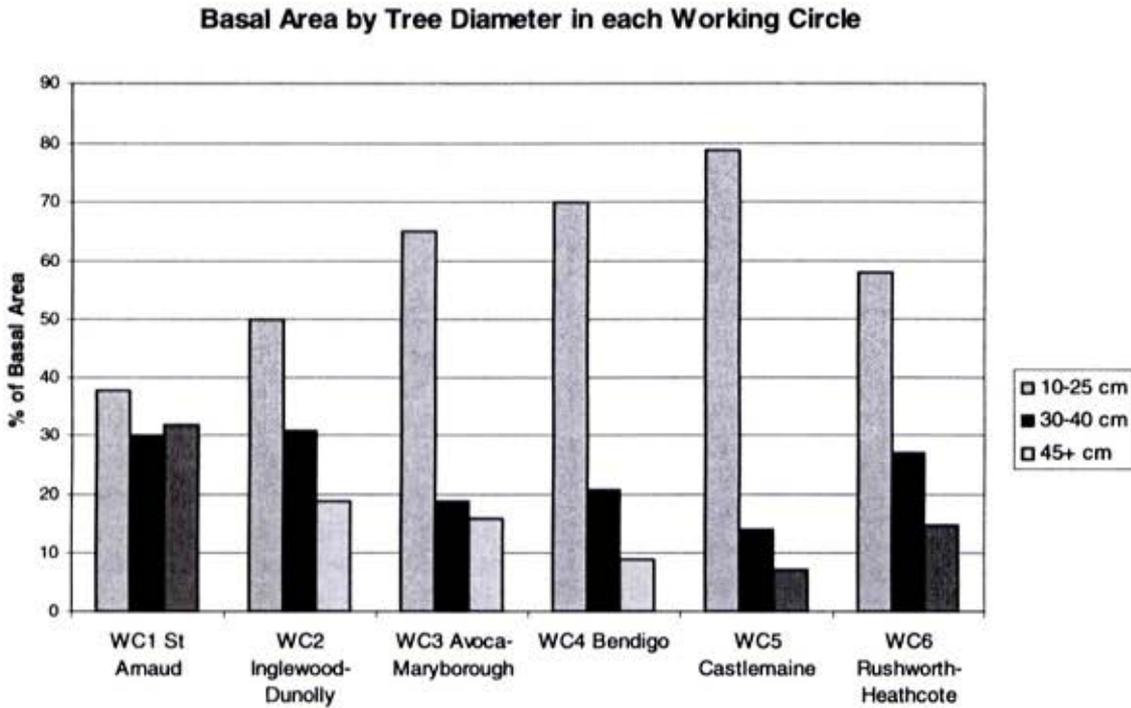


Table 15.4 Average number of stems per hectare and basal area by working circle

Work centres (and relevant working circle number)	Number of stems per hectare	Basal area (square metres per hectare)
1 St Arnaud	229	12.5
2 Inglewood-Dunolly	321 Inglewood 358 Dunolly	9.4 Inglewood 12 Dunolly
3 Avoca-Maryborough	595 Avoca 780 Maryborough	19 Avoca 9 Maryborough
4 Bendigo	574	11.7
5 Castlemaine	776	14.5
6 Rushworth-Heathcote	420 Rushworth 439 Heathcote	12.4 Rushworth 13.2 Heathcote
Average	499	12.5

Source: BITA, Bendigo FMA

Under the ECC's vision for the Box-Ironbark forests, the stand structure will more closely approximate pre-European settlement conditions. More large trees and more medium trees will benefit wildlife, and will allow an increase in the relative proportion of sawlogs in

comparison to other products, leading to increased value-adding for commercial timber harvesting.

Box-Ironbark forests are slow growing, so this vision will take many years to achieve. At current growth rates, a 40 cm tree will take about 60 years²

to grow to 60 cm. It is important to understand that while this is a long period in human terms, it is only a moment in the life of the forest.

Accordingly, an important component of forest management over coming decades is the need to address the recruitment of more large trees across the forest. Such recruitment must exceed the anticipated mortality of large trees so that there is an actual increase in large tree numbers. This will also be a slow process, so there is a need to ensure that it continues to happen despite the lack of immediate results.

An important means of ensuring the development of larger diameter stands in state forests is careful control over harvesting rates. Modelling carried out by NRE for the ECC shows that options are available which will allow an approximate doubling of the number of large diameter trees over the next 60 to 80 years by limiting the rate of sawlog harvesting. Such a strategy, in combination with specific protection of rare habitat elements, would steadily improve forest habitat while allowing continued timber production.

Thinning

The maximum diameter growth on individual Box-Ironbark stems is achieved when stands are maintained at less than fully stocked densities (20 square metres per hectare basal area)². Diameter growth in fully or over-stocked stands is very low and recruitment into large size classes relies on reducing competition through death of individual trees. Natural self-thinning in Box-Ironbark forests is slow because trees are tolerant of extreme conditions so tend to persist through droughts and fires.

Carefully conducted thinning therefore has an important role to play in producing timber for harvest, and achieving the ECC's vision for stands with more large diameter trees. The practice can benefit both timber production and wildlife values. Ecological thinning or other treatment is widely recognised as desirable in many areas within parks and reserves, as silvicultural thinning is in state forests, to ensure that, in future, medium-sized trees can grow without resource competition stunting their growth. Thinning in parks and reserves is to be driven by ecological needs after research into appropriate methods, not commercial timber production needs.

15.3 Other forest values

Heritage protection

Numerous historical sites, and Aboriginal places from before the cultural contact period, are located in state forest areas. Many of the historical sites are mining locations identified in studies of gold mining heritage across Victoria. Others were identified and assessed in recent studies funded by the Commonwealth Government.

These sites contribute to our knowledge of the past, and some are parts of networks of historical sites that can be interpreted and visited as a group. Significant sites are protected by prescriptions in state forest management. Historical sites to be protected for each forest are listed following the recommendations.

Recreation and tourism

State forests will continue to provide opportunities for a range of recreational activities. Chapter 7 outlines the various public land recreational activities, and many of these occur in state forest. Tourists visit state forest to enjoy pleasure driving, picnic sites, scenic and historical features, walking and other activities. Orienteering for example, requires extensive areas of forested land in both parks and state forest. Car rallies are not suited to parks, but are commonly run in state forests particularly in the Rushworth–Heathcote area.

Only a limited area of state forest is actually cut each year in selective harvesting operations. There are many areas of wildlife habitat where there has been very little recent disturbance. These include particular sites where threatened species are known to occur. State forests also contain many occurrences of rare plants, and naturalists and wildflower observers will continue to visit these areas.

15.4 Community views

Conservation of biodiversity in state forests, and removal of activities seen as detrimental to conservation, were priorities in numerous submissions. Some submissions suggested that timber production should be moved from Box-Ironbark forests to plantations on private land or previously cleared public land, and that use of firewood for heating should be reduced. Other submissions advocated improving forest management through mechanisms such as the use of local advisory committees.

Further restrictions on timber harvesting were called for by some, but seen as unnecessary by others who considered current management practices sustainable. Several submissions supported the multiple use of Box-Ironbark forests with timber production and biodiversity conservation given equal weight. A view in numerous submissions was that forest should remain available for firewood collection. There is clear concern about the potential for job losses in the timber industry.

15.5 Management issues

Ecological vegetation classes (EVCs)

A key issue, the representation of EVCs in reserves, is discussed in Chapter 4, Nature Conservation.

Ecological regeneration

Past practices (some dating back to the gold rush era) appear to have contributed to the decline of a significant number of flora and fauna species. Although many of the practices have now changed, this documented decline appears to be continuing. Substantial areas with relatively numerous large trees need to be firmly protected in parks and reserves to provide core areas for conservation. In state forest, additional general measures are necessary to assist in reversing the decline of numerous threatened species, particularly fauna.

Tree hollows

Tree hollows are probably the single greatest factor in conservation of Box-Ironbark fauna. The BITA results show that large trees are few in number but that they contain most hollows, and particularly the larger hollows which are required by many species. Large trees harbour a range of other values, including reliability of flowering and nectar flows, diversity of foraging substrates, presence of decorticated or loose bark, and recreation, scenic and heritage values. It is important that management plans for state forests increase the numbers of large trees by protecting existing large

trees and allowing a percentage of smaller trees to grow on.

Large old tree sites

Many of the large old tree sites identified during systematic field studies have been included in the recommended parks and reserves. However, other sites remain in state forests. These large old tree sites reflect places which would be expected to have more tree hollows, large crowns and other features valuable for fauna and should be excluded from harvesting.

Fauna refuge areas and gullies

The fauna refuge studies identified limited areas with comparatively deeper soils in gullies located at lower elevations. Timber harvesting operations should be excluded from identified fauna refuges. Any drainage lines with a defined channel should have at least a filter strip.

Forest structure

The BITA report shows that the Box-Ironbark forests now have from 230 stems per hectare (at St Arnaud Range) to 780 stems per hectare (around Maryborough and Castlemaine), contrasting with pre-European settlement tree numbers as low as 20 to 30 stems per hectare in many areas. The size class distribution is now clearly dominated by many small trees. An objective of the recommendations in this chapter is to enable the forest to develop a substantially greater relative density of large diameter trees. These issues are addressed in broad guidelines for forest management below.

15.6 Achieving a balance

The depleted and fragmented Box-Ironbark forests and woodlands are distinctly different from most other Victorian forests, and require more comprehensive conservation measures to reduce the risk of further regional fauna extinctions.

Table 15.5 Available state forest area before and after ECC proposals

State forest areas	BITA area (ha)	Other forests (ha)	Total area (ha)
Gross area before ECC proposals	196 194	14 703	210 897
Gross area after ECC proposals	119 093	2 645	121 738
Net area before ECC proposals	115 895	11 065	126 960
Net area after ECC proposals	66 070	2 093	68 163

Notes: 1. The BITA area is Bendigo FMA plus the northern Pyrenees State Forest.

2. Net area is gross area less non-productive or low productive areas or areas otherwise unavailable.

This report proposes a combination of new parks and reserves in key areas, and management of remaining state forest such that:

- biodiversity conservation is an equal primary use with timber production; and
- forest habitat values improve over time.

Several different ways of achieving this goal were considered. The main task was to provide the required level of protection for natural and heritage values, while minimising the effect on present and future industries.

A key issue was the size and location of parks and conservation reserves and the restrictions that would then be required on harvesting operations in state forest areas. To some extent there is a trade-off between a relatively small area in reserves with highly restrictive prescriptions in state forests, versus larger reserves with less restrictive prescriptions in state forests. The draft recommendations in this report were developed after considerable discussion and detailed consideration of a number of models.

This report recommends significant new areas of parks and conservation reserves along with general guidelines for forest management. It is intended that these guidelines will be used by forest managers in developing detailed prescriptions for future operations. The recommendations ensure that sufficient state forest will be available to maintain the existing Box-Ironbark sawlog industry, with at least the current level of harvesting. This will also provide opportunities for harvesting of other important wood products such as firewood.

Estimates of timber harvesting potential for the Box-Ironbark region have been modelled by NRE Forests Service (see Appendix 11). The modelling was independent of the ECC, and was carried out by NRE staff with the most expertise in this approach. The model used BITA data for the forests in the Bendigo FMA, about 196 190 ha in total. This area includes hardwood production sites, uncommitted Crown land, eucalyptus oil production areas, and certain historic areas (which

have limited availability for wood production). The southern Pyrenees State Forest is outside the Box-Ironbark study area and is excluded.

A substantial part of the Bendigo FMA is of low productivity, unproductive, unavailable, or not durable species, leaving the net available area of 115 895 ha, before the proposals in this report (see Table 15.5 above).

Other forests in both the west and east of the Box-Ironbark study area (but outside Bendigo FMA) add a further 14 700 ha, of which 11 065 ha are available for timber harvesting. This brings the total available forest in the Box-Ironbark study area to 126 960 ha. Although Bendigo FMA provides 91.3% of that total it should be noted that the growth of Box-Ironbark forest species has not been modelled in the forests outside this FMA.

NRE Forests Service modelling suggests that, with the parks and reserves proposed in this report and current management prescriptions, the following volumes of wood can be sustainably harvested:

- around 2 030 cubic metres (net of defect and utilisation losses) of sawlogs;
- around 7 975 cubic metres of fencing products; and
- around 42 670 cubic metres of firewood.

While NRE Forests Service's modelling is based on sawlog production, minor products are produced as by-products of sawlog harvesting, from thinnings, and from smaller dimension but still useable wood (for example, round posts rather than 'split posts' sawn from larger logs).

The modelled effects of the ECC's proposed changes have been calculated in Table 15.6 below.

Figures are provided for the overall Bendigo FMA as well as for individual working circles within that area. An additional withdrawal of wood resources will occur following subsequent forest management area planning.

Table 15.6 Summary of timber modelling and analysis by NRE Forests Service

Base model—net available productive forest area and modelled product volumes before proposed ECC changes (all trees greater than 60 cm retained)

Working Circle	Net available area	Sawlogs gross	Sawlogs net	Fencing products	Firewood	Total
	hectares	cubic metres	cubic metres	cubic metres	cubic metres	cubic metres
1	13 466	830	660	1 610	8 570	10 840
2	31 121	1 410	1 130	3 390	18 050	2 2570
3	20 132	824	656	1 889	10 015	12 560
4	18 917	500	400	2 900	16 070	19 370
5	5 935	160	130	570	3 100	3 800
6	26 323	1 150	920	3 410	18 200	2 2530
Total	115 894	4 874	3 896	13 769	74 005	91 670

- Notes: 1. These are the current net available forest areas and modelled wood product volumes for forests in Bendigo FMA plus the northern Pyrenees State Forest, prior to the proposed changes recommended in this report. High and medium productivity forests are included; low productivity, non-durable species, and unproductive forests are excluded. All trees 60 cm diameter and larger are assumed to be retained unharvested. Totals include net sawlogs, fencing products and firewood.
2. There are an additional 11 065 ha (8.7%) of net available area outside Bendigo FMA.

ECC changes—net available productive forest area and modelled product volumes following ECC proposed changes

Working Circle	Net available area	Sawlogs gross	Sawlogs net	Fencing products	Firewood	Total volume
	hectares	cubic metres	cubic metres	cubic metres	cubic metres	cubic metres
1	2 289	146	115	294	1 555	1 964
2	19 478	839	673	2 737	14 635	18 045
3	12 743	528	422	1 255	6 653	8 330
4	11 165	294	232	1 399	7 616	9 247
5	4 811	70	53	289	1 556	1 898
6	15 583	666	536	2 000	10 658	13 194
Total	66 069	2 543	2 031	7 974	42 673	52 678

- Notes: 1. These are the modelled net available forest areas and wood product volumes for forests in Bendigo FMA plus the northern Pyrenees State Forest, following the proposed changes recommended in this report. High and medium productivity forests are included; low productivity, non-durable species, and unproductive forests are excluded. All trees 60 cm diameter and larger are assumed to be retained unharvested. The modelled changes involve the reduced area of available forest. Totals include net sawlogs, fencing products and firewood. Note that an additional withdrawal of wood resources will occur following FMA planning.
2. There are an additional 2 900 ha (4.2%) of net available area outside Bendigo FMA.

Forest management planning after finalisation of the ECC's recommendations will aim to:

- address the development of a forest structure less dominated by small stems;
- achieve a real increase in the numbers of large trees in state forest; and
- establish an FMA zoning scheme that protects: known habitat for threatened species in state forest; occurrences of poorly protected EVCs

(to meet JANIS criteria where possible); and sites with particular values.

Principles and guidelines for state forest management

Under the following principles, no tree over 60 cm dbh will be harvested. This reinforces the effect of current prescriptions.

When ECC recommendations and subsequent forest management planning are taken into account, it is expected that at least 1 400 cubic metres per year of sawlogs will be available for harvest. That is equal to the present average cuts of sawlogs (800 cubic metres per year, plus sleepers (600 cubic metres per year) over the last 12 years. The recommended phase-out of sleeper cutting would, in effect, permit a 75% increase in sawn timber volume.

The net effect of the ECC and FMA changes to state forest areas will be a continuation of the same level of sawlog harvesting (for sawn timber and

sleepers) currently conducted. Further benefit would be derived from directing the timber towards value-added products.

Similarly, the levels of minor timber products available after implementation of these recommendations and forest management planning are likely to be comparable with present levels.

The estimated volume of fencing products available per year after establishment of the ECC's recommended parks and reserves is 143% of the current harvest. For firewood, the estimate is 122% of the current level. Some additional firewood resource is likely to become available from ecological thinning of parks and reserves (see Chapter 4). While these volumes are available within the Bendigo FMA, some cutters will need to travel further to available resources. This will have some economic impact.

PRINCIPLES AND GUIDELINES

The following principles and guidelines provide a broad framework for some aspects of state forest management.

Protection for existing large old trees

- All identified large old tree sites should be protected where possible.
- All individual trees larger than 60 cm dbh should be protected.
- A method for permanent marking of retained large trees and other habitat trees should be developed.
- Sufficient trees should be retained in the lower size classes to provide future large trees.

Protection for existing hollow trees

- Where practicable and consistent with public and forest operator safety and the attainment of other forest biodiversity objectives, all trees larger than 20 cm dbh with visible hollows should be retained.

Protection for gullies

- Forest managers should consider retaining all identified 'high' and 'medium' quality fauna refuges, including previously identified drought refuges.
- Forest managers should consider retaining buffer/filter strips along defined drainage lines, as appropriate.

Forest structure restoration

- Harvesting and silvicultural regimes should be applied that will result in a real increase in the numbers of large trees across the forest.
- Measures should be applied to shift the forest structure in other working circles over time to be at least comparable with Working Circle 1.

F State Forests

GENERAL RECOMMENDATIONS FOR STATE FORESTS

F That the area of 121 738 ha shown as state forest on Map A be used in accordance with the principles and guidelines outlined above, to:

- (a) produce hardwood timber and conserve native plants and animals, as equal primary uses, subject to the following:
 - (i) logs should be directed as far as possible to the highest value-added products,
 - (ii) minor products should as far as possible be produced from waste from operations for major products and from thinning operations that remove small diameter stems, and
 - (iii) harvesting of timber should proceed in accordance with *the Code of Forest Practices for Timber Production* and relevant prescriptions;

(b) supply water and protect catchments and streams;

(c) provide opportunities for open-space recreation and education;

(d) produce honey, gravel, sand, road-making materials and other forest products;

and that:

(e) current forest management prescriptions applying to Box-Ironbark forests in the Bendigo FMA and adjacent FMAs be revised;

(f) measures to:

(i) implement the principles and guidelines outlined above, and

(ii) make secure provision for the conservation of rare or threatened species, depleted EVCs and other characteristics of the forests that should be retained for biodiversity conservation purposes, and

(ii) be incorporated into the revised prescriptions;

(g) specific provision for improvement in stand structure be implemented via utilisation standards which integrate with habitat management prescriptions, and take into account the impact of prescriptions for wildlife conservation;

(h) Box-Ironbark forests be harvested using systems which seek to optimise growth rates on individual stems for both habitat management and wood production objectives, and which maintain stands in an uneven-aged condition;

(i) research into hollow formation in Box-Ironbark forests be conducted and, if feasible, programs which will increase the density of hollow-bearing trees be implemented;

(j) new information on wildlife ecology or forest structure be taken into account in future forest management strategies;

and that:

(k) state forests be managed by the Department of Natural Resources and Environment.

F1 Existing state forests

RECOMMENDATION

- F1** That the state forests shown on Map A (numbered F1) and listed in Appendix 10, be used:
- in accordance with the general recommendations above; and
 - the special features in state forest areas listed below be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

SPECIAL FEATURES TO BE PROTECTED^{17, 18}

Illawarra State Forest

Biodiversity conservation

- Plains Grassy Woodland EVC
- Heathy Woodland EVC
- Sedge-rich Woodland EVC
- corkscrew spear-grass
- bush stone-curlew

Glenmona State Forest

Biodiversity conservation

- large old tree site
- buloke
- swift parrot

Bealiba State Forest

Biodiversity conservation

- swift parrot
- bush stone-curlew
- powerful owl
- barking owl
- three large old tree sites and partial site

Historical

- Timber camp site

Havelock State Forest

Biodiversity conservation

- Grassy Woodland EVC
- buloke
- leafy templetonia

Historical

- Bluchers Reef whims/heaps
- Eaglehawk Gully Mine puddlers
- Eaglehawk Gully Reef Mine
- White Horse Gully Mine

Paddys Ranges State Forest

Biodiversity conservation

- Alluvial Terraces Herb-rich Woodland EVC
- Grassy Woodland EVC
- buloke
- trailing hop-bush
- clover glycine
- swift parrot
- brush-tailed phascogale
- three large old tree sites

Historical

- Blacksmiths Gully Mine
- Daisy Creek puddlers
- Workhouse Gully Cemetery puddlers
- stone outlines

Dunach State Forest

Biodiversity conservation

- sharp midge-orchid
- brush-tailed phascogale

Eglington State Forest

Biodiversity conservation

- Grassy Woodland EVC
- buloke
- two large old tree sites

Sandon State Forest

Biodiversity conservation

- Low Rises Grassy Woodland/ Alluvial Terraces Herb-rich Woodland Mosaic EVC
- sharp midge-orchid
- leafy templetonia
- brush-tailed phascogale
- powerful owl

Historical

- Harry Lauder Mine
- Stockyard Creek workings

Muckleford State Forest

Biodiversity conservation

- buloke
- swift parrot
- turquoise parrot
- square-tailed kite
- brush-tailed phascogale

Historical

- Bacon Gully Mine sinkings
- Blow Reef/Dividend Co. Mine
- Boswarva Hill
- Golden Age Co. Mine
- Ironbark Gully sinkings/puddler
- Young Australian Co. Mine

Lockwood State Forest

Biodiversity conservation

- buloke
- brush-tailed phascogale

Whipstick–Kamarooka State Forest

Biodiversity conservation

- Ausfeld's wattle
- dainty phebalium
- shrubby dampiera

Wellsford State Forest

Biodiversity conservation

- Williamson's wattle
- Ausfeld's wattle
- buloke
- sand rush
- cane spear-grass
- swift parrot
- brush-tailed phascogale
- one large old tree site

Axedale State Forest

Biodiversity conservation

- Ausfeld's wattle

Pilchers Bridge–Lyell State Forest

Biodiversity conservation

- Ausfeld's wattle
- swift parrot
- brush-tailed phascogale
- large tree research site (Lyell Forest)

Eppalock State Forest

Biodiversity conservation

- swift parrot
- regent honeyeater
- grey-crowned babbler
- brush-tailed phascogale
- one large old tree site

Knowsley State Forest

Biodiversity conservation

- Ausfeld's wattle
- one large old tree site

Upper Loddon State Forest

Biodiversity conservation

- Valley Grassy Forest EVC
- Fryerstown grevillea
- dwarf geebung.
- brush-tailed phascogale
- powerful owl
- bush stone-curlew
- four large old tree sites

Fryers Ridge State Forest

Biodiversity conservation

- Valley Grassy Forest EVC
- threatened plant—Fryerstown grevillea
- grey goshawk
- three large old tree sites

Historical

- fire tower

Barambogie State Forest

Biodiversity conservation

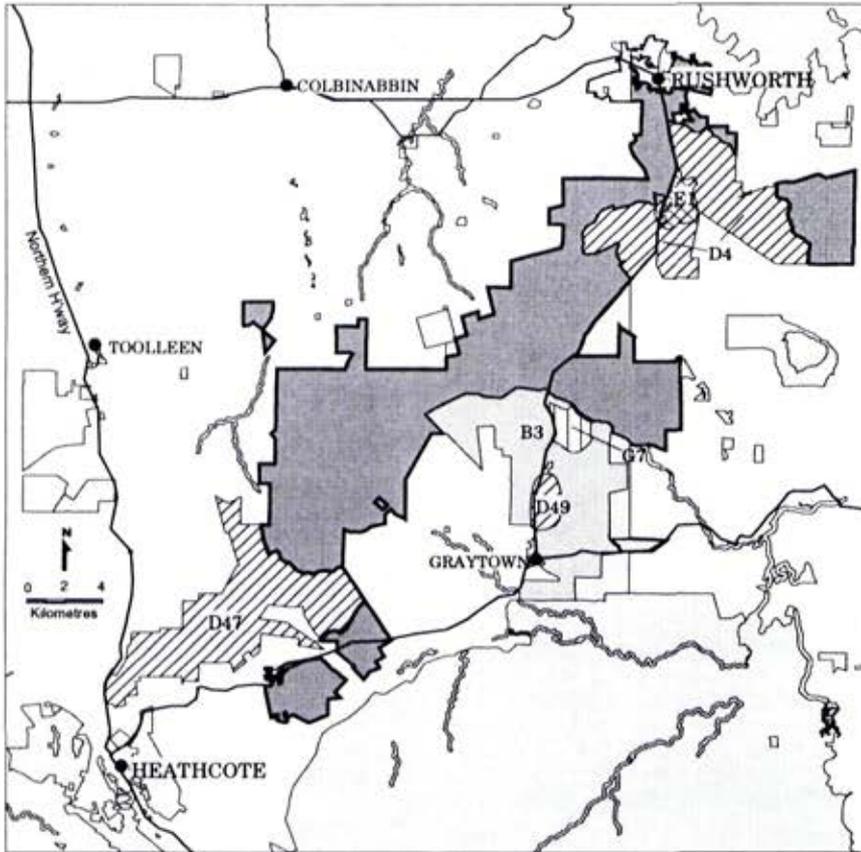
- turquoise parrot

Note: The list of features requiring protection is based on currently available information. Features may be added or removed over time; for example as better information becomes available or, as the status of particular species changes. These lists do indicate the complexities of managing forests to balance production needs while protecting significant features.

Information Sources

- ¹ NRE (1999).
- ² NRE (1998a).
- ³ Commonwealth of Australia (1992).
- ⁴ Government of Victoria (1997a).
- ⁵ JANIS (1997).
- ⁶ NRE(1996).
- ⁷ NRE (1997).
- ⁸ Soderquist (1999b).
- ⁹ Soderquist and Rowley (1995).
- ¹⁰ Holland and Cheers (1999).
- ¹¹ Stothers 1999).
- ¹² Soderquist and McNally (submitted)
- ¹³ Robinson and Rowley (1994).
- ¹⁴ Robinson and Rowley (1996).
- ¹⁵ Benson and Redpath (1997).
- ¹⁶ Newman (1961).
- ¹⁷ Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.
- ¹⁸ Bannear (various).

F2 Rushworth–Heathcote State Forests



The Rushworth–Heathcote State Forests covers a major part of the largest Box-Ironbark forest in Victoria. Its timber output will underpin the production of increasingly specialised and value-added timber products which reflect the uniquely valuable characteristics of Box-Ironbark timbers.

Benefits of the forest

Timber harvesting

The Rushworth–Heathcote State Forests will supply wood for workers in the region to transform into high-value products, maximising the economic value of the unique features of Box-Ironbark timbers.

Biodiversity conservation

Management of these areas as state forest with biodiversity conservation as an equal primary use will lead to improved habitat quality for Box-Ironbark flora and fauna. Future zoning as part of the forest management planning process will identify Special Protection Zones and Special Management Zones to protect rare or threatened species and communities.

Location

Most of the state forest is in a single large block stretching from Rushworth to Heathcote. It has a total area of 21 508 ha, including small isolated patches near Costerfield, Mt Black, Cornella, and around Rushworth. The forest is contiguous with an additional 9 807 ha recommended as parks and reserves: Mt Black State Park and Reference Area (see B3 and G7); Whroo Historic and Cultural Features Reserve (E1); and Mt Ida, Spring Creek and Whroo Nature Conservation Reserves (D46, D48 and D4).

Community views

Many submissions opposed these forests as a whole being designated as national park. There was support for maintaining the local timber industry, and some opposition to particular areas being reserved. Some submissions suggested only limited

areas should be reserved. It was seen that establishing a national park would prevent the timber industry from harvesting wood and carrying out fire prevention works. Current management practices were argued to be sustainable, and alternative energy sources to firewood were thought too expensive for some locals. There was a suggestion that the 28% of the forests currently set aside under prescription be made available for selective logging. Local community members wanted to retain access to the forests for a range of recreation activities.

In contrast, there was also support for the establishment of the Rushworth–Heathcote State Forests as a national park. Particular areas, including Graytown/Mt Black and Mt Ida/Costerfield within the Rushworth–Heathcote State Forests, were also advocated as national parks. These forests were seen to have a high conservation value.

There was a view that traditional approaches to forest management were insufficient to control future impacts from residents adjacent to these forests. It was proposed that management should focus on the relationship between forest managers and the local community. Production of high value, kiln-dried timber for furniture and floorboards rather than low value products, such as tomato stakes and sleepers, was seen as a way to reduce the volume of timber required from the Rushworth–Heathcote State Forests and still maintain a viable industry.

Environmental values

Biodiversity

The area includes important sites for:

- brush-tailed phascogale;
- squirrel glider;
- powerful owl;
- painted honeyeater; and
- Williamson's wattle.

There is representation of three threatened EVCs:

- Creepline Grassy Woodland;
- Alluvial Terraces Herb-rich Woodland; and
- Grassy Woodland.

Seven large old tree sites (total 297 ha) and numerous important gully sites are present.

Cultural heritage

There are numerous sites of historical interest including two of state significance, Poverty Diggings and White Hills puddlers. Many other historic mining sites are of regional significance and the area also includes a cemetery, wartime internment camp and other historic and scenic features (as listed in the recommendations below).

Current uses and implications

Timber harvesting

The net available forest area covered by the proposed Rushworth–Heathcote State Forests is 15 072 ha. This is 11.9% of the total forest in the study area currently available for timber harvesting. It is one of the principal sources of timber for the largest operating Box-Ironbark sawmill (located in Rushworth). Timber production will continue in the Rushworth–Heathcote State Forests.

Permits are issued for the collection of fallen timber for domestic firewood. On average approximately 4 000 cubic metres of firewood per annum are collected through Heathcote and Rushworth work centres. Subject to the land manager's discretion, there will be no change to existing access to state forest for domestic firewood collection.

Apiculture

There are 31 temporary and 16 permanent bee sites distributed through the area of the Rushworth–Heathcote State Forests. Existing provisions for access to bee sites will not change.

Recreation and tourism

This area is used regularly for:

- picnicking and barbecues;
- car touring;
- car rallies;
- orienteering;
- bush walking;
- nature study;
- fossicking;

- trail bike riding;
- firewood collection;
- hunting;
- horse-riding; and
- camping.

Subject to the land manager's discretion, there will be no change to existing use for recreation and tourism.

Mining

About half of the area of the Rushworth–Heathcote State Forests is covered by current exploration licences. The Perseverance Corporation Mine at Bailieston is just outside the Rushworth–Heathcote State Forests. State forest is 'unrestricted Crown land'. NRE Forests Service as land manager can comment on, but not refuse, exploration and mining proposals. There will be no change to existing access.

Defence training

The Department of Defence uses parts of the Rushworth–Heathcote State Forests for generally low-key training exercises, such as camping and cross-terrain navigation on foot, approximately thirty times a year on average. This training will be allowed to continue, subject to the land manager's discretion.

RECOMMENDATIONS

F2 That the Rushworth–Heathcote State Forests of 21 508 ha be used:

- (a) in accordance with the general recommendations for state forests on page 170;
- (b) for continued low-key Department of Defence training, subject to the land manager's discretion; and that
- (c) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

SPECIAL FEATURES TO BE PROTECTED

Biodiversity conservation

- brush-tailed phascogale
- squirrel glider
- powerful owl
- painted honeyeater
- Williamson's wattle
- Creepline Grassy Woodland, Alluvial Terraces Herb-rich Woodland, and Grassy Woodland EVCs
- large old tree sites

Historical (state significance)

- Poverty Diggings
- White Hills puddlers (Whroo)

Historical (regional significance)

- Curly Dog Dam puddler
- Welcome Reef Mine and puddlers
- Why Not Gully and New Why Not Company Mine (Redcastle)
- Fontainebleau dam and puddler (Whroo)
- Specimen Hill open-cut
- Nuggetty Company
- Perseverance Company and Shellback Company Mines
- Old Ned's Gully sinkings
- Robertson's Brothers and Rushworth Gold Mines battery foundations
- Chinaman's Hill surface workings
- Antonio Gully brickworks and puddler (Rushworth)

Historic sites of thematic interest

- Redcastle internment camp site, hut and ford (Moornbool West)
- Steam Traction Engine Whistle Stop
- Growlers Hill Lookout reserve and tower
- Specimen Hill cemetery (Rushworth).

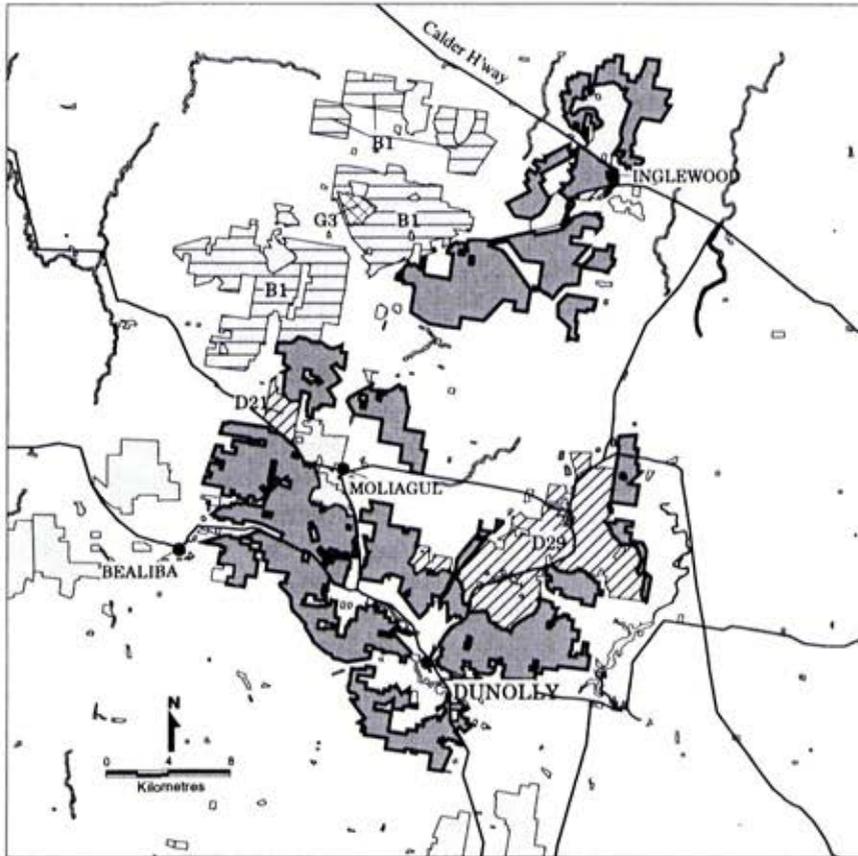
Information Sources

Bannear (1993e).

Butler (1997).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

F3 Dunolly–Inglewood State Forests



The Dunolly–Inglewood State Forests comprise a number of relatively large blocks with outlying fragments which together constitute a major Box-Ironbark forest in the heart of the gold rush country. While some larger trees remain which are able to produce sawlogs, much of the timber output will be minor products utilising the durability of Box-Ironbark timbers.

Benefits of the forest

Timber harvesting

The Dunolly–Inglewood State Forests will supply some sawlogs for value-added uses, and a range of minor sawn products—fence posts, stakes, pegs, droppers, along with firewood as a by-product of log, post and thinning operations.

Biodiversity conservation

Management of this area as state forest with biodiversity conservation as an equal primary use will lead to improved habitat quality for Box-Ironbark flora and fauna. Forest management planning will identify special protection zones and special management zones to protect rare and threatened species and communities.

Location

Dunolly–Inglewood State Forests lie in a crescent shape, from Tarnagulla to Dunolly, Moliagul, Kingower and Inglewood. Much is on metamorphic aureole hills around the Kangdaraar and Murphys Creeks granites. The total area is 28 527 ha including Longbush Potato Patch, adjoining small parcels, and forest adjoining parks and reserves. Many areas are contiguous with a number of significant proposed parks and reserves—Kooyoora State Park and reference area (see B1 and G3), and Moliagul and Waanyarra Nature Conservation Reserves (D21 and D29).

Community views

Some submissions called for maintenance of access for professional wood-cutters and private firewood collection to Dunolly forests.

Other submissions argued that traditional approaches to forest management were insufficient for controlling the impacts of residents adjacent to these forests. It was proposed that management should focus on the relationship between forest managers and the local community.

Proposals were submitted for national and state parks extending throughout the Dunolly–Inglewood State Forests. In the south, these included incorporating Mt Hooghly and Dunolly State Forests into a Dunolly–Tarnagulla National Park. In the north, Bealiba, Kingower, Brenanah and Inglewood State Forests, in addition to existing reserves such as Kooyooora State Park, were proposed in various combinations as national or state parks.

Environmental values

Biodiversity

A number of threatened species have been recorded in this area, including:

- silky glycine;
- streaked wattle;
- cane spear-grass;
- brush-tailed phascogale;
- bush stone curlew;
- powerful owl;
- barking owl;
- woodland blind snake; and
- swift parrot (important site).

A number of EVCs are represented including:

- Heathy Woodland EVC; and
- Grassy Woodland EVC.

Ten large old tree sites and 20 important gully sites are present.

Cultural heritage

Several significant mining heritage sites occur in the Dunolly–Inglewood State Forests (see list of special features in the recommendations below) as well as the old Felton Grimwade & Bickford eucalyptus distilling sites.

Current uses and implications

Timber harvesting

The net available productive area of 12 290 ha is 9.7% of the total forest in the study area currently available for timber harvesting. It provides a post and firewood resource. A major post-cutter has diversified into small dimension sawn products such as stakes and droppers. Timber production will continue in the Dunolly–Inglewood State Forests.

Permits are issued for the collection of fallen timber for domestic firewood. At Kingower, wood is also felled by NRE for domestic collection. On average approximately 2 080 cubic metres of firewood per annum is collected through Inglewood and Dunolly work centres. Subject to the land manager's discretion, there will be no change to existing access to state forest for domestic firewood collection.

Apiculture

There are 30 temporary and 32 permanent bee sites distributed through the area of the Dunolly–Inglewood State Forests. Existing provisions for access to bee sites will not change.

Recreation and tourism

These forests are very important locations for a number of recreational activities including:

- prospecting (especially around Kingower, Moliagul, Goldsborough and Dunolly);
- bushwalking (Kingower and Inglewood);
- nature observation;
- picnicking (Inglewood and Dunolly);
- low-intensity firewood-collection;
- camping;
- bike riding;
- horse riding; and
- trail bike riding.

Subject to the land manager's discretion, there will be no change to existing access for recreation and tourism.

Mining

A major tourist fossicking authority (see glossary) includes most of this forest. This permits tour

promoters to take groups around former goldfields within the authority area, and search for minerals with metal detectors or by panning. Hand tools only are used for any digging; no tree or shrub, or Aboriginal archaeological object is to be disturbed or removed.

There are numerous small mining licence areas. About half of the area is covered by current exploration licences. State forest is 'unrestricted Crown land'. NRE Forests Service as the land manager can comment on but not refuse exploration and mining proposals. There will be no change to existing access.

Management issues

Prospecting

Prospecting may cause damage in intensively used areas and may require appropriate management to limit damage, particularly to vulnerable natural or historic features.

Rehabilitation

Some past mining sites may require rehabilitation to restore vegetation.

RECOMMENDATIONS

F3 That Dunolly–Inglewood State Forests of 28 527 ha:

- (a) be used in accordance with the general recommendations for state forests on page 170; and that
- (b) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

SPECIAL FEATURES TO BE PROTECTED

Inglewood State Forest

Biodiversity conservation

- Grassy Woodland and Gravelly-Sediment Broombush Mallee/ Heathy Woodland Mosaic EVC

- dainty phebalium
- cane spear-grass
- shrubby dampiera
- Williamson's wattle
- western golden-tip
- woodland blind snake
- swift parrot

Historical

- Eaglehawk Gully Mine puddlers
- old Felton Grimwade & Bickford eucalyptus distilling sites

Kingower State Forest

Biodiversity conservation

- streaked wattle
- inland pomaderris
- swift parrot
- powerful owl
- two large old tree sites

Dunolly State Forest

Biodiversity conservation

- Heathy Woodland EVC
- Grassy Woodland EVC
- sweet quandong
- shrubby dampiera
- bandy bandy
- swift parrot
- barking owl
- powerful owl

Historical

- Old Lead Reservoir
- Swipers Gully Diggings puddler
- Wild Duck Lead Diggings puddler
- Great Sandstone Co. Mine
- Halfway Diggings
- Linger & Die Lead
- Star Reef Co. Mine

Mt. Hooghly State Forest

Biodiversity conservation

- Grassy Woodland EVC
- buloke
- silky glycine
- swift parrot

Historical

- Bet Bet Reef Workings
- Bromley Cemetery
- Burnt Creek
- Clovers Gully Diggings puddlers
- Queens Birthday Reef distillery
- Kings Birthday Co. Mine
- Perseverance Co. Mine
- South Birthday Co. Mine

Potato Patch State Forest

Biodiversity conservation

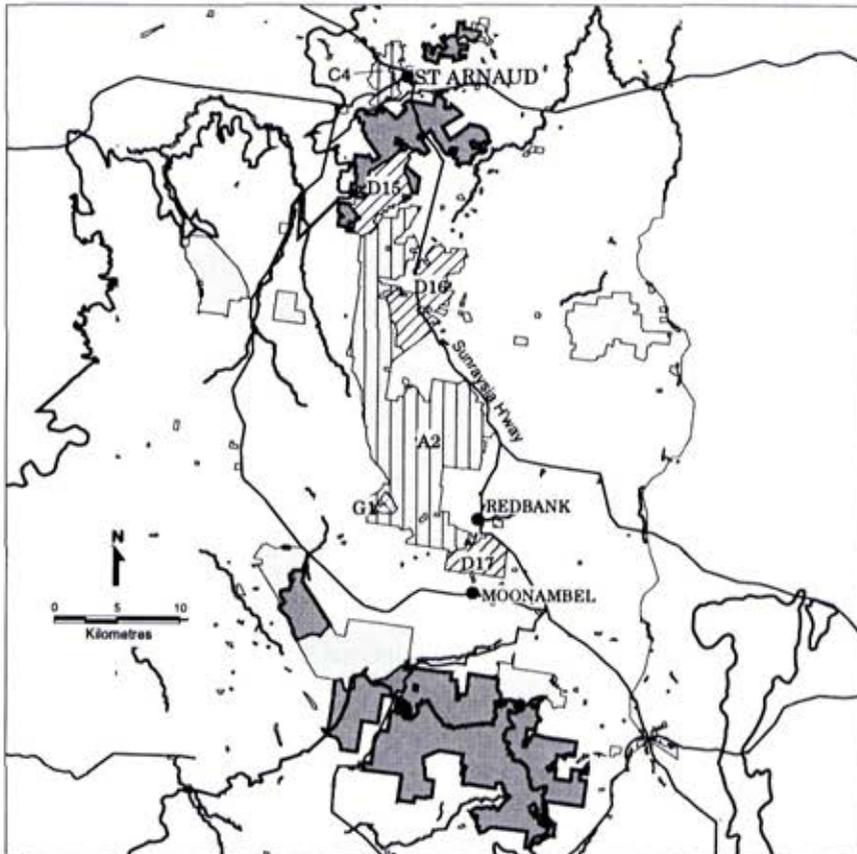
- bush stone-curlew
- Grassy Woodland EVC
- three large old tree sites

Information Sources

Bannear (1993c).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

F4 St Arnaud and Pyrenees State Forests



The St Arnaud and Pyrenees State Forests are the most steeply dissected Box-Ironbark forests. The St Arnaud Range forests are notable for their relatively balanced age structure. The comparative remoteness of these forests from large towns means they are less visited than other forests, and generally less disturbed except around localised mining locations. Pyrenees forests are at the limit of Box-Ironbark vegetation types; the southern fall of the Pyrenees Ranges, dominated by Herb-rich Foothill Forest EVC, has been excluded from the study area.

Benefits of the forest

Timber harvesting

The St Arnaud and Pyrenees State Forests will supply a range of Box-Ironbark timber products, from sawlogs to firewood.

Biodiversity conservation

Management of this area as state forest with biodiversity conservation as an equal primary use will lead to improved habitat quality for Box-Ironbark flora and fauna. Contiguity of these forests with national parks and nature conservation reserves will maximise dispersal and ranging opportunities for a variety of species across the forests.

Future zoning as part of the forest management planning process will identify special protection

zones and special management zones to protect rare or threatened species and communities.

Location

St Arnaud State Forest is in two parts; at the north end of the St Arnaud Range near St Arnaud township, and an area with mallee EVCs north-east of the town. Pyrenees State Forest is between Avoca and Landsborough. St Arnaud Range north forests contain 4 310 ha, and Pyrenees forest 7 284 ha; 11 594 ha combined. These forests are contiguous with the proposed St Arnaud Range National Park and reference area (see A2 and G1), St Arnaud Regional Park (C4), and Stoney Creek, Stuart Mill and Redbank Nature Conservation Reserves (D15 – D17).

Community views

There was some support for maintaining local timber production. Some submissions expressed either opposition to, or support for, incorporation of the St Arnaud Range State Forest into a national or state park. Inclusion of the existing Pyrenees State Forest with adjoining reserves to create a large Pyrenees nature conservation reserve was proposed.

Environmental values

Biodiversity

Threatened species recorded at St Arnaud include:

- cane spear-grass;
- broad-lip leek orchid;
- swift parrot;
- square-tailed kite; and
- painted honeyeater.

Several occurrences of threatened EVCs are found in the area:

- Grassy Woodland EVC;
- Grassy Woodland/Alluvial Terraces Mosaic EVC (St Arnaud); and
- Valley Grassy Forest EVC (Pyrenees).

There is one large old tree site along Landsborough Ridge (Pyrenees), as well as two important gully sites.

Cultural heritage

Historic eucalyptus distilleries, wood-cutter's carvings, and numerous mining history sites are located in north St Arnaud Range State Forest.

Current uses and implications

Timber harvesting

The net available productive area in the St Arnaud and Pyrenees State Forests together (6 110 ha), is 4.8% of the total forest in the study area currently available for timber harvesting. Timber production and eucalyptus oil production will continue in these forests, (subject to the provisions in this chapter and Chapter 10).

Permits are issued for the collection of fallen timber for domestic firewood, with north St Arnaud Range the most important area. On average approximately 2 040 cubic metres of firewood per annum is collected through St Arnaud and Avoca work centres. Subject to the land manager's discretion, there will be no change to existing access to state forest for domestic firewood collection.

Apiculture

There are 13 temporary and 13 permanent bee sites distributed through the St Arnaud and Pyrenees State Forests (within the study area). Existing provisions for access to bee sites will not change.

Recreation and tourism

St Arnaud Range north is used for:

- bushwalking;
- nature observation;
- fossicking;
- camping;
- hunting; and
- picnicking.

Pyrenees Range is used for:

- pleasure driving;
- trail bike riding;
- nature observation;
- fossicking;
- camping;
- picnicking; and
- horse riding.

Pyrenees Range has moderately rugged bushwalking opportunities, and important opportunities for relatively remote recreation. There is some fossicking around old goldfields in both forests. Subject to the land manager's discretion, there will be no change to existing access for recreation and tourism.

Mining

Current exploration licences cover most of these forest areas. Several small mining licences are current at north St Arnaud Range, and one at Pyrenees State Forest is 'unrestricted Crown Land'. NRE Forests Service as the land manager can comment on, but not refuse, exploration and mining proposals. There will be no change to existing access.

Defence training

The Department of Defence uses parts of the St Arnaud State Forest for generally low-key training exercises, such as camping and cross-terrain navigation on foot. This training will be allowed to continue, subject to the land manager's discretion.

RECOMMENDATIONS

- F4** That the St Arnaud–Pyrenees State Forests of 11 594 ha:
- (a) be used in accordance with the general recommendations for state forests on page 170;
 - (b) continue to allow low-key Department of Defence training, subject to the land manager's discretion; and that
 - (c) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

SPECIAL FEATURES TO BE PROTECTED

Pyrenees State Forest

Biodiversity conservation

- Grassy Dry Forest/Heathy Dry Forest Complex EVC
- powerful owl
- part of one large old tree site

North St. Arnaud Range State Forest

Biodiversity conservation

- cane spear-grass
- inland pomaderris
- powerful owl
- square-tailed kite
- painted honeyeater
- swift parrot

Historical

- Wood-cutters carvings
- Prince of Wales eucalyptus distillery
- Vernon's old eucalyptus distillery.

Information Sources

Bannear (1995).

Bannear (1994a,b).

Butler (1997).

Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.

16 Other public land use categories

G Reference areas

Reference areas are parcels of land set aside as representations of different ecosystems within an area. These areas are designed to maintain natural ecosystems into the future, and for use as a reference for comparison with similar land under other uses. Reference areas have been identified in earlier Land Conservation Council investigations and most have been securely reserved. Eleven areas totalling 3 287 ha have been set aside in the Box-Ironbark study area. They were selected on the basis of their constituent land systems, forming parts of a representative network across Victoria.

The existing reference areas in the study area are listed from west to east in Table 16.1. These relatively small areas are protected from the influence of adjoining land uses by protective buffers.

Reference areas are proclaimed under the *Reference Areas Act 1978*, and management arrangements are decided by the Minister for Environment and Conservation on advice from the Reference Areas Advisory Committee, established under that Act. Unlike most other public land use categories, reference areas are not available for recreation or resource extraction. Use of reference areas for scientific research requires the approval of the Reference Areas Advisory Committee.

The land systems used to classify the current reference areas were based on fundamental features of the landscape: rock type, topography, climate, soils and vegetation. They have repeating patterns of components, and for land systems included in reference areas, the aim is for all components to be adequately represented.

Table 16.1. Reference areas and EVC representation

Reference area	Area (ha) ¹	EVCs represented
G1 Mt Separation	188	135 ha Heathy Dry Forest, 44 ha Box-Ironbark Forest, 9 ha Grassy Dry Forest
G2 Korong Vale	460	377 ha Broombush Mallee, 78 ha Box-Ironbark Forest, 5 ha Metamorphic Slopes Shrubby Woodland
G3 Kooyoora	325	325 ha Granitic Hills Herb-rich Woodland
G4 Terrick Terrick	100	100 ha Grassy Woodland
G5 Sandhurst	690	252 ha Heathy Dry Forest, 29 ha Box-Ironbark Forest, 14 ha Valley Grassy Forest, 290 ha Grassy Dry Forest, 104 ha Hillcrest Herb-rich Woodland, 1 ha Alluvial Terraces Herb-rich Woodland
G6 Kamarooka	225	207 ha Grassy Woodland, 18 ha Broombush Mallee
G7 Mt Black	380	284 ha Box-Ironbark Forest, 96 ha Heathy Dry Forest
G8 Warby Ranges	170	19 ha Valley Grassy Forest, 36 ha Heathy Dry Forest, 112 ha Granitic Hills Woodland, 3 ha Grassy Woodland
G9 Killawarra	141	134 ha Box-Ironbark Forest, 6 ha Alluvial Terraces Herb-rich Woodland/Creepline Grassy Woodland Mosaic, 0.3 ha Alluvial Terraces Herb-rich Woodland, 0.3 ha Creepline Grassy Woodland
G10 White Box	90	15 ha Heathy Dry Forest, 45 ha Grassy Dry Forest, 16 ha Box-Ironbark Forest, 14 ha Valley Grassy Forest
G11 Pilot Range	518	22 ha Rocky Outcrop Shrubland/Herbland Mosaic, 7 ha Heathy Dry Forest, 9 ha Granitic Hills Woodland, 480 ha Grassy Dry Forest

¹ The areas in this table are GIS-based, and differ from the proclaimed areas for some reference areas.

Not all land systems can be represented in reference areas. For many land systems, no suitable public land exists that can be practically managed for scientific reference, and the extent of others is too small to justify a reference area. Many land systems, particularly those on plains and alluvial valley floors sought for agriculture, have no suitable land for reference areas available as these areas have been almost entirely modified from natural condition.

Along with floristic vegetation data, land systems were used as a basis for the development of EVCs, and especially for the pre-1750 EVC mapping (see Appendix 2). To some extent the EVC concept supersedes land systems. The predominant EVC representation in the existing reference areas is listed in Table 16.1 above.

Several major EVCs are not represented in reference areas. Plains Grassy Woodland occurs very largely on cleared private land or around the margins of public land adjoining private land. Pre-1750 occurrences of Plains Grassy Woodland in Puckapunyal Military Area are mainly on cleared former farmland. Plains Grassy Woodland/Gilgai

Wetland Mosaic occurs in Reef Hills State Park, Reedy Lake Natural Features Reserve, and on former farmland at Puckapunyal.

Creekline Grassy Woodland occurs in many small, narrow strips along streams, often at the head of cleared privately-owned valleys. The poor representation of this EVC reflects the proximity of these occurrences to private land.

A number of poorly represented EVCs occurs in or around areas of current or recommended parks and reserves. A mosaic of Low Rises Grassy Woodland with Alluvial Terraces Herb-rich Woodland occurs around the margins of Bolangum, Big Tottington, Little Tottington and Dalyenong blocks. Heathy Woodland occurs in the Lonsdale, Illawarra, Dalyenong and Waanyarra Nature Conservation Reserves, and Dunolly State Forest. Moderate areas of Alluvial Terraces Herb-rich Woodland occur in the recommended Dunneworthy addition to Ararat Regional Park. Metamorphic Slopes Shrubby Woodland occurs in Kooyoorra State Park, the Waanyarra Nature Conservation Reserve and Dunolly State Forest.

GENERAL RECOMMENDATIONS FOR REFERENCE AREAS

- G** That the reference areas listed in Table 16.1 above and shown on Map A (numbered G1 to G11) continue to be used for scientific reference, in accordance with previous recommendations and appropriate management plans.

Note: Sandhurst Reference Area (G5) has not been proclaimed. It is proposed that it remain as a reference area within the Greater Bendigo Regional Park.

H Natural features reserves

'Natural features reserve' is a general public land use grouping which includes several categories of land that have broadly similar land use objectives.

These are:

- wildlife areas (that are seasonally available for hunting);
- public land water frontages;
- streamside areas;
- bushland areas;
- natural and scenic features areas;
- geological and geomorphological features areas; and
- highway parks.

Small block information

Previous LCC investigations mainly considered larger parcels of public land and did not include Crown land in cities and towns. As a result, there are several thousand small land parcels without public land use recommendations. Some are now proposed as natural features reserves.

The recommendations for these areas are based on several recent studies and compilations of data which have contributed to the identification of additional areas warranting specific reservation.

The major sources of this information are:

- NRE assessments for small Crown land parcels;¹
- a specific consultancy (funded by the Commonwealth Government) that inspected and reported on 120 small blocks selected from aerial photos as having remnant tree cover but no LCC recommendations;²
- a study of Box-Ironbark remnants by NRE;³
- sites of botanical significance that were identified for large forest blocks and small parcels;⁴
- a study of sites of geological and geomorphological significance that identified 69 such sites. These were tabulated and shown

on Map C in the ECC's *Resources and Issues Report (1997)*;⁵

- data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife⁶ showing recorded locations of threatened species that were reviewed for small block records;
- a NRE study of disused railway lines;⁷ and
- some submissions that refer specifically to small block features.

Wildlife areas

These reserves have been distinguished from game refuges (refer to Chapter 14, Section D) by being designated as seasonally available for duck hunting.⁸ The existing reserves are wetlands, located on the northern plains near Murchison, Nagambie, and north of Violet Town and Benalla. While the wetlands often carry Wetland Formation EVC (not a Box-Ironbark unit), the surrounds commonly have Box-Ironbark vegetation in Plains Woodland/Gilgai Wetland Mosaic, or Plains Grassy Woodland EVCs.

Public land water frontages and stream beds and banks

Public land water frontage reserves are the linear Crown land abutting many streams. Most were originally set aside from selection in 1881. In the inland hills, selection and survey for farms followed along major streams and minor valleys, producing the present irregular public land boundaries. As a result, habitat along the streams and vegetation types such as Creekline Grassy Woodland EVC were usually cleared, except where a Crown land frontage was reserved. On the northern plains, these linear reserves, along with vegetated road reserves, provide most of the remaining habitat for numerous threatened species, and are of particular importance. Stream frontage reserves are also an important recreation resource.

The beds and banks of all watercourses are deemed to have remained Crown land under the *Water Act 1905* and subsequent Acts. Stream bed and bank recommendations apply to all watercourses outside major public land use categories, whether or not there is an adjoining public land water frontage.

Streamside areas

These are localised nodes along Crown stream frontages where the public land is wider. They are in effect a wider section of a public land water frontage reserve. Access is generally given by a road, either crossing, or near, the stream. Existing streamside areas were set aside for picnics and informal recreation, and in some cases, for camping. Where they carry remnant vegetation, these reserves are increasingly important for conservation.

Bushland areas

Last century many small reserves were set aside for overnight camping by drovers with their travelling stock. Others had a spring or dam and were reserved for stock water supply. Unused recreation reserves, and gravel reserves that have revegetated often also have Box-Ironbark vegetation. Remaining reserves of these types are now distributed across largely cleared freehold farmland, and many have been designated bushland areas. These scattered patches of remnant bush add scenic diversity to the landscape, and are of increasing importance for nature conservation.

Natural and scenic features areas

Hilltops with ready access, some with developed lookouts, have been set aside as scenic reserves. Several have relatively intact remnant vegetation.

Geological and geomorphological features areas

Specific features showing significant geological exposures,⁵ for example, the Permian glacial pavements at Eppalock, or geomorphic elements such as the Victoria Hill plunging anticline at Bendigo, have been reserved for scientific and wider interest.

Natural features reserve use and management

In other parts of Victoria, natural features reserves are not primarily recommended for nature conservation, but in the Box-Ironbark study area, particularly on the northern plains, these reserves may carry the only local remnants of indigenous vegetation, and are often of particular conservation value.

Some of the blocks subject to recommendations below have been or are grazed, or are used for apiculture. Because of their small size, generally these blocks do not contribute substantially to local farm income. On the inland hills, there is generally little if any grazing value, but there is the potential for severe degradation of indigenous vegetation. On the northern plains, remnant native vegetation is important wherever it occurs, and it is at risk from grazing.

NRE generally manages natural features reserves, through Parks Victoria. NRE has had discussions with organisations and institutions with an interest in, and the capability for, managing some natural features reserves. The supports such arrangements, provided the land is managed in accordance with the recommendations, and the effectiveness of such management is reviewed.

GENERAL RECOMMENDATIONS FOR NATURAL FEATURES RESERVES

- H** That natural features reserves, according to their specific characteristics, be used to:
- (a) protect natural features and values;
 - (b) provide opportunities for:
 - (i) education and passive recreation such as picnicking, walking and where relevant, angling, and
 - (ii) more intensive recreation such as camping where specified;
 - (c) conserve indigenous flora and fauna;
 - (d) protect areas with remnant vegetation or habitat value;
 - (e) provide protection for cultural heritage features and associations;
 - (f) preserve features of geological or geomorphological interest;
 - (g) maintain scenic features and the character and quality of the local landscape;
- and that:
- (h) commercial timber harvesting not be permitted;
 - (i) some firewood may be available from ecological thinning, subject to research and the approval of the land manager,
 - (ii) exploration for minerals be permitted, and mining, subject to decisions on particular cases;
 - (i) prospecting and apiculture be permitted subject to the land manager's discretion (see Notes 2 and 3 below);
 - (j) grazing generally not be permitted, unless required for short periods by the land manager; and
 - (k) they be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment.

Notes:

1. Most are shown on Map A; some are too small to appear on the map; stream beds and banks (H3) are not shown.
2. Prospecting and apiculture would generally be permitted, subject to appropriate conditions; removal of these activities would require the land manager to demonstrate a particular need.
3. Apiculture sites should be located away from picnic areas, car parks, walking tracks and other focal points for recreation.
4. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.
5. Several of the natural features reserves have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.
6. Existing reserves are to be reviewed prior to completion of the ECCs Final Report.

RECOMMENDATION FOR WILDLIFE AREAS

H1 That the wildlife areas shown on Map A (numbered H1) and listed in Appendix 10 be used in accordance with the general recommendations for natural features reserves above, and:

- (a) primarily to conserve the habitat of native fauna associated with wetlands; and
- (b) for public recreation (including hunting in season as specified by the managers) and education, where this does not conflict with the primary aim.

RECOMMENDATIONS FOR PUBLIC LAND WATER FRONTAGES

H2 That public land water frontages, where not recommended otherwise for a specific use, be used in accordance with the general recommendations for natural features reserves above, and be used to:

- (a) conserve native flora and fauna as part of an integrated system of habitat networks across the State;
- (b) maintain or restore indigenous vegetation;
- (c) protect adjoining land from erosion, and provide for flood passage;

- (d) protect the character and scenic quality of the local landscape;
- (e) provide protection for cultural heritage features and associations;
- (f) provide access for recreational activities and levels of use consistent with (a) to (e) above;

and that:

- (g) Catchment Management Authorities, in cooperation with adjoining landholders, implement programs to gradually restore frontages, where public land water frontages are currently licensed for grazing or other purposes, and where stream-bank or frontage vegetation is degraded, frontage vegetation is not regenerating, stream banks are eroding or salt-affected, or to protect natural, cultural, recreational and scenic values or water quality;
- (h) programs to restore frontages be implemented according to local priorities and a practical timetable, with particular emphasis on the Victorian Riverina bioregion (northern plains);
- (i) where frontages adjoin farmland, fencing and off-stream stock watering points be encouraged by appropriate support;
- (j) where stream frontage vegetation is to be restored, particularly in cleared or degraded areas, indigenous trees, shrubs and ground species be planted, where possible using seed of local provenance;
- (k) where appropriate, suitable areas for more intensive recreational use be identified and facilities established;
- (l) where land exchanges are proposed that involve frontage land that is no longer adjacent to rivers, efforts be made to prevent loss of any nature conservation or other values of this land from the public land estate;
- (m) where a licence has been issued for a public land water frontage, recreation

use by the public for activities such as walking, nature observation or fishing be permitted, while motorised forms of recreation not be permitted;

- (n) licensees be required to provide stiles in any fences erected across their licence area if requested to do so by the land manager;
- (o) no new cultivation of stream frontages for agriculture be permitted, and areas currently cultivated be reviewed by the land manager as part of a systematic assessment of river restoration priorities, with a view to phasing out inappropriate cultivation;
- (p) timber cutting not be permitted;
- (q) sand and gravel extraction may be permitted by the land managers where this is consistent with the above uses, and where necessary for bed and bank stability;

and that:

- (r) public land water frontages be managed by the relevant Catchment Management Authority and NRE, as appropriate.

Note: Public land water frontage recommendations apply to sections of many watercourses outside major public land use categories. They are shown diagrammatically on Map A, but are not individually listed. For details, refer to parish plans, or the Department of Natural Resources and Environment.

RECOMMENDATIONS FOR STREAM BEDS AND BANKS

H3 That stream beds and banks, subject to other relevant recommendations, guidelines and statutory requirements, be used in accordance with the general recommendations for natural features reserves on page 188, and be used to:

- (a) conserve or restore habitat for native flora and fauna;
- (b) provide for appropriate recreational activities and levels of use;
- (c) provide for flood passage and drainage requirements of adjacent land;

- (d) where necessary, provide for the passage of artificial flows of water stored within the catchment or transferred from other catchments;
- (e) maintain streams in a stable condition using environmentally sound techniques; and
- (f) where this does not conflict with the above, provide a source of sand and gravel.

Note: Stream beds and banks recommendations apply to all watercourses outside major public land use categories, whether or not there is an adjoining public land water frontage. They are not labelled on Map A.

RECOMMENDATIONS FOR STREAMSIDE AREAS

H4–H7 That all existing streamside areas (H4), and new streamside areas (H5–H7) listed in Appendix 10 and shown on Map A, be used:

- (a) in accordance with the general recommendations for natural features reserves on page 188; and
- (b) to provide opportunities for more intensive recreation such as camping at the discretion of the land manager if this does not conflict with the maintenance of the water quality in the adjacent stream.

RECOMMENDATIONS FOR BUSHLAND AREAS

H8–H109 That the existing bushland reserves (H8), except where recommended for other purposes, and new areas of bushland (H9–H109: listed in Appendix 10), as shown on Map A, be used in accordance with the general recommendations for natural features reserves on page 188.

RECOMMENDATIONS FOR NATURAL AND SCENIC FEATURES AREAS

H110 That the existing natural and scenic features areas shown on Map A be used in accordance with the general recommendations for natural features reserves on page 188.

Existing natural and scenic features areas (see Appendix 10 for locations and areas):

- Bunjil's Cave;
- Mt Gowar;
- Howell's Hill;
- Mt Buckra;
- Murchison North;
- Mt Ochertyre; and
- Barnawartha.

RECOMMENDATIONS FOR GEOLOGICAL AND GEOMORPHOLOGICAL FEATURES AREAS

H111–H113 That the following existing (H111) and new (H112 and H113) geological and geomorphological features areas shown on Map A:

- (a) be used in accordance with the general recommendations for natural features reserves on page 188; and that
- (b) educational and scientific study, and recreation, be permitted where they are compatible with protecting the geological and geomorphological features.

H111—Existing geological and geomorphological features (see Appendix 10 for locations and areas):

- Yowang Hill;
- Amherst quartz reef;
- Coliban Falls; and
- Permian glacials Moorabbee shoreline, Lake Eppalock.

H112—White Hills sediments (15.4 ha); outcrops of Ordovician sediments and Tertiary gravels.

H113—Barfold Gorge (8 ha); a spectacular gorge in an old valley cut in Ordovician sediments, exposing several newer volcanic flows, with basalt columns, waterfalls, a cave, talus cones and tessellated pavements.

Note: Only a small part of this gorge is public land.

RECOMMENDATIONS FOR HIGHWAY PARKS

H114 That the following existing highway parks and roadside stops, as shown on Map A, be used in accordance with the general recommendations for natural features reserves on page 188, and to provide opportunities for relaxation for travellers (see Appendix 10 for locations and areas):

- CA 64 Township of Ravenswood;
- adjacent CA 3 Parish of Runnymede;
- Sections 19 & 20, Township of Toolleen;
- Casey Weir, CA 19A and adjacent water reserve to the west, Parish of Goorambat; and
- CA 7A Sec 1 Parish of Barambogic.

I Water production

The water production category includes actual water storage areas, areas used primarily for water supply protection around the margins of domestic water supply reservoirs, diversion weirs, and pump intakes that obtain their supply from catchment flows.

Coliban Regional Water Authority (RWA) provides water to Bendigo and other towns from the Coliban River system via an aqueduct; and from Lake Eppalock (with additional water from the Sandhurst and Spring Gully catchments close to Bendigo). Water is also supplied to Heathcote, Castlemaine, Dunolly, Wedderburn and some smaller towns.

Goulburn Valley RWA supplies Shepparton, Euroa, Violet Town, Nagambie, Rushworth, and other northern plains towns. Wangaratta and Benalla are supplied by the Ovens RWA, while the Kiewa Murray RWA supplies Beechworth and Chiltern. In the west, the Central Highlands RWA supplies Maryborough and Avoca, and the Grampians RWA supplies St Arnaud and Stawell.

Where reservoirs store town drinking water, protective measures are required to provide protection from bacterial and viral pollution. Several small domestic water supply systems in the Box-Ironbark area have had poor bacterial water quality records over many years. In recent years piped supplies from higher quality sources have replaced several of the poorer systems.

Under the *Catchment and Land Protection Act 1994*, water catchments can be declared as 'special water supply catchment areas', and subsequently a 'special area plan' (or a pre-existing 'land use determination') can be prepared to guide catchment land use. The areas listed below have been declared under this Act, unless otherwise noted.

Other water supply sites whose catchments have not been declared include Campaspe Weir, Goulburn Weir, and the off-stream water storage areas at Waranga Basin and Lake Mokoan.

GENERAL RECOMMENDATIONS FOR WATER PRODUCTION AREAS

I That, for the water production areas shown on Map A (numbered I1) and listed below; the storage areas; diversion works and associated facilities; protective buffer zones around diversion works and storages, defined in a special area plan or land-use determination; and any other public land considered necessary; be used for:

- (a) water supply purposes;
- (b) other activities permitted by the water supply authority after consultation with NRE and the Environment Protection Authority, as appropriate;

and that:

- (c) unless otherwise securely reserved, these areas be permanently reserved under the *Crown Land (Reserves) Act 1978* for water supply purposes, and be managed by the water supply authority.

Note: Several large storage areas not primarily used for domestic water supply are also used for water-based recreation. This may continue except where it results in deteriorating water quality.

I1 Water production areas

Declared special water supply catchment areas with an existing land use determination (LUD) or land use notice (LUN) are:

- Malakoff Creek, Landsborough LUD;
- Avoca LUD;
- Cairn Curran (lake environs) LUN; and
- Eppalock (lake environs) LUD.

The catchments to the following water storages are declared special water supply catchment areas:

- Lake Lonsdale;
- Picnic Road (Ararat);
- Teddington Reservoir (Stuart Mill);

- Redbank Creek (Redbank);
- Tullaroop Reservoir;
- Laanecoore Reservoir;
- Lake Cairn Curran;
- Crusoe Reservoir (Bendigo);
- No. 7 Reservoir;
- Sandhurst Reservoir (Bendigo);
- Spring Gully Reservoir (Bendigo);
- Lake Eppalock;
- Fifteen Mile Creek (Glenrowan);
- Diddah Diddah Creek (Springhurst); and
- Barambogic Creek (Chiltern).

J Community use areas

Community use areas are primarily used for education, recreation or other specific community purposes.

Education areas

Education areas were previously recommended by the Land Conservation Council to be set aside for environmental education and some have permanent school camps established on-site or nearby. The recommendations permitted use for environmental studies that may involve some environmental manipulation which would not normally be possible in parks and conservation reserves.

Education areas are being reviewed as NRE information suggests that many of the recommended areas across the state have had little use. Those in the Box-Ironbark study area are now mostly proposed for other uses as most public land is available for environmental education.

The ECC would appreciate comments in submissions about the concept, on particular education areas, and knowledge of past and current environmental education uses in these areas.

While the recommendations of this investigation cannot apply formally outside the study area, the outcome may provide general policy guidance to NRE.

Specific proposals for previously recommended education areas are as follows:

- the large education area beside Lake Eppalock which is frequently used by school groups should continue as an education area (see Recommendation J1);
- Deep Lead Education Area should be added to the Deep Lead Nature Conservation Reserve (see Recommendation D2, Chapter 14);
- Mt Egbert Education Area should be added to the Wychitella Nature Conservation Reserve (see Recommendation D3, Chapter 14);
- Faraday Education Area should be included in Castlemaine Regional Park (see Recommendation C2, Chapter 14);
- Waranga Education Area should be a natural features reserve (see Recommendation H96 in this chapter);
- Killawarra Education Area should be added to Warby Range State Park (see Recommendation B5, Chapter 13); and
- Barambogic Education Area should be included in Chiltern–Pilot National Park (see Recommendation A1, Chapter 13).

The Eppalock education area receives frequent visits by school groups, primarily associated with school camps. It is proposed that it continue to function as an education area.

Recreation areas

Recreation areas are usually reserves close to townships and are available for organised sports (horse racing, golf, team sports), or for informal recreation (picnicking, camping). Many recreation areas have retained indigenous vegetation on at least part of their area. In some areas on the northern plains, recreation areas can be the only public land parcels aside from road reserves. Any such vegetation should be protected. Indigenous grasses and herbs present should only be grazed if that is required for management.

Other important recreation areas are the various walking, riding or driving trails around major centres, and following particular themes. These include: the O’Keefe Rail Trail at Bendigo; part of the Murray to the Mountains Rail Trail (Wangaratta to Everton, and Beechworth link); the Bendigo Bushland Trail; the Major Mitchell Trail; and the Castlemaine–Maldon Diggings Heritage Trails.

Rifle and other ranges

Rifle ranges have until recently been supervised by the Department of Defence to ensure safe operation. The Commonwealth has now ceased this inspection function and some active shooting clubs have taken over the responsibility.

Rifle ranges generally have large safety buffer zones behind the target mounds, some of which retain Box-Ironbark vegetation. If non-viable ranges on public land are to be closed, the land should be assessed for suitable future uses; the buffer areas should be reserved as nature conservation reserves, natural features reserves, or state forest as appropriate.

The freehold Bendigo Rifle Range is to be extended into Wellsford Forest to accommodate Commonwealth Games events. A shotgun range and a bow-hunting range in the buffer area are to be relocated.

In the recommended Reef Hills State Park, the ECC’s proposal is that three established range areas (cleared and infrastructure sites) not be included in the existing regional park.

Forested buffer zones at these ranges would be retained in the parks, but zoned to exclude public access.

Parklands and gardens

Botanic gardens and municipal parks on public land are used, often intensively, by the community for informal recreation.

Buildings in public use

Communities use public buildings such as halls, schools, libraries, museums, and their associated facilities, for a wide variety of purposes including education, recreation, meetings, and tourism. Many public buildings are in use for a primary purpose (such as schools), but also serve wider community purposes. Some public buildings may have historical value.

Public buildings, and other community use areas, may be held under committee of management status by shires or community organisations. Other arrangements for delegated management may also be suitable in particular circumstances.

GENERAL RECOMMENDATIONS FOR COMMUNITY USE AREAS

- J** That the recommended areas J1-J6 below be used for recreation, education or other community purposes and that:
- (a) appropriate facilities be provided;
 - (b) where relevant, and where compatible with the above, features of cultural significance, natural surroundings and the local character and quality of the landscape be maintained or restored;
 - (c) harvesting of forest products, hunting and 'stone' extraction, as defined in the *Extractive Industries Development Act 1995*, not be permitted;
- and that:
- (d) they be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment (see Note 3 below).
- Notes:
1. Some of these areas are shown on Map A; others are too small to be shown.
 2. Several of the community use areas have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.
 3. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.

RECOMMENDATIONS FOR EDUCATION AREAS

- J1** That the Eppalock Education Area be used in accordance with the general recommendations for community use areas above, and to provide opportunities for students of all ages to:
- (a) study the nature and functioning of reasonably natural ecosystems in a manner such that the integrity of those ecosystems is maintained as far as is practicable;
 - (b) compare the ecosystems within the education area with other nearby natural and modified systems;
 - (c) observe and practise methods of environmental analysis, and the field techniques of the natural sciences; and
 - (d) conduct simple long-term experiments aimed at giving an understanding of the changes occurring in an area with time.

RECOMMENDATIONS FOR RECREATION AREAS

- J2** That recreation areas be used in accordance with the general recommendations for community use areas above, and be used:
- (a) for organised sports (team sports, horse-racing, golf etc.) and informal recreation (picnicking, camping, prospecting etc.) as permitted by the land manager;
 - (b) to conserve indigenous vegetation where possible; and
 - (c) for grazing at the discretion of the land manager, in appropriate areas.

Note: Large reserves are shown on Map A; smaller reserves, particularly in townships, are generally too small to be mapped at the scale used, and are not shown.

RECOMMENDATIONS FOR RECREATION TRAILS

- J3** That the recreation trails continue to be used in accordance with the general recommendations for community use areas on page 194, and that suitable new trails for recreation and tourist use be encouraged.

RECOMMENDATIONS FOR RIFLE AND OTHER SHOOTING RANGES

- J4** That:
- (a) existing use as a rifle, pistol or clay target range, or for other shooting sports, continue, provided the club remains viable and the operator can ensure safety on the range and in adjoining areas; and
 - (b) where ranges, including buffers, close and retain remnant Box-Ironbark vegetation, those areas be reserved as nature conservation reserves, natural features reserves or state forest as appropriate.

Note: The buffer zones at several ranges have been included in adjoining parks and are subject to access limits.

RECOMMENDATIONS FOR PARKLANDS AND GARDENS

- J5** That:
- (a) gardens, community parklands or ornamental gardens on public land be used in accordance with the general recommendations for community use areas on page 194;
 - (b) the conservation, scientific, educational and historical values of botanical gardens be protected; and
 - (c) they be available for public use for passive open space recreation, appreciation and education, as determined by the land manager.

Notes:

1. Where these areas retain indigenous vegetation, it should be protected.
2. These areas are generally too small to be mapped at the scale used, and are not shown on Map A.

RECOMMENDATIONS FOR BUILDINGS IN PUBLIC USE

- J6** That various buildings in public use be used in accordance with the general recommendations for community use areas on page 195, where appropriate, and for schools, public halls, kindergartens, libraries, museums, galleries, war memorials, tourist facilities or other public uses.

Notes:

1. See also Recommendation N2.
2. These areas are generally too small to be mapped at the scale used, and are not shown on Map A.

K Plantations

Softwood plantations

This section is about the former publicly owned softwood plantations on public land. The typical Box-Ironbark environment is too dry for productive pine plantations and only small areas in the Box-Ironbark study area—at Castlemaine, Harcourt (Mt Alexander) and Chiltern (Barambogic), totalling about 916 ha—were previously designated for softwood production.

The Mt Alexander and Barambogic plantation forests are now privately owned, although the land remains Crown land. In 2015, Mt Alexander plantation reverts to the Crown, and is to be restored to eucalypt forest, under the *Victorian Plantations Corporation Act 1993*. This should then be added to the Mt Alexander Regional Park.

Hardwood plantations

Farm forestry programs support the establishment of plantations for hardwood and other purposes on private land. These are for erosion control, reducing infiltration in salinity recharge areas, and windbreaks for stock shelter, as well as providing future wood or other products. Box-Ironbark tree species are commonly planted, with sugar gum another tree suited to the conditions.

Products include sawlogs, pulpwood, firewood, and eucalyptus oil. A feasibility study⁹ outlines expected returns to landholders from sawlogs, pulpwood, and eucalyptus oil. A separate business plan¹⁰ focusses on opportunities for firewood plantations, with a view to replacing production from public land.

Emerging products include fuelwood for charcoal and green energy production, and the potential market for carbon credits.

Recommendation R2 on page 20 encourages continued programs of these types.

Rather than establishing plantations, natural regeneration of overstorey trees, and some shrubs and grasses (depending on seed sources and the condition of adjoining bush) will occur at many inland hills sites, on removal of grazing. It is likely to be the most cost-effective means of returning previously cleared areas to Box-Ironbark vegetation.

GENERAL RECOMMENDATIONS FOR PLANTATIONS

- K** That:
- (a) there be no extension of softwood plantations in the study area;
 - (b) at the time of harvest, consideration be given to the economics of establishing hardwood plantations on these areas; and
 - (c) the plantation managers address the issue of eradication of pine seedlings in adjoining forested areas.

SPECIFIC RECOMMENDATIONS FOR PLANTATIONS

- K1** That the existing plantations shown on Map A continue under present use and management.
- K2** That the Mt Alexander plantation, when re-vegetated, be added to the Mt Alexander Regional Park.

L Earth resources

Mining sites

A detailed account of all relevant aspects of Box-Ironbark exploration and mining is provided in Chapter 5, culminating in six recommendations (R14–R19) setting the proposed framework for future exploration and mining in any public land use category where it occurs within the study area. These recommendations include general principles to minimise the impact of exploration and mining on Box-Ironbark public land values.

While it is not possible to set aside sites for future mining, it is appropriate to recognise the primacy of this major use of public land at sites where currently it is virtually the exclusive use over appreciable areas.

RECOMMENDATIONS FOR MINING SITES

L1 That:

- (a) the mining sites shown on Map A (numbered L1) and listed in Appendix 10 be used for mineral extraction in accordance with the general principles and recommendations in Chapter 5;
- (b) they be temporarily reserved under the *Crown Land (Reserves) Act 1978*; and
- (c) when no longer required for mining, each site be assigned to a public land use category appropriate for its future use.

Stone reserves

Chapter 12 introduces extractive industries in the study area. Specific small areas of public land were previously recommended for stone production. Some areas recommended were commercial quarries, but most were small parcels set aside for municipal gravel resources.

Specific current operations and applications within public land proposed for other uses are listed in Appendix 10. These operations and approval processes should continue, subject to continued viability and appropriate conditions (see Principles and Guidelines below).

In the past, the cumulative effect of numerous small extraction sites has been the gradual removal or degradation of areas of Box-Ironbark vegetation. Standards and practices have undoubtedly improved, but the challenge now for extractive industries should be no net reduction and possibly a gradual increase in the area with Box-Ironbark vegetation.

PRINCIPLES AND GUIDELINES

The standards of operation and rehabilitation for stone extraction should be the same as for similar scale mining operations. The following principles and guidelines for stone extraction are proposed.

- Box-Ironbark vegetation should preferably not be removed for extraction, particularly where the same extractive resource is available on already cleared land or where the resource is shallow and extraction will be short term.
- If vegetation is to be removed, it should be replaced in kind, by the purchase of freehold land with Box-Ironbark vegetation.
- Reclamation of extraction sites needs to be of a high standard, with collection of seed from as many species as is practical from the site before operations, stockpiling of the topsoil layer, and re-establishment of a substantial complement of the original species present.
- Since broad areas are suitable and potentially available for extraction of most materials, careful planning will ensure that extraction is excluded from places of greater value for other purposes, including aesthetic or nature conservation values.
- Extraction sites should be rationalised to the smallest practical number of sites.
- Sites in use should be progressively reclaimed.
- Old extraction sites should be reclaimed where possible.
- Location of sites and conditions imposed should aim at minimising adverse effects on adjoining public land from noise, dust, unsightliness, and erosion.

PRINCIPLES AND GUIDELINES (CONT.)

- Particular care is necessary to avoid affecting water quality in run-off from extraction sites.
- Extraction should avoid highly erodible sites. The potentially adverse impacts of extraction in streambeds and granitic sands are severe, and if no alternative source is available, specific protective measures should be applied.
- Stone should not be removed from mine mullock heaps assessed as historically significant.
- In large public land areas, the land managers may extract stone from appropriate sites as required for management needs.

RECOMMENDATIONS FOR STONE RESERVES

L2 That:

- (a) the stone reserves shown on Map A (numbered L2) continue to be used for the extraction of stone in accordance with the above principles and guidelines;
- (b) proposed new extraction sites be located and operated in accordance with the above principles and guidelines;
- (c) if not already reserved for this purpose, they be temporarily reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment; and
- (d) when no longer required for extraction, each site be assigned to a public land use category appropriate for its future use.

Notes: 1. Major operations under the *Extractive Industries Development Act 1995* are listed in Appendix 10.
2. Existing stone reserves, except where recommended for another use, will be reviewed before the ECC's Final Report.

M Services and utilities

Numerous transport, electricity and gas, communications, cemeteries, water, sewerage, waste disposal and other service and utility installations are located on public land. Some involve Commonwealth controlled activities such as communications towers. Also in this category is land used for agricultural research. Areas specifically recommended for these purposes are generally small.

Roads providing access to farmland and townships also provide a crucial network of remnant natural vegetation across much of the study area. This network is particularly important on the northern plains, in locations of highly depleted plains EVCs, and in Grassy Woodland EVC occurrences abutting the inland hills. Roadside vegetation can provide a guide and a seed source for the restoration of natural vegetation; and it may represent the only remnants of some vegetation types.

Large old trees are often relatively abundant along roadsides, providing habitat, and scenic appeal for road users. In key locations roadsides provide habitat for threatened grey-crowned babbler, brush-tailed phascogale and squirrel gliders. Roadsides support a larger number of reptile species per site than comparable small or large woodland fragments, attributable to the absence of grazing from many roadsides, leaving a less-disturbed ground layer¹¹.

Unused roads can have similar values to used roads, contributing to the network of retained vegetation and habitat. A benefit is the absence of 'road kill' risk, but being located within farmland they are often unfenced and grazed, reducing biodiversity values.

In conjunction with vegetation along streams, roadsides and unused road reserves contribute to an integrated system of habitats linking larger forest and woodland areas.

Management of roads should ensure that their values are retained. Wherever possible, unused roads with indigenous vegetation should be managed to protect that vegetation. Unused roads adjoining parks and reserves should be added to those reserves where possible.

A national protocol system for management of roads in use has been proposed. This could assist in conserving biodiversity along road reserves.

Railway alignments often also retain little-disturbed examples of indigenous vegetation (except for the overstorey, removed for safety). These are important, and management should ensure actions such as fire protection are carried out at times that suit the vegetation.

Various other service and utility sites may also retain indigenous vegetation, or significant cultural heritage features.

GENERAL RECOMMENDATIONS FOR SERVICES AND UTILITIES

M1 That:

- (a) existing reserves and easements used for public services and utilities such as transport, electricity and gas, communications, cemeteries, water and sewerage, continue to be used for those purposes;
- (b) new services, or utility sites and easements or lines not be sited in or across reference areas, and wherever possible not be in or across national, state, or regional parks or nature conservation reserves;
- (c) roadsides, unused roads, railway lines, and other service and utility sites be managed to protect remnant vegetation and habitat, as far as practical; and
- (d) should a public land area or building and site used for service or utility purposes no longer be required for its primary designated use, it be assessed for its natural, recreational and cultural heritage values, and capability for other public uses, as outlined under Recommendation N2 later in the report.

Notes: 1. Many of these areas are too small to be shown on Map A.

2. Several of the services and utilities areas have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.

N Uncategorized public land

This category includes land, often in small rural parcels or in townships, that was previously recommended by the LCC as *Other reserves and public land* or *township land*, or for which no primary use was recommended or no previous LCC recommendations were made.

With new information from subsequent surveys or assessments, these areas can now be categorised for a particular public use, or where appropriate, disposed of.

Crown land assessment and classification

NRE (through Land Victoria) is carrying out a statewide assessment of Crown land parcels, for their public land attributes. These are the resources, or natural, recreational, historic or scenic values present on a block, that generally require its retention as Crown land. Surplus Crown land, that has minimal or no such values or resources, may be considered for disposal if it is surplus to government needs.

In the Box-Ironbark area, there are some 30 000 separate parcels of Crown land, many of which are small, located in old gold mining townships, and have little or no public land values. Others retain Box-Ironbark vegetation, or at least over-storey trees. Some have mature trees which provide habitat for native animals; they may also contribute to habitat corridors on private land between larger blocks of Box-Ironbark vegetation. Others have notable historical features. It is important that such values be protected, either by retention as public land, or under management by suitable organisations.

Following assessment, Crown land with public land attributes (termed public land) is generally assigned by Land Victoria to either NRE Forests Service or Parks Victoria as land manager. Some parcels of land have significant values but for various reasons may not be suited to management by either NRE Forests Service or Parks Victoria.

Land Victoria includes some such parcels in a 'land bank' pending allocation to one of the following alternatives:

- committee of management tenure, often through a municipal council;
 - licence to other organisations, for example tertiary colleges, Landcare groups, historical societies, environmental groups etc;
 - licence to private users with specified conditions;
 - sale with a land management agreement under Section 69 of the *Conservation, Forests and Land Act 1987*; or
 - retention by Land Victoria.
- Where organisations such as municipalities, tertiary colleges, Landcare groups, historical societies or environmental groups have the capability and resources to manage small Crown land parcels, the primary land managers should encourage such arrangements.
- In all cases the public land attributes would be protected; the land would remain as Crown land unless sold.
- ### Changes to existing public land use
- Where public land has an existing approved LCC recommendation for public land use, an Order in Council may be required to amend or revoke the recommendation, under Section 26(2) of the *Environment Conservation Council Act 1997*.
- On 10 March 1999, the Governor in Council approved an order to establish a procedure for the investigation, disposal, land exchange or re-categorisation of Crown land parcels in certain of the public land use categories.
- The procedure requires that for land included under approved recommendations for *Uncategorised Public Land, Services and Utilities, or Community Use Areas (Buildings in public use)*, that is apparently surplus to requirements:
- an assessment of public land values be undertaken;
 - appropriate consultation be carried out; and
 - the areas be considered for land exchange, disposal, or (where there are substantial issues) reference to the ECC.

RECOMMENDATIONS FOR UNCATEGORISED PUBLIC LAND

N1 That:

- (a) public land other than that:
 - (i) recommended for specific uses in this report, or
 - (ii) subject to previous approved specific land use recommendations,
 be uncategorised public land;
- (b) existing legal use and tenure continue for the time being; and
- (c) when Crown land assessments are completed, the land be either:
 - (i) if 'public land', assigned to an NRE land manager, or included in a 'land bank' and treated as outlined above, or
 - (ii) if assessed as surplus, disposed of.

Note: 1. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.

2. Several of the uncategorised public land areas have values worthy of protection. Notes on these values are included in Appendix 10.

N2 That for Crown land subject to existing approved but non-specific land use recommendations as either:

- uncategorised public land
- services and utilities, or
- community use areas (buildings in public use)

and which is apparently surplus to requirements;

an assessment of public land values be undertaken and, following appropriate consultation, these areas be considered for re-categorisation, land exchange or disposal.

O Land not required for public purposes

This includes public land recommended to be alienated, either for agriculture or for private use in townships.

Under Section 69 of the *Conservation, Forests and Lands Act 1987*, a binding agreement can be made between the Secretary of the Department of Natural Resources and Environment, and a landowner, including the purchaser of surplus Crown land. Such Section 69 agreements can include covenants for a range of land management matters, including the retention of existing trees and other vegetation, protection for drainage lines and so on. Agreements of this type have been applied to several Crown land sales in the study area.

RECOMMENDATIONS FOR LAND NOT REQUIRED FOR PUBLIC PURPOSES

O1 That

- (a) the land not required for public purposes, as listed in Appendix 10, be considered for alienation or for exchange for freehold land; and
- (b) land to be sold, be subject to agreements under Section 69 of the *Conservation, Forests and Lands Act 1987*, where appropriate.

Information Sources

- ¹ NRE (unpubl.; various dates).
- ² Davidson *et al.* (1997).
- ³ Davidson (1996).
- ⁴ Muir (1996).
- ⁵ Rosengren and Joyce (in prep.).
- ⁶ Data on threatened species from the Flora Information System and the Atlas of Victorian Wildlife.
- ⁷ CNR (1995).
- ⁸ Victoria Government Gazette (11 March 1999).
- ⁹ Virtual Consulting Group (1999).
- ¹⁰ VNPA (2000).
- ¹¹ Stothers ed. (1999).
- ¹² Farmar-Bowers (1999).

17 ECC's response to major issues raised in submissions

A wide range of Victorian people are strongly interested in the use of Box-Ironbark public land. The ECC has received over two thousand submissions and letters following the publication of the *Resources and Issues Report* in December 1997. Conservationists, prospectors, forest workers and naturalists were among the many who made submissions. Interested parties came from across Victoria and interstate: some from rural regions, others from urban centres. Many submissions and letters contained more than one proposal for Box-Ironbark land use, bringing the total number of proposals to around 2800.

The diversity of ways in which Box-Ironbark lands are used ensures that many different people, with widely different perspectives, are concerned for the future of this region. The Box-Ironbark study area is vital for many local industries, notably mining, tourism, bee-keeping, timber and eucalyptus oil production. Many areas support important services or utilities such as defence facilities and water production.

The forests also host a great diversity of recreational activities for residents of the region – bushwalking, prospecting, nature study, trail-bike and horse riding, and car rallies. Increasingly, the natural and cultural values of the forests are being recognised (many of which contribute to the values of other activities and industries).

Areas and artefacts of indigenous significance require protection. Many remnants of post-contact history can be found in these forests which once resonated with gold rush fever.

The forests are also home to a large number of threatened species. Many of the vegetation types represented in the remaining Box-Ironbark forests are but a tiny fraction of their original extent. Squirrel gliders, turquoise parrots and pink-tailed worm-lizards are among the many threatened species dependent upon and largely restricted to the Box-Ironbark forests and woodlands.

It is not surprising, therefore, that the submissions received in relation to Box-Ironbark public land use reflect a similar diversity of priorities, not all of which are mutually compatible. Many supported the retention or expansion of existing industries. Others called for blanket protection of all remaining Box-Ironbark forests. Activities regarded as essential for the region by one group might also be regarded as detrimental to the preservation of the forests by another.

All these divergent views and the proposals put forward had to be considered by the ECC within the context of similar land use submissions and within the context of competing land uses. In many cases different land uses are complementary or can co-exist. In others, they must be prioritised. In all cases, however, public submissions and extensive consultation make a major contribution to the way in which these recommendations are formed. The following sections attempt to summarise the way in which that process has occurred.

17.1 Box-Ironbark conservation

One of the strongest areas of concern to emerge from this investigation has been the need for conservation of the remaining Box-Ironbark forests and woodlands. The largest single group of detailed submissions called for increased protection of native vegetation in this region.

The ECC must also consider the nationally agreed criteria for the establishment of a comprehensive, adequate and representative (CAR) reserve system—known as the JANIS criteria—including the target to protect 15% of the 'pre-1750 extent' of different types of vegetation in reserves. Similarly the ECC has obligations to consider the *Flora and Fauna Guarantee Act 1988* with respect to the protection of threatened species.

Conservation of Box-Ironbark forests is also a requirement for the retention or expansion of many tourism and recreation activities. Many other industries and activities, including apiculture, some

forestry, and protection of heritage and indigenous values, also benefit from conservation.

Submissions supporting conservation priorities in the region ranged from calls to completely protect all remaining Box-Ironbark forests and woodlands in parks or reserves, to detailed submissions on particular species or communities and restrictions on particular activities within Box-Ironbark forests.

Submissions calling for complete protection often argued for the application of the JANIS criteria proposing that 15% of the pre-1750 extent of each vegetation type be included in a CAR reserve system. Strong support was expressed in many submissions for such a reserve system, with many suggesting that because only 17% of the original total extent of Box-Ironbark vegetation remains, application of these criteria would support the inclusion of all public land in the study area becoming park or conservation reserve.

The Victorian National Parks Association and supporting submissions proposed that most of the major public land blocks be given park status, with substantial smaller blocks to be made nature conservation reserves. Other submissions considered national or state parks proposals in the following areas:

- Chiltern–Pilot
- Rushworth–Heathcote
- St Arnaud Range
- Killawarra–Warby Range
- Dunolly
- Greater Bendigo
- Maryborough
- Inglewood–Bealiba
- Reef Hills
- Castlemaine–Maldon
- Mt Ida–Eppalock
- South–east Wimmera
- Broken–Boosey Creek frontages.

A large number of pro-forma letters opposed turning the Rushworth–Heathcote forests into a

national park. Opposition was also voiced to the establishment of parks and reserves in some other areas, and several submissions opposed any new parks or conservation reserves, while many wished to retain existing access to public land or the *status quo*. Multiple use areas were also supported in this context.

Many detailed submissions focussed on the need to protect particular species or regions. Some ecological vegetation classes, such as Grassy Woodland and Plains Grassy Woodland, are particularly poorly represented on public land. Compared with other vegetation types in Victoria, a high proportion of Box-Ironbark flora and fauna is classified as threatened. Protection in a reserve system was not the only way in which submissions proposed to ensure adequate habitat. Many submissions called for improved conservation management guidelines, including:

- retention of large trees (restricting felling of trees greater than 30 cm dbh)
- retention of fallen timber
- protection of all hollow-bearing trees
- protection of drainage lines
- maintenance of floristic diversity
- need for ecological burning in reserves
- need for thinning in reserves
- restoration of degraded areas
- preventing fragmentation of habitats (through linear public land reserves).

Increased education and conservation awareness about Box-Ironbark forests and woodlands was seen as important in many submissions.

Activities seen as detrimental to conservation were often criticised in submissions, and their removal or reduction in certain areas, or in all Box-Ironbark forests, was proposed. Timber extraction, firewood collection, mineral exploration, eucalyptus oil production, car rallies, mining, grazing, apiculture and prospecting were all regarded as potentially damaging in some submissions. Many submissions supported the use of alternative sources, such as the establishment of plantations on private land to provide firewood, posts and eucalyptus oil.

Response

A balanced plan for land use in the Box-Ironbark study area cannot exclude a large number of activities in favour of a single conservation priority. It is, however, clear that conservation goals need to be prioritised in considering other land use activities. This region has suffered extensive ecological damage in the past and many natural values are poorly protected. The ECC strongly supports a system of permanent parks and reserves which protects threatened species and ecological communities. The recommendations propose many blocks (or part of them) as appropriate locations for national, state or regional parks. Other areas have been recommended as nature conservation or other reserves. Substantial areas have been retained as state forests, which will be available for a wide variety of activities.

In general, the recommendations outlined in this report attempt to balance conservation objectives with other land use requirements: in particular, by assessing their compatibility with conservation. Some activities which are incompatible with conservation will be removed from new parks and reserves while restrictions are recommended for other areas and less damaging activities.

17.2 Tourism and recreation

Many tourism and recreation activities are supported by and dependent upon the retention and enhancement of natural values. Tourism is an important growth industry and already one of the major employers in the region.

Many submissions supported the importance of the Box-Ironbark forests as resources for both tourism

and recreation. Nature tourism, the value of interpretation, and promotion of the distinctive values or features represented in the Box-Ironbark forests were stressed in a number of submissions.

Other submissions highlighted the need for careful planning to prevent such activities from degrading sensitive areas while some specifically supported particular recreation activities like orienteering.

Response

Nature-based recreation and conventional tourism are supported and encouraged under the proposed recommendations.

17.3 Forestry, timber resources and eucalyptus oil

Many submissions and letters argued that there should be no further restrictions on timber harvesting. They favoured the retention of supplies of timber for sawlogs, firewood, posts and droppers. It was also recognised that improved forest management could enhance the productivity and commercial performance of the industry.

Many submissions proposed that harvested timber should go to high-value added products and that timber felled should be used in its entirety. While some submissions argued for a more efficient use of harvested timber (including use of 'waste' timber for firewood and other products), many submissions argued for a move away from firewood production.

Response

On the basis of modelling carried out by NRE Forests Service, the ECC believes that a sustainable increase in production can be achieved in these forests. Harvesting will cease in key areas for nature conservation, however, it will continue in substantial areas of state forest supplying sawlogs, firewood, posts and other products. State forest is the largest public land category in the ECC's proposals. Management guidelines enhancing conservation values, such as the protection of large trees and trees with hollows, are likely to enhance the value of these forests as habitat for many species.

While private land use is outside the remit of the ECC, the recommendations of this report support, in principle, the establishment of freehold plantations and the use of waste wood from forests other than Box-Ironbark for firewood. Alternatives are already available for many forest products and this availability is likely to increase over the medium to long term.

Similarly, better quality eucalyptus oil and better returns for producers are likely in future from blue mallee plantations on private land. Submissions from eucalyptus oil producers supported retaining their current harvesting areas with one submission proposing the development of a management plan for oil-producing areas. The ECC proposes that harvesting cease in key areas for nature conservation, a plantation-based industry be encouraged, and that harvesting continue in other areas now cut.

17.4 Mining and prospecting

Several submissions proposed the establishment of a Box-Ironbark 'reserve management system' under which Box-Ironbark forest could be managed for conservation whilst still allowing mining exploration and extraction. These submissions suggested that conservation priorities could be met by high quality post-mining rehabilitation, or international best

practice, or by purchasing Box-Ironbark vegetated private land as a replacement for forest lost to mining works.

Many submissions called for no further restrictions on the area available to prospecting with several proposing the encouragement of metal-detector tourism.

Response

The ECC recommends that exploration and mining be continued in most areas, except national and state parks (with existing licences able to continue). All miners will be required to meet the established standards of leading companies, with rehabilitation and replacement land purchases recognised as good practice. The 'reserve management system' is not feasible since it may close the forests for other resource uses. No recognised goldfield would be exempt from mining under these recommendations.

Under the ECC recommendations, in total, little area has been excluded from prospecting, while metal-detecting tourism is supported and encouraged in suitable areas.

17.5 Apiculture

A roughly equivalent number of submissions expressed support or opposition to access by apiculturalists to Box-Ironbark forests.

Response

Scientific evidence to date of any deleterious consequences of honey bee foraging on either native plant or animal species is equivocal; accordingly there is currently no justification for major restrictions on apiculture. The impact of feral bees, on both native species and apiculture, may, however, require further monitoring. The ECC recommends that access be retained to existing bee sites. This access is, however, subject to land managers' discretion, and where there is a demonstrated need, arrangements may vary, particularly in the light of further research.

17.6 Heritage and cultural values

Several submissions proposed recognition of Aboriginal interests:

- in a new reserve category;
- through the protection of heritage places;

- by taking account of native title issues; and/or
- by protection of biodiversity.

The post-contact history of the region, and the sites where it is evident, are of great importance to many people. They are also fundamental to much of the region's tourism.

Response

The ECC strongly endorses the protection of Aboriginal places. However, it is not appropriate for the ECC to recommend a new reserve category which might confound current native title claims. Native title is dealt with by the National Native Title Tribunal and several claims to Crown land in the region are under consideration. Consultation with Aboriginal people continues to be a priority for the ECC in the process of forming land use recommendations for the Box-Ironbark region.

The protection of historic places is also endorsed by the ECC, in line with a number of submissions. New reserves are proposed, and other historic sites listed for protection.

17.7 Social and economic issues

The social and economic implications of land use changes are important factors in the ECC investigation process and were raised in many submissions.

Changes to forest use have an impact on local communities, which prompted some submissions to call for redundancy payments or re-employment schemes for discharged forest workers. Similarly, a

metal detector buy-back scheme was proposed if prospecting was restricted.

Other submissions called for adequate economic values to be placed on non-timber forest 'products' such as tourism. Similarly, it was argued that timber products should be priced appropriately to reflect the environmental costs of harvesting. A number of arguments were made for the proceeds of forestry to be returned to forest management and rehabilitation.

Response

The ECC commissioned a comprehensive social and economic study of the effects of its proposals (see Appendix 3). The implementation matters raised are for Government and land managers to determine; however, the Council considers that any adverse effects of its recommendations should be implemented with equity, consultation and appropriate measures.

17.8 Public land management – consultation and strategic planning

Various land management issues were raised in submissions (both in general and applying to

particular locations) regarding fire protection, control of pest plants and animals, support for and opposition to closure of tracks, the need for more resources and similar matters.

Response

The ECC is a strategic planning organisation. In general, land management is the role of the Department of Natural Resources and Environment and other managers. The protection of the forests, both state forests and parks, from fire, pests and erosion, is a priority for all public land managers.

Concluding remarks

The ECC is committed to ensuring that the public is involved in continuing decision-making on public land use. The ECC strongly supports public involvement in this process and has made efforts to consult with groups affected by the proposals in this Draft Report.

The publication of the report heralds another opportunity for public involvement in the strategic *planning process*. The ECC will *continue to take* into account social and economic effects.

In addition to involvement in this consultation process, the ECC encourages members of the public to become involved in public land management through groups such as 'Friends of Parks'.

Public response to this report will inform the production of the Final Report. That report will make final recommendations for the protection and use of Box-Ironbark forests and woodlands, which will shape the public land use policy in the region for some time to come. This is an opportunity to make sure all views are represented.

The ECC looks forward to hearing from all interested persons and groups.

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Glossary

Acronyms

AAV	Aboriginal Affairs Victoria	IUCN	International Union for the Conservation of Nature and Natural Resources now generally referred to as the World Conservation Union.
ANZECC	Australian and New Zealand Environment and Conservation Council	JANIS	Joint ANZECC / MCFFA National Forest Policy Statement Implementation Subcommittee
BITA	Box-Ironbark Timber Assessment Project	LCC	Land Conservation Council
CAR	Comprehensive, Adequate and Representative	MCFFA	Ministerial Council on Forestry, Fisheries and Aquaculture
dbh	Diameter at breast height (1.3m)	NRE	Department of Natural Resources and Environment
dbhob	Diameter at breast height over bark	NRSP	National Reserve System Program
ECC	Environment Conservation Council	RFA	Regional Forest Agreement
EVC	Ecological Vegetation Class	WUP	Wood Utilisation Plan
FISAP	Forest Industry Structural Adjustment Package		
FMA	Forest Management Area		
GIS	Geographic Information System		

Aureole A zone of metamorphosed rock surrounding an igneous (granitic) intrusion, often resistant to weathering so higher than adjoining land.

Avifauna Bird life.

Basal area The sum of the cross sectional areas measured at breast height (1.3 m from the ground) of trees in a given stand. Usually expressed in square metres per hectare (m²/ha).

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.

Box-Ironbark Timber Assessment (report) The Box-Ironbark Timber Assessment (BITA) examined all Box-Ironbark state forests within the Bendigo Forest Management Area (FMA) and adjacent Pyrenees Range in the Midlands FMA. The primary objective of this project was to provide accurate and reliable timber resource information for the purposes of determining a sustainable yield rate for the Bendigo FMA.

Carbon in pulp A process to extract gold from quartz.

Catchment management authority (CMA) One of ten regional bodies responsible for strategic planning and coordination of Victoria's land and water resources. Four CMA regions overlap the Box-Ironbark study area: Wimmera, North Central, Goulburn Broken, and North East.

Code of Forest Practices for Timber Production The set of principles and, in some cases, minimum standards 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.

Complex (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.

Comprehensive regional assessment A joint Commonwealth/State assessment of all forest values—environmental, heritage, economic and social—leading to the establishment of a comprehensive, adequate and representative reserve system and the signing of a Regional Forest Agreement.

Comprehensive, adequate and representative (CAR) reserve system A reserve system with the following attributes:

comprehensive: the degree to which the full range of ecological communities and their biological diversity is incorporated in the reserve system;

adequate: the reserve system's ability to maintain the ecological viability and integrity of populations, species and communities; and

representative: the extent to which areas selected for inclusion in the reserve system are capable of reflecting the known biological diversity and ecological patterns and processes of the ecological community or ecosystem concerned.

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. For example, in Victoria, the World Conservation Union (IUCN 1994b) classification is used to describe the conservation status of vertebrates. In order to qualify for a threat 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 Appendix 1).

Contact era or cultural 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.

Cultural heritage value Historic, scientific, social or aesthetic value for past, present or future generations.

Dedicated reserve A reserve 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 1994a). The status of dedicated reserves is secure, requiring action by Parliament or in accordance with legislation for reservation or revocation. Dedicated reserves include, but are not limited to, parks under the *National Parks Act 1975* and flora, fauna and nature conservation reserves under the *Crown Land (Reserves) Act 1978*.

Diameter at breast height over bark (dbhob) Diameter of a tree at 1.3 metres above the ground, measured to include the bark. Because the bark of red and mugga ironbarks in particular can be several centimetres thick, the diameter of a standing ironbark (over bark) can be considerably greater than that of the log (stripped of bark) cut from the trunk of the same tree. Diameter at breast height is useful in calculating timber volumes and tree age. For clarity in this report, dbhob is often abbreviated to dbh (diameter at breast height), without meaning to imply that the measurement does not include the bark. Following Soderquist and Rowley (1995), trees of 60 cm dbh or greater are considered 'large old trees'.

Disjunct populations Disjunct populations are physically separated from one another; that is, there is no gene flow between the populations. They are formed over time due to the appearance of a barrier in a (usually) formerly continuous distribution. Disjunct populations often have distinctive features in an evolutionary sense from the 'parent' population, and in time may become separate species.

Ecological vegetation classes (EVCs) Components of a vegetation classification system derived from groupings of vegetation communities based on floristic, structural and ecological features.

Ecosystem A set of naturally co-occurring and interacting species associated with a particular setting in the physical environment. The aggregate of plants, animals and other organisms, the non-living parts of the environment with which these organisms interact, and their interactions. A dynamic complex of plant, animal, fungal and micro-organism communities and the associated non-living environment interacting as an ecological unit.

Endemic species Species confined to a particular region or locality.

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.

Exempt Crown Land Land owned by the Crown upon which, under the *Mineral Resources Development Act 1990*, exploration or mining is not permitted, except under a licence current at the time of declaration of the land in one of the public land use categories which are exempt, and subject to Section 40 of the *National Parks Act 1975*; includes national, state and wilderness parks, and reference areas.

Fauna refuge Moist gullies within Box-Ironbark forests and woodlands offering refuge to fauna during fire and drought. These areas tend to have a higher diversity of species than the surrounding forest.

Forest Industry Structural Adjustment Package (FISAP) A joint Commonwealth and Victorian Government agreement on implementing a program to assist the native forest hardwood timber industry in Victoria. Its purposes are to provide funding for industry development, necessary restructuring of industry, and assistance to those businesses directly affected by the outcomes of Regional Forest Agreements.

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.

Forest structure Refers to the main features of the physical form of the forest—such as the density and height of vegetation layers (e.g. canopy, shrub layer, ground layer), the amount of fallen timber, and size and density of trees—as opposed to the topography, or species of plants present, for instance.

Fossicking The use of metal detectors, hand tools, pans or simple sluices to search for relics or gemstones.

Fossicking authority A (tourist) fossicking authority entitles the holder and any person accompanied by the holder to search for minerals on private land with the consent of the owner and on Crown land (other than land exempted under Sections 6 or 7 of the *Mineral Resources Development Act 1990*). Where land is covered by a mining licence the holder must obtain permission to fossick from the licensee.

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.

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).

Indigenous vegetation Vegetation native to a particular location.

Inland hills One of the two principal physiographic divisions of the Box-Ironbark study area. The inland hills account for around half of the study area, mostly west of the Goulburn River but also in scattered hills adjacent to the Hume Highway. They are generally low, gentle hills—steeper in the south—mostly on Palaeozoic sediments, granites, and associated metamorphics. The other principal division is the northern plains.

Interim Biogeographic Regionalisation of Australia (IBRA) A regional framework delineating natural regions based on biophysical, environmental and vegetation considerations—for example, climate, soils, landform, vegetation, flora and fauna, and land use—that allow cross-border regionalisation.

JANIS criteria Criteria for the establishment of a comprehensive, adequate and representative (CAR) system of forest reserves (refer to Appendix 7).

Land use determination (specifically for water catchments) Some water supply catchments have prescribed land uses as described in the transition arrangements of the *Catchment and Land Protection Act 1994*.

Large old tree A tree of 60 cm dbh or greater (Soderquist and Rowley 1995).

Large old tree site A site with at least six large old trees per hectare.

Low impact exploration Mining exploration that aims to leave a site in the same condition it was in prior to exploration, with minimal disturbance to the associated biota and habitat (see Chapter 5).

Metal detecting The use of an electronic metal detector to prospect for gold or other minerals, or to fossick for metal relics.

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.

Mosaic (EVC mosaic) A vegetation unit consisting of discrete EVCs which were unable to be distinguished in the mapping due to the scale used.

National estate Those places 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. National estate places are listed on the Register of the National Estate, maintained by the Commonwealth Government.

Northern plains One of the two principal physiographic divisions of the Box-Ironbark study area—the other is the inland hills. The northern plains account for around half of the study area, mostly east of the Goulburn River and north of about Serpentine or Rushworth. The northern plains have been formed by alluvium deposited on the former floodplains of ancient watercourses over the last 2 million years. They are almost flat, broken only by occasional sand ridges or low Palaeozoic rises.

Plantation An area planted with commercial tree species; for uses such as, timber or eucalypt oil production.

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 and pre-European settlement.

Prescriptions (for timber harvesting) The standards specified within the *Code of Forest Practices for Timber Production* which describe acceptable management practices related especially to timber harvesting. They have regulatory status.

Prospecting The use of metal detectors, hand tools, pans or simple sluices to search for gold or other minerals, requiring a miner's right or mining licence under the *Mineral Resources Development Act 1990*.

Public Land Use Categories Refer to the table below.

Puddler A structure for separating gold from dug soil and rock using a water-filled trough, often circular and agitated by a horse-drawn paddle.

Recovery plan A management plan intended to ensure the long-term conservation of a species, prepared under the Commonwealth *Endangered Species Protection Act 1992* for species listed on Schedules of that Act.

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. The purpose is to reduce uncertainty, duplication and fragmentation in government decision-making by establishing a durable agreement on the management and use of forests.

Regional water authority Statutory authorities, such as Coliban Water, responsible for supplying water primarily to urban consumers and the disposal of waste water from towns.

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.

Richness (of plant or animal species) Number of species in a given area.

Riparian Associated with watercourse banks.

Rogaining A sport of long distance cross-country navigation (similar to orienteering) in which teams of two to five members visit as many checkpoints as possible in 24 hours. Teams travel entirely on foot, navigating by map and compass between checkpoints in terrain that varies from open farmland to hilly forest.

Silviculture The theory and practice of managing forest establishment, composition and growth, to achieve specified objectives.

Small blocks Small parcels of Crown land that are not contiguous with larger public land blocks.

Special area plan A plan developed for special water supply catchment areas as defined under the *Catchment and Land Protection Act 1994*.

Special Management Zone (in FMA plans) 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 FMA plans) 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.

Special water supply catchment areas Under the *Catchment and Land Protection Act 1994*, water catchments can be declared as 'special water supply catchment areas', and subsequently a 'special area plan' (or a pre-existing 'land use determination') can be prepared to guide catchment land use.

Species A group of organisms capable of interbreeding with each other.

Thinning The removal of coppice regrowth or regenerated trees. This can be used to reduce the number of trees per hectare as a silvicultural tool and also to more closely replicate pre-European densities and forest structure.

Tourist fossicking authority A mining title under the *Mineral Resources Development Act 1990*. This permits tour promoters to take groups around former goldfields within the tourist fossicking authority area, and search for minerals with metal detectors or by panning. Hand tools only are used for any digging; no tree or shrub, or Aboriginal archaeological object is to be disturbed or removed.

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.

Value-adding The further processing of commodities into higher quality, high value goods.

Visitor days Accumulated number of visits to a site including overnight stays.

Whim Historical mining feature used for deep lead mining with deep shafts. A whim consisted of a large drum with a few turns of cable wound on it. Both ends of the cable were left free to run over pulleys down the shaft. A bucket (kibble) was attached to each end of the cable. As the horse walked around, the drum revolved and one bucket would be lowered down the shaft as the other was raised. A special harness was used which enabled the horse to turn around and walk in the opposite direction in order to reverse the movement of the buckets.

Wood utilisation plan Details an area to be harvested, and the type and quantity of wood to be produced from an FMA in any one year and provisionally for the succeeding two years; together with the allocation of timber to licensees. It provides detailed maps and sawlog quantities by grade for the next year's harvesting and estimates for the following two.

Work authority The holder of a mining licence must meet a number of criteria to obtain a work authority for extractive industry (*Extractive Industries Development Act 1995*); such as, the submission of a rehabilitation plan and payment of a bond, before commencing work.

Working circle A geographical subdivision for forest management purposes; for example, Bendigo FMA is divided into six working circles (see Figure 15.1).

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.

Public land use categories—Revised and former classification systems

Revised category	Revised sub-categories	Equivalent former category	Relevant chapter
Reference Area		Reference Area	16
National Park		National Park	13
State Park		State Park	13
Regional Park		Regional Park Multi-purpose Park	14 –
Nature Conservation Reserve		Flora Reserve Flora and Fauna Reserve	14 14
Natural Features Reserve	Natural and Scenic Features Area Geological & Geomorphological Features Area Wildlife Area River Murray Reserve Streamside Area Stream Frontages, Beds and Banks Bushland Area Highway Park	Scenic Reserve Geological Reserve or Monument Wildlife Reserve River Murray Reserve Streamside Reserve Public Land Water Frontage Reserve Stream Beds and Banks Bushland Reserve Highway Park	16 16 16 – 16 16 16 16 16 16
Water Production		Water Production	16
Historic and Cultural Features Reserve		Historic Area Historic Reserve	14 14
Community Use Area	Education Area Recreation Area Parklands and Gardens Buildings in Public Use	Education Area Recreation Reserve – Utilities and Survey, Other Reserves and Public Land (containing schools, public halls, other buildings in public use etc)	16 16 16 16
State Forest		State Forest Hardwood Production Uncommitted Land Eucalyptus Oil Production	15 15 15 15
Plantation	Softwood plantation Hardwood plantation	Softwood Production –	16 16
Earth Resources	Mining Site Stone Reserve	– Mineral and Stone Production - 'Stone' Area	16 16
Services and Utilities	Transport Electricity and Gas Hospitals, public offices and justice Water and sewerage services Cemeteries Other utility uses	Roadside Conservation, Utilities and Survey Utilities and Survey Utilities and Survey Water Regulation and Drainage; Utilities and Survey (some) Cemeteries Agricultural research; Utilities and Survey, Township Land, Other Reserves and Public Land (some in each)	16 16 16 16 16 16
Uncategorised Public Land		Township Land (for future township requirements) <i>Other Reserves and Public Land (some)</i> Revegetation Area	16 – –
Land not required for public purposes		Township Land (some) Agriculture	16

Note: Wildlife reserves classified by NRE as not available for hunting are included as Nature Conservation Reserves. Those wildlife reserves where hunting may be permitted are Natural Features Reserves.

Key information sources

General Box-Ironbark information

The ECC's *Resources and Issues Report (1997)* summarised information on the resources, uses, environmental and recreational values, and relevant issues in the Box-Ironbark study area.

Social and economic studies

The following studies were commissioned by ECC for the Box-Ironbark investigation:

- Essential Economics and Read Sturgess Associates (1998)—Stage 1 Social and economic profile of the Box-Ironbark Forests and Woodlands Area.
- Essential Economics (1998)—Stage 1A Survey of Licence Holders.
- Read Sturgess Associates and Essential Economics (2000)—Stage 2 Assessment of the Effects of Proposals in the Draft Report.

Recreation and tourism (including prospecting)

- A report, Brookes (1997), was substantially funded by the Department of Primary Industries and Energy to assess fossicking and other recreation in the Box-Ironbark area. This project collated available information and included a draft chapter for the ECC's *Resources and Issues Report (1997)*.
- Read Sturgess Associates (1999) and Read Sturgess Associates and Henshall Hansen Pollock Associates (1995) provided information on, respectively, recreation in parks and state forests at the statewide level.
- The annotated prospecting map series, Stone (1979–1999), provide local information on sites of interest to prospectors.

Historic features

- The series of mining archaeological studies by Bannear for the North Central Goldfields Project (Bannear 1993a–g; 1994a,b; 1995) are well-researched and have field notes and location maps for most mining sites.
- A study for the Commonwealth Government and NRE of historical forest activity sites—charcoal, eucalyptus oil and tanbark production, forest camps, silviculture sites, and forest infra-structure by Bannear (1997), provided historical accounts and current site descriptions of places in the Box-Ironbark and Midlands areas.
- Butler (1997) assessed 1100 sites from historical themes other than mining and forest activities, and provided detailed assessments of 120 of these sites, for Environment Australia and ECC.

Public land management

- The Department of Natural Resources and Environment and its predecessors, and Parks Victoria, have produced a number of management plans for existing parks and reserves, for example CFL (1988); Parks Victoria (1998a,b). Forest Management Plans have been prepared for the Midlands and North East Forest Management Areas, the latter in conjunction with the *North East Regional Forest Agreement (Commonwealth of Australia and Government of Victoria 1999)*.
- Prior to ECC, the public land use framework was provided by the series of Land Conservation Council investigations which resulted in final recommendations to government, for example LCC (1981–1997).

Considerable assistance was received from various public land managers, both office and field staff, particularly Forestry Victoria foresters and forest officers, and Parks Victoria rangers.

Flora and fauna

Information on threatened flora and fauna distribution and abundance was obtained from the Flora Information System and the Atlas of Victorian Wildlife—NRE databases that contain several million records. Combined outputs from these databases were printed as 1:100 000 Biomaps for much of the study area.

Two studies were of particular assistance, providing descriptions and maps of high value locations:

- Sites of botanical significance in the Box-Ironbark study area, by Muir (1996); and
- Sites of high conservation value for fauna in the Box-Ironbark area, by Lumsden *et al.* (1997)

Studies to identify sites with large old trees and fauna refuges were important sources:

- Soderquist and Rowley (1995) identified large old tree sites in State forests in Bendigo FMA;
- Holland and Cheers (1999) identified large old tree sites in existing parks and reserves in Bendigo FMA, and on public land outside this FMA;
- Holland and Cheers (1999) also identified fauna refuges in public land areas not studied in the two following projects;
- Robinson and Rowley (1994, 1996) identified fauna refuges across most of Bendigo FMA
- NRE Forests Service provided digital mapping of the large old tree sites and fauna refuges.

Other key sources were:

- Flora and Fauna Guarantee information for listed threatened species was valuable, for example: Scientific Advisory Committee (1991, 1996); Benshemesh (1994); and Hills and Boekel (1996).

- The study of values and threats along the Broken, Boosey and Nine Mile Creeks by Robinson and Mann (1996a, b) contains detailed information on these areas.
- The series of Box-Ironbark fauna research and management projects carried out by Deakin University, Monash University and Arthur Rylah Institute were valuable, including the published data sheets, Stothers (ed. 1999).

Staff of NRE Parks Flora and Fauna Division were particularly helpful in providing data and information in response to a large number of varied enquiries.

Timber production and forest management

- NRE Forests Service's Box-Ironbark Timber Assessment (BITA) project report was a key data source for timber information (NRE 1998a).
- The forest management model prepared by Forests Service, NRE (1999), used the BITA data to model wood product volumes before and after the ECC's proposals.
- NRE Forests Service provided spreadsheets with production levels for each forest product in each work centre in Bendigo FMA, from 1986/87 to 1998/99.
- Timber productivity classes were provided by NRE Forests Service in map and spreadsheet form, for each forest block.
- Forest Management Area plans for parts of the study area—Midlands, Central Highlands, North East—contained information for those areas.
- The North East Victoria and West Victoria Regional Forest Agreements were relevant to areas within the Box-Ironbark study area included in those regions.

Over the course of many frequent discussions, field and office staff of NRE Forests Service and Forestry Victoria were of great assistance in providing and interpreting information as required.

Eucalyptus oil production

Detailed digital mapping of areas harvested for eucalyptus oil, and associated data tables, were provided by Forests Service.

Mining

- Data on mineral and stone resources, prospectivity, exploration and mining was prepared for ECC block descriptions by NRE Minerals and Petroleum Victoria, McHaffie (1999; unpublished).
- A report on mining disturbance on public land, NRE (1998b), assisted with quantified information.
- Minerals and Petroleum Victoria provided maps and other data on mining licences and leases, exploration licences, mineral occurrences and quarries in the study area (1999).

Minerals and Petroleum Victoria staff were extremely helpful in providing and interpreting information relating to mining, exploration and extractive industries.

Geological heritage

Rosengren and Joyce (in prep.) provided data on sites of geological and geomorphological sites of significance.

Apiculture

- Gibbs and Muirhead (1998) and Paton (1996) provided important information on apiculture.
- Locations of licensed bee sites were provided by Forestry Victoria, Land Victoria, and Parks Victoria.

Small blocks

- A project funded by the Commonwealth Government, Davidson *et al.* (1997; unpublished) collected detailed information on 120 selected small public land parcels with remnant vegetation across the study area.
- NRE Land Victoria, Bendigo office enabled access to recent on-ground information on several thousand Crown land assessments for small public land parcels prepared or overseen by Land Victoria staff.

Land Victoria staff assisted in providing information required on a large number of particular parcels.

Appendix 1

Common names, scientific names and conservation status of flora and fauna species

Note: The legend is at the end of this Appendix.

		Aust	ESP	Vic	FFG
Threatened fauna					
squirrel glider	<i>Petaurus norfolcensis</i>			e	L
spot-tailed quoll	<i>Dasyurus maculatus</i>		V	e	15
brush-tailed phascogale	<i>Phascogale tapoatafa</i>			v	79
grey-headed flying-fox	<i>Pteropus poliocephalus</i>			v	N
greater long-eared bat	<i>Nyctophilus timoriensis</i>			v	N
square-tailed kite	<i>Lophoictinia isura</i>			e	N
grey falcon	<i>Falco hypoleucos</i>			ce	83
black falcon	<i>Falco subniger</i>			e	
red-chested button-quail	<i>Turnix pyrrhothorax</i>			v	
bush stone-curlew	<i>Burbinus grallarius</i>			e	78
malleefowl	<i>Leipoa ocellata</i>	v	V	e	59
diamond dove	<i>Geopelia cuneata</i>			v	
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>			v	L
swift parrot	<i>Lathamus discolor</i>	v	E	e	L
superb parrot	<i>Polytelis swainsonii</i>	v	V	e	33
powerful owl	<i>Ninox strenua</i>			e	92
barking owl	<i>Ninox connivens</i>			e	N
masked owl	<i>Tyto novaehollandiae</i>			e	L
red-backed kingfisher	<i>Todiramphus pyrrhopygia</i>			v	
speckled warbler	<i>Chthonicola sagittata</i>			v	N
regent honeyeater	<i>Xanthomyza phrygia</i>	e	E	ce	41
painted honeyeater	<i>Grantiella picta</i>			v	L
grey-crowned babbler	<i>Pomatostomus temporalis</i>			e	34
ground cuckoo-shrike	<i>Coracina maxima</i>			e	
apostlebird	<i>Struthidea cinerea</i>			v	N
rugose toadlet	<i>Uperoleia rugosa</i>			e	
pink-tailed worm-lizard	<i>Aprasia parapulchella</i>	e	E	e	L
hooded scaly-foot	<i>Pygopus nigriceps</i>			ce	L
woodland blind snake	<i>Ramphotyphlops proximus</i>			v	
carpet python	<i>Morelia spilota variegata</i>			e	L
large ant-blue butterfly	<i>Acrodipsas brisbanensis</i>			E	70
genoveva azure butterfly	<i>Ogyris genoveva genoveva</i>			R	

		Aust	ESP	Vic	FFG
Near threatened fauna					
common dunnart	<i>Sminthopsis murina</i>			dd	
large-footed myotis	<i>Myotis adversus</i>			lr	
brown quail	<i>Coturnix psilophora</i>			dd	
grey goshawk	<i>Accipiter novaehollandiae</i>			lr	
little button-quail	<i>Turnix velox</i>			dd	
turquoise parrot	<i>Neophema pulchella</i>			lr	L
chestnut-rumped heathwren	<i>Hylacola pyrrhopygia</i>			dd	
tree goanna	<i>Varanus varius</i>			dd	
bandy bandy	<i>Vermicella annulata</i>			lr	L
bull-ant	<i>Myrmecia</i> sp. 17				L

Other fauna	
platypus	<i>Ornithorhynchus anatinus</i>
brown treecreeper	<i>Climacteris picumnus</i>
red-capped robin	<i>Petroica goodenovii</i>
crested shrike-tit	<i>Falcunculus frontatus</i>
diamond firetail	<i>Stagonopleura guttata</i>
tree martin	<i>Hirundo nigricans</i>

		Aust	ESP	Vic	FFG
Threatened flora					
Ausfeld's wattle	<i>Acacia ausfeldii</i>	R		V	X
bald-tip beard-orchid	<i>Calochilus richiae</i>	E	E	E	5
buloke mistletoe	<i>Amyema linophylla orientale</i>			V	
candy spider-orchid	<i>Caladenia versicolor</i>	V	V	V	
clover glycine	<i>Glycine latrobeana</i>	V	V	V	L
coolibah grass	<i>Panicum queenslandicum</i> var. <i>queenslandicum</i>			E	
crimson spider-orchid	<i>Caladenia concolor</i>	V	V	E	L
dainty phebalium	<i>Phebalium festivum</i>	R		V	L
Deane's wattle	<i>Acacia deanei deanei</i>			E	L
delicate love-grass	<i>Eragrostis tenellula</i>			E	
Dookie daisy	<i>Brachyscome gracilis</i>			V	N
downy Swainson-pea	<i>Swainsona swainsonioides</i>			E	
erect pepper-cress	<i>Lepidium pseudopapillosum</i>	V	V	E	L
Euroa guinea-flower	<i>Hibbertia humifusa erigens</i>	V		V	L
Fitzgerald's leek-orchid	<i>Prasophyllum fitzgeraldii</i>			E	N
green leek-orchid	<i>Prasophyllum lindleyanum</i>			V	X

		Aust	ESP	Vic	FFG
Threatened flora					
Jericho wire-grass	<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>			E	
Kamarooka mallee	<i>Eucalyptus froggattii</i>	R		V	27
lanky buttons	<i>Leptorhynchus elongatus</i>			E	
large-fruit fireweed	<i>Senecio macrocarpus</i>	V		E	68
leafless bluebush	<i>Maireana aphylla</i>			V	
long eryngium	<i>Eryngium paludosum</i>			V	
long-tail greenhood	<i>Pterostylis woollsi</i>	R		E	L
lowly greenhood	<i>Pterostylis despectans</i>	E		E	L
maroon leek-orchid	<i>Prasophyllum frenchii</i>	E	E	E	N
mallee golden wattle	<i>Acacia notabilis</i>			V	
McIvor spider-orchid	<i>Caladenia audasii</i>	E	E	E	24
mountain swainson-pea	<i>Swainsona recta</i>	E	E	E	L
Mueller daisy	<i>Brachyscome muelleroides</i>	V		E	L
myall	<i>Acacia melvillei</i>			V	
narrow goodenia	<i>Goodenia macbarronii</i>	V		V	72
narrow-leaf emu-bush	<i>Eremophila sturtii</i>			E	L
northern sandalwood	<i>Santalum lanceolatum</i>			E	75
pale spike-sedge	<i>Eleocharis pallens</i>			V	
pepper grass	<i>Panicum laevinode</i>			E	
plains leek-orchid	<i>Prasophyllum campestre</i>	R		E	X
Pomonal leek-orchid	<i>Prasophyllum subbisectum</i>	E	E	E	L
purple diuris	<i>Diuris punctata</i> var. <i>punctata</i>			V	L
purple eyebright	<i>Euphrasia collina diversicolor</i>			V	N
purple wire-grass	<i>Aristida personata</i>			E	
scented bush-pea	<i>Pultenaea graveolens</i>			V	L
silky glycine	<i>Glycine canescens</i>			E	L
silky umbrella grass	<i>Digitaria ammophila</i>			V	
slender club-sedge	<i>Isolepis congrua</i>			V	N
slender darling-pea	<i>Swainsona murrayana</i>	V		E	L
slender sunray	<i>Rhodanthe stricta</i>			E	L
small-leaf bluebush	<i>Maireana microphylla</i>			E	
small milkwort	<i>Comesperma polygaloides</i>			V	96
small scurf-pea	<i>Cullen parvum</i>	E		E	
smooth darling-pea	<i>Swainsona galegifolia</i>			E	76
southern shepherd's purse	<i>Ballantinia antipoda</i>	E	E	E	L
spiny-fruit saltbush	<i>Atriplex spinibractea</i>			E	
spotted gum	<i>Corymbia maculata</i>			V	
straw wallaby-grass	<i>Austrodanthonia richardsonii</i>			V	

		Aust	ESP	Vic	FFG
Threatened flora					
swamp billy-buttons	<i>Craspedia paludicola</i>			V	
swamp diuris	<i>Diuris palustris</i>			V	N
tawny spider-orchid	<i>Caladenia fulva</i>	E	E	E	L
three-nerve wattle	<i>Acacia trineura</i>			V	
tick indigo	<i>Indigofera adesmisifolia</i>			V	
tough scurf-pea	<i>Cullen tenax</i>			E	
trailing hop-bush	<i>Dodonaea procumbens</i>	V	V	V	
turnip-fruit copperburr	<i>Sclerolaena napiformis</i>	E		E	N
twin-leaf emu-bush	<i>Eremophila oppositifolia oppositifolia</i>			V	
umbrella grass	<i>Digitaria divaricatissima</i>		V	V	
veined pepper-cress	<i>Lepidium phlebopetalum</i>			E	
veined spider-orchid	<i>Caladenia reticulata</i>			V	
velvet daisy-bush	<i>Olearia pannosa cardiophylla</i>	R		V	L
Warby Range swamp gum	<i>Eucalyptus cadens</i>	V	V	V	21
weak daisy	<i>Brachyscome debilis</i>			V	
weeping myall	<i>Acacia pendula</i>			E	L
western golden-tip	<i>Goodia medicaginea</i>			R	
western silver wattle	<i>Acacia decora</i>			V	
Whipstick westringia	<i>Westringia crassifolia</i>	E	E	E	40
whorled zieria	<i>Zieria aspalathoides</i>			V	L
winged New Holland daisy	<i>Vittadinia pterochaeta</i>			V	
winged pepper-cress	<i>Lepidium monophlooides</i>	E		E	L
woolly plover-daisy	<i>Isiolaena tomentosa</i>			V	
yarran wattle	<i>Acacia omalophylla</i>			E	L
yellow hyacinth-orchid	<i>Dipodium hamiltonianum</i>			E	82
yellow-lip spider-orchid	<i>Caladenia xanthochila</i>	E		E	L
yellow-tongue daisy	<i>Brachyscome chrysoglossa</i>			V	N

		Aust	ESP	Vic	FFG
Near threatened flora					
austral trefoil	<i>Lotus australis</i>			K	
Australian millet	<i>Panicum decompositum</i>			K	
bear's-ears	<i>Cymbonotus lawsonianus</i>			R	
billabong daisy	<i>Brachyscome gracilis</i> (Kings Billabong)			K	N
bitter cryptandra	<i>Cryptandra amara</i> var. <i>longiflora</i>			R	
bluish raspwort	<i>Haloragis glauca glauca</i>			K	
bristly greenhood	<i>Pterostylis setifera</i>			R	
broad-lip leek-orchid	<i>Prasophyllum patens</i>			R	
broom bitter-pea	<i>Daviesia genistifolia</i>			R	
buloke	<i>Allocasuarina luehmannii</i>				L
cane spear-grass	<i>Austrostipa breviglumis</i>	R		R	
club-hair New Holland daisy	<i>Vittadinia condyloides</i>			R	
corkscrew spear-grass	<i>Austrostipa setacea</i>			R	
cotton panic-grass	<i>Digitaria brownii</i>			K	
cream spider-orchid	<i>Caladenia patersonii</i>			K	
creeping grevillea	<i>Grevillea repens</i>	R		R	
dark wire-grass	<i>Aristida calycina</i> var. <i>calycina</i>			R	
dense mint-bush	<i>Prostanthera decussata</i>			R	
forde poa	<i>Poa fordeana</i>			K	
Fryerstown grevillea	<i>Grevillea obtecta</i>	R		R	
galvanised burr	<i>Sclerolaena birchii</i>			K	
granite love-grass	<i>Eragrostis alveiformis</i>			K	
grey podolepis	<i>Podolepis canescens</i>			R	
hairy hop-bush	<i>Dodonaea boronifolia</i>			R	
hairy tails	<i>Ptilotus erubescens</i>				L
half-bearded spear-grass	<i>Austrostipa hemipogon</i>			R	
magnificent spider-orchid	<i>Caladenia magnifica</i>	K		K	L
mallee tussock-grass	<i>Poa lowanensis</i>	R		R	
naked beard-orchid	<i>Calochilus imberbis</i>			R	
narrow-leaf sida	<i>Sida trichopoda</i>			R	
outcrop guinea-flower	<i>Hibbertia hermannifolia</i>	R		R	
quinetia	<i>Quinetia urvillei</i>			R	
Reader's daisy	<i>Brachyscome readeri</i>			R	
rising star guinea-flower	<i>Hibbertia humifusa humifusa</i>	R		R	
Rohrlach's bluebush	<i>Maireana rohrlachii</i>	R			
rye beetle-grass	<i>Tripogon loliformis</i>			R	

		Aust	ESP	Vic	FFG
Near threatened flora					
scaly greenhood	<i>Pterostylis hamata</i>			R	
sharp midge-orchid	<i>Genoplesium despectans</i>			K	
shrubby dampiera	<i>Dampiera dysantha</i>			R	
sikh's whiskers	<i>Pterostylis boormanii</i>			R	
slender ruddyhood	<i>Pterostylis aciculiformis</i>			K	
slender tick-trefoil	<i>Desmodium varians</i>			K	
slender water-ribbons	<i>Triglochin dubium</i>			R	
small burr-grass	<i>Tragus australianus</i>			R	
small-leaf wax-flower	<i>Philothea difformis difformis</i>			R	
smooth minuria	<i>Minuria integerrima</i>			R	
southern swainson-pea	<i>Swainsona bebriana</i>			R	
spotted emu-bush	<i>Eremophila maculata</i> var. <i>maculata</i>			R	
spurred spear-grass	<i>Austrostipa gibbosa</i>			R	
streaked wattle	<i>Acacia lineata</i>			R	
tall wallaby-grass	<i>Austrodanthonia</i> sp. (syn. <i>Danthonia procera</i>)			K	
waterbush	<i>Myoporum montanum</i>			R	
Williamson's wattle	<i>Acacia williamsonii</i>	R		R	X
woolly buttons	<i>Ixiolaena</i> sp. (syn. <i>Leptorhynchus panaetioides</i>)			R	
woolly cloak-fern	<i>Cheilanthes lasiophylla</i>			R	

Other flora

austral bear's-ears	<i>Cymbonotus preissianus</i>
austral bracken	<i>Pteridium esculentum</i>
austral bugle	<i>Ajuga australis</i>
austral cranesbill	<i>Geranium solanderi</i>
beard heath	<i>Leucopogon</i> spp.
bidgee-widgee	<i>Acaena novae-zelandiae</i>
black bristle-sedge	<i>Chorizandra enodis</i>
black wattle	<i>Acacia mearnsii</i>
Black's goodenia	<i>Goodenia blackiana</i>
black-anther flax-lily	<i>Dianella revoluta</i>
blackwood	<i>Acacia melanoxydon</i>
blue burr-daisy	<i>Calotis cuneifolia</i>
blue finger-flower	<i>Cheiranthra cyanea</i> var. <i>cyanea</i>
blue gum	<i>Eucalyptus globulus</i>
blue mallee	<i>Eucalyptus polybractea</i>
blue pincushion	<i>Brunonia australis</i>
bottle bluebush	<i>Maireana excavata</i>
bristly wallaby-grass	<i>Austrodanthonia setacea</i>

Other flora

broombush	<i>Melaleuca uncinata</i>
brush heath	<i>Brachyloma ericoides ericoides</i>
bulbine lily	<i>Bulbine bulbosa</i>
bull mallee	<i>Eucalyptus behriana</i>
cane wire-grass	<i>Aristida ramosa</i>
chocolate lily	<i>Dichopogon</i> spp.
clustered everlasting	<i>Chrysocephalum semipapposum</i>
common beard-heath	<i>Leucopogon virgatus</i>
common bog-sedge	<i>Schoenus apogon</i>
common cutaxia	<i>Eutaxia microphylla</i>
common fringe-myrtle	<i>Calytrix tetragona</i>
common hovea	<i>Hovea linearis</i>
common lagenifera	<i>Lagenifera stipitata</i>
common raspwort	<i>Gonocarpus tetragynus</i>
common rice-flower	<i>Pimelea humilis</i>
common tussock-grass	<i>Poa labillardierei</i>
common wheat-grass	<i>Elymus scaber</i>
common woodrush	<i>Luzula meridionalis</i>
cotton fireweed	<i>Senecio quadridentatus</i>
cranberry heath	<i>Astroloma humifusum</i>
creamy stackhousia	<i>Stackhousia monogyna</i>
curved rice-flower	<i>Pimelea curviflora</i>
cut-leaf burr-daisy	<i>Calotis anthemoides</i>
daphne heath	<i>Brachyloma daphnoides</i>
drooping cassinia	<i>Cassinia arcuata</i>
drooping she-oak	<i>Allocasuarina verticillata</i>
dwarf bluebush	<i>Maireana humillima</i>
dwarf geebung	<i>Persoonia chamaepeuce</i>
feather spear-grass	<i>Austrostipa elegantissima</i>
flame heath	<i>Astroloma conostephioides</i>
fuzzy New Holland daisy	<i>Vittadinia cuneata</i>
gold-dust wattle	<i>Acacia acinacea</i>
golden pennants	<i>Glischrocaryon behrii</i>
golden wattle	<i>Acacia pycnantha</i>
gorse bitter-pea	<i>Daviesia ulicifolia</i>
green mallee	<i>Eucalyptus viridis</i>
green rock-fern	<i>Cheilanthes austrotenuifolia</i>
grey box	<i>Eucalyptus microcarpa</i>
grey everlasting	<i>Ozothamnus obcordatus</i>
grey guinea-flower	<i>Hibbertia obtusifolia</i>
grey mulga	<i>Acacia brachybotrya</i>
grey tussock-grass	<i>Poa sieberiana</i>

Other flora

hairy panic	<i>Panicum effusum</i>
hedge wattle	<i>Acacia paradoxa</i>
hill red gum	<i>Eucalyptus blakeyi</i>
honey-pots	<i>Acrotriche serrulata</i>
kangaroo grass	<i>Themeda triandra</i>
kidney-weed	<i>Dichondra repens</i>
knob sedge	<i>Carex inversa</i>
kurrajong	<i>Brachychiton populneus populneus</i>
large-leaf bush-pea	<i>Pultenaea daphnoides</i>
late-flower flax-lily	<i>Dianella tarda</i>
leafy templetonia	<i>Templetonia stenophylla</i>
lemon beauty-heads	<i>Calocephalus citreus</i>
lightwood	<i>Acacia implexa</i>
long-hair plume-grass	<i>Dichelachne crinita</i>
long-leaf box	<i>Eucalyptus goniocalyx</i>
magenta stork's-bill	<i>Pelargonium rodneyanum</i>
mallee wattle	<i>Acacia montana</i>
manna gum	<i>Eucalyptus viminalis</i>
many-flowered mat-rush	<i>Lomandra multiflora multiflora</i>
messmate	<i>Eucalyptus obliqua</i>
milkmaids	<i>Burchardia umbellata</i>
mountain ash	<i>Eucalyptus regnans</i>
mountain grevillea	<i>Grevillea alpina</i>
mugga ironbark	<i>Eucalyptus sideroxylon</i>
narrow-leaf bitter-pea	<i>Daviesia leptophylla</i>
nodding blue-lily	<i>Stypandra glauca</i>
nodding saltbush	<i>Einadia nutans nutans</i>
pale flax-lily	<i>Dianella longifolia</i>
peach heath	<i>Lissanthe strigosa subulata</i>
peppermint box	<i>Eucalyptus odorata</i>
plume-grass	<i>Dichelachne sieberiana</i>
prickly tea-tree	<i>Leptospermum continentale</i>
purplish blown grass	<i>Agrostis aemula</i>
red bird's-foot trefoil	<i>Lotus cruentus</i>
red box	<i>Eucalyptus polyanthemus</i>
red ironbark	<i>Eucalyptus tricarpa</i>
red stringybark	<i>Eucalyptus macrorhyncha</i>
red-leg grass	<i>Bothriochloa macra</i>
rice grass	<i>Tetrarrhena</i> spp.
river red gum	<i>Eucalyptus camaldulensis</i>
rock isotome	<i>Isotoma axillaris</i>
rough spear-grass	<i>Austrostipa scabra</i>

Other flora

rough-barked honey-myrtle	<i>Melaleuca parvistaminea</i>
saloop	<i>Einadia hastata</i>
scaly buttons	<i>Leptorhynchos squamatus</i>
scented sundew	<i>Drosera whittakeri aberrans</i>
scurfy pomaderris	<i>Pomaderris paniculosa</i>
sheep's burr	<i>Acaena echinata var. echinata</i>
shiny everlasting	<i>Bracteantha viscosa</i>
short-hair plume-grass	<i>Dichelachne micrantha</i>
silver wattle	<i>Acacia dealbata</i>
silvertop wallaby-grass	<i>Joycea pallida</i>
slender goodenia	<i>Goodenia gracilis</i>
slender rice-flower	<i>Pimelea linifolia</i>
slender sun-orchid	<i>Thelymitra pauciflora</i>
small grass-tree	<i>Xanthorrhoea minor lutea</i>
small mat-rush	<i>Lomandra sororia</i>
small poranthera	<i>Poranthera microphylla</i>
small St. John's wort	<i>Hypericum gramineum</i>
soft tussock-grass	<i>Poa morrisii</i>
southern cane-grass	<i>Eragrostis infecunda</i>
spear grass	<i>Austrostipa</i> spp.
spiky guinea-flower	<i>Hibbertia exutiacies</i>
spreading cutaxia	<i>Entaxia diffusa</i>
spreading wattle	<i>Acacia genistifolia</i>
spur-wing wattle	<i>Acacia triptera</i>
sticky boronia	<i>Boronia anemonifolia</i>
sticky hop-bush	<i>Dodonaea viscosa</i>
sticky sword-sedge	<i>Lepidosperma viscidum</i>
stinking pennywort	<i>Hydrocotyle laxiflora</i>
sugar gum	<i>Eucalyptus cladocalyx</i>
supple spear-grass	<i>Austrostipa mollis</i>
swamp gum	<i>Eucalyptus ovata</i>
sweet bursaria	<i>Bursaria spinosa</i>
sweet quandong	<i>Santalum acuminatum</i>
tall bluebell	<i>Wahlenbergia stricta</i>
tall raspwort	<i>Gonocarpus elatus</i>
tall sedge	<i>Carex appressa</i>
tall sundew	<i>Drosera peltata</i>
thatch saw-sedge	<i>Gabnia radula</i>
totem-poles	<i>Melaleuca decussata</i>
twiggy bush-pea	<i>Pultenaea largiflorens</i>
variable sword-sedge	<i>Lepidosperma laterale</i>
varnish wattle	<i>Acacia verniciflua</i>

Other flora

wallowa	<i>Acacia calamifolia</i>
wattle mat-rush	<i>Lomandra filiformis</i>
wax-lip orchid	<i>Glossodia major</i>
weeping grass	<i>Microlaena stipoides</i> var. <i>stipoides</i>
weeping pittosporum	<i>Pittosporum phylliracoides</i>
white box	<i>Eucalyptus albens</i>
white cypress-pine	<i>Callitris glaucophylla</i>
windmill grass	<i>Chloris truncata</i>
wingless bluebush	<i>Maireana enchylaenoides</i>
wirilda	<i>Acacia retinodes</i>
woolly New Holland daisy	<i>Vittadinia gracilis</i>
yam-daisy	<i>Microseris lanceolata</i>
yellow box	<i>Eucalyptus melliodora</i>
yellow gum	<i>Eucalyptus leucosylon</i>
yellow rush-lily	<i>Tricoryne elatior</i>

LEGEND:

Aust: conservation status in Australia, after ANZECC (1999) and NRE Flora Information System Database

ESP: status under Commonwealth *Endangered Species Protection Act 1992* (to be replaced by the *Environment Conservation and Biodiversity Protection Act* on 1 July 2000)

IUCN (1994b) categories (lower case):

ce – critically endangered
 e – endangered
 v – vulnerable
 lr – lower risk
 dd – data deficient

Vic: conservation status in Victoria, after NRE (2000) and NRE Flora Information System Database

FFG: status under the Victorian *Flora and Fauna Guarantee Act 1988*

N – nominated for listing, awaiting ;
 X – rejected or ineligible for listing;
 L – listed, no action statement published;
 numbers indicate action statement number where published

IUCN (1990) categories (upper case):

E – endangered
 V – vulnerable
 R – rare
 D – depleted
 K – poorly known

Appendix 2

EVCs found in the Box-Ironbark study area

Identification of EVCs

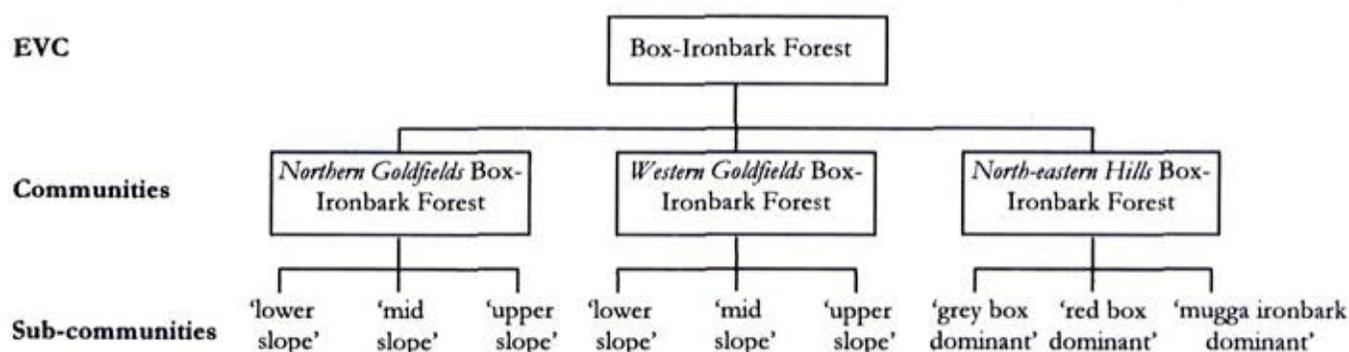
In nature, species with similar habitat requirements tend to co-occur at places where their requirements are met. Ecologists call these co-occurring collections of species **communities**. A vegetation community is a collection of co-occurring plant species—it reflects the vegetation's response to environmental 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, including over 800 sites in the Box-Ironbark study area. 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, as illustrated in the following key example for the Box-Ironbark EVC.



Note the use of italics to signify that part of the name of a vegetation unit which pertains to a community.

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. A preliminary map of the current distribution of EVCs on public land was provided in the *Box-Ironbark Resources and Issues Report (1997)*.

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—Plains Grassy Woodland/Gilgai Wetland Mosaic, 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 4). 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 which was originally cleared from areas which no longer support indigenous vegetation. It involves a similar process to mapping the current distribution of EVCs, but with much less assistance, from aerial photographs and ground-checking.

Pre-1750 EVC mapping has now been completed for the Box-Ironbark study area, and is provided in Map B. This mapping identified 116 EVCs. Of these, 43 EVCs cannot reasonably be considered “Box-Ironbark forests and woodlands” as specified in the Terms of Reference for the Box-Ironbark Investigation—basalt plains, wetland, riverine or mountain forest EVCs, for example—and are listed separately in the legend to Map B. These EVCs cover approximately 122 000 ha (pre-1750) out of a total of 2 950 929 ha. In addition, approximately 4000 ha could not be assigned to an EVC.

Complementing Map B is Appendix 6 which provides statements of the spatial extent of each of the “Box-Ironbark” EVCs. There are some differences between the EVCs listed in Map B and those listed in Appendix 6 (notably in the number of “Box-Ironbark” EVCs: 73 in Map B and 72 in Appendix 6) because Appendix 6 was generated from a slightly earlier version of EVC mapping. The most conspicuous difference between the two versions is in the south-west ‘corner’ of the study area. Several EVCs have been reassigned and some boundaries redrawn. As a result, some units with a large pre-1750 extent in Appendix 6 (such as Damp Sands Herb-rich Woodland and Heathy Woodland/Plains Grassy Woodland Mosaic) are restricted or absent in Map B, while the reverse is true for EVCs such as Plains Woodland and Grassy Woodland/Heathy Woodland. Because these EVCs are all highly depleted, these changes have little bearing on current or proposed reserve system status. The ECC Box-Ironbark Investigation Final Report will provide reserve system representation data consistent with the most recent mapping and NRE Flora and Fauna Directorate’s project to assess and document the conservation status of EVCs across Victoria, at the bioregional level.

EVC Descriptions

The following table provides descriptions of 35 EVCs which, either separately or in mosaics or complexes, make up nearly all of the 73 Box-Ironbark EVCs in Map B. Those not described below occur only in small areas, or are not Box-Ironbark EVCs.

Table 2a: Description of the main Box-Ironbark EVCs in the study area

EVC Name	Structure	Main Canopy Species	Main Shrub and Ground Layer Species	Rainfall (mm)	Altitude (m)	Landform/geology/soils	Distribution
<i>Northern Goldfields</i> Box-Ironbark Forest	open-forest	red ironbark, grey box, red box, yellow gum	golden wattle, gold-dust wattle, twiggly bush-pea, shiny everlasting, drooping cassinia, spiky guinea-flower, wattle mat-rush, black-anther flax-lily, bristly wallaby-grass	400-600	220 (mean)	Gently undulating rises to low hills. Shallow stony soils from Ordovician sediments	Rushworth to Heathcote; around Bendigo; Dunolly to Inglewood; Puckapunyal Military Area
<i>Western Goldfields</i> Box-Ironbark Forest	open-forest	red box, red ironbark, grey box, yellow gum	golden wattle, gold-dust wattle, hedge wattle, drooping cassinia, narrow-leaf bitter-pea, spiky guinea-flower, wattle mat-rush, small mat-rush, black-anther flax-lily, bristly wallaby-grass, slender rice-flower	450-650	270 (mean)	Gently undulating rises to low hills. Shallow stony soils from Ordovician sediments	Dunolly to south of Maryborough; south of St Arnaud; Stawell
<i>North-eastern Hills</i> Box-Ironbark Forest	open-forest	mugga ironbark, grey box	golden wattle, gorse bitter-pea, slender rice-flower, grey guinea-flower, shiny everlasting, black-anther flax-lily, silvertop wallaby-grass, common wheat-grass, rough spear-grass, stinking pennywort	550-700	200 (mean)	Gently undulating rises to low hills. Shallow stony soils from Ordovician sediments	Euroa to Chiltern
<i>Northern Goldfields</i> Heathy Dry Forest	open-forest	red stringybark, red box	daphne heath, mountain grevillea, common rice-flower, common beard-heath, common hovea, blue finger-flower, silvertop wallaby-grass, grey tussock-grass, black's goodenia, milkmaids, tall sundew	450-650	250 (mean)	Upper slopes and ridgetops of undulating terrain and low hills. Shallow stony soils from Ordovician and Lower Devonian sediments	South of Bendigo; Rushworth to Heathcote; north of Dunolly
<i>Northern Foothills</i> Heathy Dry Forest	open-forest	red stringybark, red box, long-leaf box	daphne heath, gorse bitter-pea, slender rice-flower, common hovea, silvertop wallaby-grass, grey tussock-grass, stinking pennywort, blue pincushion, tall sundew	500-700	370 (mean)	Upper slopes and ridgetops of undulating rises and rolling hills; lower slopes of mountain ranges. Shallow stony soils from Ordovician and Cambrian sediments	Castlemaine; south of St Arnaud; Pyrenees; Euroa to Chiltern
<i>North-eastern Hills</i> Heathy Dry Forest	open-forest	red stringybark, hill red gum, red box	daphne heath, grey guinea-flower, silvertop wallaby-grass, small poranthera, stinking pennywort, common woodrush	550-700	320 (mean)	On ridgetops and plateaus. Soils derived from granite or contact metamorphosed Ordovician sediments	Warby Ranges to Chiltern
<i>Northern Goldfields</i> Grassy Dry Forest	open-forest	red stringybark, red box, yellow box	grey tussock-grass, blue finger-flower, kangaroo grass, common woodrush, magenta stork's-bill, short-hair plume-grass	450-650	295 (mean)	On upper slopes and ridgetops of low hills. Often close to Heathy Dry Forest (Northern Goldfields). Shallow, stony soils from Ordovician and Lower Devonian sediments	North of Heathcote; north-west of Dunolly

EVC Name	Structure	Main Canopy Species	Main Shrub and Ground Layer Species	Rainfall (mm)	Altitude (m)	Landform/geology/soils	Distribution
<i>Northern Foothills</i> Grassy Dry Forest	open-forest	red stringybark, yellow box, red box, long-leaf box	grey tussock-grass, tall bluebell, stinking pennywort, small St. John's wort, green rock-fern, cotton fireweed, magenta stork's-bill, austral cranesbill, common woodrush	550-700	440 (mean)	Sheltered aspects on upper slopes and ridgetops of rolling hills and lower slopes of ranges. Shallow, stony soils derived from Ordovician and Cambrian sediments	Pyrenees; south end of St Arnaud Range
<i>Northern Goldfields</i> Heathy Woodland	low open-woodland	red ironbark, red box, grey box	daphne heath, common fringe-myrtle, mountain grevillea, cranberry heath, shiny everlasting	450-550	200 (mean)	Undulating plains, rises and low hills. Sandy or clay soils	Around Bendigo, Dunolly and Tarnagulla
<i>Western Goldfields</i> Heathy Woodland	low open-woodland	long-leaf box, yellow gum	daphne heath, brush heath, flame heath, common fringe-myrtle, wax-lip orchid, scented sundew	450-650	220 (mean)	Undulating plains, rises and low hills. Tertiary sands with a thin covering of clay; sandstone often altered to quartzite gravel	Stawell; south-east and south-west of St Arnaud
Metamorphic Slopes Shrubby Woodland	woodland	grey box, drooping she-oak	wallowa (a wattle), sticky hop-bush, tall raspwort, rough spear-grass	400-500	230 (mean)	Rocky slopes of metamorphic aureoles adjacent to granitic plutons	Dunolly; Tarnagulla; Inglewood
Granitic Hills Woodland	woodland	hill red gum, red box, white cypress-pine	grey guinea-flower, mountain grevillea, daphne heath, nodding blue-lily, tall raspwort, stinking pennywort, cotton fireweed, green rock-fern, common fringe-myrtle	500-700	290 (mean)	Crests and slopes of granitic hills. Coarse, sandy soils	Warby Range; Chesney Vale Hills
Rocky Outcrop Shrubland/Herbl and Mosaic	shrubland and herbl and	no tree canopy	spur-wing wattle, common fringe-myrtle, nodding blue-lily, rock isotome, mosses, lichens, annual herbs	500-700	270 (mean)	Outcropping of flat sheets of granite. Coarse, sandy soils in pockets between rock slabs	Warby Range; Chesney Vale Hills; Terrick Terrick
Sedge-rich Woodland	woodland	yellow gum	sticky sword-sedge, black bristle-sedge, slender sun-orchid, bulbine lily	500-650	220 (mean)	Flat or slightly undulating terrain with seasonally inundated depressions. Tertiary sands and sandstones. Soils are clay loams with ironstone gravel at the surface	Illawarra; Deep Lead

EVC Name	Structure	Main Canopy Species	Main Shrub and Ground Layer Species	Rainfall (mm)	Altitude (m)	Landform/geology/soils	Distribution
<i>Low Rises</i> Grassy Woodland	woodland	grey box, white box	golden wattle, spreading wattle, gold-dust wattle, varnish wattle, common cutaxia, twiggy bush-pea, sweet bursaria, sticky hop-bush, drooping cassinia, feather spear-grass, supple spear-grass, rough spear-grass, saloop, fuzzy New Holland daisy, blue burr-daisy, lemon beauty-heads	400-500	200-300	Plains and gently undulating terrain. Soils derived from Ordovician sediments and alluvium	Fringes of Box-Ironbark hills around Rushworth, Costerfield, Heathcote, Goomalibee, Goorambat, Killawarra and Boweya; Kamarooka; Bendigo; Wedderburn; previously found around Ararat, Stawell and the Pyrenees
<i>Rainshadow</i> Grassy Woodland	woodland	white box, hill red gum	kurrajong, lightwood, varnish wattle, gold-dust wattle, sweet bursaria, daphne heath, curved rice-flower, kangaroo grass, wallaby-grasses, red-leg grass, grey tussock-grass, nodding blue-lily, wattle mat-rush, tall raspwort, stinking pennywort	< 700	150-500	Low hills. Soils are sandy clay loams derived from Ordovician metamorphic rocks and Devonian granitoids	Isolated hills around Dookie Agricultural College, Boxwood, north of Heathcote, Warrenbayne
<i>Slopes Box</i> Grassy Woodland	open-woodland	grey box	golden wattle, hedge wattle, black wattle, lightwood, gold-dust wattle, drooping cassinia, wallaby-grasses, spear-grasses, kangaroo grass, grey tussock-grass, black-anther flax-lily, wattle mat-rush, bulbine lily	650-850	200-600	Low hills or lower slopes. Devonian sediments of siltstone and sandstone	Seymour; Glenaroua; Tooborac
<i>Shrubby Granitic-outwash</i> Grassy Woodland	open-forest to woodland	hill red gum, red stringybark, red box	various wattles and guinea flowers, daphne heath, common fringe-myrtle, cane wire-grass, spear-grasses, wallaby-grasses, kangaroo grasses, soft tussock-grass, stinking pennywort, common raspwort, chocolate lily, black-anther flax-lily, wattle mat-rush, milkmaids	550-750	< 300	Gentle, lower slopes on the edges of granite hills, often on north to north-western aspects. Soils are freely-draining, deep sandy clay colluviums	Mount Pilot; Mount Barambogie; Warby Range; Chesney Vale Hills
Creekline Grassy Woodland	open-woodland	river red gum	wirilda (a wattle), black wattle, silver wattle, rough-barked honey-myrtle, weeping grass, common wheat-grass, common tussock-grass, tall sedge, rushes	450-650	190 (mean)	Ephemeral drainage lines and smaller intermittent creeks. Wide range of suitably fertile geological substrates with colluvial/alluvial soils	Across study area (tiny remnants). Previously more widespread
Valley Grassy Forest	open-forest	yellow box, long-leaf box, white box	silver wattle, weeping grass, kangaroo grass, common wheat-grass, austral cranesbill, austral bear's-ears, chocolate lily, cotton fireweed, small St. John's wort, small poranthera, stinking pennywort	550-700	335 (mean)	Along creek flats and gully heads in dissected hills. Recent alluvial deposits and soils derived from Ordovician and Cambrian sediments	Fryers Range; Pyrenees; Warby Range; Mount Pilot

EVC Name	Structure	Main Canopy Species	Main Shrub and Ground Layer Species	Rainfall (mm)	Altitude (m)	Landform/geology/soils	Distribution
Hillcrest Herb-rich Woodland	woodland	yellow box, long-leaf box, grey box	stinking pennywort, magenta stork's-bill, clustered everlasting, cotton fireweed, tall raspwort, creamy stackhousia, green rock-fern, kangaroo grass	450-650	350 (mean)	Broad ridgetops and upper slopes of undulating rises and rolling hills. Soils from Ordovician and Cambrian sediments and metamorphic rock	Maldon; St Arnaud to Bendigo; Mount Bolangum; Pyrenees
Granitic Hills Herb-rich Woodland	woodland	hill red gum, red stringybark, yellow box, long-leaf box	Deane's wattle, black wattle, hedge wattle, cranberry heath, peach heath, daphne heath, grey everlasting, stinking pennywort, austral bugle, austral bear-car, green rock-fern, cotton fireweed, tall raspwort, wallaby-grasses, rough spear-grass, common bog-sedge	450-700	310 (mean)	Crests and slopes of hills with granite or granodiorite outcropping; also sedimentary sandstones	Mount Korong; Kooyoora; Mount Black; Mount Ida; north-west and south of Stawell
Alluvial Terraces Herb-rich Woodland	woodland	yellow box, grey box, river red gum, white box	golden wattle, hedge wattle, silver wattle, stinking pennywort, sheep's burr, common wheat-grass, plume-grass, weeping grass, wallaby-grasses, common bog-sedge, common lagenifera, common raspwort, slender goodenia, milkmaids, yam-daisy, chocolate lily, yellow rush-lily	450-700	270 (mean)	Lower slopes, drainage lines and old alluvial plains of gently undulating landscapes. Sodic soils derived from Ordovician sediments or Tertiary alluvium	South-west and south-east of St Arnaud; Maryborough to Stawell; Euroa to Chiltern; Graytown
Gravelly-sediment Broombush Mallee	open-scrub to low open-forest	bull mallee, blue mallee, green mallee	gold-dust wattle, broombush, twiggie bush-pea, common fringe-myrtle, mountain grevillea, grey everlasting, totem-poles, golden pennants, black-anther flax-lily, shiny everlasting, cranberry heath, rough spear-grass	400-500	190 (mean)	Gentle rises. Shallow stony soils derived from Ordovician sediments (Lower Devonian sediments in Rushworth area)	St Arnaud; Wedderburn; Kamarooka; Inglewood; Rushworth
Northern Goldfields Broombush Mallee	open-scrub	broombush, wallowa (a wattle), green mallee	cranberry heath, common fringe-myrtle, golden pennants, mountain grevillea, grey everlasting, totem-poles, shrubby dampiera	400-500	190 (mean)	Tops of gentle rises on shallow stony soils (quartz gravel and ferruginised rock) derived from Ordovician sediments	Wedderburn; Inglewood; St Arnaud; Kamarooka
Plains Grassy Woodland	open-woodland or woodland	grey box, buloke, yellow gum, river red gum, yellow box	gold-dust wattle, hedge wattle, peach heath, cranberry heath, honey-pots, yellow rush-lily, milkmaids, scaly buttons, sundew, spear-grasses, kangaroo grass	550-700	350-380	Broad flat to undulating plains. Brown clay soils derived from former Quaternary swamp deposits	Across study area (small remnants). Previously widely distributed throughout study area
Riverina Plains Grassy Woodland	woodland	grey box, buloke, yellow gum	golden wattle, mallee wattle, gold-dust wattle, drooping cassinia, spear-grasses, bristly wallaby-grass, windmill grass, kangaroo grass, common wheat-grass, grey tussock-grass, wingless bluebush, saloop, nodding saltbush, woolly New Holland daisy, lemon beauty-heads, knob sedge	400-550	100-200	Broad flat to undulating plains. Sodic, duplex soils (clay loam to sandy clay loam) of Quaternary origin	Across the northern plains (small remnants). Previously widely distributed across the northern plains

EVC Name	Structure	Main Canopy Species	Main Shrub and Ground Layer Species	Rainfall (mm)	Altitude (m)	Landform/geology/soils	Distribution
Sand Ridge Woodland	woodland to open-forest	white cypress-pine, yellow box, yellow gum, grey box	common fringe-myrtle, grey mulga, lightwood, golden wattle, mallee wattle, gold-dust wattle, spreading wattle, weeping pittosporum, sweet bursaria, drooping cassinia, beard heath, rice grass, hairy panic, common wheat-grass, spear-grasses, wallaby-grasses, small scurf-pea, smooth minuria	400-550	100-150	Source-bordering dunes composed of deep sandy soil. Soils develop on sands blown up by wind action from a prior stream bed	In close proximity to the Goulburn and Murray Rivers; Puckapunyal Military Area
Pine Box Woodland	woodland	yellow box, white cypress-pine, buloke	golden wattle, varnish wattle, mallee wattle, sweet bursaria, curved rice-flower, many-flowered mat-rush, rough spear-grass, bristly wallaby-grass, long-hair plume-grass	400-550	100-200	Generally flat topography with some undulations. Sheets of sandy soils from stream deposits weathered to low relief	Northern half of the plains (small remnants only). Previously more widely distributed
Plains Grassy Woodland/Gilgai Wetland Mosaic	open-woodland	river red gum, hill red gum, white box, grey box	hedge wattle, golden wattle, native daisies, chocolate lily, milkmaids, cut-leaf burr-daisy, purplish blown grass	400-600	100-200	Shallow basins surrounded by low hills and plains. Soils are heavy self-mulching clays which develop a gilgai profile	Graytown; north-west to south-west of Benalla; Glenrowan; Tungamah; south of Echuca; north of Heathcote
Valley Heathy Forest	open-forest	red box, long-leaf box, grey box	prickly tea-tree, small grass-tree, golden wattle, black wattle, hedge wattle, thatch saw-sedge, milkmaids, black-anther flax-lily, variable sword-sedge, small St. John's wort, common wheat-grass, wallaby-grasses, kangaroo grass, spear-grasses	750-850	200-400	Protected colluvial slopes and valleys below low granitic or sedimentary hills. Soils are colluvial sands	Lower slopes of the foothills of the Great Dividing Range – south-west of Seymour; south of Heathcote
Damp Sands Herb-rich Woodland	open-woodland	yellow box	silver wattle, mallee wattle, golden wattle, austral bracken, pale flax-lily, wattle mat-rush, supple spear-grass, common wheat-grass, wallaby-grasses	700-900	100-150	Plateau and dissected landscapes of granite and granodiorite geologies. Gullies, protected slopes and well drained gully heads	North of Reedy Swamp, Nagambie
Spring Soak Woodland	herbland to woodland	hill red gum	prickly tea-tree, narrow goodenia, sedges, rushes	600-700	150-250	Plateau, valleys and colluvial slopes. Mostly granitic geologies of Silurian and Devonian origin	Mt Pilot Range; Warby Range; Killawarra Forest; west of Euroa
Creepline Herb-rich Woodland	open-woodland	swamp gum, river red gum	blackwood, silver wattle, large-leaf bush-pea, sweet bursaria, austral bracken, common tussock-grass, bidgee-widgee, kidney-weed	500-700	250-600	Creek terraces of ephemeral streams	Lexton area
Plains Woodland	woodland or open-woodland	grey box, buloke, yellow gum	gold-dust wattle, cranberry heath, lemon beauty-heads, fuzzy New Holland daisy, grey tussock-grass, black-anther flax-lily, common wheat-grass, bristly wallaby-grass, herbs	< 600	160 (mean)	Fertile, brown clay soils derived from former Quaternary swamp deposits, on terrain of low relief.	terraces along the upper Wimmera Rivers and its tributaries

Appendix 3

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Social and Economic Studies in the Box-Ironbark Forests and Woodlands Area

Stage 2

Assessment of the Effects of Proposals in the Draft Report

for

Environment Conservation Council

Read Sturgess & Associates Pty Ltd

and

Essential Economics Pty Ltd

April 2000

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NOTE: The original Appendix 1 and Appendix 2 of this (consultants) report have been taken out and made into separate appendices. Appendix 1 is now part of Appendix 7 to the ECC Draft Report and Appendix 2 is now part of Appendix 11 of the ECC Draft Report.

SUMMARY

This Study has assessed the social and economic impacts of the ECC's draft proposals for changes in management of public land sites in the Box-Ironbark Forests and Woodlands Area. Two types of assessment have been undertaken:

1. 'benefit cost analysis', an economic assessment which compares the total benefits and costs from Society's viewpoint, regardless of who experiences the impacts of those benefits and costs. Benefit cost analysis tells us whether there has been a net gain or loss; that is, whether the total Australian economy has been made larger or smaller.
2. 'regional impact analysis', a social assessment which identifies the communities and organisations which experience the benefits and costs.

For both types of evaluation, we estimate differences in future economic values **with and without** implementation of the ECC proposals.

This evaluation should be viewed as providing information about the benefits and costs associated with the draft proposals, in a timely and cost-effective way. As well as conventional economic and social assessment methods, key concepts applied have been:

Optimal ignorance - knowing what facts are not worth knowing.

Appropriate imprecision - knowing that precise data are often unnecessary to reach a clear conclusion and (particularly in the case of this Study) precise data are sometimes impossible to obtain.

COSTS ASSOCIATED WITH IMPLEMENTATION OF DRAFT PROPOSALS

Impacts for timber industry

The estimated impacts on the overall timber industry, and on individuals engaged in that industry are based on projections of the future levels of timber harvesting from the available net productive area of State Forests in the Box-Ironbark Study Area, with and without implementation of the ECC's changes.

Modelling by DNRE's Forests Service for Bendigo Forest Management Area suggests that after implementation of the ECC's Draft Recommendations, future levels of sawlog harvesting could be increased by 45 per cent over the levels of actual cut in recent years; that is, from 1,400 to 2,030 m³ per year, prior to forest management planning. If there were no ECC Investigation, no regional forest agreement (RFA) planning, and no forest management planning, the modelling indicates that the forest now available could produce 3,900 m³ of sawlogs per year. The harvest of posts and firewood could also increase.

Importantly, regardless of the ECC, other forest management processes would require additional zoning and prescriptions that would exclude timber harvesting from certain areas due to application of the National Forest Criteria (JANIS 1997). ECC officers have estimated that whereas the proposed ECC recommendations would lead to a reduction in extent of net productive area of State Forests of approximately 90,000 hectares, the likely reduction due to these other forest management processes would be approximately 70,000 hectares. The impacts are summarised in Summary Table 1.

Summary Table 1 Estimates of impacts on timber harvesting

	Volumes available (cubic metre p.a. rounded to '00)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	1,400	5,900	37,000	44,300
Potential harvest from existing net productive area	3,900	13,770	74,000	91,700
Potential harvest from reduced net productive area due to ECC changes	2,030	7,970	42,670	52,700
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	2,400	9,300	49,600	61,300

	Employment (full time equivalents)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	17	11	34	61
Potential harvest from existing net productive area	47	25	67	139
Potential harvest from reduced net productive area due to ECC changes	24	14	39	78
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	29	17	45	91

	Net economic contribution (\$M p.a.)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	\$0.09	\$0.08	\$0.61	\$0.78
Potential harvest from existing net productive area	\$0.24	\$0.18	\$1.22	\$1.65
Potential harvest from reduced net productive area due to ECC changes	\$0.13	\$0.10	\$0.71	\$0.94
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	\$0.15	\$0.12	\$0.82	\$1.09

Whereas the notional net economic contribution from harvest and cutting/milling of timber from the Box-Ironbark Study Area would be about \$1.09 M p.a. from 2007 based on the potential cut from the net productive area remaining after the estimated changes that would be made regardless of the ECC, it would be \$0.94 M p.a. based on the potential cut from the net productive area remaining after the ECC changes. **This represents a notional net cost to the industry of \$0.15 M p.a. from 2007 onwards** (calculated as \$1.09 less \$0.94). This would comprise a loss in future growth of the sector rather than an absolute reduction in the present size of the industry (now about \$0.78M).

In terms of employment, there are now about 61 full-time job equivalents. Whereas the total employment would be equivalent to 91 jobs from 2007 without the ECC proposals, it would be 78 jobs with implementation of the ECC's Draft Recommendations. This represents a net cost to the industry of 13 jobs from 2007 onwards. Once again, this would be a real loss in future growth of employment for (mainly part-time) licensees, rather than a loss for existing licensees.

All references to employment levels are expressed throughout this report as 'full-time equivalents'. However, much of the employment for timber workers (and to a lesser extent apiarists, eucalyptus oil producers and tourism workers) involves part-time jobs. Consequently the full-time job equivalents, quoted in the previous point, are spread over a much larger number of employees. For example, the present level of 61 (full-time equivalent) jobs in the timber sector would involve individuals engaged full-time and part-time, and be spread over about 300 individuals.

Impacts for eucalyptus oil production

The ECC's proposals will have some impact on the production of eucalyptus oil from public land. These impacts arise from redesignation of some areas of State Forest currently used for eucalyptus oil production to State Park or Nature Conservation Reserve. The ECC's proposals would reduce the area harvested for eucalyptus oil by 415 hectares, or 18 per cent of the total area currently harvested.

The reported returns from harvesting are approximately \$55 per hectare. The variable costs of production are estimated at \$30 per hectare and the net economic value, or 'producer surplus', is calculated as \$25 per hectare (i.e. \$55 less \$30). The economic loss as a result of the ECC proposals would be of the order of \$10,000 per year.

There would be reduction in expenditure in the Study Area of approximately \$12,000. This would reduce the labour requirement of eucalyptus oil production by up to one full-time job equivalent. However, this loss would be spread amongst a number of operators, particularly those operating around Wedderburn and in the Whipstick-Kamarooka link.

There are amelioration measures which could be put in place to protect this fragile industry, including a revision of licence areas and royalty arrangements, and encouragement of the development of plantations for the production of eucalyptus oil on private land.

Impacts for mining

The value of minerals (mainly gold) production foregone as a result of the declaration of new State and National Parks in the Box-Ironbark area is not known. Whether any gold would otherwise be produced is not known. The application of state-wide averages suggests that the present level of exploration expenditure might bring forth gold production in the future with a gross value of up to \$0.78 million per year from sites affected by the ECC's proposal.

Whether any impact would actually be experienced depends on many factors. Under the ECC's proposals, exploration under existing licences can continue, and mining activity could be undertaken in the newly declared parks, in which case no significant gold production would be foregone. This would depend on the attitude of the Minister of the day and on the willingness of the exploration company to accept the risk of not being able to proceed to mining if an economic deposit were found. The ECC's proposed Park boundaries have been developed taking into account existing recognised gold fields which have previously produced gold and which remain a focus of exploration interest. Accordingly, they are generally less prospective than other parts of the Box-Ironbark public land.

Based on the calculations and estimates presented here, the economic surplus foregone by significant producers *could* be up to about \$0.1 million per year. The consultants' estimates suggest that there could be a loss of expenditure in the economy of the Study Area of up to \$1.2 million per year, which could support up to 12 mining and exploration jobs in the area. The consultants believe that this is likely to be an over-estimate and that it should be considered only as a 'worst case scenario'. Whether exploration companies will choose not to continue to operate in the proposed Parks is not yet known. However, there is evidence that exploration may continue in prospective areas in new parks (e.g. the Chiltern-Box-Ironbark National Park).

The impacts of the ECC recommendations to raise the standard required for all miners could potentially result in the cessation of some small mining operations such as doze and detect mining throughout the Study Area. This is based on our assumptions about the production costs of small miners, and the additional costs that would be incurred as a result of the need to replace land mined and the need to demonstrate economic significance prior to mining. If all doze and detect operations were to close, we estimate that the loss of expenditure would be of the order of \$0.8 million per year. The reported value of gold produced in this sector is only \$95,000 in the last year for which figures are available, but the consultants believe that for various reasons the actual returns are likely to be more substantial than this. In a rational world, small miners would not expend \$0.8 million per year unless they expected to recoup more than that amount.

Impacts for grazing

The ECC's draft proposals would exclude grazing from some riparian areas currently grazed under licence, in particular along sections of the Broken and Boosey Creeks. The ECC's draft proposal would impact on both grazing licences and water frontage licences (see Summary Table 2). The total area of grazing and water frontage licences within the ECC's draft proposal is 641 ha and the average grazing licence per property is 9.4 hectares.

Summary Table 2 **Grazing licences affected by ECC proposals**

Type of Licence	Hectares	Number of licences
Grazing Licences	195	8
Water Frontage Licences	446	62
Total	641	70

There would be three major types of costs for society in the event that the grazing licences were extinguished (see Summary Table 3), comprising a total impact of approximately \$49,000 per year following implementation of the ECC proposals, equivalent to an average impact of about \$700 per licence per year.

Summary Table 3 **Estimated impacts due to cessation of grazing**

	Annual Equivalent Costs
Loss of pasture production	\$9,000
Additional fencing	\$29,000
Additional livestock watering points	\$11,345
Total	\$49,345

These grazing licences represent about 3 per cent of the total farm area, and much less than this in terms of carrying capacity. It is, therefore, very unlikely that the removal of grazing licences will significantly change the financial performance of those landholders affected by the ECC proposals.

Impacts for park management

Administrative responsibility for land proposed to be included in a new Park or Reserve will be transferred from DNRE to Parks Victoria. Parks Victoria have higher management costs with respect to visitors because of the higher level of facilities, management and promotion associated with Parks and Reserves compared with State Forest.

Parks Victoria has supplied an estimate of the unit costs of their role in managing additional areas of parks, and DNRE has provided an estimate of its unit costs for management of recreation in State Forests. This suggests that the additional costs for Parks Victoria would be approximately \$530,000 per year, but these would be offset by a saving of \$225,000 for DNRE's Forest Service, thus suggesting a net increase of about \$300,000 per year.

A satisfactory level of funding by Parks Victoria for management of recreation at the additional areas of parks would be necessary to ensure the benefits (see below) associated with an increase in visitation to sites affected by the ECC's proposals.

Total impacts

The estimated impacts reported above suggest a total impact of about \$0.6 million per year, but the consultants believe that the \$0.1 million estimate for mining may be an over-estimate and should be considered as a 'worst case' scenario.

COSTS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Additional park management	\$0.30
Reduction in future growth of timber industry	\$0.16
Reduction in value of future minerals exploration	Up to, but most likely to be less than \$0.10
Reduction in value of future eucalyptus oil production	\$0.01
Reduction in income for graziers excluded from floodplain grazing licences	\$0.05
Total costs	Up to, but likely to be less than, \$0.6 million p.a.

There is some uncertainty about the size of impact on the timber industry owing to the very approximate nature of the estimates of future timber harvesting levels, for both the 'with ECC' and 'without ECC' scenarios. Confidence ranges of, say, plus and minus 30 per cent should be imposed on our estimates for the impacts for the timber sectors.

BENEFITS ASSOCIATED WITH IMPLEMENTATION OF DRAFT PROPOSALS

Impacts for tourism and recreation

Tourism in the Box Ironbark area will be increased by the various proposals of the ECC. These effects arise mainly from the redesignation of parcels of public land as parks. It is expected that there will be better visitor facilities and more promotion of these areas as places to visit, and therefore that there will be more visitors and tourism activity. The Box-Ironbark Study Area is already well situated with respect to highways, other roads, transport services and tourism infrastructure. This makes it most likely that the declaration of additional and larger parks would lead to an increase in visitation to sites affected by the ECC's draft proposals.

Our analysis has examined:

1. existing visitation to sites affected by the ECC's proposals,
2. changes in visitation to newly designated parks and
3. likely changes in tourism expenditure resulting from changes in visitation.

We have been able to derive estimates of existing visitation at 17 sites of relevance to the ECC's proposals. The total visitation to the 17 sites for which data were available is about three-quarters of a million per year. The consultants have little basis for forming even guesstimates of visitation for other proposed parks, but the consultants and ECC officers believe that the 17 parks for which data are available would be the parks with the highest level of visitation.

These estimates of existing visitor numbers have been derived from two main sources:

- Existing visitor numbers to particular parks and reserves have been taken from a database provided by Parks Victoria. Those values represent the average annual visitation over the two years 1996/97 and 1997/98.
- Estimates of visitation to particular sites in State Forests have been taken from a database compiled by the consultants for DNRE (Read Sturgess Associates with Henshall Hansen Associates 1994).

Judging from past experience, a change in status from State Forest to Park, or from Regional Park to State or National Park, is likely to increase visitation in most instances. The precise scale of change cannot be predicted with certainty, since this depends on a variety of factors including:

- accessibility to major markets;
- nature of the scenic resource;
- presence of key attractors (including well-known natural or historic attractions);
- potential activities available for visitors (e.g. whether the areas host water sports, major touring routes etc.);
- existing level of investment in surrounding tourist facilities; and
- expenditure by Park managers on facilities and promotion.

We have calculated the extent by which the present level of visitation at sites affected by the ECC's draft proposals would have to increase in order that this benefit alone was sufficient to cover all the costs associated with implementation of ECC's draft proposals. The total costs associated with implementation of the draft proposals has been estimated at \$0.6 million p.a.. Given that the net economic surplus due to the existing level of recreation and tourism at sites affected by the ECC's proposals is estimated to be approximately \$6.5 M per year, the present level of visitation would have to increase by only 9 per cent in order to cover all the costs associated with implementation of ECC's draft proposals.

The consultants believe it is likely that the present level of visitation could increase by more than 9 per cent; that is, that the benefits associated with increased recreation and tourism would in themselves more than outweigh the total costs associated with implementation of the draft proposals. In reaching this conclusion, the consultants have developed two scenarios describing the likely increase in visitation. Those scenarios are based on two previous examples where land has changed designation from State Forest to national park; namely the declaration of Grampians as a National Park in 1984 and Murray-Sunset National Park in 1991. Those represent the only examples where estimates of visitation before and after the change are available. Anecdotal evidence about trends at other parks has been provided by officers of Parks Victoria. Overall, it appears that a change in designation of land to Park, or a higher level of Park, creates an increase in visitation that is somewhere between 30 per cent and 100 per cent or more of pre-existing visitation. Existing parks in the Study Area may also gain slightly due to the promotion of new parks in the same region.

The two scenarios developed by the consultants imply a 29 per cent and a 38 per cent increase in the visitation to sites

affected by the draft proposals. A 29 per cent increase would produce a benefit equivalent to a net economic value of about \$1.7 million per year. The 29 per cent scenario is based on an increase in visitation only at the new or enlarged parks, while the 38 per cent scenario is based on additional increases of 10 per cent for the remaining parks that already exist in the Study Area.

The increase in visitation would generate an increase in expenditure by visitors. Total additional expenditure in the region by park visitors is estimated to be approximately \$8 million per year. This expenditure would be spread throughout the Box-Ironbark Study Area. We estimate that each \$100,000 in expenditure would support one full-time job equivalent. The additional total expenditure would therefore support approximately 80 jobs throughout the Study Area.

The additional expenditure from tourism would be expended mainly in the towns where commercial facilities are able to cater for visitors. The Parks likely to experience a significant increase in visitation will generate the most additional expenditure. The towns likely to benefit the most from the increase in visitation are Bendigo (as the principal regional centre), Castlemaine and the towns of the north east (Beechworth, Chiltern, Wangaratta, Benalla etc). Smaller increases in visitors are likely for the towns and areas west of Bendigo and Castlemaine.

Impacts associated with increased conservation values

A direct and accurate assessment of the economic values associated with nature conservation in the Box Ironbark forests and woodlands can only be achieved through a study specifically targeted at those areas. In the present circumstances such a study is not possible. We can, however, form an *impression* of the values that various environmental and ecological characteristics could conceivably have in the box-ironbark areas. We can form this impression by looking at past studies of unit values of similar characteristics and ask the hypothetical question:

What would be the total value of the resource if people in the box-ironbark areas (and all Victorians) held a range of (conservative) values based on the known cases?

We have adopted this approach in an attempt to gain an impression of the possible orders of magnitude of value. Whichever way one combines the impressions of value held both by the communities within and outside the box-ironbark woodlands, the total value is a large number. How large the benefit would be depends primarily on what might be the average willingness to pay across the large number of Victorian households.

Even a small value per household would produce a large aggregate benefit in present value terms. For example, if 50 per cent of all Victorian households were willing to pay one dollar per year to achieve the objectives of the ECC's proposals, then that amount would more than cover the estimated negative impacts of \$0.6 million per year.

Other benefits

Some of the areas nominated for inclusion in parks/reserves comprise parts of catchments that contribute to water supply for Bendigo and small townships. Water quality is likely to benefit from a reduction in mining and timber harvesting, both with respect to suspended solids and nutrient loads.

Further, the restriction of grazing from riparian areas would also lead to improved water quality due to reduced streambank erosion and reduced bacteriological contamination from livestock.

Any reduction in timber harvesting would represent a benefit with respect to increased carbon sequestration.

COMPARING BENEFITS AND COSTS

This Study has identified that there would be large economic benefits associated with implementation of the ECC's draft proposals, but that these would be partly offset by costs. The consultants are confident that the benefits would exceed greatly the costs, but have not been able to quantify all the benefits and hence cannot estimate the absolute size of the net gain.

Implementation of the draft proposals would impose **substantial costs** for:

1. **saw mills and forest workers** due to a reduction in the future growth of timber extraction in some areas;
2. **mining companies** due to a possible cessation of exploration and minerals extraction in some areas; and for
3. **Parks Victoria** which would be responsible for managing the new areas of parks and reserves.

Implementation of the draft proposals would impose **relatively small costs** for:

1. eucalyptus oil processors due to a cessation of eucalyptus oil extraction in some areas and for
2. graziers, due to a cessation of grazing from some riparian areas along the Broken-Boosey Creeks system.

Increased conservation of natural values and biodiversity appear to represent a primary motivation for the ECC's recommendations; but the economic value of those benefits has not been quantified.

While the major benefit of the ECC's proposed changes cannot be quantified in economic terms for this Study, our estimates suggest that benefits associated with increased tourism and recreation alone will outweigh costs. As explained above, we have calculated that the present level of visitation at sites affected by the ECC's draft proposals would have to increase by only 9 per cent in order that the recreation/tourism benefits in itself were sufficient to cover all the costs associated with implementation of ECC's draft proposals. The consultants believe that the present level of visitation would be likely to increase by more than 9 per cent; that is, that **the benefits associated with increased recreation and tourism would in themselves more than outweigh the total costs associated with implementation of the draft proposals.**

Based on previous examples of State Forest sites being re-designated as parks, such an increase appears achievable. Importantly, this will require additional visitor facilities and more promotion of these areas as places to visit. The Box-Ironbark Study Area is already well situated with respect to roads, transport services and tourism infrastructure. This makes it most likely that the declaration of additional and larger parks would lead to an increase in visitation to sites affected by the ECC's draft proposals.

The benefits and costs identified in this Study are summarised in Summary Table 4. In some cases there remains some considerable uncertainty about how things would occur in the future. This means that estimates of the absolute size of impacts for some sectors, notably mining and timber, should be interpreted as being 'indicative' rather than precise. The impacts for the mining sector have been based on the application of statewide averages to all individual sites affected by the ECC's draft proposals. The impacts for the timber sector have been based on very approximate estimates of the likely future levels of available forest with and without implementation of the ECC's draft proposals. Confidence ranges of, say, plus and minus 50 per cent should be imposed on our estimates for the impacts for these sectors. Even with those broad confidence ranges, our conclusion would remain the same; namely, that the overall economic benefits would exceed greatly the economic costs.

Summary Table 4 Summary of benefits and costs

BENEFITS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Increased biodiversity and natural values	This appears to be a primary motivation for the ECC's recommendations. Benefit has not been quantified but is likely to be very substantial.
Increased value of tourism and recreation in new and expanded parks/reserves	\$1.70 or greater
Improved water quality	Not quantified but likely to be significant.
Total benefits	Substantially greater than \$1.7 million p.a.
COSTS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Additional park management	\$0.30
Reduction in future growth of timber industry	\$0.16
Reduction in value of future minerals exploration	Up to, but most likely to be less than \$0.10
Reduction in value of future eucalyptus oil production	\$0.01
Reduction in income for graziers excluded from floodplain grazing licences	\$0.05
Total costs	Up to, but likely to be less than, \$0.6 million p.a.

SOCIAL AND REGIONAL CONSEQUENCES

The most important positive impacts of the ECC proposals for the Study Area would be felt as a result of increased visitation throughout the Study Area, especially in the provincial centre of Bendigo and the regional towns closest to the proposed new parks. Bendigo is a major destination for tourists and also the centre from which many tourism operators in the region source supplies. Other centres will gain as a result of increases in food and accommodation expenditure.

The principal negative impacts would result from the potential loss of expenditure on mining and timber production. Potentially affected miners include both employees at large mines and self-employed (mainly doze and detect) miners. Potentially affected persons in the timber industry would include a reduced future increase in employees of saw mills and individual licensed forest operators, particularly those who cut sleepers and firewood, on a full-time or part-time basis. There may be some local impacts resulting from the location of available forests. Establishment of parks and reserves close to some towns may require more travel to forests further away, and hence additional cost to individuals.

Losses for such individuals would be felt in smaller towns throughout the Study Area as well as in Bendigo. Again Bendigo is likely to experience the largest share of any impact because of its status as the service centre for much of the region. However, there may be larger proportional impacts on smaller towns, particularly those west of the Goulburn River which are dependent on affected industries. While employment losses would be small relative to total employment in the region, it must be considered that the areas most reliant on production from public land are those in the west of the Study Area. These areas have relatively low incomes, high unemployment and low or negative population growth. These areas are likely to be least able to cope well with economic change, unless alternative opportunities are purposely developed.

It appears likely that few areas will experience very large overall negative or positive impacts since, in most communities where significant adverse effects are experienced, those would be balanced by equally significant positive effects. The exceptions would be that Bendigo and Castlemaine would be likely to experience substantial net positive impacts due to the large increase in expenditure by tourists.

Summary Table 5 presents a summary of these impacts.

LAYOUT OF MAIN REPORT

Section 2 summarises the socio-economic characteristics of the Study Area that were compiled for Stage 1 of this consultancy. Sections 3 to 7 present the consultants' estimates of the costs associated with implementation of the ECC's proposals; namely:

- Reduction in future growth of timber industry (Section 3)
- Reduction in value of future eucalyptus oil production (Section 4)
- Reduction in value of future minerals exploration (Section 5)
- Reduction in income for graziers excluded from floodplain grazing licences (Section 6)
- Additional park management costs (Section 7)

Section 8 presents the consultants' estimates of the benefits associated with implementation of the ECC's proposals; namely:

- Increased value of tourism and recreation in new and expanded parks/reserves
- Increased biodiversity and natural values
- Improved water quality and other indirect use values

Finally the overall benefits and costs are compared in Section 9.

Summary Table 5 Summary of regional and social impacts

Sector/community	Economic activity (\$M p.a. gross incomes/expenditure)		Employment (full-time equivalents)		Main towns affected
	Gains	Losses	Gains	Losses	
Tourism industry	approximately \$8 M or greater	-	approximately 80 or greater, spread over a much greater number of establishments (restaurants, motels, petrol outlets etc)	-	Bendigo, Castlemaine, Inglewood, Beechworth, St Arnaud, Nagambie, Wangaratta, Benalla, Maryborough, Avoca
Miners	-	in the range \$0 to \$1.2 M	-	in the range 0 to 12, concentrated mainly on large mining companies, but also including part-time self-employed miners	Bendigo, St Arnaud, Avoca, Nagambie, Inglewood, Benalla, Beechworth
Saw mills and timber workers	-	approximately \$1 M	-	approximately 10 to 20 (loss in future growth), but spread over probably some full-time workers and many more part-time workers	Rushworth, Heatcote, Avoca, Dunolly, Maryborough, Talbot, St Arnaud
Parks Victoria	approximately \$1 M	-	approximately 5	-	Bendigo, Wangaratta, Benalla
Eucalyptus oil producers	-	less than \$0.1 M	-	approximately 1, spread over 5 to 10 workers	Bendigo, Wedderburn
Graziers	-	less than \$0.1 M	-	less than 1, probably spread over 70 graziers	Benalla, Wangaratta, Shepparton

1 INTRODUCTION

The Environment Conservation Council (ECC) is currently reviewing the status of public land in an area of Victoria designated as the Box-Ironbark Study Area. This economic consultancy forms part of the analysis of the Box-Ironbark Study Area. It provides a benefit cost analysis of the ECC's Draft Proposals.

This report draws on an earlier consultancy, by the same consultants, which compiled a socio-economic profile of the region. The major emphasis for this Stage 2 consultancy is on social benefit cost analysis, which determines whether there is a net gain to economy from the ECC's proposals. A regional impact analysis is also provided, which identifies which communities comprise the winners and losers that make up that net impact. Given the two different types of analyses, it is important for readers to understand the distinction between:

1. loss of economic value, and
2. loss of economic activity.

The economic value of something is what people are prepared to pay for it (even if not required to do so), while economic activity concerns the flows of money and resources set in train as a result of the economic value.

From the viewpoint of Victoria/Australia, the costs of providing services to consumers must be offset against the expenditure by consumers. Oversimplifying, the net gain to the economy is \$35 when a restaurant prepares a meal for a family at a cost of \$65 and sells it for \$100. The amount of economic activity would be \$100, but the (net) economic value would be only \$35. Further, from the viewpoint of the nation/State, expenditure in a particular region would have many substitutes and such expenditure would only lead to a net increase in total expenditure in Australia if it would not otherwise have been spent in another region in Australia.

As a generalisation, evaluations from the viewpoint of the **region** will be more concerned with changes in **economic activity**, while (social benefit cost) evaluations from the viewpoint of the **broader Victorian/Australian economy** will be more concerned with changes in (net) **economic value**.

2 SOCIO-ECONOMIC CHARACTERISTICS OF THE STUDY AREA

The socio-economic profile prepared for Stage 1 of this consultancy emphasised that the population of the Study Area:

- comprises around 29 per cent of the population of Country Victoria and around 8 per cent of the total Victorian population
- has been growing faster than the average for Victoria and is forecast to continue to grow at 1.0 per cent per year compared with 0.7 per cent for Victoria
- is more likely to work in primary production than Victorians as a whole (12.6 per cent of the labour-force compared with 4.2 per cent)
- has a lower household income than the rest of Country Victoria (\$25,500 per year compared to \$27,100)
- experiences higher unemployment than Victoria as a whole - currently around 9.7 per cent for the Study Area compared with 9.1 per cent in Victoria (seasonally unadjusted)

The key industries which are dependent on the resources of the box-ironbark forests and woodlands on public lands are:

- timber
- mining
- tourism
- eucalyptus oil production
- apiary

Some parts of the Study Area are more dependent on these industries than others. A number of towns in the Study Area have been identified which are more than proportionately reliant on these key industries for employment. These towns are:

- Dunolly (with greater than average dependence on all key industries)
- Avoca
- Beechworth
- Heathcote
- Maldon
- Nagambie
- Rushworth

In addition, some of these towns are in areas of high or very high unemployment and where average household incomes are low, or very low.

The following points provide a summary of the dependence on public land in the Study Area:

- The gross value of production from public land in the Study Area is estimated to be \$24.7 million. Mining contributes around \$16.6 million, apary \$8.5 million, tourism \$8.0 million, timber \$3.4 million and eucalyptus oil \$0.1 million.
- Approximately 380 full time equivalent jobs in the Study Area are directly generated by production from public land.
- Mining is the largest generator of jobs (150 jobs), followed by tourism (90 jobs), apiculture and honey processing (80 jobs), timber (60 jobs), and eucalyptus oil (10 jobs).
- Much of the employment for timber workers (and to a lesser extent apiarists, eucalyptus oil producers and tourism workers) involves part-time jobs. Consequently the full-time job equivalents, quoted in the previous point, are spread over a much larger number of employees.
- The municipalities of Greater Bendigo and Northern Grampians have the largest number of jobs generated by production from public land in the Study Area (75 and 73 full-time job equivalents respectively).
- The proportion of jobs from public land to population in the Study Area is around 0.1 per cent. Municipalities which have a higher proportion (i.e. are more dependent on public land for employment) are, in descending order of dependence:
 - Northern Grampians
 - Loddon
 - Central Goldfields
 - Pyrenees
 - Mount Alexander

The relatively high number of jobs in the Northern Grampians Shire is mainly due to one employer (the Stawell Goldmines operation). Employment from public land in other municipalities is more broadly spread amongst the various key industries.

The areas most reliant on production from public land are those in the west of the Study Area. These areas have relatively low incomes, high unemployment and low or negative population growth. These areas are likely to be least able to cope well with economic change, unless alternative opportunities are purposely developed.

3 TIMBER

3.1 SUMMARY OF ASSESSMENT PREPARED FOR STAGE 1

Approximately 95 per cent of the total timber volume cut commercially in the Study Area is derived from the Bendigo Forest Management Area (FMA); however, the Study Area includes also a number of forest blocks in the Midlands FMA, Horsham FMA and Mid-Murray FMA, which total 7 per cent of productive forest in the Study Area.

The total level of employment for harvest and cutting/milling timber from the Box-Ironbark Study Area is estimated as

being equivalent to about 60 full time jobs, but this is spread across about 300 licensed forest operators. The industry is dominated by part-time firewood cutters. We estimate that there would be about 15 persons employed full time in cutting firewood/posts/sleepers and about 11 persons employed full time in saw log processing, including tree felling and log transport. The remaining employment would be spread across many part-time licensed forest operators.

Firewood represents the major product in terms of volume harvested and employment. Firewood from public lands in the Study Area would represent about 2 to 5 per cent of the total quantity of firewood consumed in Victoria. However, it would represent about 15 to 20 per cent of the total supply from public lands in Victoria.

About 70 per cent of the total firewood cut is consumed within the region. It is likely that there will remain a continuing strong demand for firewood from native forests in the region, particularly in the vicinity of regional cities and towns. All other things equal, policies for public land affect firewood collection and habitat on both public land and private land and vice versa. For example, if firewood collection were reduced, or excluded from some areas of public land, an immediate effect would be to increase firewood collection on private land, and hence the pressure on habitat on private land would be increased if no other actions were taken.

Most of the sawlogs cut for sawn timber from public lands in the Study Area are processed at the saw mill in Rushworth. The owner is seeking an additional allocation of saw logs and hopes to install additional kiln capacity. That additional kiln capacity would lead to an increase in employment from the present level of 8 full time employees, to 12 full time employees. Volumes of sawlogs have been tendered to other sawmills. Logs cut for sleepers would be suitable also for cutting as sawlogs.

While the value per m³ of timber cut for firewood is much lower than for sawlogs, the total value of production for firewood greatly exceeds the value of production for sawlogs due to the overwhelmingly large volume of firewood that is cut relative to sawlogs. Firewood production comprises 64 per cent of total timber products from the Study Area by value and 59 per cent by employment, but 83 per cent by volume. Sawlog production comprises 15 per cent of total timber products from the Study Area by value, but only 2 per cent by volume.

3.2 IMPACTS FROM DRAFT RECOMMENDATIONS

The impacts of the ECC's Draft Recommendations should be considered in light of the level of timber harvesting for the Box-Ironbark Study Area, details of which are presented in Table 3-1.

Table 3-1 Present level of timber harvesting for the Box-Ironbark Study Area

Product	m ³
Sawlog (includes sleepers)	1,400
Posts	5,900
Firewood	37,000
	44,300

Source: BITA Report, and reported volumes from other FMAs.

For estimating the net economic impacts of the ECC proposals, we are interested in the difference in value of the sector with and without implementation of the ECC proposals. These should be based on estimates of the future levels of potential production from the available net productive area of State Forests with and without the changes. A major difficulty for this Study is that we have been provided only with approximate estimates of:

- Potential level of timber harvesting from present net productive area of State Forests.
- Potential level of timber harvesting with the changes proposed by the ECC.
- Potential level of timber harvesting without the changes proposed by the ECC.

Officers of both the Forests Service and ECC have advised that the estimates provided for those parameters should be viewed as 'very approximate', most particularly in relation to the third of these – the potential level of timber harvesting that would prevail after other changes that would be made in the absence of the ECC.

Officers of the ECC and the Forests Service have advised that other forest management planning processes would necessitate reductions in the future availability of timber resources in the Box-Ironbark Study Area. That is, regardless of the ECC processes, additional zoning and prescriptions would require exclusions of timber harvesting from certain areas due to criteria (JANIS 1997) relating to representation of vegetation types in protected areas, protection of threatened flora and fauna, recreation and scenic landscape sites, habitat protection and water quality for forest streams.

3.2.1 Level of production without ECC recommendations

In developing our scenarios for the likely future levels of timber harvesting from the Box-Ironbark forests of the Study Area, we need to consider:

1. Firstly, the modelled yield from the present net productive area of State Forests.
2. Secondly, the reductions in available net productive area of State Forests that would be likely to occur regardless of proposed ECC changes.

The Forests Service completed its Box-Ironbark Timber Assessment (BITA) Project in 1998 (Forests Service Technical Report 98-3). Subsequently Forests Service developed an uneven age spreadsheet model, using the BITA data, and this indicated that actual harvest levels have been substantially below the preliminary estimates of potential production for the net productive area of State Forests. Based on the Forests Service's modelling, the level of timber harvesting could increase substantially in the absence of any changes to the available forest land base (resulting from ECC recommendations, government decisions or forest management planning).

Whereas the actual level of cut over the past decade has been approximately 45,000 m³ p.a., the Forests Service has estimated that the potential yield of the net productive area would allow an approximate doubling of timber harvesting for each product type from the existing net productive area of State Forests.

The industry is aware of this re-assessment of resource availability and appears to expect that, even with a withdrawal of substantial areas of State Forests from timber production after the ECC's Inquiry, that they will be able to increase their level of production. Discussions with individual licensees and representatives of the Forests Protection Society have revealed that the industry hopes that, after the ECC's Investigation, the Forests Service would develop a Forest Management Plan for the Bendigo FMA that would allocate increased levels of timber harvesting.

The industry believes that markets are available for the increased production for all product types and that it could rapidly expand its level of harvest and timber processing. The consultants have assessed the market potential for each product type (see Stage 1 report) and we believe that there is little doubt that the markets for firewood in Victoria could accommodate substantially increased volumes from the Box-Ironbark Study Area, particularly because of the potential to substitute additional produce from the Box-Ironbark Study Area for similar produce coming from other (mainly poorer) forest types in Victoria and interstate. It is difficult to understand the industry's view that markets would accommodate increased volumes of posts. Post logs are being processed into small dimension sawn products by several small new sawmills in the study area, operating out of the Maryborough, Inglewood and Rushworth areas.

The market situation for kiln-dried products from sawlogs is less clear. The consultants believe that marketing of substantially increased volumes of kiln-dried products from sawlogs in the Box-Ironbark Study Area would be more feasible if longer term licences were available, so that saw mills could negotiate long term contracts for sale of the additional produce. It is stressed that the growth in saw milling capacity would be slow unless there was a change in marketing emphasis. At present the processed sawlogs from the Box-Ironbark Study Area that are kiln dried are being sold into small 'niche' markets such as for flooring and high priced furniture. Those markets are unlikely to accommodate rapid and substantial increases in volumes. It is more likely to be only export markets for products such as kiln-dried floor boards that would accommodate rapid and substantial increases in volumes.

Discussions with representatives of the industry confirm this view, but representatives of the industry have advised the consultants that contracts to supply markets, such as export markets for kiln-dried floor boards, could be developed and they believe that higher levels of production could be achieved progressively over a five year period from the time that the Forests Service notified them that long term increases in allocations were available.

3.2.2 Level of production with implementation of ECC recommendations

Officers of DNRE's Forests Service have estimated the likely future levels of timber harvesting from the forest available after implementation of the ECC's Draft recommendations (see Table 3-2). The Forests Service's assessment method is summarised in Appendix 11 to the ECC's Draft Report.

Table 3-2 Estimates of future levels of availability of timber resources from Box-Ironbark Study Area

	Volumes available (cubic metre p.a. rounded to '00)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	1,400	5,900	37,000	44,300
Potential harvest from existing net productive area	3,900	13,770	74,000	91,700
Potential harvest from reduced net productive area due to ECC changes	2,030	7,970	42,670	52,700
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	2,400	9,300	49,600	61,300

Sources: 'Recent actual from existing net productive area' and 'Potential cut from existing net productive area' – BITA Report and Forests Service
 'Potential cut from reduced net productive area due to ECC changes' – Advice to ECC from Forests Service
 Potential cut from reduced net productive area due to changes that would be made regardless of the ECC – ECC officers' estimates of areas required to meet JANIS targets

The Forests Service's modelling suggests that even with implementation of the ECC's Draft Recommendations, future levels of sawlog harvesting could be increased by 57 per cent over actual cuts in recent years; that is, from 1,400 to 2,030 m³ per year. If there were no ECC Investigation, no RFA planning, and no forest management planning, the modelling indicates that the forest now available could produce 3,900 m³ per year of sawlogs.

The harvest of posts and firewood could also increase, in the absence of management planning.

3.2.3 Reductions in net productive area of State Forests that would be likely to occur regardless of proposed ECC changes

Officers of the ECC have advised that the Box-Ironbark forests, in the absence of the ECC investigation, would have been subject to forest management area (FMA) planning processes. A key feature of these processes is the use of the nationally-agreed JANIS (1997) criteria for establishment of a comprehensive, adequate and representative reserve system (see Appendix 7).

JANIS (1997) includes criteria for areas required to adequately represent a range of values in the reserve system, where timber harvesting is generally excluded. Preliminary analysis by the ECC indicates that approximately 70,000 hectares of gross forest area currently available for timber production would be required to meet just the JANIS criteria for representation of EVCs (ecological vegetation classes - the standard unit of vegetation classification used in Victoria), compared to approximately 90,000 ha of gross forest which the ECC proposals make unavailable for timber harvesting.

For this analysis, we have taken Forest Service's modelled reduction in sustainable cut due to ECC changes and reduced that by the ratio of 70,000 divided by 90,000, and taken that as the basis for the 'without ECC' scenario.

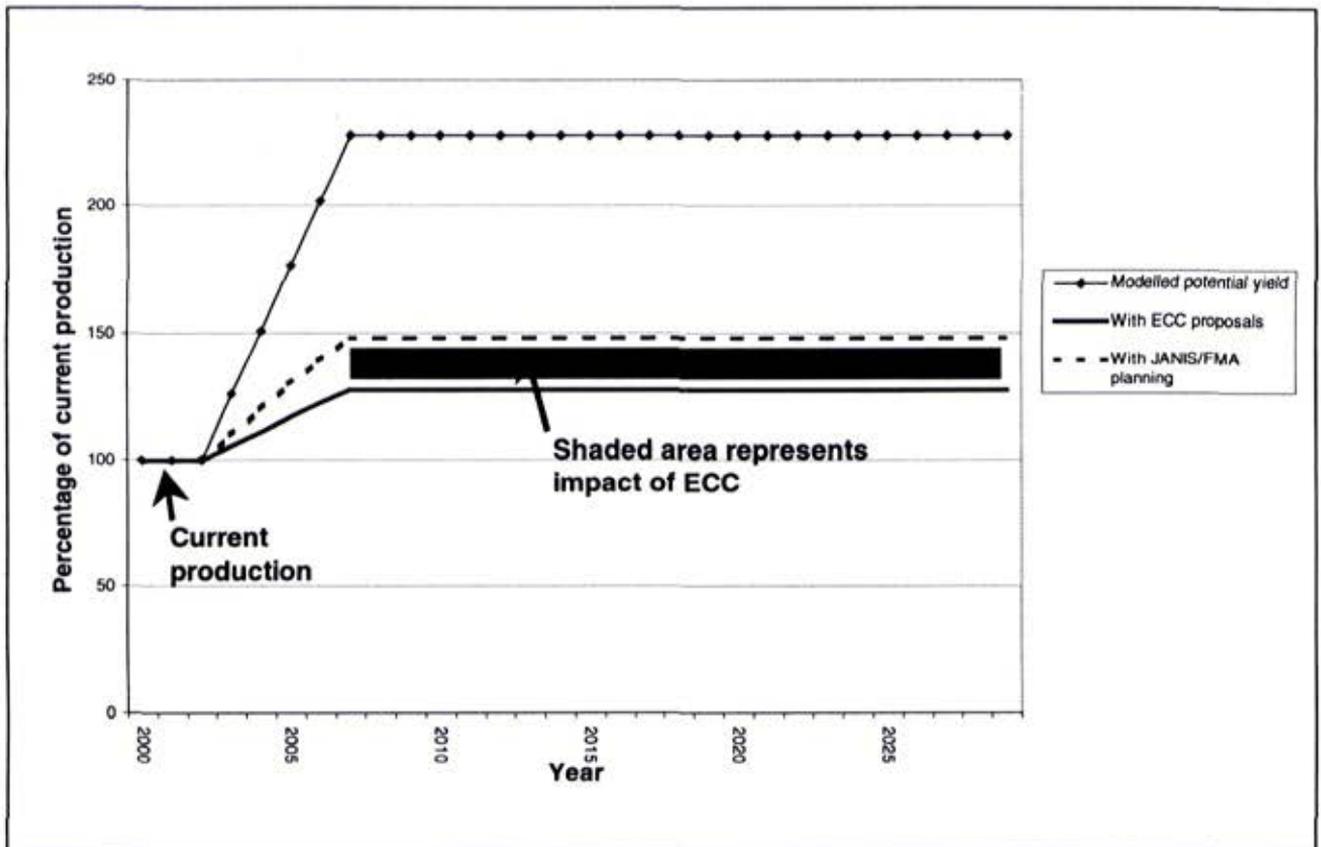
3.2.4 Economic evaluation of impacts from implementation of ECC recommendations

Given the Forests Service's assessment that timber harvesting would increase relative to present levels even with implementation of the ECC's Draft Recommendations, the **impacts can be perceived as a reduction in future growth in harvesting rather than a reduction in the absolute level of harvesting**. The impact of the notional reduction in future levels of timber harvesting from the Box-Ironbark forests is shown diagrammatically in Figure 3-1. The difference, shown as the shaded area, represents the notional cost which can be attributed to the ECC's Draft Recommendations for public land use, against an approximate line indicating application of the JANIS criteria in FMA planning.

In social benefit cost analysis we are concerned with net economic values. The net economic value of something is what people are prepared to pay for it (even if not required to do so), while economic activity concerns the flows of money and resources set in train as a result of the economic value. Economic value is the relevant concept for benefit cost analysis.

From the viewpoint of Victoria/Australia, the costs of providing services to consumers must be offset against the expenditure by consumers. Oversimplifying, the net gain to the economy is \$35 when a timber cutter transforms a tree into cut firewood at a cost of \$15 and sells it for \$50. The amount of economic activity would be \$50, but the (net) economic value would be only \$35. As a generalisation evaluations from the viewpoint of the region will be more concerned with changes in economic activity while evaluations from the viewpoint of the broader Victorian/Australian economy will be more concerned with changes in (net) economic value.

Figure 3-1: Future levels of timber harvesting in Box-Ironbark Study Area with and without ECC's Draft Recommendations (assumes Timber Industry progressively increases production to revised potential yield over next five year)



A change to the level of access to public lands for timber harvesting affects the access to standing timber. Consequently the net economic effect of a change in access should be estimated as the net value of the standing timber.

We have used the economic models developed during the Stage 1 consultancy to estimate the net economic contribution from the timber industry which is dependent on the Box-Ironbark resource in the Study Area with and without the implementation of the ECC's Draft Recommendations.

Those models were based on discussions with individual forest workers, during which we have gained an impression of the range of technology and productivity across the sector. That information was provided freely by forest workers, on the understanding that it would remain confidential to the consultants. Consequently, while we could not present estimates for actual enterprises, we proposed some hypothetical enterprises based on our estimates of average productivity levels (see Table 3-3). The net economic contribution has been derived here as a 'residual price'. It has been calculated as the surplus, or 'residual', over and above costs (including all labour valued at mean Australian weekly earnings). That is, it represents the return to licensees above basic wages. It is this component of economic activity which contributes to economic growth.

Table 3-3 Comparison of costs and returns by type of product

	Per cubic metre cut				
	Firewood sold in local region	Firewood sold in Melbourne	Posts sold in local region	Sleepers sold in local region	Sawlogs sold as mix of dried/green timber in local region
Price	\$45.00	\$70.00	\$117.00	\$129.00	\$496.00
Royalty	\$10.30	\$10.30	\$32.76	\$38.70	\$41.00
Labour	\$22.73	\$31.06	\$54.17	\$35.83	\$332.00
Fuel & other inputs	\$0.45	\$1.29	\$1.81	\$3.58	\$20.00
Capital equipment	\$2.94	\$2.85	\$21.15	\$13.99	\$41.10
NET ECONOMIC CONTRIBUTION (measured as net return to licensee over & above their wages)	\$8.58	\$24.50	\$7.12	\$36.89	\$61.90

A more conceptually appealing and detailed approach of estimating the net economic contribution of the standing timber is to use observations of the prices paid by timber mills to gain access to standing timber. Unfortunately, there is no recent data to undertake such an assessment, but data from 1990 provide some insights. Outside the Box-Ironbark area, Victoria has a system of long-term transferable licences for timber which allows individual saw millers to buy and sell rights to quotas for timber from State Forests. Royalties paid to the State government do not necessarily reflect the full value of the timber resource to licensed owners. The bid prices of sawmillers for those licences reflects primarily how much more than royalty rates the standing timber is worth to them. The Australian Bureau of Agricultural and Resource Economics (ABARE) analysed information for sale prices in 1990 for licences covering most regions of Victoria and the full range of log grades. They found that, depending on the grade of log, shadow prices were 33 to 61 per cent above royalty rates. Taking royalties for the mix of logs harvested from the Bendigo FMA over recent years, the mean royalty plus 33 to 61 per cent would be \$54 to \$66 per m³. This is broadly consistent with the residual price estimate of \$62 per m³ (Table 3-3).

For our base case we have specified that the timber industry would commence an increase in production from the Year 2002 and attain the full increase in 2007 (after another 5 years). This assumes firstly that, to complete the ECC's processes, for Government to consider ECC's recommendations, for the Forests Service to contemplate the implications and then to prepare a Forests Management Plan for the area, would take until 2002. It also assumes achievement of the industry's expectations that it could expand production in a five year period from the time that the Forests Service notified them that long term increases in allocations were available.

Whereas the notional net economic contribution from harvest and cutting/milling would be \$1.09 M p.a. from 2007 based on the potential cut from the net productive area remaining after changes that would be made regardless of the ECC, it would be \$0.94 M p.a. based on the potential cut from the net productive area remaining after the ECC changes (Table 3-4). This represents a notional net cost to the industry of \$0.15 M p.a. from 2007 onwards (calculated as \$1.09 less \$0.94). The relative size of net economic contribution from 2007 onwards for each scenario is shown in Figure 3-2, which takes the present harvest level as a base shown as 100.

In terms of employment the notional net impact is once again represented by the shaded area in Figure 3-1. Whereas the total employment would be equivalent to 91 jobs from 2007 without the ECC proposals, it would be 78 jobs with implementation of the ECC's Draft Recommendations. This represents a net cost to the industry of 13 jobs from 2007 onwards (calculated as 91 less 78).

3.2.5 Conclusion

The impacts are summarised in Table 3-4. Importantly, the Forests Service's assessment implies that the level of timber harvesting could increase even with the changes proposed by the ECC. The Forests Service's modelling suggests that even with implementation of the ECC's Draft Recommendations, future levels of sawlog harvesting could be increased by 45 per cent over actual cuts in recent years; that is, from 1,400 to 2,030 m³ per year.

Given the Forests Service's assessment that timber harvesting would increase relative to present levels even with implementation of the ECC's Draft Recommendations, the impacts will still leave an increase over the present cut, but

this level would represent a notional reduction in the theoretically even higher future growth that could occur without the ECC proposals and without RFA/FMA planning.

Whereas the notional net economic contribution from harvest and cutting/milling of timber from the Box-Ironbark Study Area would be \$1.09 M p.a. from 2007 based on the potential cut from the net productive area remaining after changes that would be made regardless of the ECC, it would be \$0.94 M p.a. based on the potential cut from the net productive area remaining after the ECC changes. This represents a notional net cost to the industry of \$0.15 M p.a. from 2007 onwards (calculated as \$1.09 less \$0.94). This would comprise a loss in future growth of the sector rather than an absolute reduction in the present size of the industry.

In terms of employment, whereas the total employment would be equivalent to 91 jobs from 2007 without the ECC proposals, it would be 78 jobs with implementation of the ECC's Draft Recommendations. This represents a net cost to the industry of 13 jobs from 2007 onwards. Once again, this would be a real reduction in future growth of employment for (mainly part-time) licensees, rather than a loss for existing licensees.

Figure 3-2 Relative size of net economic contribution from 2007 onwards

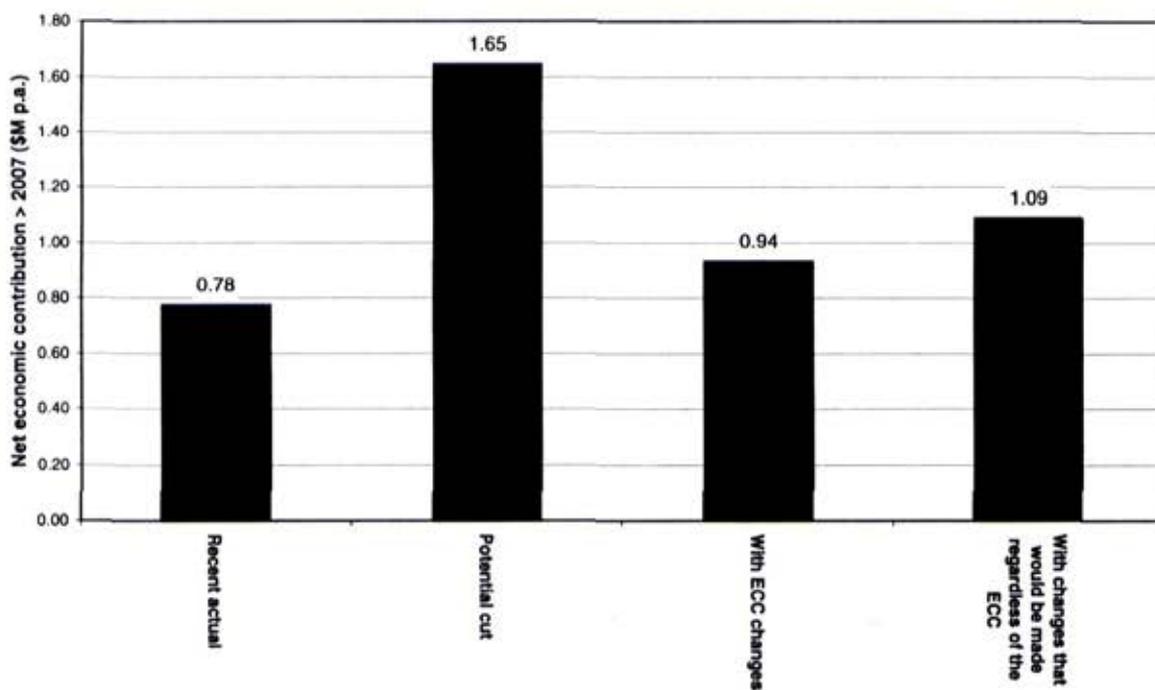


Table 3-4 Estimates of impacts on timber harvesting

	Volumes available (cubic metre p.a. rounded to '00)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	1,400	5,900	37,000	44,300
Potential harvest from existing net productive area	3,900	13,770	74,000	91,700
Potential harvest from reduced net productive area due to ECC changes	2,030	7,970	42,670	52,700
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	2,400	9,300	49,600	61,300

	Employment (full time equivalents)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	17	11	34	61
Potential harvest from existing net productive area	47	25	67	139
Potential harvest from reduced net productive area due to ECC changes	24	14	39	78
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	29	17	45	91

	Net economic contribution (\$M p.a.)			
	Saw log (includes sleepers)	Posts	Firewood	Total
Recent actual from existing net productive area	\$0.09	\$0.08	\$0.61	\$0.78
Potential harvest from existing net productive area	\$0.24	\$0.18	\$1.22	\$1.65
Potential harvest from reduced net productive area due to ECC changes	\$0.13	\$0.10	\$0.71	\$0.94
Potential harvest from reduced net productive area due to changes that would be made regardless of the ECC	\$0.15	\$0.12	\$0.82	\$1.09

4 EUCALYPTUS OIL PRODUCTION

4.1 SUMMARY OF PROFILE PREPARED FOR STAGE 1

The local eucalyptus oil industry has the following characteristics:

- Seven eucalyptus oil producers operate on public land in central Victoria
- Value of eucalyptus oil production from public land in 1995/96 is estimated at \$125,000
- Employment in the industry is estimated at 5-10 full time job equivalents

The industry is in long-term decline, with local producers unable to compete effectively with bulk imports.

There are plans for bulk production of eucalyptus oil in Western Australia as a by-product of salinity management. This could effectively end the industry in Victoria unless local producers can survive by identifying new markets. The Australian industry is presently seeking new markets for bulk supplies of eucalyptus oil, plus the Victorian industry can continue to seek niche markets or to seek gains as part of the tourism product of the region (part of the "bush industry heritage").

4.2 AFFECTED AREAS

The ECC proposals will have some impact on the production of eucalyptus oil from public land. These impacts arise from redesignation of some areas of State Forest currently used for eucalyptus oil production to State Park or Nature Conservation Reserve. The areas currently licensed for eucalyptus oil production that will be affected by the proposed changes are described in Table 4.1.

Table 4.1 Eucalyptus oil harvest areas affected by ECC proposals

Affected area	Proposed designation	Area licensed for eucalyptus oil harvesting	Area harvested for eucalyptus oil in an average year
Whipstick-Kamarooka link	State Park	1,200	80
Wedderburn	Nature Conservation Reserve	2,103	285
Rushworth State Forest	NCR	50	50
St Arnaud Regional Park	Regional Park	n/a	0
Total		3,353	415

Source: ECC

The total area of land licensed for eucalyptus oil production covered by these proposals is approximately 3,350 hectares. However, only a certain portion of licence areas have traditionally been harvested, and these areas have been established by management agreement with DCNR. The extent of the various potentially affected licence areas which are currently harvested is estimated to be 415 hectares. This represents approximately 18 per cent of all public land which is cut for eucalyptus oil in the Study Area (total area cut in an average year is 2,268 hectares, according to ECC estimates).

4.3 VALUE OF PRODUCTION

The value of eucalyptus oil production from the Study Area is estimated to be approximately \$125,000 (figure for 1995-96 provided in the Stage 1 report). Given a total cut of 2,268 hectares, this suggests a value of production of \$55 per hectare.

Discussions with producers in the Study Area and references from plantation operators in Western Australia (CALM, 1996) suggest that the variable costs of production are in the range \$20-\$60 per hectare depending on the terrain, the nature of the resource, distances to processing plants, and so on. For our purposes, we take a relatively low cost of \$30 per hectare given that producers have no land-holding costs. The net economic value, or 'producer surplus', is therefore around \$25 per hectare (ie \$55 value of production less \$30 variable costs).

It appears that the returns from eucalyptus oil production are low, similar to marginal dryland farming. This factor may explain why most of the operators are part-time or have other sources of income.

Given the estimate of 415 hectares in areas potentially no longer available for harvesting, we estimate that the net economic loss resulting from this proposal could be of the order of \$10,000 per year.

4.4 REGIONAL IMPACTS

The proposals would result in the loss of gross expenditure to the Box-Ironbark Study Area. This would amount to \$12,000 per year based on expenditure on variable costs of \$30 per hectare per year (and making a reasonable assumption that production expenditure is all expended within the region).

We estimate the proposals could result in the loss of up to 1 full time job equivalent. In fact, the loss of income will be spread amongst a number of operators. Some of these may transfer their efforts to other areas of public land or to eucalyptus harvesting on private land.

4.5 AMELIORATION MEASURES

There are several amelioration measures that could be put in place to restrict the impact of the ECC proposals, including:

- Revising the licence areas to ensure that working operators who have lost their licence area can have access to other licence areas which are not harvested regularly; and/or
- Assist affected operators (and possibly all operators) to take part in farm forestry and plantation experiments in order to create a more economically viable industry on private land.

It may also be possible to reward more efficient production by changing the royalty system to charge on the basis of area cut (or volume produced) rather than on the price for which the product is sold.

4.6 SUMMARY

1. The ECC proposals will reduce the area harvested for eucalyptus oil by 415 hectares, or 18 per cent of the total area currently harvested.
2. The reported returns from harvesting are approximately \$55 per hectare. The variable costs of production are estimated at \$30 per hectare and the producer surplus at \$25 per hectare. The economic loss as a result of the ECC proposals will be of the order of \$10,000.
3. There will be reduction in expenditure in the Study Area of approximately \$12,000. This will reduce the labour requirement of eucalyptus oil production by up to one full-time job equivalent. However, this loss will be spread amongst a number of operators, particularly those operating around Wedderburn and in the Whipstick-Kamarooka link.
4. There are amelioration measures which could be put in place to protect this fragile industry, including a revision of licence areas and royalty arrangements, and encouragement of the development of plantations for the production of eucalyptus oil on private land.

5 MINING

5.1 SUMMARY OF PROFILE PREPARED FOR STAGE 1

This Stage 1 review provided the following information:

- The 10 largest gold producers account for all but a tiny proportion of production.
- These producers had mining licences over 6,901 hectares in the Study Area, of which 24 per cent were in Box-Ironbark forest, mainly in public land.
- Gold mining in the Study Area provides 621 jobs directly, with an estimated 149 (24 per cent of the total) due to mining on public land.
- Employment in gold mining is concentrated in the Northern Grampians and Greater Bendigo. Stawell Gold Mines accounts for 54 per cent of all Victorian gold production and is by far the largest employer. At the other end of the scale, the small “doze and detect” operators and recreational prospectors concentrate in the Central Goldfields, Loddon, Mount Alexander and Pyrenees municipalities.
- Mineral exploration licences cover most of the western part of the Study Area and comprise 40 per cent to 60 per cent of the total for Victoria.
- The outlook for gold is for an increase in local production despite relatively low gold prices. The three largest mines hope to be generating a total of \$160 million per year in five years.
- Stone production in the box-ironbark Study Area is worth around \$38.5 million per year, with employment of 78 people. Stone resources are widespread and are not dependent on quarrying from public land. Production generally takes place at the closest convenient point to the source of demand. The outlook for demand is steady, with continuing urban development and a number of major road projects in the Study Area.

5.2 POTENTIAL LOSS OF MINERAL PRODUCTION

The proposals of the ECC would have some economic effects on mining (particularly gold-mining) in the Box-Ironbark area. These effects arise from:

1. the redesignation of a number of parcels of public land from management regimes in which mining and mineral exploration is permitted to regimes in which it is more difficult to undertake (i.e. through the declaration of additional areas of State and National Parks);
2. changes to the management regimes of several blocks of public land to prohibit surface mining (although still allowing underground mining); and
3. changes to mining licences, with additional requirements on miners to demonstrate the likely economic benefits of mining compared with the other uses of the land, and stricter requirements for rehabilitation of the land following mining.

The economic impacts may include:

- the potential loss of mineral production and revenues to miners
- additional costs of production resulting from changes in management and licence requirements (which in some instances may prohibit mining, particularly by small operators)
- reduction in revenues of service providers in the Box-Ironbark region

Each of these impacts is examined separately. The analysis concentrates on gold production since production of other minerals in affected areas is marginal.

The ECC's proposals for new State and national parks on public land which currently accommodates exploration and mining will permit existing mining tenements to continue, and exploration to continue under existing licences. If an economic resource is found, the Government will decide on a specific proposal for a mining operation. However the Council's proposals will effectively prohibit the granting of new licences to undertake these activities, as the new parks would be exempt from new licences. Gold remaining in the ground in the new State and National Parks will no longer be available for extraction, except by firms holding existing exploration or mining licences. To work out the potential economic value of this foregone resource, we need to know:

- how much gold is in the ground in proposed new areas of State and national park? and
- is it feasible to mine that gold, given costs of production and the price of gold?

The answers to these questions are unknowable given our current understanding. However, in order to provide a broad estimate of the potential scale of the resource foregone we can make a series of assumptions and extrapolations based on recent Victorian experience.

5.2.1 Method

Gold mining on any significant scale follows exploration and discovery of a mineable resource. We presume that, other things being equal, the scale of the exploration effort has a direct relationship to the value of gold produced. If we make the tentative assumption that there is a stable relationship between the two that will hold good in the future, and if we know the exploration costs, we can estimate the value of gold that could be produced.

5.2.2 The relationship between exploration and gold mined

MPV have provided figures on exploration expenditure and gold mined in Victoria during the period 1992/93 to 1997/98. We have examined the relationship of exploration costs to the value of mined gold each year and also to the value of mined gold two years later, in order to allow a time lag between exploration and mining.

These relationships are shown in Table 5.1.

Table 5.1 Relationship between exploration costs and gold mined, Victoria, 1992/93 to 1997/98

	Exploration costs (\$million)	Mined gold (oz)	Value of mined gold (\$million)	Relationship of exploration costs to value of gold produced	Relationship of exploration costs to value of gold produced 2 years later
1992/3	6.8	128,395	56.5	831%	0
1993/4	16.0	125,960	55.4	346%	0
1994/5	22.8	138,876	61.1	268%	899%
1995/6	29.4	155,550	68.4	233%	428%
1996/7	31.2	151,229	66.5	213%	292%
1997/8	33.4	160,122	70.5	211%	240%
Total	139.6	860,132	378.5	271%	355%

Source: MPV, Essential Economics

The time-lagged relationship provides a better explanation of the growth in the mined resource, and this is the relationship we use in further calculations.

Whilst the relationship of exploration costs to the value of gold production over the period has not been stable, on average, the weighted value of gold produced from successful mines has been 355% of exploration costs two years earlier. Looked at another way, the figures show that exploration costs are 28% of the value of gold produced. This is a high figure but represents cumulative exploration costs over a number of years by successive explorers. We have adopted the 355 per cent figure, but stress it may be an over-estimate for the future in the Study Area, particularly since the value of production from the Stawell joint venture is included in the data set used.

5.2.3 Exploration costs

Table 5.2 shows the area currently covered by exploration licences in the areas of proposed State and National Parks. It shows that exploration licences cover approximately 9,000 hectares in proposed State and National Parks, and this is 0.9% of the total exploration licence areas in the Study Area.

Table 5.2 Area of exploration licences in proposed Park areas

Park proposal	Exploration licence area (hectares)
St Arnaud Range	305
Kooyoora SP (extension)	4,446
Paddys Ranges SP (extension)	299
Whipstick-Kamarooka Link	2,025
Mt Black SP	0
Reef Hills	0
Warby Ranges SP	0
Chiltern-Pilot NP (extension)	2,021
Total in affected areas	9,096
Total Box-Ironbark Study Area	1,047,188
Proportion in affected areas	0.9%

Source: MPV, ECC

In Stage 1 of this consultancy (Essential Economics and Read Sturgess & Associates, 1998), we estimated that total expenditure on exploration in the Box-Ironbark Study Area was \$25.9 million (1996/97). Assuming this exploration cost is equally spread amongst all exploration licence areas, we estimate that the cost of exploration in the proposed Parks is of the order of \$0.2 million (ie 0.9% of \$25.9 million).

For the purposes of our present estimate, we assume that this level of exploration expenditure will continue into the future.

5.2.4 Calculation of the value of the potential gold resource

Having an estimate of exploration costs in proposed Parks and an estimate of the relationship between exploration and gold production, it is possible to estimate the value of the gold which may otherwise be produced in the new Park areas. This calculation is illustrated in Table 5.3.

Table 5.3 Potential value of gold production and producer surplus in proposed State and National Parks in the Box-Ironbark area

Variable		Reference
Estimated exploration costs	\$220,000	Estimated above
Proportion of mined gold to exploration costs	355%	Estimated above
Value of mined gold	\$780,000	Calculated
Gold price (\$/oz)	\$440	Approximate current gold price
Quantity of gold mined (oz)	1,773	Calculated
Cost of mining/oz	\$275	Estimate from Victorian Chamber of Mines
Cost of mining	\$490,000	Calculated
Total cost of production (mining & exploration)	\$710,000	Calculated
Producer surplus (value less total cost of production)	\$70,000	Calculated

Source: Essential Economics

This set of estimates and calculations suggests that the annual value of gold production in the proposed State and National Parks in the Box-Ironbark area could be \$0.78 million per year, and that the producer surplus (the economic value) could be \$0.07 million per year. This represents a 10% return on costs which is a reasonable industry average (and gives us some further confidence in our estimate of the relationship between exploration costs and mining production).

5.2.5 Likelihood of gold production

Our calculation is based on State-wide averages for the relationship between exploration and gold production. However, there is no guarantee that exploration in a particular area will discover any mineable gold.

It is said that one mine results from every 1,000 explorations (RSA, 1994). The Victorian Chamber of Mines suggests that the continued exploration and re-exploration of an area is important in creating an information base from which successful mining will eventuate if a resource is present. It follows, therefore, that the probability of achieving the production outlined above is more than 0 but significantly less than 1, although this probability would grow with continued exploration.

However, for every year that no economic gold resource is discovered, we would expect that exploration expenditure would decline, as exploration companies become discouraged. This in turn would further reduce the likelihood of economic gold deposits being discovered.

In addition, the ECC has developed the Park boundaries taking into account existing recognised gold fields which have previously produced gold and which remain a focus of exploration interest. Accordingly, they are generally less prospective than other parts of Box-Ironbark public land.

5.2.6 Gold production foregone

Within the proposed new State and National Parks no new exploration licences will be granted. Therefore, no mining of mineral deposits will occur from areas explored under new licences. However, existing exploration licences may continue; and if economic deposits are discovered mining may be allowed at the discretion of the Minister.

We do not know the probability of whether firms will give up their exploration licences in the proposed new Park areas. Advice from the Chamber of Mines suggests that this will be very likely. On the other hand, there is still an exploration licence in the Chiltern Box-Ironbark National Park (declared in 1997). This example may indicate that miners are becoming more willing to take the risk that exploration could result in a workable mine in a National Park.

This factor, along with the uncertainty that exploration will lead to any gold production suggests that the estimated producer surplus of \$0.1 million per year should be regarded as the maximum amount which may be foregone.

It is also the case that the expenditure on exploration in the proposed Park areas may be switched to other parts of the Box-Ironbark area or other parts of Victoria. However, exploration companies are international in scope and expenditure foregone in the proposed Parks may just as easily be switched to other continents as to Victoria or Australia.

5.3 POTENTIAL CHANGE IN MANAGEMENT COSTS

Two types of management changes are examined here:

1. It is proposed that surface mining is prohibited in two areas of new regional park to the south of Bendigo. This may impose additional costs in mining gold found in these areas.
2. A series of general provisions are proposed to apply to all exploration and mining on public land, which may impose additional costs on all miners.

5.3.1 Prohibition of surface mining in parts of the Greater Bendigo Regional Park

The ECC proposes to prohibit surface mining in two blocks of the Greater Bendigo Regional Park (but underground mining will still be allowed). This may impose additional costs on mining in these areas.

The cost of a large-scale mining operation is determined largely by the amount of material that must be removed to extract the resource.

- The cost of surface (open cut) mining is approximately \$5 - \$10 per tonne of material removed.
- The cost of underground mining is approximately \$25 - \$45 per tonne of material removed, but much less is removed.

The type of mining chosen normally depends on the depth of the identified resource. A calculation is made about the volume of material that needs to be removed to work out the most economical mining method. Clearly, a shallow resource deposit is usually accessed by open-cut mining, whilst a deep deposit is cheaper to access via underground mining.

If an economic resource is discovered close to the surface in the areas in which surface mining is prohibited, there will be a cost penalty for miners in extracting that resource. The cost of extracting a surface resource by underground mining could be five times the cost of open-cut mining. However, it is considered unlikely that a resource will be discovered at the surface, given the intensive exploration of these areas during the first gold boom.

Any additional cost of this proposal will depend on:

- the discovery of economic mineral deposits in the area
- the depth at which those deposits are located
- the precise comparative cost of surface mining compared with underground mining
- the practicality of the site in relation to urban areas

We cannot determine the scale of any additional costs but we can say that the probability that additional costs to miners will be incurred is greater than zero.

5.3.2 Impacts of general management provisions

The ECC draft proposals for mining on public land are for the inclusion of current environmental best practice as standard mining licence conditions. Best practices in this context include:

- exploration to have virtually zero impacts on public land (requiring prior site assessment, careful use of the site and high quality rehabilitation)
- compensation to be provided for the loss of land cleared for mining (and this could be in the form of the purchase and donation of land to the public estate, or the provision of an equivalent monetary amount)
- the need to demonstrate the economic significance of the resource prior to mining (currently applicable to large mines but proposed to apply to all mining operations)

For larger miners and exploration companies, these practices are sometimes already in place although there may well be additional costs for some firms to come up to this standard of practice. However, we judge that the practices recommended by the ECC would be implemented by larger miners in any case. There will therefore be no impacts on the larger miners as a result of ECC recommendations. For smaller miners, however, the impacts may be highly significant.

Currently, small miners (typically those with a mining licence area of 5 hectares or less) do not engage in exploration as a separate exercise, but proceed straight to mining activity. This often takes the form of a “doze and detect” operation, in which the vegetation is cleared, the surface soil is stripped and stockpiled, then a metal detector is used to scan the sub-soil. Further excavations are undertaken if the site is felt to be prospective. The site is then rehabilitated using the stockpiled soil and replanted. The object of the search is usually nugget gold.

The reported returns from these small mining operations is very low - in 1997-98, only 204 ounces from all licences of less than 5 hectares, out of a total Victorian production of 160,122 ounces (MPV, 1999). This level of production was worth approximately \$95,000 on current gold prices. (Actual returns are likely to be more substantial than this; discussions with the Miners and Prospectors Association of Victoria suggest that some individual *prospectors* are finding more than 204 ounces of gold per year. We speculate that the reasons for under-reporting are a combination of tax avoidance and fears about security by individuals working in rural and remote areas.)

Information supplied by the Prospectors and Miners Association of Victoria Inc (PMAV, personal communication) allows us to estimate the costs for a typical “Doze and Detect” operation to be as follows:

- permits and office expenses - \$5,000
- earth moving costs - \$5,000 (assuming miner undertakes this task)
- rehabilitation costs - \$5,000 (based on the bond required by MPV)
- Total variable cost - \$15,000 per year

Small miners will be faced with several additional costs as a result of the ECC recommendations, notably:

- the potential requirement to purchase comparable freehold land to the mining licence area and donate it to the public estate (and this applies to all miners)
- the requirement to demonstrate the likely economic significance of the resource being sought by the mining operation

These aspects are examined below.

1. *Purchase of land*

The price of privately owned Box-Ironbark woodland to replace areas under mining licence would vary with location in the Study Area. However, the cost of available broad-hectare forested land is of the order of \$1,000 per hectare. The additional cost imposed by this requirement could therefore be of the order of \$5,000 for a 5 hectare mining licence.

2. *Test of economic significance*

The form of the proposed test for economic significance of the potential resource from a doze and detect operation has not been defined. Nor has the necessary level of confidence in the test been established. The test could be:

- examination of historical records of past mining activity (by the proponent or previous licence-holders)
- a detailed metal detection operation of the surface of the area
- a trial excavation and sampling of material from holes or trenches

Discussion with the Geological Survey of Victoria suggests that physical testing for shallow deposits of nugget gold would be highly imprecise. One method of physical testing would require the excavation of several holes and the examination of the excavated material. Each hole could cost of the order of \$1,500, with the need to excavate up to seven holes over a five hectare licence area. The cost of this operation could therefore be of the order of \$10,000 for a five hectare licence.

3. *Would small miners continue to operate?*

The additional costs to a small miner as a result of the ECC recommendations could potentially be \$15,000. This is equivalent to the existing variable cost of production identified above. On this basis, involving a doubling of mining costs at least for the first year, it appears unlikely that many small miners would continue to operate. (The extent to which small miners do continue to operate following implementation of the recommendations would indicate the returns are much higher than we have allowed for, or that the new costs of land purchase and exploration are much less.)

4. *Potential impacts*

There are currently 65 mining licences in the Study Area with an area of 5 hectares or less. Excluding the licences held by large companies, there are 54 licences which are potentially "doze and detect" operations. If these operations were to cease as a result of the ECC recommendations, the potential reduction in expenditure would be (54 x \$15,000) \$810,000 per year. This is likely to be an over-estimate as some of the 54 licences are small-scale shaft mines involving relatively small areas of surface disturbance.

However, given the reported returns of approximately \$95,000 per year compared with expenditure of \$810,000, it would appear that a positive economic outcome of around \$715,000 per year would result of the cessation of small mining. The consultants do not believe the stated returns. In a rational world, small miners would not expend \$0.8 million per year unless they expected to recoup more than that amount. For example, a typical rate of return from other investments would be about 5 to 10 per cent which would suggest a net economic surplus of \$0.04 to \$0.08 million per year. However, it remains conceivable that small miners would be satisfied with a lower return if they were motivated also by non-monetary goals (e.g. leisure).

5.4 REGIONAL IMPACTS

Regional economic impacts from the ECC recommendations will arise as a result of the reduction in mining expenditure.

The components of potential regional economic impact are provided in Table 5.4.

Table 5.4 Components of regional economic impact (Maximum potential impact)

Component of potential change in expenditure	Loss of expenditure	Loss to the Study Area	Potential jobs lost
Exploration in new Parks	\$224,970	\$180,000	2
Mining in new Parks	\$490,000	\$392,000	4
Prohibition of surface mining in Bendigo forests	not known	not known	not known
Small miners throughout Study Area	\$810,000	\$648,000	6
Total	\$1,524,970	\$1,220,000	12

Notes: We assume that 80% of expenditure would otherwise be undertaken in the Study Area.

We assume that there is one full-time equivalent job in mining and exploration for every \$100,000 in expenditure.

The loss of expenditure from cessation of mining and exploration in new Parks, and the additional impost on small miners, could be \$1.2 million per year in the Study Area, resulting in the loss (or non-creation) of 12 jobs. We consider this to be the *worst case scenario*, with a maximum estimate of mining potential in the Parks and an assumption that all exploration and small mining would cease.

Any impacts would be felt in Bendigo (as the principal source of supplies for the regional mining industry) and the smaller towns close to the newly designated Parks, including St Arnaud, Avoca, Nagambie, Benalla and Beechworth.

5.5 CONCLUSIONS

1. The value of gold production foregone as a result of the declaration of new State and National Parks in the Box-Ironbark area is not known. Whether any gold would otherwise be produced is not known, although we can say that there is a probability that the value is greater than zero. The application of state-wide experience suggests that the value of production could be up to \$0.78 million per year. This value of production represents up to 1% of the recent annual total gold production in Victoria (\$74.3 million in 1997/98). Whether this, or any impact will actually be experienced depends on:

- the identified resource in the ground
- the conditions for gold production (price, techniques employed etc)
- the political and legislative framework for allowing continued exploration and mining in Parks
- the willingness of particular mining firms to accept additional investment risks in Parks

These factors will change over time.

Exploration can continue, and it is possible that mining activity could be undertaken in the newly declared parks, and that no significant gold production would be foregone. This would depend on the attitude of the Minister of the day and on the willingness of the exploration and mining companies to accept the risk of not being able to proceed if an economic deposit were found.

2. Based on the calculations and estimates presented here, the surplus foregone by significant producers *could* be up to \$0.07 million per year. If we also take into account the reduction in apparent economic losses as a result of the possible cessation of doze and detect operations (see 4 below), there could be a positive economic benefit of \$0.6 million. However, we do not believe that estimate since it is clear that the total value of gold production from doze and detect miners has been under-stated.
3. Whether exploration companies choose not to continue to operate in the proposed Parks is not yet known. However, there is evidence that exploration may continue in prospective areas (eg the Chiltern Box-Ironbark NP).
4. The impacts of the ECC recommendations on small miners could potentially result in the cessation of doze and detect operations throughout the Study Area. This is based on our assumptions about the production costs of small miners, and the additional costs that would be incurred as a result of the need to replace land mined and the need to demonstrate economic significance prior to mining. If all doze and detect operations were to close, we estimate that the loss of expenditure would be of the order of \$810,000 per year.
5. There will be a loss of expenditure in the economy of the Study Area as a result of the recommendations. This could be up to \$1.2 million per year. This level of expenditure could support up to 12 jobs in the area. We consider this level of impact to be a worst case scenario.

6 IMPACTS FOR GRAZING ENTERPRISES

The ECC's draft proposals include the exclusion of grazing from some riparian areas along the Broken-Boosey Creeks system which are currently grazed under licence. The area included within the ECC's draft proposal includes both grazing licences and river frontage licences. (Table 6-1).

Table 6-1 Grazing licences affected by ECC proposals

Type of Licence	Hectares	Number of licences
Grazing Licences	195.4	8
Water Frontage Licences	445.6	62
Total	641.0	70 ¹

¹ Two properties hold two licences

The total area of grazing and water frontage licences within the ECC's draft proposal is 641 ha and the average grazing licence per property is 9.4 hectares.

Almost 40 per cent of the licences are less than or equal to 5 hectares, and 77 per cent are less than or equal to 10 hectares (Table 6-2).

Table 6-2 Frequency distribution for property size.

<i>Area</i>	<i>Frequency</i>	<i>Cumulative %</i>
5	24	39.34%
10	23	77.05%
15	7	88.52%
20	5	96.72%
25	1	98.36%
30	0	98.36%
35	0	98.36%
More	1	100.00%

The average carrying capacity of the licences in question is estimated at 1.2 dry sheep equivalent (DSE) per hectare. The frequency distribution shown as Table 6-3 shows that 97 per cent of the licences have a carrying capacity less than or equal to 2.0 DSE per hectare.

Table 6-3 Frequency distribution for DSE per hectare.

<i>DSE/ha</i>	<i>Frequency</i>	<i>Cumulative %</i>
0.5	19	31.15%
1	22	67.21%
1.5	7	78.69%
2	11	96.72%
2.5	1	98.36%
More	1	100.00%

6.1 COSTS OF REMOVING GRAZING LICENCES

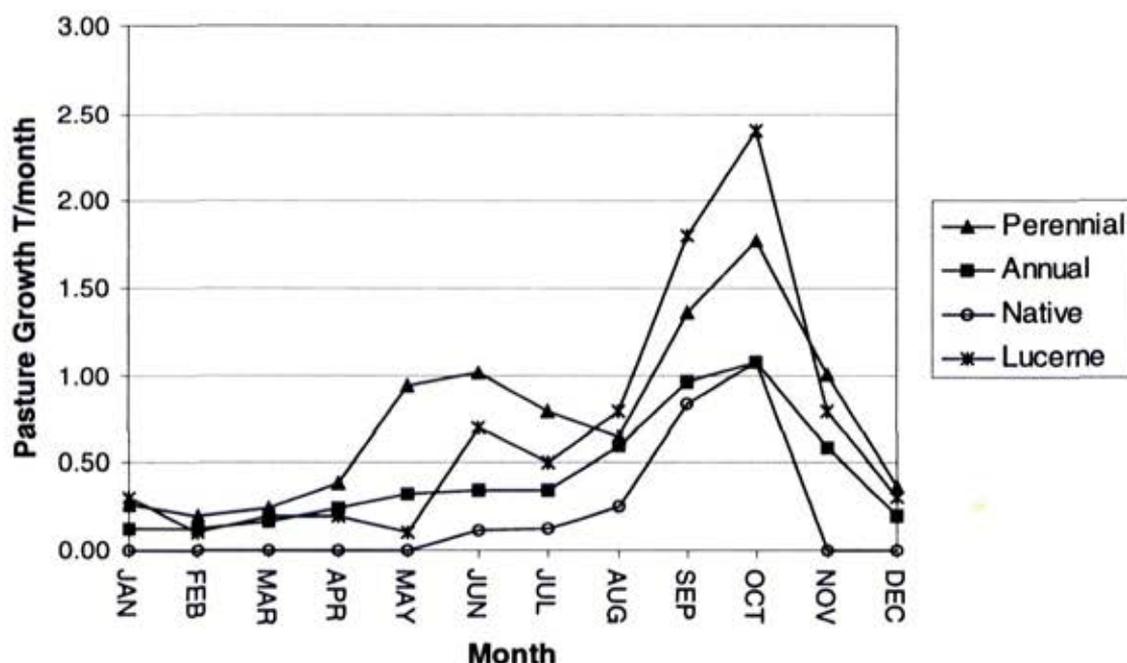
6.1.1 Pasture Production

A benefit of grazing licences is the value of the feed that the land provides, which can be measured based on the dry matter production and the value of the feed. Its overall value will depend on the quantity of dry matter grown, its quality and timeliness. Dryland pastures in southern Australia are most active in Spring, with little if any growth over the Summer. The precise distribution of pasture growth will depend on the pasture species present and rainfall (Figure 6-1).

It is common for there to be a surplus of feed in the months September through November, and a shortage over Summer. A common practice is for surplus dry matter to be conserved as hay or silage during the Spring and fed throughout the year as required.

Like all resources, the value of dry matter is greatest when it is the most limiting. An additional tonne of dry matter over the Summer is more valuable than similar growth in the Spring, because of the opportunities it creates to increase stocking rates throughout the year. While farmers trade in livestock to coincide with pasture growth, the base number of breeding ewes and cows is most dependent on the carrying capacity when dry matter is most scarce.

Figure 6-1 Pasture Growth in NE Victoria for different pasture types.



Source: DNRE

The public water frontage reserves controlled by grazing and water frontage licences about the Broken - Boosey Creeks system generally consist of native pasture species, although there is an increasing incidence of weeds. The areas chosen by the ECC for addition to the conservation reserve system (grazing to be excluded) generally have a much lower incidence of weeds. As is shown in Figure 6-1, dry matter growth for native pastures is minimal and what growth does occur, is in the Spring when dry matter is at its most plentiful. The value of this growth in terms of grazing is limited, apart from perhaps as roughage during the Summer months.

A gross margin for livestock was calculated based on individual gross margins for prime lambs, store weaners and yearling steers. A one-third split for each enterprise has been assumed based on an analysis of ABS statistics for the Study Area.

An average gross margin of \$11.3 per DSE was calculated. Assuming an average carrying capacity of 1.2 DSE per hectare, this corresponds to a gross margin per hectare of approximately \$14.0 per hectare. Applying this mean loss of grazing to the 641 hectare of licences to be extinguished, the annual impact is estimate as \$9,000.

Table 6-4: Livestock gross margins for north east Victoria.

	Income \$/DSE	Costs \$/DSE	Gross Margin \$/DSE
Prime Lamb	25	11.9	13.1
Yearling steers	15.3	4.2	11.1
Store Weaner	14.3	4.7	9.6

SOURCE: consultants' own financial modelling

6.1.2 Fencing Water Frontages

The cost of fencing depends on the shape of the frontage to be fenced. Generally, fencing river frontages is more expensive than typical boundary fences because of the number of bends involved. While typically fencing costs are in the order of \$2.50 per metre for materials and as much again for labour, fencing of river frontages is estimated to cost as much as \$6.00 to \$7.00 per metre (D. Lavery pers comm.). We have assumed a cost of \$6.50 per metre in this analysis.

In a survey of crown land frontages in the Goulburn Broken Catchment, Robinson and Mann (1998) calculated that 40 per cent of the land frontages (area) was fenced, 42 per cent was partly fenced and 18 per cent was unfenced. These estimates provide the best indication the consultants have for estimating the proportion of the area contained within the ECC proposal that could be already fenced. Assuming that half the partly fenced is actually fenced, then we can estimate that 61 per cent of the area of grazing and water frontage licences within the ECC proposal are fenced.

Of the area of grazing licences, it is estimated that 250 ha (calculated as 641 hectares times 39 per cent) would need to be fenced. If we assume an average width per frontage of 50 metres (D. Robinson pers comm.), then 0.2 km of fence is required per hectare of licensed area. The overall cost to fence 250 hectares is estimated at roughly \$325,000, or \$1,300 per hectare. Assuming a discount rate of 8 per cent over 30 years, this capital cost has an annual value of roughly \$29,000, or \$115 per hectare fenced.

6.1.3 Provision of Shade

Controlling temperature via shade is important for livestock productivity. Undoubtedly, the Box Ironbark trees within the grazing licences contained within the ECC proposal, provide shade to the livestock grazing the frontages. While this could be a benefit where the river frontages are the only source of shade, this is not the case for this area. Therefore this benefit has not been valued in this analysis.

6.1.4 Stock Watering

Many river frontages are important for stock watering. Where a river frontage is fenced, it is necessary to provide an alternative source for stock water, such as by:

- Carting water to stock from another source
- Piping water from an existing supply
- Pumping water from the water source into tanks or dams

The option that is appropriate for each landholder will depend on the relative cost of each alternative, which will depend on the availability of alternative water supplies and the presence/absence of existing reticulation infrastructure. While irrigators will have on-farm reticulation, this is unlikely to be the case for dryland farmers.

In determining the cost of providing alternative sources of water, it was assumed that irrigators already had an alternative watering point and therefore would not incur any additional costs where the river frontage was fenced. Of the dryland farmers who have not fenced-off the stream frontage, it is assumed that all of these frontages would require an alternative watering point. Although no data is available to suggest otherwise, based on the location of licences, we have

assumed that 50 per cent of the licences are dryland farming. This suggests that an additional watering point would be required for 13 licences (calculated as 68 licences multiplied by 39 per cent times multiplied by 50 per cent of farms)

The cost of watering points varies significantly according to:

- Type of watering point (dam or reticulated trough)
- Number and type of stock which are serviced by the watering point

We have estimated the costs to supply water based on using reticulated troughs. The cost to construct a reticulated trough to provide off-stream watering is generally around \$450 per point. Labour to install the trough is estimated at roughly 10-12 hours, at a cost of \$20 per hour. The cost of a pressure pump has been estimated at \$2,000.

The average number of off-creek watering points will vary according to the length of stream frontage that is to be fenced. On average 2-3 watering points per kilometre of frontage fenced would be appropriate. We have assumed that one kilometre of frontage is typical of a grazing licence, and that each licence would require two troughs.

The total cost per licence that requires additional watering points would be \$3,340, comprising:

2 Troughs	\$900
Labour	\$440
Pump	\$2,000

The cost of additional watering points can therefore be estimated based on the once off capital cost of roughly \$44,720 (calculated as \$3,340 per property multiplied by the 13 dryland licences affected). Assuming a discount rate of 8 per cent, over 30 years, this capital cost has an equivalent annual value of roughly \$4,000.

In addition to capital costs, there are on-going costs associated with the operation and maintenance of pumps and troughs as well as depreciation. An average operation and maintenance cost of \$265 per year has been estimated per landholder based on 10 hours labour and \$65 pumping costs. Depreciation has been estimated at \$300 per year based on a pump lifespan of 10 years. Therefore the ongoing costs are estimated at roughly \$7,345 per year (calculated as \$565 multiplied by 13).

Summing the capital and ongoing costs gives a total cost of \$11,345 per year.

6.1.5 Summary of Costs

	Annual Equivalent Costs
Pasture Production	9,000
Fencing	29,000
Access to Water	
<i>Capital Cost</i>	\$4,000
<i>Operation and Maintenance</i>	\$3,445
<i>Depreciation</i>	\$3,900
Total	\$49,345

6.2 IMPACT ON FARM VIABILITY

Where grazing licences represent significant parcels of land and have been leased and grazed for significant periods of time, impacts may extend to an overall impact on farm viability. The current profitability of dryland farming is marginal at best, so much so that any significant loss in the carrying capacity of a farm may be sufficient to cause a farm to cease being viable.

ABARE surveys annually a national sample of broadacre farms and publishes the results in the *Australian Farm Surveys Report*. Roughly 30 farms are surveyed in north east Victoria – the region most relevant to the Broken-Boosey Creeks system. The farm financial performances of these farms have been analysed for the four years 1992-93 to 1995-96.

Survey results for the four years 1992-93 to 1995-96 reveal that the average size of farms was about 300 hectares with most land used for grazing. Total cash receipts ranged from around \$50,000 to almost \$80,000 according to seasonal conditions and prices. This was only slightly more than total cash costs, but cash costs did not include the owners' labour nor capital. This means that there was little cash surplus as a return for the labour provided by owner operators and their families nor as a return to the capital invested in the farm operation. Whichever way these data are interpreted, farmers in the Study Area are not making much money.

The mean labour used on ABARE survey farms in the Study Area was between one and one and a half labour units per year. If this labour is valued at average weekly earnings, the small cash surplus on farm operations is translated into a significant loss. That is, the surplus of cash receipts over cash expenditure, when expressed on a weekly basis, would be less than Australian average weekly earnings. This leaves those farmers poorly paid for their labour and receiving no return to their capital investment or management skills.

Not surprisingly, most farm households have off-farm sources of income. Total off-farm income from wages and salaries, social security and earnings from investments was around \$30,000 per year. That is, roughly half the cash receipts obtained from farm operations. The picture that emerges of farming in the Study Area is of small farms with a large number of part-time operations.

Grazing licences represent about 3 per cent of the total farm area, and much less than this in terms of carrying capacity. It is therefore very unlikely that the removal of grazing licences will significantly change the financial performance of those landholders affected by the ECC proposal.

7 ADDITIONAL PARK MANAGEMENT COSTS

Administrative responsibility for land proposed to be included in a new Park or Reserve will be transferred from DNRE to Parks Victoria. Parks Victoria have higher management costs with respect to visitors because of the higher level of facilities and promotion associated with Parks and Reserves compared with State Forest.

Parks Victoria has supplied an estimate of the unit costs of their role in managing additional areas of parks and DNRE has provided an estimate of its unit costs for management of recreation in State Forests.

DNRE has estimated that it expends annually on average \$0.50 per visitor.

Parks Victoria has estimated that it expends annually on average \$0.61 per additional visitor and \$0.83 per additional hectare of park.

We have applied those unit rates to the estimated levels of visitation and area of proposed parks (see Section 0 and Appendix 3 for details of how the consultants developed scenarios to describe future levels of visitation). In the cases where present levels of visitation are unknown, we have assumed a visitation level of 1,000 per year. This suggests that the additional costs for Parks Victoria would be approximately \$530,000 per year, but these would be offset by a saving of \$225,000 for DNRE's Forest Service, thus suggesting a net increase of about \$300,000 per year.

8 BENEFITS

The economic benefits of the ECC's proposals should be considered as an increase in the net economic contribution that arises from the Box-Ironbark Study Area. The economic contribution that arises from natural resources can be considered to be composed of three elements (Pearce and Turner 1990):

- *direct use value* - of direct consumptive use to humans, such as the opportunities for timber production, recreation, water production, and grazing;
- *indirect use value* - such as the values associated with life support and pollution assimilation functions of wetlands; and
- *non-use value* - such as the value people place on the existence of a wetland whether or not they use it.

8.1 TOURISM AND RECREATION

8.1.1 Summary of profile prepared for Stage 1

The tourism industry in the Study Area has the following characteristics:

- The box-ironbark forests form the setting for many of the principal attractions of the Study Area, including the historic towns, rural goldfields areas, wineries, and scenic drives.
- Direct expenditure on tourism to public land in the Study Area generates an estimated 90 full time equivalent jobs.
- Prospecting as a recreational activity generates a significant proportion of the visitor expenditure, perhaps as much as 20 per cent of the total.
- Tourism in Victoria is expected to experience real growth. However, growth in visitation to the public land of the Study Area will depend on development and packaging of the goldfields heritage and on the successful marketing of indulgent weekends with forests as part of the food/wine/relaxation package. Major projects such as Bendigo Steam World and the Benalla Bushrangers National Hall of Fame will also encourage significant visitation to the public land of the Study Area.

8.1.2 Present level of visitation to areas included in draft recommendations

Tourism in the Box Ironbark area will be affected by the various proposals of the ECC. These effects arise mainly from the redesignation of parcels of public land as parks, with an expectation that there will be better visitor facilities and more promotion of these areas as places to visit, and therefore that there will be more visitors and tourism activity

Our analysis examines:

- changes in visitation to newly designated parks
- likely changes in tourism expenditure resulting from changes in visitation

We have been able to derive estimates of existing visitation at only 17 sites of relevance to the ECC's proposals and these are presented in Table 8-1. These estimates of existing visitor numbers have been derived mainly from two main sources:

1. Wherever possible, existing visitor numbers to particular parks and reserves have been taken from a database provided by Parks Victoria. Those values represent the average annual visitation over the two years 1996/97 and 1997/98.
2. Estimates of visitation to particular sites in State Forests have been taken from a database compiled by the consultants for Department of Natural Resources and Environment (Read Sturgess Associates with Henshall Hansen Associates 1994).

An exception is that the estimates for the Bendigo sites represent guesstimates by the consultants, made after discussions with rangers of Parks Victoria who have observed, but not counted, visitors to the areas of State Forests and parks/reserves which are adjacent to Bendigo. We have adopted guesstimates which are much lower than the visitation observed by officers of DNRE and Parks Victoria because many of the visitors observed would be local residents of Bendigo who make very short visits (jogging, horse riding, walking the dog etc.).

The total visitation to the 17 sites for which data were available is about three-quarters of a million per year. Importantly, this analysis excludes visitation to the following other parks for which visitation data are not available:

Ararat	Fryers Ridge
Big Tottington	Glynwylln
Broken-Boosey	Gobarup
Bung Bong	Havelock
Caralulup	Heathcote
Castlemaine-Chewton	Illawarra
Crosbie	Jallukar
Dalyenong	Korong Vale
Dunach	Landsborough
Eppalock	Landsborough Hill

Lexton	Shelbourne
Little Tottington	Spring Creek
Lonsdale	St Arnaud
Moliagul	Stoney Creek
Morri Morri	Stuart Mill
Mt Ida	Talbot
Mt Separation	Taradale
Mt Sugarloaf	Tooborac
Muckleford	Tungamah
Nathalia	Tunstalls
Numurkah	Upper Loddon
Percydale	Waggarandall
Pilchers Bridge	Warrenmang
Pilot Range	Wattville
Pyrenees	Wehla
Redbank	White Box
Sandhurst	Whroo

We have no basis for forming even guesstimates of visitation for those parks, but suspect that as a generalisation the 17 parks for which data are available would be the parks with the highest level of visitation.

Table 8-1 Estimate of present visits for 17 of the sites affected by ECC's proposals

New Name	State Forests component	Existing park/reserve component	Total
Bendigo	250,000	100,000	350,000
Chiltern-Pilot National Park	0	123,100	123,100
Deep Lead	23,000	1,800	24,800
Kamarooka	0	2,700	2,700
Kooyoora	70,000	70,100	140,100
Maldon	0	2,500	2,500
Maryborough	0	2,000	2,000
Mt Black	4,400	0	4,400
Paddys Ranges	6,000	5,000	11,000
Reef Hills	0	14,100	14,100
St Arnaud Range National Park	0	7,000	7,000
Terrick Terrick	0	6,200	6,200
Timor	1,000	0	1,000
Waanyarra	2,000	0	2,000
Warby Ranges	31,000	29,700	60,700
Whipstick-Kamarooka	0	9,800	9,800
Wychitella	0	6,000	6,000
Grand Total	387,400	380,000	767,400

Valuation of recreation and tourism

We have adopted unit values for the net economic contribution for visitors to parks/reserves, based mainly on another consultancy undertaken for DNRE (Read Sturgess and Associates 1999). That consultancy developed a generalised travel-cost model for the repeatable measurement of the economic value of recreation in Parks. Valuations of recreational use were undertaken for approximately 30 metropolitan parks in Melbourne and 35 National Parks and other sites in rural Victoria. It included consideration of the following parks of relevance to the ECC's proposals:

- Kooyoora SP
- Reef Hills Park
- Chiltern Box-Ironbark NP
- Kara Kara SP
- Deep Lead FFR

The consultancy found that unit values (per visitor day) varied greatly between different parks and reserves, depending on particular characteristics of each park. Interestingly, the Study concluded that the features that were most highly correlated with unit values were:

- Proximity to Melbourne
- Coastal location
- High scenic values
- Interpreted walk

The mean value of parks outside of Melbourne was about \$20 per visitor day, but that mean is dominated by high value parks such as Port Campbell and Grampians National Park.

The estimated net economic contribution per visitor day was in the range of \$10 to \$15 per visitor day for Reef Hills, Kara Kara, Deep Lead and Kooyoora parks, while the estimated value for the Chiltern Box-Ironbark National Park was approximately \$20 per visitor day. For the present analysis of values associated with the existing and future visitation to proposed parks, we have remained deliberately conservative and used the following unit values:

- \$5 per visitor day for visitation to existing State Forests sites; and
- \$12 per visitor day for visitation to all parks/reserves.

By applying these unit values to the estimates of present visitation at each park, we have estimated that the net economic surplus due to the existing level of recreation and tourism at sites affected by the ECC's proposals would be approximately \$6.5 M per year.

Judging from past experience, a change in status from State Forest to Park, for example, or from Regional Park to State or National Park, is likely to increase visitation in most instances. The precise scale of change cannot be predicted with certainty, since this depends on a variety of factors including:

- accessibility to major markets
- nature of the scenic resource
- presence of key attractors (including well-known natural or historic attractions)
- potential activities available for visitors (e.g. whether the areas host water sports, major touring routes etc.)
- existing level of investment in surrounding tourist facilities
- expenditure by Park managers on facilities and promotion

We have calculated the extent by which the level of visitation would have to increase in order that this benefit in itself was sufficient to cover all the costs associated with implementation of ECC's draft proposals. The total costs associated with implementation of the draft proposals have been estimated at \$0.6 million p.a. (see Sections 3 to 7 and Table 8-2). Given that the net economic surplus due to the existing level of recreation and tourism at sites affected by the ECC's proposals would be approximately \$6.5 M per year, the present level of visitation would have to increase by 9 per cent in order to cover all the costs associated with implementation of ECC's draft proposals.

The consultants believe that the present level of visitation would increase by more than 9 per cent. The consultants have developed two scenarios describing the likely increase in visitation. Those scenarios are based on two previous examples where land has changed designation from State Forest to national park (see Appendix 3 for details). Those two scenarios imply about a 30 per cent increase in the visitation to sites affected by the ECC's draft proposals.

Table 8-2 Summary of costs associated with implementation of ECC's draft proposals

COSTS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Additional park management	\$0.30
Reduction in future growth of timber industry	\$0.16
Reduction in value of future minerals exploration	Up to, but most likely to be less than \$0.10
Reduction in value of future eucalyptus oil production	\$0.01
Reduction in income for graziers excluded from floodplain grazing licences	\$0.05
Total costs	Up to, but likely to be less than, \$0.6 million p.a.

8.1.3 Economic activity associated with increased recreation and tourism

The increase in visitation will generate an increase in expenditure by visitors. From our Stage 1 report for this study, the expenditure by visitors to public land is as follows:

- Nearby residents account for 35 per cent of all visitors to public land, with an average expenditure of approximately \$10 per person per day.
- Tourists (ie, those travelling more than 50 km) account for 65 per cent of all visitors to public land, with an average expenditure of \$36 per person per day.

The balance of visitation between local residents and tourists will vary depending on the Park in question. We would expect that tourists would form the great majority of visitors to the Castlemaine Regional Park, for example, because of its cultural heritage features and its position within a highly visited tourist region. The surrounding area also has a relatively small resident population. On the other hand, we would expect the Bendigo Regional Park to attract a large proportion of local residents, because of its position as Bendigo's 'backyard', and because it has few highly attractive features that would generate trips from the major Melbourne market.

In the following assessment, we continue to use the established ratio of 35:65 of residents to tourists. Table 8-3 provides an estimate of how much additional expenditure will be generated by the increase in visitation to the Parks and Reserves created as a result of the ECC recommendations.

Table 8-3 Additional economic activity associated with increased recreation and tourism for 17 of the sites affected by ECC's proposals

New Name	Likely increase in total visitation	Additional expenditure by visitors
Bendigo	90,000	\$2,421,000
Chiltern-Pilot National Park	36,900	\$993,000
Deep Lead	7,400	\$199,000
Kamarooka	0	\$0
Kooyoora	42,000	\$1,130,000
Maldon	0	\$0
Maryborough	600	\$16,000
Mt Black	1,300	\$35,000
Paddys Ranges	3,300	\$89,000
Reef Hills	4,200	\$113,000
St Arnaud Range National Park	2,100	\$56,000
Terrick Terrick	1,900	\$51,000
Timor	300	\$8,000
Waanyarra	600	\$16,000
Warby Ranges	18,200	\$490,000
Whipstick-Kamarooka	0	\$0
Wychitella	1,800	\$48,000
Grand Total	928,000	\$7,614,000

Total additional expenditure is estimated to be approximately \$8 million per year. This expenditure would be spread throughout the Box-Ironbark Study Area. We estimate that each \$100,000 in expenditure would support one full-time job equivalent. The additional total expenditure would therefore support approximately 90 jobs throughout the Study Area.

The additional expenditure from tourism would be expended mainly in the towns where commercial facilities are able to cater for visitors. The Parks likely to experience a significant increase in visitation will generate the most additional expenditure. Towns close to these Parks are likely to benefit most from the increase in visitation. Table 8-4 identifies which towns are likely to benefit from the most significant increases in visitation.

Table 8-4 Towns likely to benefit from increase in visitation

Park or Reserve proposal	Likely increase in total visitation	Closest towns
Bendigo	155,000	Bendigo
Kooyoora	77,000	Inglewood, Bendigo
Chiltern-Pilot National Park	36,900	Beechworth, Chiltern, Wodonga, Wangaratta
Warby Ranges	33,700	Wangaratta
Deep Lead	18,900	Stawell
Reef Hills	4,200	Benalla
Wychitella	1,800	Wedderburn
Paddys Ranges	6,300	Maryborough, Avoca
Mt Black	3,500	Graytown, Heathcote, Nagambie
St Arnaud Range National Park	2,100	Avoca, St Arnaud
Maryborough	600	Maryborough
Waanyarra	1,600	Tarnagulla, Dunolly

Table 8-4 illustrates that the towns likely to benefit most from the increase in visitation are Bendigo (as the principal regional centre) and the towns of the north east (Beechworth, Chiltern, Wangaratta, Benalla etc). Smaller increases in visitors are likely for the towns and areas west of Bendigo and Castlemaine.

8.2 NON-USE VALUES

A direct and accurate assessment of the economic values associated with nature conservation in the Box Ironbark forests and woodlands can only be achieved through a study specifically targeted at those areas. In the present circumstances such a study is not possible. When this is the case, it may be possible to transfer values estimated, using techniques such as contingent valuation, at another site to the site of interest. Unfortunately there are few values that can be transferred legitimately from an original site of valuation to sites in the box-ironbark areas.

We can, however, form an *impression* of the values various environmental and ecological characteristics could conceivably have in the box-ironbark areas. We can form this impression by looking at past studies of unit values of similar characteristics and ask the hypothetical question:

What would be the total value of the resource if people in the box-ironbark areas (and all Victorians) held a range of (conservative) values based on the known cases?

We have adopted this approach in an attempt to gain an impression of the possible orders of magnitude of value. The term impression of value is used to ensure that this process is not regarded as having scientific rigour.

The following Sections briefly describe some of the values of interest related to rare and endangered fauna that live in box-ironbark forests and woodlands, and give some impressions of value.

8.2.1 Aquatic fauna

There is concern about a number of species of native fish which exist in the Lower Goulburn catchment, including:

- Trout cod (endangered);
- Murray cod (vulnerable);
- Silver perch (vulnerable);
- Freshwater catfish (vulnerable)
- Golden perch (rare);
- Bony bream (rare); and
- Flat-headed galaxias (rare).

Murray cod, one of the best-known native fish, even amongst non-anglers, is listed as a threatened species under Schedule 2 of the *Flora and Fauna Guarantee Act* 1988. Trout cod has the same status.

To the consultant's knowledge there has been no study of the value of preserving particular species of freshwater fish in Australia. Most of the overseas studies on preservation values have involved marine mammals, such as dolphins and whales. Some notable exceptions are the Colorado squawfish and the Arctic grayling and cutthroat trout (see Loomis and White 1996). It was estimated that Colorado households were willing to pay \$8 per year (\$US1993) to avoid the loss of squawfish. One-off lump sum contributions from US visitors for river improvement to preserve the Arctic grayling and cutthroat trout were assessed at \$15 per household (\$US1993).

The platypus occurs in some of the minor permanent streams that run through box-ironbark forests and woodlands. The platypus is a unique creature that has great appeal to members of the public and can be regarded as one of the nation's wildlife icons. Although not threatened as a species, the continuation of its existence as 'common' could be brought into question in some areas.

Read Sturgess and Associates (1997) conducted a pilot study in the Goulburn-Broken catchment to determine householders' willingness to pay to protect the *habitat* for platypus and native fish¹. The study was conducted in the cities of Shepparton, Seymour and Benalla and revealed an average willingness to make a one-off contribution to a fund for this purpose in the Goulburn-Broken catchment of about \$11 per household. We do not know whether this amount

¹ Copies of the pilot study are available on request from Read Sturgess and Associates, 89 Gladstone St., Kew, Vic. 3101

could be used to value the habitat of other streams frequented by platypus and native fish in the box-ironbark woodlands. Nevertheless, along with the orders of magnitude from the US studies it provides an impression of value that could be used when asking 'what if values in the box-ironbark areas were similar?'

8.2.2 Significant terrestrial fauna

A number of significant species of mammals (that is, threatened species) occur in the box-ironbark forests and woodlands. These include the Squirrel glider and Brush-tailed phascogale.

In common with the native fish, there are no studies that have attempted to value the preservation of these species. However, a local study that attempted to assess willingness to pay for the preservation of a mammalian species was that of Jakobsson, Kennedy and Elliot (1995). These authors estimated that Victorians would be prepared to pay between \$29 and \$75 per household per year to preserve Leadbeater's possum. This meant that for Victoria as a whole the value ranged from \$40 million to \$103 million per year. They also estimated Victorian's willingness to pay to prevent extinction and be certain of the survival of the Eastern barred bandicoot at \$34 million.

These figures show that Victorians are prepared to pay to ensure the survival of particular terrestrial species - albeit species with what might be termed a 'high public profile' (Leadbeater's possum is Victoria's faunal emblem). Taken in conjunction with the results of the pilot survey discussed above, these figures may indicate that Victorians tend to place higher values on terrestrial fauna than aquatic fauna.

8.2.3 Significant birds

The following are some of the threatened species of birds in the box-ironbark areas.

- Mallee fowl
- Square-tailed kite
- Bush stone-curlew
- Superb parrot
- Powerful owl
- Barking owl
- Regent honeyeater

Studies in the USA of endangered bird species have shown the following unit values - expressed as annual values per household in 1993 \$US (Loomis and White 1996):

- | | |
|---------------------------|---------------|
| • Northern spotted owl | \$70 per year |
| • Whooping crane | \$35 per year |
| • Red-cockaded woodpecker | \$13 per year |
| • Bald eagle | \$24 per year |
| • Striped shiner | \$6 per year |

Unfortunately, we have no reasonable way of arguing from these species to, say, the rare birds of the box-ironbark forests and woodlands. Again, the figures indicate that people are willing to pay significant amounts for the preservation of endangered species. Furthermore, the extent of the 'market' for non-use values is likely to be much larger than for use values so that even a small unit value when multiplied by a large number of interested people would be a large aggregate value.

There are also a number of significant species of reptiles and amphibians for which there are no known valuations.

8.2.4 Historical and cultural values

Some of the values of the box-ironbark forests and woodlands are related to the history of exploitation and settlement. Some places within the area, notably the major goldfields, can rightly be regarded as the crucibles in which part of Australian heritage and culture was fused, and the genesis of several major towns in the region, including Bendigo and Castlemaine. The consultants know of no information relating to the non-use values of historical or cultural sites.

8.2.5 Impressions of value

In order to gain an impression of what might be the implication for public land management for non-use values of the rare or threatened species that live in the box-ironbark forests and woodlands, we investigate several 'what if' scenarios.

A starting hypothesis is that people closer to the resource in question may have a greater sense of 'ownership' and may tend to place a higher value on the resource. "I'm not a bird watcher but I am pleased to know that there is a flock of Superb parrots in this region."

The resident population of the Municipalities containing the box-ironbark areas was about 365,000 in 1996. Assuming the same number in 1999 and about 2.75 persons per household, the number of households in the area would be of the order of 132,000.

Suppose the residents of the area were prepared to pay an average of \$5 per household per year to avoid the threat posed by loss of habitat for **all** the rare, endangered or threatened species listed above in the tree-covered areas of public land in the box-ironbark Study Area (325,705 ha). If this were true, the total willingness to pay would be \$660,000 per year.

The figure of \$5 per household for **all significant species** is equivalent to one-sixth of the lower bound of Victorians' valuation of Leadbeater's possum. It is less than one-half of the figure which residents of the major cities of the Goulburn-Broken catchment were willing to pay for the preservation of habitat for native fish and platypus.

Suppose, further, that the remaining households in Victoria (say, about 1.35 million) were prepared to pay an average of \$1 per household per year for the same purpose (that is, between about 1 per cent and about 3 per cent of the estimated range of the value per household of Leadbeater's possum).

If such values were found to be indicative of the non-use values for the habitat of these significant species, the total annual value would be just over \$2.0 million. The present value (a lump sum) equivalent to this annual value (over 30 years) is about \$35 million at a discount rate of 4 per cent (\$23 million at a discount rate of 8 per cent). This corresponds to about \$107 per hectare of all the tree-covered public land in the box-ironbark Study Area².

We do not know with confidence that these values are indicative of the value of this habitat, therefore, this and other 'what if' scenarios are shown in Table 8-5 and Table 8-6.

Table 8-5 Present values of hypothetical willingness to pay by local households for preserving habitat for significant fauna in the box-ironbark areas

	'What if' households in box-ironbark areas were willing to pay \$2 per year	'What if' households in box-ironbark areas were willing to pay \$5 per year	'What if' households in box-ironbark areas were willing to pay \$10 per year
Present value at 4 per cent discount rate	\$4.6 m	\$11.4 m	\$22.8 m
Present value at 8 per cent discount rate	\$3.0 m	\$7.4 m	\$14.9 m

² This figure can be interpreted as the capital value of preserving a hectare of tree-covered public land as habitat for rare and endangered species for the next 30 years. At the same discount rate (4 per cent) this would be a capital value of about \$154 to preserve the habitat in perpetuity.

Whichever way one combines these impressions of value held both by the communities within and outside the box-ironbark woodlands, the total value is a large number. How large the benefit would be depends primarily on what might be the average willingness to pay across the large number of Victorian households. Even a small value per household would produce a large aggregate benefit in present value terms.

Table 8-6 Present values of hypothetical willingness to pay by Victorian households outside the box-ironbark areas for preserving habitat for all box-ironbark areas significant species

	'What if' remaining Victorian households were willing to pay \$0.50 per year	'What if' remaining Victorian households were willing to pay \$1.00 per year	'What if' remaining Victorian households were willing to pay \$2.00 per year
Present value at 4 per cent discount rate	\$11.7 m	\$23.3 m	\$46.7 m
Present value at 8 per cent discount rate	\$7.6 m	\$15.2 m	\$30.4 m

We can compare the unit values used in these indicative illustrations with those that have been estimated for other forested areas using contingent valuation methods.

The Nadgee Nature Reserve on the south coast of New South Wales has some characteristics in common with parts of the box-ironbark woodlands and forests. The Reserve contains a number of endangered species of birds and a diverse set of habitats in a natural setting. Using the contingent valuation method, Bennett (1984) estimated that the average existence benefit (measured as a once-only lump sum) of this preserved natural area to the residents of Canberra over the age of 18 years was about \$27 per person in 1979 dollars.

The Resource Assessment Commission (1992, Appendix U) measured the community's willingness to pay for those areas currently used for timber production in south-east NSW and East Gippsland to be converted to conservation zones of the National Estate. This revealed that the median willingness to pay for total preservation of the National Estate was about \$43.50 per household per year in the dollar values at that time³.

Lockwood *et al* (1992) used contingent valuation procedures to estimate the Victorian Community's willingness to pay to reserve unprotected National Estate forests in East Gippsland from timber harvesting. The median value of the willingness to pay was \$25 per household in the dollar values of the time.

Clearly, none of these estimates is exactly relevant to the situation being investigated because of either location or the types of benefits being measured. For example, the latter two estimates may involve more than just existence value whereas the Nadgee value appears to come closest to a pure non-use (existence) but the nature of the country is different. The results from the RAC and Lockwood *et al* relate to the value of having no forestry. By comparison with these estimates our illustrative assumptions are very conservative.

³ For the purposes of economic analysis the mean willingness to pay is the appropriate value to use. If payment were actually required, the mean value multiplied by the number of people or households paying would give the total receipts. On the other hand, the median willingness to pay "is probably the more appropriate measure to assist a democratic decision making process in relation to the allocation of a public good... The median measure is an estimate of the amount that half the population would approve in a referendum to secure [the proposal]" (Lockwood *et al*, p.10).

In an extremely 'broad-brush' approach to valuing the world's ecosystem services and natural capital, Costanza *et al.* (1997) considered a category termed 'cultural services', defined as aesthetic, artistic, educational, spiritual and/or scientific values of ecosystems. In the case of temperate forests these were measured as aggregate willingness to pay for the existence values of ecosystems or endangered species in the US and Mexico.

Costanza *et al.* recognised that these values are likely to depend upon income levels of the culture in question and adjusted to worldwide values using measures of purchasing power of GNP per capita. The estimated worldwide average value was \$US2.00 per hectare per year (range \$0 to \$US4). Without adjusting for inflation, this is equivalent to about \$A3.10 in late 1999. Applying this figure to the 325,705 ha of tree-covered public land in the box-ironbark Study Area suggests a value for 'cultural services' of just over \$1.0 million per year (range \$0 to \$A2.0 million per ha per year). Coincidentally, the upper boundary of Costanza's range (not an unreasonable result for a developed country) gives a value very close to that obtained using our assumptions of \$5 per household in the box-ironbark area and \$1 per household for all other Victorians.

Finally, it must be emphasised that not only is the size of the total value associated with preservation of environmental values in the Box-Ironbark Study Area unknown, but it is not clear how much of the future preservation could be attributed to the ECC proposals *per se*. While the proposed incorporation of approximately 90,000 additional hectares of public lands into parks and reserves would contribute substantially to the preservation of environmental values; only a relatively small part of that benefit can be attributed to the ECC proposals *per se*. This is because, regardless of the ECC processes, as a result of forest zoning and prescriptions to protect a range of natural values (see Section 3.2.1 for more detail), timber harvesting would have been excluded from approximately 70,000 of those hectares.

8.3 INDIRECT USE VALUES

Some of the areas nominated for inclusion in parks/reserves comprise parts of catchments that are important for water supply to regional centres such as Bendigo and smaller townships. Water quality is likely to benefit from a reduction in timber harvesting, both with respect to suspended solids and nutrient loads.

Further, the restriction of grazing from riparian areas would also lead to improved water quality due to reduced streambank erosion and reduced bacteriological contamination from livestock.

While not valued in this analysis, research in Canada has shown that cattle given unrestricted access to natural water holes gained 20 per cent less weight than those drinking from a piped water source (LWRDC 1996). The research did not conclude a reason for the difference in weight gain, but suggesting that stock tend to drink less water if it is polluted, which in turn reduces their production.

River frontages can provide landholders with an area to camp stock during flood or high rainfall events when pastures are prone to plugging. While this may represent a private benefit to the landholder, such practices lead to externalities such that they damage the river frontages by soil plugging, bank erosion and preventing the regeneration of trees and shrubs. It is also probable that such areas will be over-grazed which reduces the biodiversity values of the riparian and instream environments along creek systems (Robinson and Mann 1998).

Any reduction in timber harvesting would represent a benefit with respect to increased carbon sequestration.

9 COMPARING BENEFITS AND COSTS

This Study has identified that there would be large economic benefits associated with implementation of the ECC's draft proposals, but that these would be partly offset by costs. The consultants are confident that the benefits would exceed greatly the costs, but have not been able to quantify all the benefits and hence cannot estimate the absolute size of the net gain.

Implementation of the draft proposals would impose **substantial costs for:**

1. **saw mills and forest workers** due to a reduction in the future growth of timber extraction in some areas;
2. **mining companies** due to a possible cessation of exploration and minerals extraction in some areas; and for
3. **Parks Victoria** which would be responsible for managing the new areas of parks and reserves.

Implementation of the draft proposals would impose **relatively small costs for:**

1. eucalyptus oil processors due to a cessation of eucalyptus oil extraction in some areas and for
2. graziers, due to a cessation of grazing from some riparian areas along the Broken-Boosey Creeks system.

Increased conservation of natural values and biodiversity appear to represent a primary motivation for the ECC's recommendations; but the economic value of those benefits has not been quantified. However, we can form an *impression* of the values various environmental and ecological characteristics could conceivably have in the box-ironbark areas, and have concluded that those benefits are likely to be very substantial.

While the major benefit of the ECC's proposed changes cannot be quantified in economic terms for this Study, our estimates suggest that benefits will outweigh costs. As explained above, we have calculated that the present level of visitation at sites affected by the ECC's draft proposals would have to increase only by 9 per cent in order that the recreation/tourism benefit in itself were sufficient to cover all the costs associated with implementation of ECC's draft proposals. The consultants believe that the present level of visitation would be likely to increase by more than 9 per cent; that is, that **the benefits associated with increased recreation and tourism would in themselves more than outweigh the total costs associated with implementation of the draft proposals.**

Based on previous examples of State Forest sites being re-designated as parks, such an increase appears achievable. Importantly, this will require additional visitor facilities and more promotion of these areas as places to visit. The Box-Ironbark Study Area is already well situated with respect to roads, transport services and tourism infrastructure. This makes it most likely that the declaration of additional and larger parks would lead to an increase in visitation to sites affected by the ECC's draft proposals.

Table 9-1 Summary of benefits and costs

BENEFITS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Increased biodiversity and natural values	This appears to be a primary motivation for the ECC's recommendations. Benefit has not been quantified but is likely to be very substantial.
Increased value of tourism and recreation in new and expanded parks/reserves	\$1.70 or greater
Improved water quality	Not quantified but likely to be significant.
Total benefits	Substantially greater than \$1.7 million p.a.
COSTS OF ECC PROPOSALS	(\$M p.a. from time of implementation)
Additional park management	\$0.30
Reduction in future growth of timber industry	\$0.16
Reduction in value of future minerals exploration	Up to, but most likely to be less than \$0.10
Reduction in value of future eucalyptus oil production	\$0.01
Reduction in income for graziers excluded from floodplain grazing licences	\$0.05
Total costs	Up to, but likely to be less than, \$0.6 million p.a.

The benefits and costs identified in this Study are summarised in Table 9-1. In some cases there remains some considerable uncertainty about how things would occur in the future. This means that estimates of the absolute size of impacts for some sectors, notably mining and timber, should be interpreted as being 'indicative' rather than precise. Even so the consultants believe that the Study has provided sufficient detail in order that we can conclude that the economic benefits would exceed greatly the economic costs. The remaining doubts pertain to the absolute size of the impacts for some sectors; in particular, mining and timber sectors.

The impacts for the mining sector have been based on the application of statewide averages to all individual sites affected by the ECC's draft proposals, and some of the financial data provided to the consultants seem erroneous. The impacts for the timber sector have been based on very approximate estimates of the likely future levels of available forest with and without implementation of the ECC's draft proposals. Confidence ranges of, say, plus and minus 50 per cent should be imposed on our estimates for the impacts for these sectors. Even with those broad confidence ranges, our conclusion would remain the same; namely, that the overall economic benefits would exceed greatly the economic costs.

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NOTE: Refer to the bottom of the contents page for information on Appendix 1 and 2.

APPENDIX 3 DETAILS OF SCENARIOS DESCRIBING POSSIBLE INCREASE IN LEVEL OF VISITATION TO PARKS

An indicative estimate of the likely increase in visitation has been formulated based on two previous examples where land has changed designation.

Example 1: The Grampians was declared a National Park in 1984. Visitor numbers prior to declaration (2 years' figures) averaged 1.12 million visitor days. Visitor numbers following the park declaration (figures for 11 years) have averaged 1.50 million. That is, the increase in visitors following Park designation was 30 per cent.

Example 2: Murray-Sunset National Park was declared in 1991. Visitor numbers post designation have averaged 2.3 times those pre designation (27,200 average compared with 12,000).

Other examples have been examined but we have insufficient visitor data pre- or post- park designation with which to make a judgement. (Nevertheless, it appears that initial estimates for Parks that were declared in 1997 have exhibited growth within the range identified above.)

Overall, it appears that a change in designation of land to Park, or a higher level of Park, creates an increase in visitation that is equivalent to somewhere between 30% and 130% of pre-existing visitation. Existing parks in the Study Area may also gain slightly due to the promotion of new parks in the same region.

For the purposes of this analysis, we propose the following two broad scenarios:

	Conservative scenario	Optimistic scenario
Increase in visitation for areas that change from State Forest to Park/reserve, and for the level of visitation for existing Parks or reserves which are upgraded	30 per cent	30 per cent
Increase in visitation for existing Parks which do not change in status nor total area	Nil	10 per cent

Appendix Tables 3.1 and 3.2 present the estimated increase in visitation for each area under these two scenarios. The scenarios suggest an increase in visitation of about 30 per cent.

Appendix Table 3.1 Estimated increase in visits for 17 of the sites affected by ECC's proposals – conservative scenario

New name	Present total visits (state forests and park/reserve components)	Percent increase in visits		Likely future level of total visits	Net increase
		State forest component	Existing park/reserve component		
Bendigo	350 000	30%	30%	455 000	105 000
Chiltern-Pilot National Park	123 100	30%	30%	160 000	36 900
Deep Lead	24 800	30%	30%	32 200	7 400
Kamarooka	2 700	n.a.	n.a.	2 700	0
Kooyooora	140 100	30%	30%	182 100	42 000
Maldon	2 500	n.a.	n.a.	2 500	0
Maryborough	2 000	n.a.	30%	2 600	600
Mt Black	4 400	30%	30%	5 700	1 300
Paddys Ranges	11 000	30%	30%	14 300	3 300
Reef Hills	14 100	n.a.	30%	18 300	4 200
St Arnaud Range National Park	7 000	30%	30%	9 100	2 100
Terrick Terrick	6 200	n.a.	30%	8 100	1 900
Timor	1 000	30%	n.a.	1 300	300
Waanyarra	2 000	30%	30%	2 600	600
Warby Ranges	60 700	30%	30%	78 900	18 200
Whipstick-Kamarooka	9 800	n.a.	n.a.	9 800	0
Whchitella	6 000	n.a.	30%	7 800	1 800
Grand total	767 400			993 000	225 600

Appendix Table 3.2 Estimated increase in visits for 17 of the sites affected by ECC's proposals – optimistic scenario

New name	Present total visits (state forests and park/reserve components)	Percent increase in visitation		Likely future level of total visits	Net increase
		State forest component	Existing park/reserve component		
Bendigo	350 000	30%	30%	455 000	105 000
Chiltern-Pilot National Park	123 100	30%	30%	160 000	36 900
Deep Lead	24 800	30%	30%	32 200	7 400
Kamarooka	2 700	n.a.	10%	3 000	300
Kooyoora	140 100	30%	30%	182 100	42 000
Maldon	2 500	n.a.	10%	2 800	300
Maryborough	2 000	n.a.	30%	2 600	600
Mt Black	4 400	30%	30%	5 700	1 300
Paddys Ranges	11 000	30%	30%	14 300	3 300
Reef Hills	14 100	n.a.	30%	18 300	4 200
St Arnaud Range National Park	7 000	30%	30%	9 100	2 100
Terrick Terrick	6 200	n.a.	30%	8 100	1 900
Timor	1 000	30%	n.a.	1 300	300
Waanyarra	2 000	30%	30%	2 600	600
Warby Ranges	60 700	30%	30%	78 900	18 200
Whipstick-Kamarooka	9 800	n.a.	10%	10 800	1 000
Whchitella	6 000	n.a.	30%	7 800	1 800
Grand total	767 400			994 600	277 200

Appendix 4

List of organisations consulted during the process

Aboriginal Affairs Victoria	Highlake Resources
Agriculture Fisheries and Forestry Australia	Ironbark Heritage & Tourism Group
Barrie Johnson Detector Sales and Service	Land Victoria (NRE)
Beechworth Environment Group	Loddon Shire
Benalla District Environment Group	Loddon Tourism Board
Bendigo and District Environment Council	Maryborough Field Naturalists Club
Bendigo Brick	Midlands Historical Society
Bendigo Field Naturalists Club	Minerals and Petroleum Victoria (NRE)
Bendigo Mining	Mirimbiak Nations Aboriginal Corporation
Bendigo Prospectors Club	North Central Catchment Management Authority
Bendigo Tourism	North East Catchment Management Authority
Bird Observers Club of Australia	North-east Apiarists Association
Birds Australia	Parks Victoria
Broken Creek Field Naturalists Club	Parks, Flora and Fauna Division (NRE)
Central Goldfields Shire	Perseverance Corporation
Central Goldfields Tourism Board	Prospectors and Miners Association of Victoria
Central Victorian Apiarists Association	Public Land Council
City of Greater Bendigo	Pyrenees Shire
Coliban Water	Reef Mining
Delatite Shire	G. Risstrom and Sons
Department of Defence	Rural City of Wangaratta
Department of Natural Resources and Environment (various divisions – listed separately)	Shire of Indigo
Department of Premier and Cabinet	Stawell Gold Mines
Department of Prime Minister and Cabinet	Taigs Eucalyptus Distillery
E. & B. Holdings Pty Ltd	Threatened Species Network
Environment Australia	Timber Communities Australia
Environment Victoria	Timberline Log Homes
Forest Protection Society (now Timber Communities Australia)	Trackline Detectors
Forests Service (NRE)	Victorian Apiarists Association
Friends of Chiltern Park	Victorian Chamber of Mines
Goulburn Valley Environment Group	Victorian Eucalyptus Oil Distillers Association
Goulburn–Broken Catchment Management Authority	Victorian Farmers Federation
Goulburn–Murray Water	Victorian Metal Detector and Prospectors Association
Hartlands Eucalyptus Distillery	Victorian National Parks Association
	Woodlands, Wareek
	Note: This list is not exhaustive.

Appendix 5

Members of the Box-Ironbark Investigation Advisory Group

Name	Expertise
Dr Andrew Bennett, Deakin University, Clayton	Landscape ecology and fauna conservation
Dr Andrew Brookes, Latrobe University, Bendigo	Recreation
Dr Malcolm Calder, University of Melbourne, Parkville	Conservation; author of 'The Forgotten Forests'
Mr David Clark, formerly North Central Catchment Management Authority, Waubra	Landcare and catchment management
Mr Ian Fenselau, apiarist, White Hills	Apiculture
Mr Rod Gowans, Parks, Flora and Fauna (NRE)	Parks and biodiversity planning
Dr Steve Hamilton, University of Melbourne, Dookie College	Remnant vegetation protection
Mr Andrew Maclean, Forests Service (NRE)	Forest management
Mr Joseph McMahon, Timberline Log Homes, Heathcote	Timber industry
Mr Ian Miles, Forests Service (NRE)	Forest planning, regional forest agreements
Mr David Parkes, Parks, Flora and Fauna (NRE)	Biodiversity conservation management
Mr Phil Roberts, Minerals and Petroleum Victoria (NRE)	Exploration and mining
Ms Marilyn Sprague, Goldfields Revegetation, Bendigo	Exploration and mining restoration
Dr Barry Traill, Australian Woodlands Conservancy, Chiltern	Flora and fauna ecology and conservation
Mr Kevin Wareing, Kevin Wareing and Associates, Melbourne	Wood products
Mr David Watters, Trackline Detectors, Bendigo	Metal detecting and fossicking; recreational, and commercial sales and tourism

Appendix 6

Reservation status of Ecological Vegetation Classes (EVCs) expressed as the percentage of pre-1750 EVC extent represented in the conservation reserve system

The following is a detailed key for the column headings and symbols used in Table 6a (see later in this Appendix).

KEY

Data in the following table (Table 6a) were derived by 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
- existing and proposed public land use categories.

Key features of the EVC-based system of vegetation classification are described in Appendix 2, including brief explanations of the methods used to determine the pre-1750 extent of EVCs, and of changes to the list of Box-Ironbark EVCs identified in the *ECC Resources and Issues Report (1997)*. Descriptions of EVCs are also provided in Appendix 2.

The area of public land covered by the table (other than for pre-1750 area) is 378 068 ha. Of this, 191 333 ha is within the 'Proposed New Reserve System' and 186 738 ha is 'Other public land'. There is an additional 52 954 ha of public land which has been cleared. This is comprised of water storage areas and the large areas at Puckapunyal Military Area which have been cleared.

Column 1: Ecological Vegetation Classes and Vegetation Communities

The names of the 72 Box-Ironbark EVCs¹ mapped within the study area. Here, the term 'EVCs' is used to describe several units of classification: EVCs *per se*, vegetation communities (components of names which relate to vegetation communities are indicated by italics), and complexes and mosaics—see Appendix 2 for definitions of these units and their relationships to each other. 'Other' includes non-Box-Ironbark EVCs (see Appendix 2), and various small mapping gaps.

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: Interim Conservation Status (JANIS)

The status of each EVC in terms of the categories developed by JANIS.¹ These categories are summarised in Appendix 7; the percent remaining (column 4) is a key factor in assigning EVCs to JANIS categories. These assessments have been completed in consultation with NRE Flora and Fauna Division, as part of a statewide project to assess and document the conservation status of EVCs at the bioregional level.

¹ JANIS (1997). *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*. Report by the Joint ANZECC/MCFFA National Forest Policy Implementation Sub-committee. Commonwealth of Australia, Canberra.

Column 6: Current Reserve System

The total area in hectares of each EVC in existing public land categories which comprise the conservation reserve system.²

Column 7: ECC Reserve System additions

The total area in hectares of each EVC proposed (in this report) to be added to those public land use categories which comprise the conservation reserve system.

Column 8: Proposed New Reserve System

The total area in hectares of each EVC in the new reserve system proposed in this report (column 6 plus column 7).

Column 9: Other public land

The total area in hectares of each EVC proposed (in this report) in all public land categories outside the conservation reserve system.

Column 10: New Reserve System as a percentage of pre-1750 extent

The proposed new reserve system (column 8) as a percentage of the pre-1750 extent (column 2), for each EVC.

Column 11: New Reserve System as a percentage of current extent on public land

The proposed new reserve system (column 8) as a percentage of the current extent on public land (column 8 plus column 9), for each EVC.

Column 12: Representation Outcomes

The letters A, B, C and D give an indication (see below) of factors which have limited opportunities to improve representation (where this is not obvious from the data).

- A: extent on public land outside the reserve system is largely in small isolated units;
* = high proportion of these units may have been cleared and/or severely degraded.
- B: extent within large public land units and outside the reserve system is mostly in small patches which are most appropriately protected by forest management zoning (which will improve representation level).
- C: very small absolute extent on public land; * = does not currently occur on public land.
- D: peripheral occurrence in the study area (main occurrence is outside the study area).

Column 13: Current extent on private land as a percentage of pre-1750

The total area in hectares of each EVC on private land with tree cover as a percentage of the pre-1750 extent (column 2).

² See Table 4.1 and related discussion in Chapter 4. In summary, the reserve system is composed of national, state and regional parks, reference areas, nature conservation reserves, and natural features reserves (other than wildlife reserves where grazing and hunting are allowed, and public land water frontages).

Appendix 6a: Reservation status (percentage of pre-1750 extent represented in the conservation reserve system) of Ecological Vegetation Classes (EVCs)

Note: see previous pages for key to column headings and symbols.

Column 1 Ecological Vegetation Classes and Vegetation Communities	2 Area in ha		4 Percent Remaining	5 Interim Conservation Status (IANIS)	6-9 Area in ha				10 New Reserve System as % of pre-1750	11 New Reserve System as % of current extent on public land	12 Representation Outcomes	13 Current extent on private land as % of pre-1750
	Pre-1750 extent	Current extent (public and private land)			Current Reserve System	ECC Reserve System additions	Proposed New Reserve System	Other public land				
Alluvial Terraces Herb-rich Woodland	20 835	4 671	22.4	V	358	2 140	2 498	1 217	12.0	67.2	A, B	4.6
Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic	14 726	2 585	17.6	V	42	250	292	1 350	2.0	17.8	A	6.4
Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic	761	541	71.1		519	0	519	0	68.2	100.0		2.9
Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Complex	1 538	46	3.0	E	21	0	21	23	1.4	48.3	A*, C	0.1
Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Mosaic	1 047	814	77.8	E	0	600	600	177	57.3	77.2	A*, C	3.7
Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland/Gilgai Wetland Mosaic	1 120	0	0.0	E	0	0	0	0	0.0	0.0	C*	0.0
Alluvial Terraces Herb-rich Woodland/Valley Grassy Forest Complex	917	59	6.5	E	9	0	9	32	1.0	22.7	A, C	2.0
Box-Ironbark Forest	407 971	211 243	51.8		18 122	58 543	66 665	98 041	16.3	40.5		9.0
Box-Ironbark Forest/ <i>Shrubby Granitic-outwash</i> Grassy Woodland Complex	1 345	68	5.1	R, E	1	0	1	1	0.1	41.3	C	4.9
Broombush Mallee	44 165	27 236	61.7		8 587	3 676	12 263	8 046	27.8	59.3		14.9
Creekline Grassy Woodland	50 233	13 550	27.0	V	1 164	810	1 975	9 080	3.9	17.8	A*, B	5.0
Creekline Grassy Woodland/Red Gum Wetland Mosaic	558	110	19.6	V	54	0	54	0	9.7	100.0		9.9
Creekline Herb-rich Woodland	225	173	76.8	R	6	0	6	59	2.6	9.2	A, C, D	48.2
Damp Sands Herb-rich Woodland	9 755	451	4.6	R, E	57	23	80	227	0.8	26.0	A*, C	1.5
Damp Sands Herb-rich Woodland/Sedgy Riparian Woodland Mosaic	4 150	888	21.4	R, V	69	8	78	469	1.9	14.2	A*	8.2
Floodplain Riparian Woodland/Plains Grassy Woodland Mosaic	220	1	0.3	R, E	0	0	0	1	0.0	0.0	A, C, D	0.0
Granitic Hills Herb-rich Woodland	12 893	5 777	44.8		3 921	30	3 951	152	30.6	96.3		13.0
Granitic Hills Woodland	24 161	12 063	49.9		7 335	2 136	7 966	388	33.0	95.4		16.3
Granitic Hills Woodland/Rocky Outcrop Shrubland/Herbland Mosaic	3 969	3 278	82.6		2 396	84	2 472	201	62.3	92.5		15.2
Grassy Dry Forest	74 369	32 934	44.3		10 910	6 687	17 597	7 796	23.7	69.3		10.1
Grassy Dry Forest/Heathy Dry Forest Complex	6 192	425	6.9		156	0	156	4	2.5	97.6		4.3
Grassy Dry Forest/Spring Soak Woodland Mosaic	62	10	16.6	R, V	0	0	0	0	0.0	-	C*	16.6
Grassy Woodland	527 783	41 729	7.9	E	9 757	3 260	13 017	12 568	2.4	50.9	A, B	3.1
Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	518	82	15.9	E	0	75	75	0	14.5	100.0		1.3
Grassy Woodland/Heathy Dry Forest Complex	506	9	1.8		0	0	0	0	0.0	-	C*	1.8

Column 1 Ecological Vegetation Classes and Vegetation Communities	2 Area in ha		3 Percent Remaining	4 Interim Conservation Status (IANIS)	6 Area in ha				9 New Reserve System as % of pre-1750	10 New Reserve System as % of current extent on public land	11 Representation Outcomes	12 Current extent on private land as % of pre-1750
	Pre-1750 extent	Current extent (public and private land)			Current Reserve System	ECC Reserve System additions	Proposed New Reserve System	Other public land				
<i>Gravelly-Sediment</i> Broombush Mallee/Box-Ironbark Forest Mosaic	4 589	861	18.8	R, V	7	0	7	185	0.1	3.6	B, C	14.6
<i>Gravelly-Sediment</i> Broombush Mallee/Heathy Woodland Mosaic	138	138	100.0	R	0	0	0	138	0.0	0.0	B, C, D	0.0
Heathy Dry Forest	104 854	62 524	59.6		15 191	19 205	34 396	13 985	32.8	71.1		13.5
Heathy Dry Forest/ <i>Shrubby Granitic-outwash</i> Grassy Woodland Complex	260	7	2.8	R, E	4	0	4	0	1.7	100.0		1.1
Heathy Woodland	22 576	6 163	27.3	V	786	1 275	2 061	941	9.1	68.7	B	14.0
Heathy Woodland/Plains Grassy Woodland Mosaic	27 158	2 278	8.4	E	171	140	310	1 167	1.1	21.0	A, B	2.9
Hillcrest Herb-rich Woodland	13 458	5 390	40.1		1 665	1 033	2 698	1 224	20.0	68.8		10.9
<i>Low Rises</i> Grassy Woodland Mosaic/Alluvial Terraces Herb-rich Woodland Complex	55	11	19.3	R, V	0	0	0	11	0.0	0.0	A, C, D	0.0
<i>Low Rises</i> Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	98 730	7 524	7.6	E	1,065	1 871	2 936	2 024	3.0	59.2	A	2.6
<i>Low Rises</i> Grassy Woodland/Heathy Woodland Mosaic	1 314	11	0.8	R, E	0	0	0	4	0.0	10.1	A, C	0.5
Metamorphic Slopes Shrubby Woodland	5 813	3 355	57.7		793	844	1 637	810	28.2	66.9		15.6
Pine Box Woodland	20 927	341	1.6	R, E	30	36	66	79	0.3	45.5	A, C	0.9
Pine Box Woodland/ <i>Riverina</i> Plains Grassy Woodland Mosaic	113 290	1 804	1.6	E	175	420	595	596	0.5	50.0	A*	0.5
Plains Grassy Woodland	975 790	16 741	1.7	E	1 438	624	2 062	7 632	0.2	21.2	A*	0.7
Plains Grassy Woodland/Box-Ironbark Forest Complex	81	34	41.7	R	10	0	10	4	12.5	73.3	A, C, D	24.7
Plains Grassy Woodland/Creekline Grassy Woodland Mosaic	171	6	3.4	R, E	0	0	0	0	0.0	-	C*, D	3.4
Plains Grassy Woodland/Creekline Grassy Woodland/Floodplain Riparian Woodland Mosaic	68	2	2.4	R, E	0	0	0	1	0.0	0.0	A*, C, D	0.9
Plains Grassy Woodland/Creekline Grassy Woodland/Wetland Mosaic	6 480	334	5.2	R, E	0	0	0	136	0.0	0.0	A*, C	3.0
Plains Grassy Woodland/Floodplain Riparian Woodland Complex	185	2	1.3	R, E	0	0	0	2	0.0	0.0	A*, C	0.0
Plains Grassy Woodland/Gilgai Wetland Mosaic	105 894	4 522	4.3	E	1 967	1 421	3 388	731	3.2	97.9		1.0
Plains Grassy Woodland/Gilgai Wetland Mosaic/Plains Grassy Wetland Mosaic	1 499	0	0.0	R, E	0	0	0	0	0.0	-	C*	0.0
Plains Grassy Woodland/Gilgai Wetland Mosaic/ <i>Shrubby Riverina</i> Plains Grassy Woodland Mosaic	7	0	0.0	R, E	0	0	0	0	0.0	-	C*, D	0.0
Plains Grassy Woodland/Plains Grassland/Plains Grassy Wetland Mosaic	861	15	1.7	R, E	0	0	0	7	0.0	0.0	C	0.9
Plains Grassy Woodland/Plains Sedgy Woodland Mosaic	3	2	84.0	R	0	0	0	2	0.0	0.0	C, D	16.4
Plains Grassy Woodland/ <i>Rainshadow</i> Grassy Woodland Complex	1 320	204	15.5	R, V	0	0	0	193	0.0	0.2	A*, C	0.8

Column 1	2	3	4	5	6	7	8	9	10	11	12	13
Ecological Vegetation Classes and Vegetation Communities	Area in ha		Percent Remaining	Interim Conservation Status (IACIS)	Area in ha				New Reserve System as % of pre-1750	New Reserve System as % of current extent on public land	Representation Outcomes	Current extent on private land as % of pre-1750
	Pre-1750 extent	Current extent (public and private land)			Current Reserve System	ECC Reserve System additions	Proposed New Reserve System	Other public land				
Plains Grassy Woodland/Valley Grassy Forest Complex	1 572	32	2.0	R, E	2	0	2	14	0.1	11.9	A, B, C	1.0
Rainshadow Grassy Woodland/Valley Grassy Forest Mosaic	257	0	0.1	R, E	0	0	0	0	0.0	-	C*, D	0.1
Riverina Plains Grassy Woodland/Plains Grassland/Plains Grassy Woodland/Gilgai Wetland Mosaic	11 714	66	0.6	R, E	0	0	0	41	0.0	0.0	A*, C	0.2
Riverina Plains Grassy Woodland/Riverine Grassy Chenopod Woodland/Wetland Mosaic	6 100	134	2.2	R, E	8	0	8	70	0.1	10.3	A*, C	0.9
Riverina Plains Grassy Woodland/Shrubby Granitic-outwash Grassy Woodland Mosaic	518	5	1.0	R, E	0	0	0	0	0.0	0.0	A*, C*	1.0
Riverine Grassy Woodland/Plains Grassy Woodland/Gilgai Wetland/Riverina Plains Grassy Woodland Complex	3 908	63	1.6	R, E	0	0	0	2	0.0	0.0	A*, C	1.5
Riverine Grassy Woodland/Riverina Plains Grassy Woodland Complex	2 536	132	5.2	R, E	0	0	0	102	0.0	0.0	A*, C	1.2
Riverine Grassy Woodland/Riverina Plains Grassy Woodland/Riverine Grassy Chenopod Woodland Mosaic	7 810	84	1.1	R, E	3	0	3	8	0.0	30.0	C	0.9
Rocky Outcrop Shrubland	16	0	0.0		0	0	0	0	0.0	-		0.0
Rocky Outcrop Shrubland/Herbland Mosaic	2 050	1 005	49.0		850	84	934	26	45.6	97.3		2.5
Sand Ridge Woodland	4 042	121	3.0	R, E	3	13	16	58	0.4	21.6	A*, C	1.1
Sedge-rich Woodland	913	789	86.4	R	408	13	422	330	46.2	56.1	B	4.1
Sedge-rich Woodland/Plains Grassy Woodland Mosaic	56	52	93.0	E	0	0	0	50	0.0	0.0	C	3.2
Shrubby Granitic-outwash Grassy Woodland/Plains Grassy Woodland Complex	1 322	57	4.3	R, E	0	0	0	23	0.0	0.0	A*, C	2.5
Shrubby Granitic-outwash Grassy Woodland/Valley Grassy Forest Complex	80	14	17.3	R, V	13	0	13	1	15.9	92.2	B, C, D	0.0
Slopes Box Grassy Woodland/Box-Ironbark Forest Complex	137	1	0.9	R, E	0	0	0	0	0.0	-	C*, D	0.9
Spring Soak Woodland	201	40	20.1	R, V	8	1	9	0	4.4	100.0		15.8
Valley Grassy Forest	52 846	11 458	21.7	V	3 509	1 425	4 934	2 012	9.3	70.9	B	8.5
Valley Grassy Forest/Box-Ironbark Forest Complex	1 444	132	9.1	V	0	0	0	0	0.0	-	C*	9.1
Valley Grassy Forest/Creekline Grassy Woodland Mosaic	653	27	4.1	V	0	0	0	23	0.0	0.1	B, C	0.6
Valley Grassy Forest/Plains Grassy Woodland Complex	246	0	0.0	E	0	0	0	0	0.0	-	C*, D	0.0
Valley Heathy Forest	1 078	77	7.2	R, E	4	0	4	22	0.4	16.8	B, C, D	4.8
Other	135 890	22 838			4 882	202	5 085	8 775				
Total:	2 950 929	508 143	17.2		96 476	106 368	191 333	186 738	6.5	50.6		4.2

Appendix 7

Reserve system status of public land use categories and summary of JANIS biodiversity criteria

Appendix 7a: Reserve system status of public land use categories

Public land use category	Level of protection: constraints on major potentially threatening uses*	Management priority given to nature conservation	Reserve system status
National park	high: timber harvesting, grazing, mining, and hunting excluded	high: parks service; nature conservation a primary objective	✓
State park	high: timber harvesting, grazing, mining, and hunting excluded	high: parks service; nature conservation a primary objective	✓
Reference area	high: timber harvesting, grazing, mining, and recreation excluded	high: parks service; nature conservation a primary objective	✓
Nature conservation reserve	moderate: timber harvesting, grazing and hunting excluded; mining restricted	high: parks service; nature conservation a primary objective	✓
Regional park	moderate: timber harvesting, grazing and hunting excluded; mining restricted	moderate: parks service; nature conservation a secondary objective	✓
Natural features reserves			
Wildlife reserve	low: timber harvesting excluded	low: parks service; nature conservation a secondary objective	✗
Public land water frontage	low: timber harvesting excluded	low: catchment management authorities; nature conservation an objective	✗
Other natural features reserve	moderate: timber harvesting, grazing and hunting excluded	moderate: parks service; nature conservation a secondary objective	✓
Historic and cultural features reserve	moderate: mining restricted	low: parks service; nature conservation a secondary objective	✗
Community use area	low	low: various managers	✗
Water production	moderate: timber harvesting and grazing excluded	low: water authorities; nature conservation a secondary objective	✗
State forest	low	moderate: forests service; nature conservation a primary objective	✗
Earth resources	low	low: various managers	✗
Services and utilities	low	low: various managers	✗
Commonwealth land	moderate	low: Department of Defence	✗

* See Chapter 5 for a full explanation of the provisions operating with respect to mining and exploration.

✓ = generally included in the reserve system; ✗ = generally not included in the reserve system.

Reserve system status reflects the general situation in the Box-Ironbark study area for each public land use category. The recommendations proposed in this report are included in these assessments, which has the effect of adding natural features reserves (other than wildlife reserves and public land water frontages) to the reserve system through the general exclusion of grazing, and reducing the number of exceptions in other categories (such as some regional parks in which timber harvesting is currently permitted). Particularly at a statewide level, there are many exceptions to this general scheme. Significant exceptions within the study area are:

- Maldon Historic and Cultural Features Reserve, where exclusion of timber harvesting is proposed;
- Eppalock Education Area (a community use area) where exclusion of timber harvesting is proposed;
- informal reserves in state forests where timber harvesting is excluded or restricted (special protection zones and special management zones to be designated after the completion of the Box-Ironbark Investigation); and
- wildlife reserves where hunting and grazing are currently not permitted would also be exceptions, but all those in the study area are proposed as nature conservation reserves (see Recommendations D32, D53 and 54).

Appendix 7b: Summary of JANIS biodiversity criteria

Ecosystem status		Definition	Representation target
Rare	R1	total range less than 10 000 ha.	100% of remaining extent
	R2	total area generally less than 1000 ha.	
	R3	patch sizes generally less than 100	
Endangered	E1	distribution has contracted to less than 10% of original range.	100% of remaining extent
	E2	less than 10% of original area remaining.	
	E3	90% of extent is in small patches subject to threatening processes.	
Vulnerable	V1	approaching greater than 70% lost (depletion)	60% of remaining extent[†]
	V2	threatening processes have caused:	
	(a)	significant changes in species composition,	
	(b)	loss or decline in species that play a major role within the ecosystem, or	
(c)	significant alteration to ecosystem processes.		
V3	subject to continuing threatening processes		
'Other'	None of the above.		15% of pre-1750* extent

[†] This target generates an anomalous result: a less depleted vulnerable EVC has a lower representation target relative to its pre-1750 extent and in absolute terms, than a more depleted vulnerable EVC. For example, for an EVC with 30% of its pre-1750 extent remaining (depleted by 70%), the representation target of 60% of its remaining extent equates to 18% of its pre-1750 extent, whereas for a more depleted EVC, with say 15% of its pre-1750 extent remaining, this target equates to 9% of its pre-1750 extent.

* Pre-1750 extent refers to the extent of each ecosystem prior to European settlement (see Appendix 2).

Appendix 8

Representation of key values in the current and proposed reserve system

Values	Unit	Total	Current reserve system	ECC reserve system additions	Proposed new reserve system	Proposed other public land	Freehold land
Selected threatened species — Fauna							
brush-tailed phascogale	records/blocks	74	20 (27% of total)	22	42 (57% of total)	9	23 ¹ (31% of total)
squirrel glider	records/blocks	79	22 (28% of total)	8	30 (38% of total)	2	47 ¹ (60% of total)
square-tailed kite	records/blocks	11	3 (27% of total)	3	6 (55% of total)	2	3 (27% of total)
swift parrot ²	key sites	36	6 (17% of total)	18	24 (67% of total)	12	0
turquoise parrot	records/blocks	136	105 (77% of total)	13	118 (87% of total)	1	17 (13% of total)
powerful owl ²	territories	37	10 (27% of total)	21	31 (84% of total)	6	0
barking owl	known sites	35	11 (31% of total)	8	19 (54% of total)	6	10 (29% of total)
painted honeyeater	records/blocks	45	26 (58% of total)	9	35 (78% of total)	4	6 (13% of total)
pink-tailed worm-lizard	records	14	9 (64% of total)	2	11 (79% of total)	1	2 (14% of total)
bandy bandy (snake)	records	7	4 (57% of total)	2	6 (86% of total)	1	0
woodland blind snake	records/blocks	40	11 (28% of total)	4	15 (38% of total)	4	21 (53% of total)
Selected threatened species — Flora							
Ausfeld's wattle	records	58	17 (29% of total)	14	31 (53% of total)	14	13 (22% of total)
bald-tip beard-orchid	populations	1	0	1	1 (100% of total)	0	0
bristly greenhood	records	11	2 (18% of total)	4	6 (55% of total)	4	1 (9% of total)
broom bitter-pea	records	17	4 (24% of total)	3	7 (41% of total)	3	7 (41% of total)
cane spear-grass	records	38	16 (42% of total)	3	19 (50% of total)	7	12 (32% of total)
crimson spider-orchid	records	13	2 (15% of total)	4	6 (46% of total)	1	6 (46% of total)
Dookie daisy	records	34	9 (26% of total)	13	22 (65% of total)	0	12 (35% of total)

Appendix 8 (continued)

Values	Unit	Total	Current reserve system	ECC reserve system additions	Proposed new reserve system	Proposed other public land	Freehold land
hairy hop-bush	records	6	2 (33% of total)	2	4 (67% of total)	2	0
Kamarooka mallee	records	38	20 (53% of total)	3	23 (61% of total)	2	13 (34% of total)
long-tail greenhood	populations	1	0	1	1 (100% of total)	0	0
lowly greenhood	populations	1	0	1	1 (100% of total)	0	0
McIvor spider-orchid	records	4	3 (75% of total)	1	4 (100% of total)	0	0
narrow goodenia	records	41	8 (20% of total)	2	10 (24% of total)	1	30 (73% of total)
purple diuris	records	17	0	2	2 (12% of total)	0	15 (88% of total)
rising star guinea-flower	records	9	4 (44% of total)	4	8 (89% of total)	0	1 (11% of total)
sikh's whiskers	records	9	6 (67% of total)	2	8 (89% of total)	1	0
small milkwort	records	17	11 (65% of total)	3	14 (82% of total)	1	2 (12% of total)
smooth darling-pea	records	6	4 (67% of total)	1	5 (83% of total)	0	1 (17% of total)
tawny spider-orchid	records	9	6 (67% of total)	1	7 (78% of total)	0	2 (22% of total)
tick indigo	records	2	1 (50% of total)	1	2 (100% of total)	0	0
Warby swamp gum	records	14	5 (36% of total)	5	10 (71% of total)	0	4 (29% of total)
weak daisy	records	9	4 (44% of total)	2	6 (67% of total)	0	3 (33% of total)
Whipstick westringia	records	12	3 (25% of total)	6	9 (75% of total)	0	3 (25% of total)
Williamson's wattle	records	69	25 (36% of total)	15	40 (58% of total)	11	18 (26% of total)
whorled zieria	populations	2	1 (50% of total)	1	2 (100% of total)	0	0
yellow hyacinth-orchid	records	5	2 (40% of total)	1	3 (60% of total)	0	2 (40% of total)
yellow-lip spider-orchid	records	2	1 (50% of total)	1	2 (100% of total)	0	0

Appendix 8 (continued)

Values	Unit	Total	Current reserve system	ECC reserve system additions	Proposed new reserve system	Proposed other public land	Freehold land
Large old tree sites and fauna refuge sites							
large old tree sites	number	126	17 (13% of total)	72 ³	89 (71% of total) ³	44 ⁴	-
	total area (ha)	26 279	7 060 (27% of total)	16 631 ³	23 691 (90% of total) ³	2 588 ⁴	-
fauna refuge sites	number	255	49 (19% of total)	105 ³	154 (60% of total) ³	95 ⁵	41
	total area (ha)	10 048	3 043 (30% of total)	2 804 ³	5 847 (58% of total) ³	2 631 ⁵	1 529

¹ Includes records from road reserves.

² Territories/key sites counted twice where they extended over two land categories; actual totals were 29 swift parrot key sites and 28 powerful owl territories.

³ Number of large old tree sites and fauna refuge sites includes all sites partially within the proposed reserve system; area of large old tree sites and fauna refuge sites includes only that part of a site within the proposed reserve system.

⁴ Both number and area of large old tree sites includes 3 sites (totalling 231 ha) found on Commonwealth land within Puckapunyal Military Area.

⁵ Both number and area of fauna refuge sites includes 3 sites (totalling 637 ha) found on Commonwealth land within Puckapunyal Military Area.

Data sources:

- swift parrot key sites – Kennedy, S.J. and Tzaros, C.L. (2000). Foraging ecology of the swift parrot *Lathamus discolor* in the Box-Ironbark forests and woodlands of Victoria. Unpublished report for the Department of Natural Resources and Environment, Melbourne.
- powerful owl territories – Soderquist, T. (1999). Home range and habitat quality of the powerful owl *Ninox strenua* in the box-ironbark forest. Unpublished report for Arthur Rylah Institute, Melbourne.
- barking owl sites – Taylor, I. and Kirsten, I. (2000). Targeted Barking Owl survey for the West Region Comprehensive Regional Assessment. Unpublished report, Department of Natural Resources and Environment, Melbourne.
- other fauna – data provided by NRE from the Atlas of Victorian Wildlife
- plant species – data provided by NRE from the Flora Information System
- large old tree sites
 - Soderquist, T. and Rowley, L. (1996). Mature tree sites in the Bendigo Forest Management Area. Unpublished report, Department of Natural Resources and Environment, Bendigo.
 - Holland, G. and Cheers, G. (1999). Identification of large old tree sites and fauna refuges in the ECC's Box-Ironbark study area. Unpublished report, Environment Conservation Council, Melbourne.
- fauna refuges
 - Robinson, J. and Rowley, L. (1994). Drought refuge identification project for the Box-Ironbark ecosystem within the Campaspe, Goulburn and Loddon catchments. Unpublished report, Bendigo Field Naturalists Club, Bendigo.
 - Robinson, J. and Rowley, L. (1996). Drought refuge identification project for the West Loddon, Avoca and Avon-Richardson catchments within the Bendigo Forest Management Area. Unpublished report, Department of Natural Resources and Environment, Bendigo.
 - Holland, G. and Cheers, G. (1999). Identification of large old tree sites and fauna refuges in the ECC's Box-Ironbark study area. Unpublished report, Environment Conservation Council, Melbourne.

Appendix 9

Suggested format for Local Habitat Conservation Networks

The purpose of Local Habitat Conservation Networks would be to:

- coordinate and prioritise resourcing for the management of important patches of remnant vegetation for biodiversity conservation in the severely depleted ecosystems of the northern plains;
- focus attention and hence funding and works on the importance of remnant vegetation, and especially the most significant remnants, for biodiversity conservation;
- seek broad community support, and ultimately, a process driven and run by local groups;
- with biodiversity conservation as an aim, improve communication between, and the knowledge base of, local land managers; and
- identify new sites to add to the network and enhance their management for biodiversity conservation.

Proposed operational parameters include:

- completely voluntary for freehold land owners;
- initially, at least, the main focus for each network would be on key sites which have already been identified and which are easily added to the network: larger or more significant public land sites; presumably freehold sites which were already managed for nature conservation; at present there is no framework to systematically advance biodiversity conservation in these areas
- expand as new remnants are added to the network;
- maintain a register of sites in the network, with at least annual visits to update the management condition and objectives for each site;
- regular Steering Committee meetings;
- regular newsletters to participants/audience;
- workshops and discussion to assist land managers to maximise the efficiency of their management for biodiversity conservation; and
- part-time coordinator with office; and
- five to ten years timeframe.

Timing:

- establishment of an effective and self-sustaining habitat conservation network will require consistent support (including adequate resources) for at least five to ten years, preferably longer subject to review; and
- the need for improved management for nature conservation on the northern plains is urgent; ideally, the pilot networks would be initiated as soon as possible.

Lead agencies:

- NRE Parks, Flora and Fauna; Parks Victoria;
- Catchment Management Authority, specifically the Biodiversity Implementation Committee; and
- possibly Landcare groups and Trust for Nature if appropriate.

Likely participants/audience:

- Catchment Management Authority;
- land holders/licensees with important remnants;
- land holders adjacent to important public land remnants;
- local Aboriginal communities;
- local branch of the Victorian Farmers' Federation;
- local field naturalists/environment group(s);
- local Trust for Nature officer;
- Landcare groups;
- local government;
- NRE Parks, Flora and Fauna; Parks Victoria where appropriate; other public land managers with important remnants; and
- relevant local biologists.

Steering Committee:

- Catchment Management Authority;
- NRE Parks, Flora and Fauna or Parks Victoria;
- key landholders;
- Landcare representative;
- local Aboriginal representative;
- local Trust for Nature officer;
- local government representative; and
- local field naturalists/environment group.

Suggested Trial Area:

Broken–Boosey Creeks system, based around the proposed Broken–Boosey State Park (see Recommendation B4) and nearby nature conservation reserves (D51, D52, D56–D62). This is a highly significant area for remnant vegetation, with a higher than usual proportion of significant remnants on public land; already well-documented; there is keen local interest; Trust for Nature have recently commenced initiatives in the Tungamah area; Goulburn Broken Catchment Management Authority (Biodiversity Implementation Committee, in particular) and managers of Broken–Boosey State Park would be specific lead agencies.

Appendix 10

Full list of Draft Report recommendations

Part Two

General recommendations for application across the study area

RECOMMENDATION

- R1** That the Government through NRE—and in partnership with other relevant agencies or groups such as the Country Fire Authority, local government, catchment management authorities, salinity management groups, Landcare groups, and other community groups—continue to provide and improve fire protection and suppression, pest plant and animal control, and programs to address salinity and soil erosion threats on and to public land, and to identify priority public land areas for particular landscape-scale action to ameliorate salinity and soil erosion.
- R2** That the Government continue to encourage protection and restoration of indigenous Box-Ironbark vegetation, and planting for indigenous revegetation, plantations, and farm forestry woodlots on private land.
- R3** That land managers continue effective research and monitoring programs, develop targeted new programs, and apply the results where appropriate.
- R4** That the Government support measures to increase awareness, appreciation, education, interpretation and promotion of Box-Ironbark forests and woodlands.
- R5** That the Government allocate adequate resources for the implementation of all recommendations in this report.
- R6** That, upon Government agreement to recommendations, land be managed in accordance with those recommendations, and subsequent implementation of recommendations and land management allow flexibility for minor boundary adjustments and priorities for expenditure.

Chapter 3: Aboriginal heritage, use and management

RECOMMENDATIONS

- R7** That planning and management relating to traditional interests and uses be based on recognition of and respect for the traditional relationship of Aboriginal people with the land.
- R8** (a) That there be ongoing consultation between the Victorian Government and Aboriginal groups and communities in relation to implementation of approved ECC recommendations on public land use and management, and access for traditional purposes.
- (b) That joint management between the Government and Aboriginal groups, for public land areas containing Aboriginal historic or archaeological places or other Aboriginal places, be investigated.
- R9** That existing consultative processes provided for under the *Native Title Act 1993* and other relevant legislation such as the *Mineral Resources and Development Act 1990* continue with the relevant Aboriginal groups and communities before the issue of any licences or permits which could affect Aboriginal interests.
- R10** That the relevant recommendations of the Royal Commission into Aboriginal Deaths in Custody⁴ be implemented through providing opportunities for increased employment and training opportunities for Aboriginal people, particularly as park rangers.

Chapter 4: Biodiversity Conservation

RECOMMENDATIONS

- Several recommendations to improve Box-Ironbark nature conservation apply to specific public land use categories and, accordingly, are formally documented elsewhere:
- the reserve system itself is proposed in a series of recommendations for individual national and state parks (in Chapter 13), regional parks, nature conservation reserves, and some historic and cultural features reserves (in Chapter 14), and reference areas and some natural features reserves (in Chapter 16);
 - as part of a long-term vision to achieve a reserve system which more closely resembles pre-European forests, implementation of an ecological management strategy including ecological thinning in the reserve system is recommended in Chapters 13 and 14;
 - incorporation in the reserve system of large old tree sites on Commonwealth land is recommended in Chapter 11; and
 - incorporation of large old tree sites in informal reserves, retention of large old trees, and nature conservation as an equal primary use in state forest, are recommended in Chapter 15.
- R11** The Department of Natural Resources and Environment initiate an ecological management strategy to achieve a reserve system that more closely resembles the pre-European forests, and specifies the nature of any ecological thinning, as defined above.
- R12** The managers of the proposed Broken-Boosey State Park, together with the Goulburn Broken Catchment Management Authority, establish and support a pilot 'Local Habitat Conservation Network' to complement public land nature conservation in the Broken-Boosey Creeks system.
- R13** The Goulburn Broken, North Central and North East Catchment Management Authorities, in partnership with appropriate public land managers, investigate and pursue opportunities to establish Local Habitat Conservation Networks at suitable locations in their regions.

Chapter 5: Mining**RECOMMENDATIONS**

- R14** (a) The existing set of public land use categories and their classification under *the Mineral Resources Development Act 1990*, and existing provisions in the National Parks Act 1975 relating to mining in areas scheduled under that Act, be retained as the appropriate policy and legislative framework for the administration of mining on Box-Ironbark public land. In particular, reference areas, and national and state parks continue to be exempt from mining and exploration;
- except that for new national and state parks, or land added to existing national or state parks:
- (b) mining or exploration licences current at the time of Government approval of this recommendation be renewable at the discretion of the Minister for Environment and Conservation and after tabling in Parliament, until they lapse;
- and that:
- (c) mining licences may be granted within the area of such current exploration licences, at the discretion of the Minister for Environment and Conservation and after tabling in Parliament.
- R15** All works associated with exploration and mining be situated, where practicable, to minimise impacts on natural, cultural and recreational values, and especially to minimise removal of native vegetation.
- R16** All exploration licences issued over Box-Ironbark public lands include conditions to effect low impact exploration, in accordance with the principles outlined above. These licence conditions would be additional, rather than alternative to other conditions specified by the responsible authorities.
- R17** Proposals to clear vegetation on public land in the Box-Ironbark study area for mining should demonstrate that the benefit to the community will exceed the value of the natural, recreational and cultural heritage lost prior to approval.
- R18** All mining licences issued over Box-Ironbark public lands include conditions to effect high quality mining and rehabilitation, in accordance with the principles outlined above. These licence conditions would be additional, rather than alternative to other conditions specified by the responsible authorities.
- R19** Bonds should be adequate to provide for best practice rehabilitation, relevant departmental costs, and amelioration of any difficult chemicals resulting from mining or processing, such as arsenic or cyanide.

Chapter 6: Apiculture**RECOMMENDATIONS**

- R20** That apiculture continue in state forest and minor reserves, and subject to Recommendation R22 below, in national and state parks, and nature conservation reserves.
- R21** That apiculture continue to be excluded from reference areas and buffers.
- R22** That land managers have the power to temporarily or permanently exclude apiculture from localised areas within national or state parks or conservation reserves where research indicates the effects of nectar removal by managed bees are most likely to be deleterious to natural or recreational values.
- R23** That all managers of public land continue to have discretion to restrict access or otherwise regulate use of areas where management problems arise as a result of access by bee-keepers.
- R24** (a) That an ecosystem-wide program be established to reduce feral bee colonies, focussed initially on areas likely to be most deleteriously affected; and
(b) that feral bee distribution be monitored.
- R25** That the means to regulate apiarists placing hives on cleared private land next to forests or parks, particularly where they may affect sites with sensitive values, be investigated.

Chapter 7: Recreation**RECOMMENDATIONS****Recreation**

- R27** That Box-Ironbark public lands be used for a range of recreation activities appropriate to the land use category, for community enjoyment and appreciation.

Prospecting

- R28** That prospecting be generally permitted on public land, with the following exceptions:
- (a) permanent exclusion from areas where evidence suggests it may adversely affect significant natural or historic values, as specified in management plans; and
- (b) exclusion from national parks and reference areas.
- R29** That prospecting be allowed in state parks specified in Chapter 13, in accordance with Note 1 below.
- R30** That 'raking' as a prospecting aid not be permitted on public land.
- R31** That land managers monitor areas favoured by prospectors, and respond appropriately if excessive damage to historical, natural or landscape values, is occurring.
- R32** That the prospecting community be supported in developing a code of conduct to address in particular the issue of unfilled holes, and minimising damage to sensitive vegetation.

Orienteering

- R33** That orienteering and rogaining be permitted at the land manager's discretion in all land use categories except:
- reference areas;
 - domestic water storage areas; and
 - nature conservation, or other, reserves where sensitive natural features are vulnerable to disturbance.

Car rallies

- R34** That car rallies be permitted on formed tracks at the land manager's discretion in state forests.

Trail bikes

- R35** That land managers endeavour to provide some dedicated areas for off-road trail bike riding where significant demand exists.
- R36** That otherwise, trail bike riding be restricted to formed tracks as per current practice.

Education

R37 That the land managers develop educational programs to encourage:

- (a) increased use of Box-Ironbark public land for recreation; and
- (b) responsible use of Box-Ironbark public land.

Note 1: Metal detecting should be permitted in designated zones, located to avoid significant park values, notably threatened small ground-dwelling animals and plants, which may be damaged as a result of fossicking or prospecting, while providing discretion for park managers, particularly in gaining compliance. These zones should be developed as part of the standard management plan process, consulting with representatives of prospectors who use the respective park areas. This variation is not intended to affect current arrangements for metal detecting in existing state parks in the study area or elsewhere in Victoria.

Chapter 8: Tourism**RECOMMENDATIONS**

R38 That Tourism Victoria, NRE, Parks Victoria, regional tourism boards and local government develop coordinated programs to increase public land tourism in Box-Ironbark forests and woodlands.

R39 That land managers explore opportunities to assist tourism promotion in the recommended new parks and reserves, and in state forests.

R40 That the specific strengths of the Box-Ironbark study area, such as gold, flora and fauna, and heritage, be used in tourism promotions.

Chapter 9: Wood products**RECOMMENDATIONS**

R41 That sawlogs be the primary wood product, and that value-added kiln-drying be encouraged.

R42 That sleeper cutting be phased out of Box-Ironbark forests, with timber used instead for sawlogs.

R43 That commercial fencing production be reduced where necessary, with the use of substitutes encouraged.

R44 (a) That use of less dense firewood from other forest areas in western Victoria and timber from plantations be encouraged;
 (b) that controlled thinning of dense coppicing and regrowth in state forests be applied to improve the growth rate of retained larger trees, and to produce firewood in commercial operations;
 (c) that ecological thinning in parks and reserves, where required for management, and subject to appropriate research, be applied to improve the growth rate of retained larger trees (see note below); and
 (d) that domestic firewood collection be subject to strict controls to reduce theft of wood and avoid cutting of habitat trees, and that forest managers reduce domestic firewood collection in areas with sensitive biological values.

R45 That comparable treatment regarding industry structural adjustment should apply for timber industries inside and outside the Box-Ironbark study area and Regional Forest Agreement areas.

R46 That an industry plan be prepared which includes a long-term program to encourage Box-Ironbark plantations for sawlogs on private land.

Note: The objective of ecological thinning is to improve the habitat conditions in parks and reserves by increasing the numbers of large trees. Where it occurs thinning will produce wood as a by-product, which can provide a firewood resource.

Chapter 10: Eucalyptus oil production**RECOMMENDATIONS**

R47 That eucalyptus oil harvesting be excluded from specific currently available areas near Wedderburn, Bendigo, and Rushworth, and incorporated into Wychitella Nature Conservation Reserve (Recommendation D3), Whipstick-Kamarooka State Park (B2), and Whroo Nature Conservation Reserve (D4) respectively, as indicated on Map A (see back pocket of this report).

R48 That sites in state forest at St Amand, Wedderburn, Inglewood, West Brennanah, Glenalbyn, Bendigo Whipstick and Rushworth, where eucalyptus oil harvesting has occurred since 1995 inclusive, be identified, zoned, and used to:

- (a) produce eucalyptus oil;
- (b) provide opportunities for fossicking and prospecting;

and that

- (c) drainage lines and an appropriate buffer strip not be harvested.

R49 That within the areas previously available for oil production, sites not harvested for eucalyptus oil harvesting since 1994 be identified, zoned and used to:

- (a) conserve biodiversity, particularly threatened species and species which (in the study area) are dependent on Broombush Mallee EVC;
- (b) produce honey;
- (c) provide opportunities for fossicking and prospecting;
- (d) provide opportunities for open-space recreation and education;

and that

- (e) these areas remain or become state forest under the provisions of the *Forests Act 1958*, and be managed by NRE Forests Service.

R50 Where areas are retained for eucalyptus oil production in the long term, greater tenure of licences should be granted to encourage investment.

Chapter 11: Commonwealth land**LAND USE PROPOSALS**

- R51** (a) That the Puckapunyal Military Area and Graytown Proof & Experimental Establishment:
- (i) continue to be used to provide military training and testing; and
 - (ii) maintain 'no go' and 'no impact' zones listed above to conserve and protect communities of indigenous animals and plants, and for military training, as appropriate.
- (b) That the Department of Defence:
- (i) use indigenous species of local provenance where possible when areas are being rehabilitated or otherwise planted;
 - (ii) not permit harvesting of forest products; and
 - (iii) exclude grazing from the 'no go' and 'no impact' areas as far as practical.
- R52** That 508 ha at Longlea be used to:
- (a) conserve and protect communities of indigenous animals and plants;
 - (b) provide for special vehicle testing on the existing road network and existing cleared areas;
- and that:
- (c) harvesting of forest products and grazing not be permitted;
 - (d) flora and fauna and heritage surveys be carried out to assist management; and
 - (e) when no longer required for vehicle testing or other approved military training purposes, and after the Victorian Government has acquired Longlea, the fence be removed and the firebreak revegetated, and the area be reserved and added to the Greater Bendigo Regional Park.
- R53** That five hectares at Longlea be retained by the Commonwealth Government and used as a multi-user depot.
- R54** That 87 ha adjoining Longlea (outside the security fence):
- (a) be managed and used as a natural features reserve bushland area;
- but that:
- (b) as per R52(c), when Longlea is no longer required for vehicle testing or other approved military training purposes, and after the Victorian Government has acquired Longlea, this area be reserved and added to the Greater Bendigo Regional Park.

Note: Commonwealth land is shown as P1 on Map A and Map D.

Part Three**Chapter 13: National and state parks****GENERAL RECOMMENDATIONS FOR NATIONAL PARKS**

- A** That the national parks shown on Map A (numbered A1 to A3)
- (a) be used to:
 - (i) conserve and protect biodiversity and natural processes;
 - (ii) protect significant historic sites and places;
 - (iii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage; and
 - (iv) protect natural landscapes;
- and that:
- (b) the following activities generally be permitted:
 - (i) apiculture on licensed sites, and subject to the outcome of research into the ecological impacts of this industry, and park management requirements;
 - (ii) bushwalking, car touring, mountain and trail bike riding on formed roads, picnicking and camping;
 - (iii) nature observation, bird watching and visiting historic features;
 - (iv) orienteering and rogaining; and
 - (v) research, subject to permit;
- and that:
- (c) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- and that:
- (d) the following activities not be permitted:
 - (i) harvesting of forest products including eucalyptus oil, grazing by domestic stock, hunting and the use or possession of firearms;
 - (ii) exploration and mining, other than continuation of operations within existing licences, as approved; and
 - (iii) metal detecting, prospecting, fossicking, and gold panning;
- and that:
- (e) they be included on a schedule to the *National Parks Act 1975*, and managed by the Department of Natural Resources and Environment.

- Notes: 1. Exceptions to the above general recommendations are noted in the recommendations for specific parks, where relevant.
2. Should ecological thinning (recommendation (c) above) require removal of wood from parks, that wood may be sold.

A1 Chiltern–Pilot National Park**RECOMMENDATIONS**

- (a) The Chiltern–Pilot National Park area of 21 742 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88;
- (b) that gemstone fossicking and gold prospecting, with hand tools only, be permitted in a zone extending 100 metres from each bank of, and including, Reedy Creek; and
- (c) that protection of the water and catchments of the Barambogic Reservoir and the creeks which supply water to Springhurst be maintained.

A2 St Arnaud Range National Park**RECOMMENDATIONS**

- (a) That the St Arnaud Range National Park area of 13 526 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88; and that
- (b) protection of the water and catchments of the Redbank and Teddington Reservoirs be maintained.

A3 Terrick Terrick National Park**RECOMMENDATIONS**

- (a) That the Terrick Terrick National Park area of 3 854 ha shown on Map A be used in accordance with the general recommendations for national parks on page 88; and
- (b) that low intensity sheep grazing of some grassland areas but not woodland areas, where necessary for biodiversity conservation, continue at the land manager's discretion.

Note: Regal's and Davies' homesteads demonstrate farm dwellings typical of this area; their historical significance should be assessed and appropriate action taken.

GENERAL RECOMMENDATIONS FOR STATE PARKS

B That the state parks shown on Map A (numbered B1 to B7):

- (a) be used to:
 - (i) conserve and protect biodiversity and natural processes;
 - (ii) protect significant historic sites and places;
 - (iii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage; and
 - (iv) protect natural landscapes;

and that:

- (b) the following activities generally be permitted:
 - (i) apiculture on licensed sites, and subject to the outcome of research into the ecological impacts of this industry, and park management requirements;
 - (ii) bushwalking, car touring, mountain and trail bike riding on formed roads, picnicking and camping;
 - (iii) nature observation, bird watching and visiting historic features;
 - (iv) orienteering and rogaining; and
 - (v) research, subject to permit;

and that:

- (c) (i) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees; and
- (ii) except for parks where specifically excluded, metal detecting (prospecting) be permitted in designated zones defined in park management plans (see Note 2 below);

and that:

- (d) the following activities not be permitted:
 - (i) harvesting of forest products including eucalyptus oil, grazing by domestic stock, hunting and the use or possession of firearms; and
 - (ii) exploration and mining, other than continuation of operations within existing licences, as approved;

and that:

- (e) they be included on a schedule to the *National Parks Act 1975*, and managed by the Department of Natural Resources and Environment.

- Notes:
1. Exceptions to the above general recommendations are noted in the recommendations for specific parks, where relevant.
 2. Metal detecting should be permitted in designated zones, located to avoid significant park values, notably threatened small ground-dwelling animals and plants, which may be damaged as a result of fossicking or prospecting, while providing discretion for park managers, particularly in gaining compliance. These zones should be developed as part of the standard management plan process, consulting with representatives of prospectors who use the respective park areas. This variation is not intended to affect current arrangements for metal detecting in existing state parks in the study area or elsewhere in Victoria.
 3. Should ecological thinning (recommendation (c), above) require removal of wood from parks, that wood may be sold.

B1 Kooyoora State Park

RECOMMENDATION

That the Kooyoora State Park area of 11 646 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

B2 Whipstick–Kamarooka State Park

RECOMMENDATION

That the Whipstick–Kamarooka State Park area of 12 150 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

B3 Mt Black State Park

RECOMMENDATION

That the Mt Black State Park area of 5 418 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

B4 Broken–Boosey State Park

RECOMMENDATIONS

- (a) That the Broken–Boosey State Park area of 3 067 ha shown on Map A and Map D be used in accordance with the general recommendations for state parks on page 97; and
- (b) that metal detecting not be permitted.

B5 Warby Range State Park

RECOMMENDATIONS

- (a) That the Warby Range State Park area of 11 084 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97; and
- (b) that metal detecting not be permitted.

B6 Reef Hills State Park

RECOMMENDATIONS

- (a) That the Reef Hills State Park area of 2 013 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97; and that
- (b) should the current use as shooting ranges of any of the three adjacent areas lapse, they be rehabilitated and added to the state park.

B7 Paddys Ranges State Park

RECOMMENDATION

That the Paddys Ranges State Park area of 1954 ha shown on Map A be used in accordance with the general recommendations for state parks on page 97.

Chapter 14: Regional parks, nature conservation reserves, and historic and cultural features reserves

GENERAL RECOMMENDATIONS FOR REGIONAL PARKS

- C** That regional parks shown on Map A (numbered C2 to C9)
- (a) be used:
 - (i) for informal recreation associated with the enjoyment of natural surroundings by large numbers of people;
 - (ii) to conserve indigenous flora and fauna, and natural features;
 - (iii) to protect features of historical or cultural significance;
 - (iv) for apiculture and recreational prospecting, where consistent with (i), (ii) and (iii) above, and subject to the approval of the land manager;
 - (b) not be available for timber harvesting or grazing;
 - (c) be subject to a management plan with zoning to protect biodiversity and significant features;
- and that:
- (d) in accordance with the ecological management strategy proposed in Recommendation R11 (Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- and that:
- (e) regional parks be reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment, except where otherwise specified.

C1 Greater Bendigo Regional Park**RECOMMENDATIONS**

That the Greater Bendigo Regional Park area of 11 928 ha shown on Map A:

- (a) be used to:
 - (i) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments and cultural heritage,
 - (ii) conserve and protect biodiversity and natural processes, and
 - (iii) protect significant historic sites and places;
- (b) generally permit the following activities:
 - (i) apiculture on traditionally licensed sites, subject to park management requirements,
 - (ii) bushwalking, car touring, trail bike riding on formed roads, picnicking and camping,
 - (iii) nature observation, bird watching and visiting historic features,
 - (iv) orienteering and rogaining,
 - (v) other recreational activities in accordance with a management plan; and
 - (vi) research, subject to permit;

and that:

- (c) in accordance with the ecological management strategy proposed in Recommendation R11 in Chapter 4, dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- (d) harvesting of forest products, grazing by domestic stock, hunting and the use of firearms not be permitted; and
- (e) One Tree Hill and Mandurang South blocks not be available for surface mining;
- (f) the park managers and Coliban Water jointly prepare a management plan for the Sandhurst and Spring Gully catchments according to agreed principles for management;
- (g) if not required for future system augmentation, Crusoe Reservoir and its immediate surrounds be managed as a community recreation and tourism focus point; and
- (h) the park be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment.

Note: If not required for future system augmentation, measures to ensure the safety of Crusoe and No. 7 Reservoirs should aim to maintain the highest practical safe water level, and protect historic features.

C2 Castlemaine Regional Park**RECOMMENDATIONS**

- (a) That the Castlemaine Regional Park of 5 992 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116; and
 - (b) *certain locations within the park be managed by the Shire of Mount Alexander, by arrangement with the park managers.*
- Notes
1. ECC is aware of the need for a waste transfer station near Castlemaine. This should preferably be sited outside the regional park.
 2. Measures to ensure safety of the Crocodile Reservoir should aim at maintaining the highest practical safe water level.

C3 Ararat Regional Park**RECOMMENDATIONS**

- (a) That the Ararat Regional Park of 3 671 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116; and
- (b) that the park managers implement ecological thinning (see Recommendation R11 in Chapter 4) where necessary as a priority in the Dunneworthy block, and allow the wood resource removed in such thinning operations to be available for domestic firewood.

C4 St Arnaud Regional Park**RECOMMENDATION**

That the St Arnaud Regional Park of 929 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116.

C5 Heathcote Regional Park**RECOMMENDATION**

That the Heathcote Regional Park of 3 803 ha shown on Map A be used in accordance with the general recommendations for regional parks on page 116.

C6 Maryborough Regional Park**RECOMMENDATION**

That the area of 226 ha shown on Map A be added to the Maryborough Regional Park and used in accordance with the general recommendations for regional parks on page 116.

C7 Mt Alexander Regional Park**RECOMMENDATION**

That the 1 240 ha Mt Alexander Regional Park:

- (a) be used in accordance with the general recommendations for regional parks on page 116; and
- (b) be managed in consideration of new information on EVCs and large old trees.

C8 Hepburn Regional Park

RECOMMENDATION

That the Hepburn Regional Park of 59 ha be used in accordance with the general recommendations for regional parks on page 116.

C9 Beechworth Regional Park

RECOMMENDATION

That the Beechworth Regional Park of 1 078 ha shown on Map A be retained on Schedule 3 of the *National Parks Act 1975*, and otherwise be managed in accordance with the general recommendations for regional parks on page 116.

Former Regional Parks

The **Reef Hills Regional Park** at Benalla is now recommended as a state park (see Chapter 13, B6).

Eaglehawk Regional Park at Bendigo is to be included in the Greater Bendigo Regional Park (see Chapter 14, C1).

One Tree Hill Regional Park at Bendigo is to be included in the Greater Bendigo Regional Park (see Chapter 14, C1).

D Nature conservation reserves

GENERAL RECOMMENDATIONS FOR NATURE CONSERVATION RESERVES

- D** That nature conservation reserves shown on Map A (numbered D1 to D64) be used to:
- (a) conserve and protect species, communities or habitats of indigenous animals and plants;
 - (b) provide for educational and scientific study if consistent with (a) above, and in ways that minimally affect the area;
 - (c) provide for passive recreation such as nature study and picnicking, where consistent with (a) above or as otherwise specified;
- and that:
- (d) minimum impact exploration for minerals be permitted with the approval of the Minister for Environment and Conservation, except in the existing Deep Lead Flora and Fauna Reserve;
 - (e) mining be subject to Government decision on individual proposals;
 - (f) recreational prospecting be permitted except:
 - (i) in areas where it may adversely affect significant natural values, and
 - (ii) where specified for specific reserves below;
 - (g) grazing, harvesting of forest products, hunting and the use of firearms not be permitted;
 - (h) apiculture be permitted except where specified, and subject to:
 - (i) the outcome of research into the ecological impacts of this industry, and
 - (ii) management requirements;
 - (i) in accordance with the ecological management strategy proposed in Recommendation R11 (see Chapter 4), dense eucalypt regrowth be thinned to enhance the growth of retained trees;
- and:
- (j) unless otherwise specified, they be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment.

D1 Existing nature conservation reserves

RECOMMENDATIONS

That the existing flora and fauna reserves, and flora reserves described below and listed in Appendix 10 be re-designated as nature conservation reserves, and used in accordance with the general recommendations for nature conservation reserves above.

Proposed new or enlarged nature conservation reserves

D2 Deep Lead Nature Conservation Reserve

RECOMMENDATIONS

- (a) That prospecting not be permitted in Deep Lead Nature Conservation Reserve;
- (b) that the existing Deep Lead Flora and Fauna Reserve remain reserved under Schedule 4 of the *National Parks Act 1975*; and
- (c) that other parts of the proposed Deep Lead Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

D3 Wychitella Nature Conservation Reserve

RECOMMENDATIONS

That:

- (a) prospecting be generally permitted in the additions to Wychitella Nature Conservation Reserve;
- (b) the existing Wychitella Flora and Fauna Reserve remain reserved as at present; and
- (c) other parts of the proposed Wychitella Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

D4 Whroo Nature Conservation Reserve**RECOMMENDATION**

That the proposed Whroo Nature Conservation Reserve be reserved under the *Crown Land (Reserves) Act 1978*, and used in accordance with the general recommendations for nature conservation reserves on page 133.

D5–D64 Other proposed nature conservation reserves**RECOMMENDATIONS**

That the proposed reserves described above and listed in Appendix 10 be used in accordance with the general recommendations for nature conservation reserves on page 133.

Rec No.	Nature conservation reserve name	Location	Area (ha)
Existing nature conservation reserves			
D1	Mt Bolangum Flora and Fauna Reserve	South-west of St Arnaud	2 930
	Mt Hope Flora and Fauna Reserve	North of Terrick Terrick	106
	Hard Hills Flora Reserve	North-east of St Arnaud	15
	Gowar Flora Reserve	North-east of St Arnaud	120
	Gowar South Flora Reserve	North-east of St Arnaud	23
	Dalyenong West Flora Reserve	West of Bealiba	16
	Alex Chisholm Flora Reserve	Maryborough	16
	Inglewood Flora Reserve	Three blocks – north, west and south-west of Inglewood	1 200
	Walmer Flora Reserve	East of Maldon	13
	Walmer South Flora Reserve	East of Maldon	15
	Metcalfe Flora Reserve	East of Taradale	300
	Runnymede Flora Reserve	West of Colbinabbin	240
	Costerfield Flora Reserve	North-east of Heathcote	10
	Gobanup Flora Reserve	South-west of Rushworth	300
	Dohertys Pine (Rochester West) Flora Reserve	North-east of Elmore	10
	Mangalore Flora Reserve	North of Seymour	70
	Big Hill Flora Reserve	South-west of Euroa	62
	Gowangardie Flora Reserve	North of Violet Town	2
	Upotipotpon Flora Reserve	North of Violet Town	5
	Sub-total	5453	
Proposed new nature conservation reserves			
D2	Deep Lead	North-west of Stawell	1 823
D3	Wychitella	North of Wedderburn	6 280
D4	Whroo	South of Rushworth	3 896
D5	Lonsdale	North-west of Stawell	737
D6	Illawarra	South-west of Stawell	580
D7	Jallukar	South of Stawell	1 165
D8	Morri Morri	North-east of Stawell	1 991
D9	Joel Joel	East of Stawell	260
D10	Navarre	West of Navarre	4
D11	Big Tottington	South-west of St Arnaud	2 120
D12	Little Tottington	South-west of St Arnaud	480
D13	Landsborough Hill	South of Navarre	1 044
D14	Landsborough	West of Avoca	3 157
D15	Stoney Creek	South of St Arnaud	1 600
D16	Stuart Mill	South of St Arnaud	2 480
D17	Redbank	North-west of Avoca	1,193
D18	Dalyenong	West of Bealiba	2 570

D19	Tunstalls	North of Bealiba	1 640
D20	Wehla	East of St Arnaud	312
D21	Moliagul	North-east of Bealiba	530
D22	Lexton	South-east of Avoca	243
D23	Bung Bong	East of Avoca	420
D24	Talbot	West of Talbot	174
D25	Caralulup	South of Talbot	1 400
D26	Dunach	South of Talbot	494
D27	Timor	North of Maryborough	735
D28	Havelock	North of Maryborough	1 779
D29	Waanyarra	North-east of Dunolly	6 307
D30	Mt Korong	South-east of Wedderburn	465
D31	Mysia	North-east of Wedderburn	4
D32	Bells Swamp	North-west of Maldon	10
D33	Leichardt	North-west of Bendigo	33
D34	Wilson's Hill	West of Bendigo	21
D35	Shelbourne	North of Maldon	840
D36	Muckleford	South of Maldon	543
D37	Upper Loddon	South of Castlemaine	1 130
D38	Fryers Ridge	South-east of Castlemaine	2 149
D39	Taradale	East of Taradale	191
D40	Pilchers Bridge	South-east of Bendigo	2 270
D41	Salomon Gully	Bendigo township (south)	20
D42	Jackass Flat	Bendigo township (north)	71
D43	Whipstick	North of Bendigo	83
D44	Mt Sugarloaf	East of Bendigo	840
D45	Eppalock	West of Heathcote	160
D46	Crosbie	North of Heathcote	1 640
D47	Mt Ida	North-east of Heathcote	4 657
D48	Tooborac	South-east of Heathcote	330
D49	Spring Creek	West of Nagambie	401
D50	Murchison-Girgarre Disused Railway	Between Murchison and Girgarre (via Rushworth)	111
D51	Nathalia	North of Nathalia	35
D52	Numurkah	East of Numurkah	35
D53	Gum Swamp	North of Euroa	16
D54	Shire Dam Swamp	North-west of Violet Town	25
D55	Dookie-Katamatite Disused Railway	Between Dookie and Katamatite	70
D56	Wattville	North-east of Dookie	39
D57	Youarang West	South-east of Katamatite	16
D58	Youarang	West of Tungamah	28
D59	Waggarandall	South-west of Tungamah	37
D60	Tharanbeggia	North of Tungamah	6
D61	Tungamah	East of Tungamah	36
D62	Mt Meg	North-east of Benalla	440
D63	Cookinburra	East of Chiltern	88
D64	Fell Timber Creek	East of Chiltern	144
		Sub-total	62 398
		TOTAL	67 851

E Historic and cultural features reserves

GENERAL RECOMMENDATIONS FOR HISTORIC AND CULTURAL FEATURES RESERVES

That the historic and cultural features reserves (see Note 1 below) shown on Map A (numbered E1–E31) be used:

- (a) primarily, to protect places with highly significant historical values, including remnant historical features such as buildings, structures, relics or other artefacts;
- (b) (i) where compatible with protecting the above values, to conserve indigenous flora and fauna, and
(ii) where appropriate in the context of present use and management, to provide opportunities for recreation and education;
- (c) to provide protection for, where present:
 - (i) cultural values, including aesthetic and social values, and
 - (ii) scenic landscape and natural values;

and that:

- (d) minimum impact exploration be permitted with the approval of the Minister for Environment and Conservation (see Note 2 below);
- (e) mining be subject to Government decision on individual proposals (see Note 2 below);
- (f) prospecting be permitted except in areas where it may adversely affect significant historical values;
- (g) timber harvesting not be permitted;
- (h) the re-use of buildings, including for community uses, be permitted where appropriate, with any modifications subject to the approval of the land manager;
- (i) conservation management plans or conservation and action strategies for the historic features be prepared by the land manager;
- (j) the areas referred to in recommendations E1 to E18 be permanently reserved under the *Crown Land (Reserves) Act 1978*, and be managed by the Department of Natural Resources and Environment;

and that:

- (k) the areas referred to in recommendations E19 to E31 be identified as historic and cultural features management zones in state forest, and be managed by the Department of Natural Resources and Environment.

Notes:

1. The reserves consist either of the relevant Crown parcel alone, or in broad acre public land, the area of the features to be protected plus the area within 100 m (for areas of state significance) or 50 m (for areas of regional significance) of the features.
2. In relation to exploration and mining proposals, provisions for a buffer around specific features, principles for consideration of particular proposals, and where appropriate, compensation, are to be determined by the land managers.
3. The ECC is aware of a proposal for Bendigo Regional Institute of TAFE to carry out a management planning project using several historic mining sites around Bendigo, considering issues such as renewed mining, protection of historic features, promotion and interpretation, visitor use and management, safety, fire and pest plant control, and future use and ownership, within the framework of the ECC's proposed uses.

E1 Existing historic and cultural features reserves

RECOMMENDATION

That the existing historic and cultural features reserves, historic areas and historic reserves described below and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves above.

E2–E18 Proposed historic and cultural features reserves

RECOMMENDATION

That the proposed reserves described above and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves on page 152.

E19–E31 Historic and cultural features zones in state forest

RECOMMENDATION

That the proposed zones described above and listed in Appendix 10 be used in accordance with the general recommendations for historic and cultural features reserves on page 152.

E32 Other historic sites in state forest

RECOMMENDATION

That the historic sites in state forests listed in Chapter 15 be protected by zoning in forest management planning or prescriptions during forest operations.

Rec No.	Historic and cultural features reserves name	Location	Area (ha)
E1	Hand in Hand Cyanide Works	Deep Lead	8
E1	Leviathan Cyanide Works	Stawell	5
E1	North Magdala Co. Mine	Stawell	0.2
E1	Moonlight/Magdala Mine	Stawell	3
E1	Oriental Co. Mine	Stawell	1
E1	Three Jacks Co. Mine	Stawell	1
E1	Great Western Lead Mine	Great Western	5
E1	Long Gully Shallow Lead	Armstrongs	11
E1	Lloyd's Whip Shaft and mud-brick structure	Stuart Mill	13

E1	Bell Rock Co. Mine	North-east of St Arnaud	3
E1	Percydale Historic Area	West of Avoca	1 272
E1	Moliagul Historic Area	North-west of Dunolly	1 010
E1	Maldon Historic Area	Surrounding the township of Maldon	2 520
E1	Whroo Historic Area	South of Rushworth	490
E1	Glendhu Historic Reserve	South of Navarre	40
E1	Landsborough Historic Reserve	South of Navarre	16
E1	Lower Homebush Historic Reserve	North-east of Avoca	1
E1	Nine Mile Historic Reserve	West of Wedderburn	12
E1	Tipperary Hill Historic Reserve	North-west of Maryborough	5
E1	Timor Historic Reserve	North of Maryborough	7
E1	Bristol Hill	Maryborough	26
E1	Majorca Historic Reserve	South-east of Maryborough	16
E1	Kong Meng Historic Reserve	South-east of Maryborough	20
E1	Goldsborough Historic Reserve	North-west of Dunolly	7
E1	McIntyre Historic Reserve	North-west of Tamagulla	38
E1	Rheola Hill Historic Reserve	South-west of Inglewood	72
E1	Gooseberry Hill Historic Reserve	South of Dunolly	1
E1	Wild Dog Diggings Historic Reserve	East of Dunolly	24
E1	Wanalta Weir Historic Reserve	West of Rushworth	5
E1	Balieston Historic Reserve	North-west of Nagambie	158
E1	Murchison Waterworks Trust Historic Reserve	South-west of Murchison	1
E1	Boxwood Historic Reserve	East of Dookie	52
E1	Chiltern Valley Extended Mine Historic Reserve	West of Chiltern	10
Sub-total			5 853.2
Proposed new historic and cultural features reserves			
E2	Alma Lead Cyanide Works	North-west of Maryborough	10.7
E3	Janevale Monier Bridge	North-east of Dunolly	0.5
E4	Pickpocket Diggings	South of Newstead	4.9
E5	South Frederick the Great	North of Bendigo	13
E6	Deborah Company	Bendigo (south)	0.5
E7	North Deborah	Bendigo (south)	0.9
E8	Central Deborah Tourist Mine	Bendigo (south)	0.5
E9	Victoria Hill	Bendigo (west)	14.2
E10	Royal George Company	Bendigo (west)	15.8
E11	Pearl, Pearl East and Stanfield Mine Workings	Bendigo (west)	42
E12	Comet Shaft, KK Shaft and Comet Diggings	Bendigo (central)	6.7
E13	Johnson's Nos. 1 & 2 Mines and Golden Age Mine	Bendigo (north-west)	13
E14	Chinese Diggings	Bendigo (east)	4.1
E15	Woodbrook Road Bridge	North of Castlemaine	0.2
E16	Dysart Military Siding	South-west of Seymour	4.9
E17	Echuca and Waranga Trust Irrigation Pump and Channel	North of Nagambie	4.9
E18	Day's Mill	South of Murchison	5
Sub-total			141.8

Proposed historic and cultural features zones in state forest			
Historic and cultural features zone name			
E19	Wet Patch Lead	St Arnaud-Pyrenees State Forest west of Avoca	1.5
E20	Three Grain Gully	Dunolly-Inglewood State Forest north-west of Dunolly	1.5
E21	Bet Bet Lead	Dunolly-Inglewood State Forest south of Dunolly	1.5
E22	Almedia Reef	Dunolly-Inglewood State Forest east of Dunolly	1.5
E23	Wild Duck Lead Diggings	Dunolly-Inglewood State Forest east of Dunolly	1.5
E24	Possum Gully Cement Workings	Paddys Ranges State Forest south-west of Maryborough	1.5
E25	White Horse Gully	Maryborough State Forest south of Maryborough	1.5
E26	Battery Dam Eucalyptus Distilling Site	Maryborough State Forest south of Maryborough	1.5
E27	North German Gully	Eglington State Forest south-east of Maryborough	1.5
E28	Gardners Gully	Muckleford State Forest south of Maldon	1.5
E29	Green Gully	Muckleford State Forest south of Maldon	1.5
E30	Welcome Reef Mine Site	Rushworth-Heathcote State Forest north-east of Heathcote	1.5
E31	Poverty Diggings	Rushworth-Heathcote State Forest north of Rushworth	1.5
Sub-total			19.5
Total			6 014.5

15 State forests and forest management

GENERAL RECOMMENDATIONS FOR STATE FORESTS

- F That the area of 121 738 ha shown as state forest on Map A be used in accordance with the principles and guidelines outlined above, to:
- (a) produce hardwood timber and conserve native plants and animals, as equal primary uses, subject to the following:
 - (i) logs should be directed as far as possible to the highest value-added products,
 - (ii) minor products should as far as possible be produced from waste from operations for major products and from thinning operations that remove small diameter stems, and
 - (iii) harvesting of timber should proceed in accordance with *the Code of Forest Practices for Timber Production* and relevant prescriptions;
 - (b) supply water and protect catchments and streams;
 - (c) provide opportunities for open-space recreation and education;
 - (d) produce honey, gravel, sand, road-making materials and other forest products;
- and that:
- (e) current forest management prescriptions applying to Box-Ironbark forests in the Bendigo FMA and adjacent FMAs be revised;
 - (f) measures to:
 - (i) implement the principles and guidelines outlined above, and
 - (ii) make secure provision for the conservation of rare or threatened species, depleted EVCs and other characteristics of the forests that should be retained for biodiversity conservation purposes, and
 - (iii) be incorporated into the revised prescriptions;
 - (g) specific provision for improvement in stand structure be implemented via utilisation standards which integrate with habitat management prescriptions, and take into account the impact of prescriptions for wildlife conservation;
 - (h) Box-Ironbark forests be harvested using systems which seek to optimise growth rates on individual stems for both habitat management and wood production objectives, and which maintain stands in an uneven-aged condition;
 - (i) research into hollow formation in Box-Ironbark forests be conducted and, if feasible, programs which will increase the density of hollow-bearing trees be implemented;
 - (j) new information on wildlife ecology or forest structure be taken into account in future forest management strategies;
- and that:
- (k) state forests be managed by the Department of Natural Resources and Environment.

F1 Existing state forests**RECOMMENDATION**

That the state forests shown on Map A (numbered F1) and listed in Appendix 10, be used:

- (a) in accordance with the general recommendations above; and
- (b) the special features in state forest areas listed below be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

F2 Rushworth–Heathcote State Forests**RECOMMENDATIONS**

That the Rushworth–Heathcote State Forests of 21 508 ha be used:

- (a) in accordance with the general recommendations for state forests on page 170;
- (b) for continued low-key Department of Defence training, subject to the land manager's discretion; and that
- (c) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

F3 Dunolly–Inglewood State Forests**RECOMMENDATIONS**

That Dunolly–Inglewood State Forests of 28 527 ha:

- (a) be used in accordance with the general recommendations for state forests on page 170; and that
- (b) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

F4 St Arnaud and Pyrenees State Forests**RECOMMENDATIONS**

That the St Arnaud–Pyrenees State Forests of 11 594 ha:

- (a) be used in accordance with the general recommendations for state forests on page 170;
- (b) continue to allow low-key Department of Defence training, subject to the land manager's discretion; and that
- (c) the following special features be protected under Section 50 of the *Forests Act 1958*, Section 4 of the *Crown Land (Reserves) Act 1978*, the *Flora and Fauna Guarantee Act 1988*, or through the implementation of management prescriptions, as appropriate.

Rec No.	State forest name	Location	Area (ha)
F1	Stawell Township	Stawell	261
F1	Illawarra	West of Stawell	731
F1	Glynwylln	North east of Stawell	750
F1	Wedderburn	Wedderburn	766
F1	West Brenanah	West of Inglewood	724
F1	Glenmona	East of Avoca	1 649
F1	Havelock-Timor	North of Maryborough	4010
F1	Paddy's Ranges-Lillicur	South-west of Maryborough	8449
F1	Majorca	South-east of Maryborough	202
F1	Eglington	South of Maryborough	1512
F1	Dunach	South of Maryborough	399
F1	Sandon	South-west of Newstead	2697
F1	Muckleford	South of Maldon	3 133
F1	Upper Loddon	South of Castlemaine	6 358
F1	Castlemaine	South of Castlemaine	52
F1	Fryers Ridge	South-east of Castlemaine	3 326
F1	Taradale	South-east of Castlemaine	241

F1	Lockwood	South-west of Bendigo	997
F1	Myers Flat	North-west of Bendigo	412
F1	Whipstick	North of Bendigo	846
F1	Wellsford	East of Bendigo	7 346
F1	Mandurang South	South-east of Bendigo	1 183
F1	Axedale	East of Bendigo	943
F1	Pilcher's Bridge	South-east of Bendigo	1 661
F1	Eppalock	South-east of Bendigo	1 776
F1	Knowsley	East of Bendigo	1 204
F1	Barambogie	South of Chiltern	1 880
F1	Other forests (adj. Goulburn R., Murray R., Benalla)	various	6 601
F2	Rushworth-Heathcote	Between Rushworth and Heathcote	21 508
F3	Dunolly-Inglewood	Around Dunolly and west of Inglewood	28 527
F4	St Arnaud-Pyrenees	South of St Arnaud and west of Avoca	11 594
Total			121 738

16 Other public land use categories

G Reference areas

GENERAL RECOMMENDATIONS FOR REFERENCE AREAS

G That the reference areas listed in Table 16.1 above and shown on Map A (numbered G1 to G11) continue to be used for scientific reference, in accordance with previous recommendations and appropriate management plans.

Note: Sandhurst Reference Area (G5) has not been proclaimed. It is proposed that it remain as a reference area within the Greater Bendigo Regional Park.

Rec No.	Reference Area Name	Location	Area (ha) ¹
G1	Mt Separation	West of Redbank	188
G2	Korong Vale	North of Wedderburn	460
G3	Kooyoora	Kooyoora State Park	325
G4	Terrick Terrick	Terrick Terrick National Park	100
G5	Sandhurst	South of Bendigo	690
G6	Kamarooka	Whipstick – Kamarooka State Park	225
G7	Mt Black	Mt Black State Park	380
G8	Warby Ranges	Warby Ranges State Park	170
G9	Killawarra	Warby Ranges State Park	141
G10	White Box	Chiltern – Pilot National Park	90
G11	Pilot Range	Chiltern – Pilot National Park	518
Total			3 287

¹ The areas in this table are from GIS measurements, and they differ from the proclaimed areas for some reference areas.

H Natural features reserves

GENERAL RECOMMENDATIONS FOR NATURAL FEATURES RESERVES

H That natural features reserves, according to their specific characteristics, be used to:

- (a) protect natural features and values;
- (b) provide opportunities for:
 - (i) education and passive recreation such as picnicking, walking and where relevant, angling, and
 - (ii) more intensive recreation such as camping where specified;
- (c) conserve indigenous flora and fauna;
- (d) protect areas with remnant vegetation or habitat value;
- (e) provide protection for cultural heritage features and associations;
- (f) preserve features of geological or geomorphological interest;
- (g) maintain scenic features and the character and quality of the local landscape;

and that:

- (h) commercial timber harvesting not be permitted;
 - (i) some firewood may be available from ecological thinning, subject to research and the approval of the land manager,
 - (ii) exploration for minerals be permitted, and mining, subject to decisions on particular cases;

	(i) prospecting and apiculture be permitted subject to the land manager's discretion (see Notes 2 and 3 below);
	(j) grazing generally not be permitted, unless required for short periods by the land manager; and
	(k) they be permanently reserved under the <i>Crown Land (Reserves) Act 1978</i> , and managed by the Department of Natural Resources and Environment.
Notes:	
	1. Most are shown on Map A; some are too small to appear on the map; stream beds and banks (H3) are not shown.
	2. Prospecting and apiculture would generally be permitted, subject to appropriate conditions; removal of these activities would require the land manager to demonstrate a particular need.
	3. Apiculture sites should be located away from picnic areas, car parks, walking tracks and other focal points for recreation.
	4. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.
	5. Several of the natural features reserves have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.
	6. Existing reserves are to be reviewed prior to completion of the ECC's Final Report.

H1 Recommendation for wildlife areas

That the wildlife areas shown on Map A (numbered H1) and listed in Appendix 10 be used in accordance with the general recommendations for natural features reserves above, and:

- primarily to conserve the habitat of native fauna associated with wetlands; and
- for public recreation (including hunting in season as specified by the managers) and education, where this does not conflict with the primary aim.

Rec. No.	Wildlife reserve name	Location	Area (ha)
H1	Greens Creek Swamp	North-east of Stawell	39
H1	Reedy Lake	North-west of Nagambie	1 400
H1	Doctors Swamp	West of Murchison	263
H1	Tabilk Lagoon	South-west of Nagambie	198
H1	McBurney Swamp	North of Euroa	33
H1	Lehmann Swamp	North of Euroa	65
H1	Jubilee Swamp	North-east of Violet Town	147
H1	Morphett Swamp	North-east of Violet Town	22
H1	Dowdle Swamp	North-east of Tungamah	291
H1	Black Swamp	North of Wangaratta	126
Total			2 584

H2 Recommendations for public land water frontages

That public land water frontages, where not recommended otherwise for a specific use, be used in accordance with the general recommendations for natural features reserves above, and be used to:

- conserve native flora and fauna as part of an integrated system of habitat networks across the State;
- maintain or restore indigenous vegetation;
- protect adjoining land from erosion, and provide for flood passage;
- protect the character and scenic quality of the local landscape;
- provide protection for cultural heritage features and associations;
- provide access for recreational activities and levels of use consistent with (a) to (c) above;

and that:

- Catchment Management Authorities, in cooperation with adjoining landholders, implement programs to gradually restore frontages, where public land water frontages are currently licensed for grazing or other purposes, and where stream-bank or frontage vegetation is degraded, frontage vegetation is not regenerating, stream banks are eroding or salt-affected, or to protect natural, cultural, recreational and scenic values or water quality;
- programs to restore frontages be implemented according to local priorities and a practical timetable, with particular emphasis on the Victorian Riverina bioregion (northern plains);
- where frontages adjoin farmland, fencing and off-stream stock watering points be encouraged by appropriate support;
- where stream frontage vegetation is to be restored, particularly in cleared or degraded areas, indigenous trees, shrubs and ground species be planted, where possible using seed of local provenance;
- where appropriate, suitable areas for more intensive recreational use be identified and facilities established;
- where land exchanges are proposed that involve frontage land that is no longer adjacent to rivers, efforts be made to prevent loss of any nature conservation or other values of this land from the public land estate;
- where a licence has been issued for a public land water frontage, recreation use by the public for activities such as walking, nature observation or fishing be permitted, while motorised forms of recreation not be permitted;

- (n) licensees be required to provide stiles in any fences erected across their licence area if requested to do so by the land manager;
- (o) no new cultivation of stream frontages for agriculture be permitted, and areas currently cultivated be reviewed by the land manager as part of a systematic assessment of river restoration priorities, with a view to phasing out inappropriate cultivation;
- (p) timber cutting not be permitted;
- (q) sand and gravel extraction may be permitted by the land managers where this is consistent with the above uses, and where necessary for bed and bank stability;

and that:

- (r) public land water frontages be managed by the relevant Catchment Management Authority and NRE, as appropriate.

Notes: 1. Public land water frontage recommendations apply to sections of many watercourses outside major public land use categories. They are shown diagrammatically on Map A, but are not individually listed. For details, refer to parish plans, or the Department of Natural Resources and Environment.
2. Vegetation along public land water frontages often includes large old trees, for example, Bullock Creek at Marong, which should be protected.

Public land water frontages (Note):

Vegetation along public land water frontages often includes large old trees, for example, Bullock Creek at Marong, which should be protected.

H3 Recommendations for stream beds and banks

That stream beds and banks, subject to other relevant recommendations, guidelines and statutory requirements, be used in accordance with the general recommendations for natural features reserves on page 188, and be used to:

- (a) conserve or restore habitat for native flora and fauna;
- (b) provide for appropriate recreational activities and levels of use;
- (c) provide for flood passage and drainage requirements of adjacent land;
- (d) where necessary, provide for the passage of artificial flows of water stored within the catchment or transferred from other catchments;
- (e) maintain streams in a stable condition using environmentally sound techniques; and
- (f) where this does not conflict with the above, provide a source of sand and gravel.

Note: Stream beds and banks recommendations apply to all watercourses outside major public land use categories, whether or not there is an adjoining public land water frontage. They are not labelled on Map A.

Streamside areas

Existing streamside reserves (Note):

H4 (North Central K38) Crown land south and east of Cas16 and 17 Tp. Taradale, 15 ha. On this site are two significant oak trees, planted to commemorate the marriage of H.R.H. Prince of Wales in 1863, and a Scots Pine. These should be preserved. They are also included on the Victorian Heritage Register.

H4-H7 Recommendations for streamside areas

That all existing streamside areas (H4), and new streamside areas (H5-H7) listed in Appendix 10 and shown on Map A, be used:

- (a) in accordance with the general recommendations for natural features reserves on page 188; and
- (b) to provide opportunities for more intensive recreation such as camping at the discretion of the land manager if this does not conflict with the maintenance of the water quality in the adjacent stream.

Proposed streamside areas

Rec. No.	Parish	Description ¹	Parcel numbers ²	Area (ha)	Stream and location
H5	Sandhurst	CA 54B	P127069	15.5	Bendigo Creek, White Hills, Bendigo
		CA 54C	P127070		
		CA 54D	P127071		
		CA 54E	P127072		
		CA 54F	P127073		
		CA 54H	P127075		
		CA 60	P127076		
		CA 60A	P127077		
H6	Axedale	CA 8C Sec 7A	P131992	5.3	Campaspe River, north of Axedale
H7	Elmore	CA A29	P120605	14	Picaninny Creek, west of Elmore
			Total	34.8	

Notes: ¹ The Crown description of the public land included in these and later reserves comprises the Crown allotment (CA) number and the relevant parish or township.

² The Crown parcel number (P number) is the unique identifier for each piece of Crown land.

Bushland areas**Existing bushland reserves**

Notes: 1. Total area of existing bushland reserves is 4 334 ha.

2. H8 (North Central H28) Crown land south-west of CA 19 sec M Par. Maldon, 20 ha—Sandy Creek diggings are present on this parcel at Welshman's Reef, and should be protected.

H8-H109 Recommendations for bushland areas

That the existing bushland reserves (H8), except where recommended for other purposes, and new areas of bushland (H9-H109) listed in Appendix 10), as shown on Map A, be used in accordance with the general recommendations for natural features reserves on page 188.

Proposed bushland areas

Rec No.	Crown description	Parcel numbers	Area (ha)
H9	CA 233A No Sec, Illawarra (unfenced)	P022228	5.1
H10	CA 189F No Sec, Illawarra	P022241	12.3
H11	CA 249C No Sec, Illawarra	P022243	4.1
H12	CA 249B No Sec, Illawarra (unfenced)	P022242	5.3
H13	CA 249A No Sec, Illawarra	P025520	7.1
H14	CA 87A Sec Y, Mokepilly	P022204	13
H15	CA 158A No Sec, Illawarra	P020346	7.8
H16	CA 1 Sec 273, CA 1 Sec 274, CA 1 Sec 275A, CA 1 Sec 275B, CA 1 Sec 281, CA 3 Sec 145, CA 146 No Sec, Stawell	P023819, P023821, P023822, P023823, P023824, P023825, P023826	17.6
H17	CA 1 Sec 137, CA 1 Sec 138A, CA 1 Sec 138B, CA 1 Sec 138C, CA 1 Sec 139A, CA 1 Sec 139B, CA 1 Sec 139C, CA 1 Sec 139D, Stawell	P023831, P023832, P023833, P023834, P023835, P023836, P023838, P023839	7.2
H18	CA 191B No Sec, Stawell	P023656	25
H19	CA 26, CA 28 Sec 49B, Illawarra	P023844, P023845	20
H20	CA 32E No Sec, Stawell	P023635	4.6
H21	2 ha addition to existing Watta Wella reserve (NC H17); CA 5F, CA 31D, CA 31E, Watta Wella	P108498, P105744, P105745	10
H22	CA 84A, CA 84B Sec 5, Concongella South	P106955, P106965	3.2
H23	CA 39A Sec A, Lexington	P105653	2.02
H24	CA 117A, CA 122 Concongella	P102438, P102437	2.3
H25	CA 13A Sec 6, Concongella	P106265	4.8
H26	CA 37A Sec 6, Concongella	P106284	1.7
H27	Includes part of existing Concongella reserve (NC H14); CA 30D1, CA 30F, CA 30M, CA 30P, CA 30Q, Part CA 30G Sec Y, Concongella	P106267, P106298, P106299, P106297, P106295, Part P106300	25
H28	28 ha addition to existing Garden Gully reserve (SW2 180); CA 23A Sec 15A, Ararat, 36ha east of CA 98B Sec 15A, and unused government road east of CA 101 Sec 15, Ararat	inc. P103448	64
H29	CA 82A, 83A & 102C, No Sec, Glynwylln	P106968, P106975, P106976	43
H30	CA 1C, Landsborough	P104200	4.9
H31	4.1 ha addition to existing Landsborough reserve (NC H37); CA 26A Sec 2, and 4 ha east of allotment 39 Sec 5, Landsborough	inc. P104207	8.1
H32	CA 279A No Sec, Navarre	P106228	7.6
H33	CA 43A Sec BB, St Arnaud Note: Use by St Arnaud Pony Club may continue	P126988	20
H34	CA 44D, CA 44E Sec AA, St Arnaud	P126973, P126974	7.6
H35	CA 80G Sec A, Carapooee	P120929	8.1
H36	CA 54 G Sec 1, Moyreisk Note: Forms part of a habitat corridor	P107335	6.1
H37	Cas 9 – 12, CA 16A&C, CA 24A, Sec J, Glenmona	P104275, P104276, P104277, P104278, P104273, P104274, P104280	20
H38	CA 35B Sec M, Glenmona (unfenced)	P104261	4.9
H39	CA 1Z1, Archdale	P120001	12.6
H40	CA 14B, CA 14C Sec 16, Bealiba	P128317, P128336	9.9

H41	CA 30J Sec B, Tchuterr	P124371	4
H42	CA 10B, CA 10C Sec C Brennanah	P122059, P122060	7.9
H43	Wedderburn Junction–Wedderburn disused railway line		33
H44	CA 1A, CA 1B Sec 5, Mohagul	P130221, P130222	19.1
H45	CA 30B Sec 11, Moliagul	P124938	4.3
H46	CA 20C, CA 20D, CA 22A, CA 22B Dunolly	P128894, P128895, P128897, P128899	13.5
H47	CA 13B Sec 3, Wareek	P107030	3.6
H48	CA 15C Sec 112, Wareek	P107014	24
H49	CA 18A & 18B Sec 13, CA 1B Sec 20B, Maryborough	P104821, P104822, P108256	38
H50	CA 18 Sec 61, Maryborough	P107091	16
H51	CA 23C Sec 8, Amherst	P107408	3.3
H52	3.5 ha addition to existing Amherst reserve (NC 180); CA 47D, and 10ha (part) of allot 5C Sec 2 Amherst.	inc. P107399	13.5
H53	CA 6, Amherst	P134422	7.5
H54	CA 130, Bridgewater	P120886	10
H55	CA 6 No Sec, Leichardt	P122816	5
H56	CA 2B, Woodstock	P125581	4.3
H57	2 ha addition to existing reserve (NC 1146); CA 51 Sec 22, Marong	P132423	10
H58	CA 13M, CA 18A Nerring Note: Ausfeld's wattle is present	P123943, P123949	219
H59	CA 9A Sec E, Nerring	P123919, P134217	3.8
H60	CA 2X Sec 19, Yarraberb	P132586	5.4
H61	CA A4P, Neilborough	P123403	4
H62	CA 54A, CA 94A Maldon	P126300, P126301	1.2
H63	CA 21B, Maldon Note: Historic graves in this reserve are to be preserved	P126321	1.6
H64	CA 6A, CA 10A Sec 1B, CA 3A Sec 1C Yandoit	P143952, P143695, P143969	118
H65	CA 29 & 30, Castlemaine	P121124, P121135	5
H66	CA 11A Sec 35A, Castlemaine	P128480	2.8
H67	Part CA 22A Sec G4, Castlemaine	P121009	4.6
H68	CA 7K, CA 7L Sec 3B, Castlemaine	P121038, P121039	31
H69	CA 35A, Chewton	P121481	1.3
H70	CA 42Z1 Sec L, Sandhurst	P128116	16.7
H71	CA 88F Sec 7A, Sandhurst	P125789	2.2
H72	part CA 28 Sec K1 (21ha); part CA 300A Sec N (11ha); and Cas 115 – 119, CA 125B, CA 231E, CA 269J, CA 269H, CA 269M Sec N, Sandhurst	P126847, P126431, P126424, P126423, P126428, P133533, P126427, P126422, P126421, P126420, P126419, P126418	48
H73	CA 52J Sec N, Sandhurst	Part of P127983	2.3
H74	CA 2A Sec F6, CA 47A Sec N1, Sandhurst	P128015, P126779	10.3
H75	CA 13 Sec 13, Sandhurst	P132723	0.5
H76	CA 240Q Sec O, Sandhurst	P128259	0.9
H77	CA 248 J Sec O, Sandhurst CA 248H Sec O	P129368, P129367	3.6
H78	CA 91C, CA 91D, CA 91E No Sec, Sandhurst	P128189, P128190, P128191	2.5
H79	CA 81H, CA 81J No Sec, Sandhurst, and water frontage between these parcels	P128186, P128187	9.9
H80	CA 1 Sec 4, Strathfieldsaye	P124147	4
H81	CA 1 Sec 10, Strathfieldsaye	P131085	1.8
H82	CA 28C No Sec, Strathfieldsaye	P131088	1.3
H83	CA 18A, CA 18B, Kamarooka	P121111, P121164	8.2
H84	CA 23, CA 40, CA 40A Sec B, Kamarooka	P132630, P132631, P132632	15.3
H85	Elmore–Cohuna disused railway line	-	109
H86	CA 2 Sec 9, Goomong	P129568	4

H87	CA 34P & 34Q, Redesdale	P123611, P123612	278
H88	CA F1A No Sec, Emberton	P120660	107
H89	CA 120B No Sec, Corop	P121708	3.4
H90	CA 62A No Sec, Gobarup	P122239	6
H91	CA 61C So Sec, Gobarup	P122240	2.0
H92	CA 38A No Sec, Gobarup	P122238	6
H93	CA 2J Sec 2, Heathcote (unfenced)	P122622	3.0
H94	Rushworth–Colbinabbin disused railway line	-	71
H95	CA 31 Sec A, Northwood	P180132	6.3
H96	CA 74B, CA 99A, CA 103A, CA 103B, CA 103C, CA 103D, CA 105B No Sec, Waranga Note: This is the former Waranga Education Area	P124833, P124836, P124837, P124838, P124839, P124840, P125261	264
H97	Part CA 81A No Sec, Murchison	P125264 (Part)	7.2
H98	CA 48B, CA 48D No Sec, Wyuna	P162992, P162994	149
H99	Numurkah – Picola disused railway line Note: Significant flora occurring along this line should be protected	-	102
H100	CA 5A Sec E, Shadforth	P160196	1.4
H101	CA 77B No Sec, Goomalibee	P161327	2.1
H102	CA 19C, Goorambar	P163487	1.9
H103	CA 140D No Sec, Samaria	P162223	5.5
H104	CA 27F No Sec, Bungeet	P160960	5.9
H105	CA 56F No Sec, Bungeet Note: Tennis courts on this block may continue to be used.	P160965	7.5
H106	CA 40D No Sec, Mokoan	P163490	1.5
H107	CA 10A No Sec, Lurg	P161804	1.6
H108	CA 23B No Sec, Tatong	P163872	4.1
H109	Peechelba–Myrtleford disused railway line Note: Important grasslands on this line should be protected	-	82
Total			2 368

H110 Recommendations for natural and scenic features areas

That the existing natural and scenic features areas shown on Map A and listed in Appendix 10 be used in accordance with the general recommendations for natural features reserves on page 188.

Rec No.	Existing natural and scenic features area name	Location	Area (ha)
H110	Black Range	Great Western	418
H110	Mt Gowar	West of Wedderburn	62
H110	Howells Hill	East of Charlton	85
H110	Mt Buckra	North-west of Wychitella	33
H110	Murchison North	East of Waranga Basin	2
H110	Mt Ochertyre	North of Chiltern	26
H110	Barnawartha Hill	North-east of Chiltern	60
Total			686

H111-H113 Recommendations for geological and geomorphological features areas

That the following existing (H111) and new (H112 and H113) geological and geomorphological features areas shown on Map A and listed in Appendix 10:

- (a) be used in accordance with the general recommendations for natural features reserves on page 188; and that
- (b) educational and scientific study, and recreation, be permitted where they are compatible with protecting the geological and geomorphological features.

Rec No.	Geological and geomorphological features name	Location	Area (ha)
Existing geological and geomorphological features			
H111	Yowang Hill	North-east of St Arnaud	70
H111	Amherst quartz reef	West of Talbot	8
H111	Coliban Falls	West of Redesdale	4
H111	Permian glacials, Moorabbee shoreline, Lake Eppalock	North-west of Heathcote	34
Proposed geological and geomorphological features			
H112	White Hills sediments	White Hills, Bendigo	15.4
H113	Barfold Gorge	Campaspe River, Redesdale	8
Total			139.4

H114 Recommendations for highway parks

That the following existing highway parks and roadside stops, as shown on Map A, be used in accordance with the general recommendations for natural features reserves on page 188, and to provide opportunities for relaxation for travellers (see Appendix 10 for locations and areas):

Rec No.	Highway parks (HP) and roadside stops (RS)	Location	Area (ha)
H114	CA 64 Township of Ravenswood (HP)	Calder Highway, Ravenswood	24
H114	Adjacent CA 3 Parish of Runnymede (HP)	Northern Highway, Elmore	10
H114	Sections 19 & 20, Township of Toolleen (RS)	Northern Highway, Toolleen	3
H114	Casey Weir, CA 19A and adjacent water reserve, Parish of Goorambat (HP)	Midland Highway, Benalla	42
H114	CA 7A Sec 1 Parish of Baramboige (RS)	Rocky Creek Road, Springhurst	18
Total			97

I Water production

GENERAL RECOMMENDATIONS FOR WATER PRODUCTION AREAS

I That, for the water production areas shown on Map A (numbered II) and listed below; the storage areas; diversion works and associated facilities; protective buffer zones around diversion works and storages, defined in a special area plan or land-use determination; and any other public land considered necessary; be used for:

- (a) water supply purposes;
- (b) other activities permitted by the water supply authority after consultation with NRE and the Environment Protection Authority, as appropriate;

and that:

- (c) unless otherwise securely reserved, these areas be permanently reserved under the *Crown Land (Reserves) Act 1978* for water supply purposes, and be managed by the water supply authority.

Note: Several large storage areas not primarily used for domestic water supply are also used for water-based recreation. This may continue except where it results in deteriorating water quality.

Rec. No.	Water production area name	Status	Area (ha)
II	Lake Lonsdale	Declared water catchment	2 950
II	Picnic Road (Ararat)	Declared water catchment	15
II	Malakoff Creek (Landsborough)	Land use determination	4
II	Teddington Reservoir (Stuart Mill)	Declared water catchment	20
II	Redbank Creek (Redbank)	Declared water catchment	15
II	Avoca	Land use determination	15
II	Tullaroop Reservoir	Declared water catchment	130
II	Laanecoone Reservoir	Declared water catchment	320
II	Lake Caim Curran [includes McCay Reservoir catchment] Note: McCay Reservoir water production reserve east of Chewton— native vegetation on this site should be protected	Declared water catchment	1 480
II	Caim Curran (lake environs)	Land use notice	5 500 ²
II	Crusoe Reservoir (Bendigo)	Declared water catchment	35
II	No 7 Reservoir (Bendigo)	Declared water catchment	8
II	Sandhurst Reservoir (Bendigo)	Declared water catchment	40
II	Spring Gully Reservoir (Bendigo)	Declared water catchment	55
II	Lake Eppalock	Declared water catchment	2 950
II	Eppalock (lake environs)	Land use determination	25 800

II	Waranga Basin	Not declared	6 380
II	Lake Nagambie	Not declared	1 270
II	Fifteen Mile Creek (Glenrowan)	Declared water catchment	4
II	Lake Mokoan	Not declared	7 540
II	Diddah Diddah Creek (Springhurst)	Declared water catchment	15
II	Baramboogie Creek (Chiltern)	Declared water catchment	15
Total			23 261

Notes: 1. Areas listed are the measured or estimated area of the relevant reservoir.
2. The areas of the land use notice at Cairn Curran and land use determination at Eppalock are omitted from the total as they include large areas of private land.

J Community use areas

GENERAL RECOMMENDATIONS FOR COMMUNITY USE AREAS

- J That the recommended areas J1-J6 below be used for recreation, education or other community purposes and that:
- appropriate facilities be provided;
 - where relevant, and where compatible with the above, features of cultural significance, natural surroundings and the local character and quality of the landscape be maintained or restored;
 - harvesting of forest products, hunting and 'stone' extraction, as defined in the *Extractive Industries Development Act 1995*, not be permitted;
- and that:
- they be permanently reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment (see Note 3 below).

Notes: 1. Some of these areas are shown on Map A; others are too small to be shown.
2. Several of the community use areas have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.
3. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.

J1 Recommendations for education areas

That the Eppalock Education Area be used in accordance with the general recommendations for community use areas above, and to provide opportunities for students of all ages to:

- study the nature and functioning of reasonably natural ecosystems in a manner such that the integrity of those ecosystems is maintained as far as is practicable;
- compare the ecosystems within the education area with other nearby natural and modified systems;
- observe and practise methods of environmental analysis, and the field techniques of the natural sciences; and
- conduct simple long-term experiments aimed at giving an understanding of the changes occurring in an area with time.

J2 Recommendations for recreation areas

That recreation areas be used in accordance with the general recommendations for community use areas above, and be used:

- for organised sports (team sports, horse-racing, golf etc.) and informal recreation (picnicking, camping, prospecting etc.) as permitted by the land manager;
- to conserve indigenous vegetation where possible; and
- for grazing at the discretion of the land manager, in appropriate areas.

Note: Large reserves are shown on Map A; smaller reserves, particularly in townships, are generally too small to be mapped at the scale used, and are not shown.

Recreation areas (Notes):

- J2 Princes Park, Maryborough—significant historic features at this site include Illawarra flame trees, a grandstand, rotunda and stone lined drain. These should be preserved. They are also listed on the Victorian Heritage Register.
- J2 Timor Recreation Reserve, Bet Bet Creek Road has remnant native vegetation which should be protected.
- J2 Porcupine Flat, Maldon—the natural vegetation and large seasonal wetland depression within this reserve are to be conserved.
- J2 Queen Elizabeth Oval, Bendigo—the grandstand is on the Victorian Heritage Register and should be preserved.
- J2 recreation reserve between Laurel and Maple Streets, Bendigo—the creek frontage adjoining this reserve has old stone work and timber slab retaining walls that should be retained.
- J2 Happy Jack water and recreation reserve (adjacent to the Calder Highway), Bendigo—access to water on this parcel is to be retained.
- J2 Specimen Hill mini bike track, Bendigo—historic mining relics on this reserve should be preserved.
- J2 Albert Roy recreation reserve, Eaglehawk—native vegetation, including examples of Granitic Hills Herb-rich Woodland and Hillcrest Herb-rich Woodland EVCs, should be protected.

J3 Recommendations for recreation trails

That the recreation trails continue to be used in accordance with the general recommendations for community use areas on page 194 and that suitable new trails for recreation and tourist use be encouraged.

Recreation trails (Note):

- J3 Bendigo Bushland Trail Bendigo—the railway bridge where this trail crosses the Mc Ivor Highway is a significant heritage structure and should be retained.

J4 Recommendations for rifle and other shooting ranges

That:

- existing use as a rifle, pistol or clay target range, or for other shooting sports, continue, provided the club remains viable and the operator can ensure safety on the range and in adjoining areas; and
- where ranges, including buffers, close and retain remnant Box-Ironbark vegetation, those areas be reserved as nature conservation reserves, natural features reserves or state forest as appropriate.

Note: The buffer zones at several ranges have been included in adjoining parks and are subject to access limits.

Rifle and other shooting ranges (Note):

- J4 Castlemaine Pistol Club—native vegetation at this site should be protected.

J5 Recommendations for parklands and gardens

That:

- gardens, community parklands or ornamental gardens on public land be used in accordance with the general recommendations for community use areas on page 194;
- the conservation, scientific, educational and historical values of botanical gardens be protected; and
- they be available for public use for passive open space recreation, appreciation and education, as determined by the land manager.

Notes:

- Where these areas retain indigenous vegetation, it should be protected.
- These areas are generally too small to be mapped at the scale used, and are not shown on Map A.

Parklands and gardens (Notes):

- J5 Rosalind Park, Bendigo—includes memorial statues that are on the Victorian Heritage Register and should be preserved.
- J5 reserve bound by Murphy, Ross, Dundas and Heywood Streets, Bendigo—vegetation at the northern end of this reserve includes Ausfeld's wattle and should be protected.
- J5 Lake Tom Thumb and adjoining reserve, Eaglehawk—contains rare plants that should be protected.
- J5 Former state school site, corner Langslow and Monaghan Streets, Castlemaine—the stand of Cunnacks Valonia oak trees is of historic significance and should be retained.

J6 Recommendations for buildings in public use

That various buildings in public use be used in accordance with the general recommendations for community use areas on page 194, where appropriate, and for schools, public halls, kindergartens, libraries, museums, galleries, war memorials, tourist facilities or other public uses.

- Notes:
- See also Recommendation N2.
 - These areas are generally too small to be mapped at the scale used, and are not shown on Map A.

Buildings in public use (Notes):

- J6 Moliagul Primary School—buildings on this site are of historical significance and should be protected.
- J6 Dunolly Primary School, Bridgewater—Dunolly Road—old weatherboard buildings on this site have heritage value and should be protected.
- J6 Francis Street State School, Maldon—buildings on this site are on the Victorian Heritage Register and should be protected.
- J6 Stanley Street State School, Eaglehawk—school buildings are of historic significance and should be protected.
- J6 Commonwealth School, between Church and Brazier Streets, Eaglehawk—buildings on this site are on the Victorian Heritage Register and should be protected.
- J6 Common School, Lockwood—historic features on this site should be protected.
- J6 Guildford Primary School—buildings on this site (excluding the toilet block and shed) are on the Victorian Heritage Register and should be protected.

K Plantations**GENERAL RECOMMENDATIONS FOR PLANTATIONS**

K That:

- there be no extension of softwood plantations in the study area;
- at the time of harvest, consideration be given to the economics of establishing hardwood plantations on these areas; and
- the plantation managers address the issue of eradication of pine seedlings in adjoining forested areas.

SPECIFIC RECOMMENDATIONS

K1 That the existing plantations shown on Map A continue under present use and management.

K2 That the Mt Alexander plantation, when re-vegetated, be added to the Mt Alexander Regional Park.

L Earth resources

L1 Recommendations for mining sites

That:

- the mining sites shown on Map A (numbered L1) and listed in Appendix 10 be used for mineral extraction in accordance with the general principles and recommendations in Chapter 5;
- they be temporarily reserved under the *Crown Land (Reserves) Act 1978*; and
- when no longer required for mining, each site be assigned to a public land use category appropriate for its future use.

Rec. No.	Name	Location	Area ha
L1	Stawell Gold Mines	Stawell	122
L1	Reef Mining	Tarnagulla	10
L1	Bendigo Mining	Kangaroo Flat and Eaglehawk	70
L1	Fosterville	North of Axedale	136
L1	Nagambie	East of Nagambie	72
Total			410

L2 Recommendations for stone reserves

That:

- the stone reserves shown on Map A (numbered L2) continue to be used for the extraction of stone in accordance with the above principles and guidelines;
- proposed new extraction sites be located and operated in accordance with the above principles and guidelines;
- if not already reserved for this purpose, they be temporarily reserved under the *Crown Land (Reserves) Act 1978*, and managed by the Department of Natural Resources and Environment; and
- when no longer required for extraction, each site be assigned to a public land use category appropriate for its future use.

Notes: 1. Major operations under the *Extractive Industries Development Act 1995* are listed in Appendix 10.
2. Existing stone reserves, except where recommended for another use, will be reviewed before the ECC's Final Report.

Rec. No.	Material	Location	Area Ha
Existing stone reserves			
Note: Some 1 880 ha of stone reserves were recommended in earlier investigations. Approximately 80 ha have been recommended for another use.			
New stone reserves and other extractive industries			
The following extractive industries are operating under work authorities on public land. Those located on small isolated public land parcels are proposed to be L2 stone reserves.			
in E1	Sand/granite	Percydale, north-west of Avoca	29.2
L2	Hornfels	south-east of Charlton	38
in F1	Sand/gravel	south of Maryborough	35
in F3	Sand/gravel	west of Inglewood [0.4 ha on private land]	0.4
in E1	Hornfels	north-west of Maldon	11.6
L2	Sand/gravel [application]	south-west of Eaglehawk	3.6
in C1	Slate	west of Kangaroo Flat	5
L2	Sand/gravel	White Hills, Bendigo	43.9
L2	Sand/gravel [application]	Bendigo	na
in F1	Sand/gravel	Wellsford State Forest west	25
in C7	Granite	Mt Alexander Regional Park	6
in C7	Granite	Mt Alexander Regional Park	3.8
in C2	Slate	east of Castlemaine	2.3
in C2	Sedimentary	south-east of Castlemaine	34.2
in C2	Slate	south-east of Castlemaine	1
in F1	Sedimentary	Wellsford State Forest east	19.9
L2	Sedimentary	north-east of Elmore [98 ha on private land]	22
L2	Sedimentary	south of Pechelba	8

L2	Granite	West of Glenrowan [19 ha on private land]	1
in A1	Hornfels	in Chiltern–Pilot National Park	12
in A1	Granite [application]	in Chiltern–Pilot National Park	na
Total			301.9

M Services and utilities

GENERAL RECOMMENDATIONS FOR SERVICES AND UTILITIES

M1 That:

- (a) existing reserves and easements used for public services and utilities such as transport, electricity and gas, communications, cemeteries, water and sewerage, continue to be used for those purposes;
- (b) new services, or utility sites and easements or lines not be sited in or across reference areas, and wherever possible not be in or across national, state, or regional parks or nature conservation reserves;
- (c) roadsides, unused roads, railway lines, and other service and utility sites be managed to protect remnant vegetation and habitat, as far as practical; and
- (d) should a public land area or building and site used for service or utility purposes no longer be required for its primary designated use, it be assessed for its natural, recreational and cultural heritage values, and capability for other public uses, as outlined under Recommendation N2 later in the report.

Notes: 1. Many of these areas are too small to be shown on Map A.
2. Several of the services and utilities areas have values worthy of protection other than their primary use. Notes on these other values are included in Appendix 10.

Service and Utilities (Notes):

- M1 Maryborough Fire Station—this building was constructed in 1861 and should be protected.
- M1 Stone lined drain, Maryborough—this drain is of historic value and should be retained.
- M1 Maldon Cemetery—this site contains important historical, social, architectural and aesthetic features that should be protected.
- M1 Mitiamo Cemetery—significant grassy vegetation in the eastern half of the cemetery block should be protected by continuing to exclude grazing.
- M1 Magistrates Court and lockup, Eaglehawk—these buildings are of historic significance and should be protected.
- M1 Anne Caudle Centre, Barnard Street, Bendigo—this site is on the Victorian Heritage Register and should be protected.
- M1 Bendigo Cemetery—this site has features of heritage value, including rotundas, a chapel, funerary, gates and fence. It is on the Victorian Heritage Register and should be protected.
- M1 Campbell's Creek Cemetery, Castlemaine—this site contains trees, Chinese burning towers and a caretaker's building of historic significance. These features should be protected.
- M1 Castlemaine Court House and cell block—these buildings have historic values and should be protected.
- M1 Chewton Cemetery and cemetery extension—historic features of this site should be protected.
- M1 Melbourne to Echuca Railway—constructed in the late 1850s, this line which remains in use has numerous fine structures, particularly bridges including the Taradale viaduct, and tunnels near Elphinstone and south of Bendigo, some of which are listed on the Victorian Heritage Register.
- M1 Axedale Cemetery—native vegetation on this site should be protected.
- M1 Tip site, Axedale—this site has historical features that should be protected.
- M1 Rushworth Court House—this building is the only major surviving 19th century building on the former Government Camp site which became the town of Rushworth, and should be protected.

N Uncategorised public land

N1 Recommendations for uncategorised public land

That:

- (a) public land other than that:
 - (i) recommended for specific uses in this report, or
 - (ii) subject to previous approved specific land use recommendations,
 be uncategorised public land;
- (b) existing legal use and tenure continue for the time being; and
- (c) when Crown land assessments are completed, the land be either:
 - (i) if 'public land', assigned to an NRE land manager, or included in a 'land bank' and treated as outlined above, or
 - (ii) if assessed as surplus, disposed of.

Note: 1. While the primary public land manager remains NRE, on-ground management can be delegated to organisations or institutions other than NRE, as committee of management, under licence or other arrangement, subject to review of management effectiveness.
2. Several of the uncategorised public land areas have values worthy of protection. Notes on these values are included in Appendix 10.

N2 That for Crown land subject to existing approved but non-specific land use recommendations as either:

- uncategorised public land
 - services and utilities, or
 - community use areas (buildings in public use)
- and which is apparently surplus to requirements;

an assessment of public land values be undertaken and, following appropriate consultation, these areas be considered for re-categorisation, land exchange or disposal.

Uncategorised land (Notes):

- N1 Parcel opposite Specimen Hill School, Bendigo—native vegetation on this site should be protected.
- N1 Parcel in Anderson Street, Bendigo—historic mine shafts should be protected.
- N1 Windmill Hill Historic Interest Reserve, Bendigo—mine shafts and mullock heaps on this site are of historic interest and should be protected.
- N1 Parcel near corner of Ross and Andrew Streets, Bendigo—native vegetation at this site includes Ausfeld's wattle and should be protected.
- N1 Parcel adjacent to Maldon-Lockwood Road, Mount Alexander—native vegetation at this site is to be protected.
- N1 Parcel to the west of Axedale Cemetery—this parcel has good quality Box-Ironbark vegetation that should be protected.
- N1 Old rail reserve, Tooborac—this corridor has vegetation and railway relics that should be protected.

O Land not required for public purposes

O1 Recommendations

That

- (a) the land not required for public purposes, as listed in Appendix 10, be considered for alienation or for exchange for freehold land; and
- (b) land to be sold, be subject to agreements under Section 69 of the *Conservation, Forests and Lands Act 1987*, where appropriate.

Rec No.	Parish	Parcel	Allotment/Lot	Section/Plan	Size ha
O1	Navarre	P106232	CA 254	No Sec	10.9
O1	Gowar	P132267	CA 44F	Sec B	6.0
O1	Yeungroon	P125747	CA 28A	Sec 5	4
O1	Woosang	P125628	CA 8A	Sec E	4
O1	Maryborough	P104818	Part CA 18	Sec 13	3.5
O1		P104822	CA 18B	Sec 13	
O1	Shelbourne		CA 11A	Sec 2	1.1
O1	Ravenswood	P123560	CA 4D	Sec 29	0.45
O1	Muckleford	P125237	CA 18	Sec 9	5.7
O1	Castlemaine	P121263	CA 1B	Sec 7C	0.25
O1		P121287	CA 1G	Sec 2A	2.4
O1	Fosterville (Tp.)	P128318	CA 6	Sec 12	0.1
O1		P129319	CA 7	Sec 12	0.1
O1	Heathcote	P129679	Part CA 8A	Sec 28	7.2
O1	Liliput	P366305	CA 3A	Sec 12	1.4
O1		P202009	CA 9A	Sec 12	3.1
O1		P202010	CA 9B	Sec 12	1.5
O1		P202011	CA 9C	Sec 12	10.5
O1	Belvoir West		CAs 13, 13, 15	Sec 1	401
O1	Belvoir West		CA 11	Sec 5	204
O1	Belvoir West		CA 9, 11, 12	Sec 8	246
O1	Belvoir West		CA 3, 9A, 10A	Sec 9	279
O1	Belvoir West		Lot 2	LP 133307	73
O1	Wodonga		Lot D	LP 200570	195
Total					1460.2

Note: the small size of many of these parcels prevents them from being visible on Map A.

Appendix 11

Details of the Box-Ironbark Timber Model developed by NRE Forests Service

After developing its proposals for public land use in the Box-Ironbark study area, the ECC requested NRE Forests Service to prepare an assessment of the likely effects of the proposals on the timber industry, as part of the overall social and economic assessment.

Forests Service subsequently prepared the model described below, using data from the Box-Ironbark timber assessment (BITA).

The BITA study area included the southern Pyrenees Forests, which are outside the Box-Ironbark study area. The original analyses were made for the whole BITA study area, on the basis that the data was collected and modelled for this area. An adjustment based on area has been made to the modelled estimate for working circle 3, to exclude the southern Pyrenees.

The BITA study area also included the Fryers Ridge and Upper Loddon Forests, but they (and other small forest areas) were excluded from the timber modelling as they contain only a low level of durable species, or are unproductive. These forests are however within the Box-Ironbark study area, and contribute to the gross state forest area.

The outcome of the application of the model to the Box-Ironbark study area is shown in Table 15.6, which compares the modelled volume of durable species from the current available forest with the volume available after allowing for the ECC's proposals.

In determining land use, the recommendations were developed for a comprehensive, adequate and representative reserve system as required by the terms of reference. In designing the system every effort was made to minimise the impact on present and future activities such as timber harvesting.

The ECC's current view is that the reserve system as proposed provides overall balanced use of the forests. If new information indicates that the volumes are different to those currently predicted, this would not automatically translate to a change in the reserve areas proposed. This matter will be further considered by the ECC before the Final Report is prepared later this year.

The following information, on model structure and assumptions of the model, was provided by NRE Forests Service.

Model structure

An uneven age forest management model (Excel based) was developed for the Box Ironbark forests of Central Victoria. This model has been applied to each of the six working circles identified in the Box-Ironbark Timber Assessment (BITA) project. The model utilises area and tree based data for each working circle, including diameter distributions for total, merchantable and retained stems, diameter growth rates, and product outputs (sawlogs, sleepers, firewood, fencing timber) by diameter class. Data exclude plots in historic areas and include corrections derived from the felling plots.

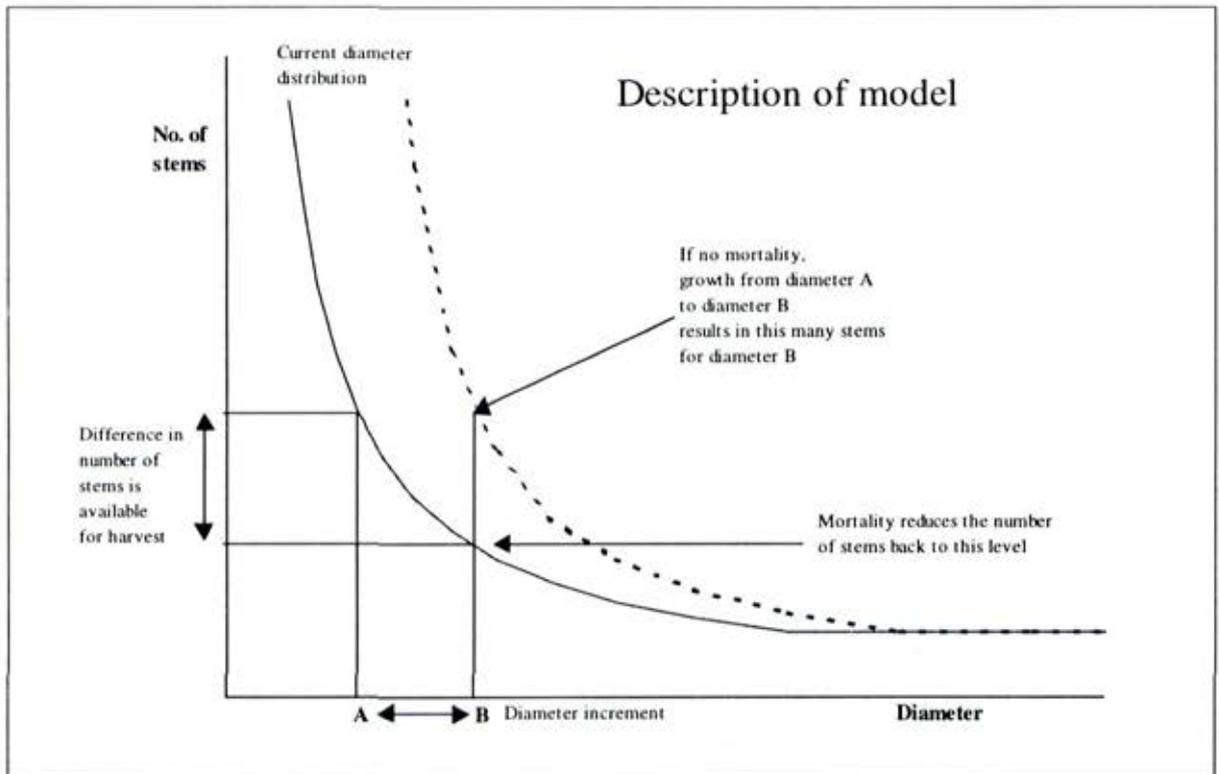
The model has been developed on the assumption that the current diameter class distribution based on total stocking, as determined by the BITA assessment for each working circle, is an indication of site capacity. The structure of an uneven aged forest can be described by a "reverse J" function of number of stems by diameter class. The application of this relationship to uneven aged forests is well documented in the literature [Meyer *et al* (1952), Smith *et al* (1997)].

To incorporate this relationship in the model, an exponential function was developed for the total stocking and retained stems in each working circle. When fitting the function, the stems less than 20 cm were excluded. A comparison of total basal area for actual and predicted diameters (including stems < 20 cm) was used to test the "goodness of fit" of the functions. It was found that the best fit for each of the functions was obtained when some of the larger diameter classes were excluded. This is most likely due to the small number of stems (<1/ha) in these size classes giving disproportionate weight to the curve. Given the small numbers of stems in these size classes, fitting the curves in this way was not considered to be a problem.

Given that the total stocking, as defined by the fitted function, is indicative of the capacity of the site, the model has been developed on the assumption that as trees increase in size, the number of trees that the site can support will diminish, following the “reverse J” curve. It is assumed that stocking will diminish at a constant rate, as result of mortality, with increasing diameter. It is also assumed that the plots measured for the BITA inventory cover the range of stand conditions from the start to the end of a cutting cycle. The diameter distributions used in the model therefore represent the average distribution half way through the cutting cycle, and the average of the range to which the model can be expected to apply. Harvesting within this range can be expected to result in minimal losses due to mortality, as the stocking is within the capacity of the site. Growth rates used in the model can only be expected to apply within this range.

Retaining a stand structure beyond the upper limit of the diameter class range will result in increasing site occupancy, with increasing competition between trees and declining growth rates. In the absence of harvesting, growth rates of individual trees will be influenced by the mortality of neighbouring trees. In dry forest types, this mortality is typically slow relative to other forest types.

In the model, harvesting and mortality are assumed to follow the average curve. In effect, growth and harvesting occurs within the limits represented by this curve. The forecast of timber resource availability is based on maintaining the average diameter distribution. Using this approach, it is possible to calculate the theoretical number of stems available for harvesting, based on tree growth rates and changes in tree numbers between successive diameter classes.



The theoretical stocking for a particular diameter class is the number of trees in that diameter class as determined by the derived stocking function. The theoretically available stems is calculated as the difference between the stems remaining in the

previous period and theoretical stocking for the diameter classes in the current period, less the number of unmerchantable stems remaining after mortality. If more stems are harvested than recommended in any period, the stocking will fall

below the curve, so fewer stems will be available in the following period. The objective of the suggested harvesting regime is to maintain the shape of the curve (which is based on the data from the BITA plots). The model is driven by the shape of the curve (for each working circle), which is assumed to be constant, and is scaled so that the function passes through the actual stocking remaining after mortality and/or harvesting which occurred in the previous period.

This relationship can be summarised as follows:

$$TAS = MSR_{(p-1)} - TS_m$$

where

TAS = Theoretically available stems

$MSR_{(p-1)}$ = Merchantable stems remaining after harvest/mortality in previous period

TS_m = Theoretical stocking (merchantable stems) site can support for current period

and

$$TS_m = TS_t - TS_r$$

where

TS_t = Theoretical stocking (total stems) determined by fitted function

TS_r = Theoretical stocking (retained stems)

The benefits of this approach are:

- site capacity can be described by the total stocking diameter distribution
- the concept of sustainability for uneven aged forest can be expressed in terms of maintaining a stand structure, as defined by the diameter class distribution
- the impact of the number of unmerchantable stems on the availability of merchantable stems can be modelled.

Assumptions of the model

There are a number of assumptions included or implied in the model.

1. Stocking from the BITA plots is the best available information on the current condition of the forest.
2. The per hectare diameter distributions from the BITA assessment plots are assumed to apply equally across the net available area of each respective working circle and diameter increment is assumed to apply equally to all size classes for each working circle. Average values are based on plots within the available area, after additional reserve areas proposed by the ECC have been excluded.
3. The combined merchantable/retained stems stocking is taken as being indicative of site capacity.
4. Predicted stocking is modelled by applying an exponential function to actual total and retained (non-merchantable) stocking for each working circle. Stocking per diameter class is obtained from the BITA data, and is assumed to apply to the mid-point of the 5 cm diameter classes. Stocking figures loaded into the model are assigned to the start of the 5 cm class ie 10cm diameter class contains stems from 10-15 cm. When extracted from BITA these figures appear as 12.5cm diameter (midpoint of the 10-15 cm class).
5. Harvesting at the suggested stocking, based on the fitted functions, will maintain the current structure of the forest as defined by the BITA diameter distributions. In addition, continuation of current practices will continue to produce measured growth rates.
6. The stocking present (in number and distribution by diameter class) at the time of assessment is the basis for modelling. It is assumed that natural mortality will result in the current diameter distribution being maintained. It is assumed that if an area is not treated or harvested in a cutting cycle, the volume that would have been available is lost through mortality, and is not available in the future.

7. A theoretical long-term sustainable yield (based on per annum increment by the net available area) cannot readily be determined as there are no plots with successive measurements which can be used to estimate increment.
8. The model does not allow for ingrowth of small diameter sizes. Stocking <20 cm is obtained from BITA. This only allows for an estimate of the contribution of these stems to sawlog availability at the end of the model. The availability of minor forest products cannot be satisfactorily predicted for the latter part of the model.
9. As the amount of timber harvested is determined by theoretical stocking, balancing of sawlog volume cannot be undertaken in the same manner as can be done for an even aged forest. Harvesting at more than the theoretical rate reduces future availability. Harvesting at less than the theoretical rate results in unharvested stems being lost due to mortality. Timber availability is determined by the stocking and diameter distribution at the time of assessment, and will fluctuate accordingly.
10. Model comparisons are based on predicted rather than actual diameter class distributions due to variability in the actual stocking between successive diameter classes. This is to provide smoother outputs from the model. Use of predicted values from the exponential function also enabled model inputs to be generated up to 150 cm. However, due to the very low number of stems in these size classes, the impact on retained stems was insignificant.
11. The model assumes all areas will be treated at the same intensity. As this is not likely to be reflected in practice, per hectare stocking from the BITA plots are assumed to apply only to medium and high productivity strata.
12. The period lengths for the model are defined so that the increment between successive periods is exactly 5 cm (Period length = 5cm/diameter increment). This is necessary to overcome fluctuations in output volumes which occur due to the boundary between 5 cm classes in the product profile. The period length is approximately 13.2 years for northern working circles and 15.6 years for southern working circles.
13. Sawlog volumes obtained from the BITA plots are gross volumes only. These have been reduced by 20%, comprising 10% for internal defect (obtained from log sales data) and a further 10% allowance for scaling factors and utilisation losses. This is consistent with allowances applied in similar assessments.
14. All models included an upper diameter limit of 60 cm dbh for harvesting as this is the effective limit that results from implementation of existing habitat tree prescriptions, which are applied on a per coupe basis.
15. It was assumed that stems in the smallest (15 cm) diameter class were not harvested, as this distorts the number of stems harvested per year. This has minimal impact on product volume.
16. A 10% contingency allowance has been applied to cater for errors and uncertainties not specifically identified as part of the modelling process.



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