FOREST MANAGEMENT PLAN

FOR THE

MID-MURRAY
FOREST MANAGEMENT AREA

Department of Natural Resources and Environment

April 2002

Published by the Department of Natural Resources and Environment
8 Nicholson Street, East Melbourne, Victoria 3002 Australia
http://www.nre.vic.gov.au

National Library of Australia Cataloguing-in-Publication entry:
Forest management plan for the Mid-Murray Forest Management Area

Bibliography.
ISBN 0 7311 4968 8

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FOREWORD

The Mid-Murray Forest Management Area (FMA) covers approximately 1.86 million hectares (ha) and extends from Rutherglen in the east, almost to Swan Hill in the west and South to Murchison. The woodlands and floodplain forests of the Mid-Murray FMA are centred on the Murray, Goulburn and Ovens Rivers. Within the FMA, public land covers approximately 163 200 ha or less than 9% of the total area. Parks and other conservation reserves comprise more than 30% of this area. The FMA includes a number of major tourist destinations, such as Barmah and Gunbower Forests. Importantly, the forests fulfil the dual roles of conserving the natural and cultural values of the region as well as contributing to its economy.

The State forests of the Mid-Murray FMA, covering some 58 100 ha, contain valuable habitat for a diverse range of flora and fauna while providing the majority of Victoria's red gum timber. These forests are of great importance to local Indigenous communities, who are recognised by NRE as the traditional custodians of the lands and waters in the region.

This Forest Management Plan provides for the balanced use and care of State forest, consistent with the Victorian Government's commitment to ecologically sustainable forest management. This commitment by the Government is to ensure the long-term future of our forests, the timber industry and regional communities, as set out in the policy statement *Our Forests, Our Future*. Most significantly, this Plan addresses one of Victoria's key challenges to promote the sustainability of our environments, communities and industries. This can be achieved by seeking an environment in which forest ecosystems are maintained or enhanced and sensitive environmental and cultural values are protected, while timber production, recreation and other forest uses can continue to benefit Victorian communities.

In developing this Plan, NRE adopted a process of integrated planning drawing on a broad range of expertise and interest from within and outside the Department. Public participation and community partnerships have been fundamental with an Advisory Committee, drawn from key stakeholder groups and the local community, bringing a range of perspectives to the planning process and a community based Submissions Reference Group assisting in the review of submissions to the Proposed Plan. NRE is committed to maintaining ongoing partnerships with the community and greatly appreciates the efforts and dedication of the advisory committee, reference group and the interest and contributions by other groups and individuals.

This Plan provides a comprehensive framework for the sustainable management of State forest within the Mid-Murray FMA. Responsive to the expanding knowledge of the forest ecosystem and changing community expectations, NRE will adapt management practices as new information becomes available. NRE is committed to fostering a culture of openness, partnership and participation with communities to enhance the stewardship of the Mid-Murray forests.

Chloe Munro
Secretary
Department of Natural Resources and Environment

SUMMARY

Much of the public land of the Mid-Murray Forest Management Area (FMA) lies along the Murray River between Rutherglen and Lake Boga and along the lower reaches of the Goulburn and Ovens Rivers. The FMA covers a total area of more than 1.8 million ha, of which only 9% (about 163 200 ha) is public land. State forest covers about 58 100 ha and conservation reserves total some 53 500 ha, together containing the largest consolidated areas of River Red Gum forest in Victoria. State forest complements State parks and other reserves in the FMA in providing for nature conservation, recreation and the tourism industry. In addition, sawn timber and other products from State forest contribute to the regional economy.

This Plan sets long-term directions for ecologically sustainable management of State forest. It takes account of legislative requirements, including the sustainable yield requirements of the *Forests Act 1958* and current sawlog licence commitments to the timber industry, the *Catchment and Land Protection Act 1994*, *Heritage Rivers Act 1992* and the *Flora and Fauna Guarantee Act 1988*.

Management priorities are determined and permitted uses identified for different parts of State forest through a system of Forest Management Zones, differentiated by the values and various uses that will be permitted.

A series of guidelines and actions are described that establish the framework for the future management of State forest. These commit the Department of Natural Resources and Environment (NRE) to undertake specific management actions for State forest that will enhance its environmental, cultural, social and economic values.

The Plan establishes a process for reviewing and refining forest management strategies and zones. This ensures that forest management programs remain responsive to new information, community expectations and other developments in natural resource management, while maintaining forest resources for regional timber industries.

Combined, these strategies provide:

- a system of protected areas and habitat management that complement the State parks and other formal conservation reserves in the FMA;
- a framework for sustainable use of the forest for timber production and other purposes;
- a systematic process for adapting to change.

In doing so, this Plan will fulfil the Victorian Government's approach to sustainable forest management together with the requirements of the *National Forest Policy Statement* (Commonwealth of Australia 1992a).

PRINCIPAL DIRECTIONS

Biodiversity conservation

- The Plan addresses a series of processes that may threaten flora and fauna populations and identifies measures to mitigate such threats.
- Areas identified as Special Protection Zone in State forest will complement formal conservation reserves in protecting examples of the major forest and woodland vegetation communities in the FMA. When mapping of the pre-1750 distribution of each vegetation community is completed for the FMA, the current levels of protection will be reviewed and, where necessary and practicable, amended to be consistent with the National Comprehensive, Adequate and Representative reserve system (JANIS criteria).

- Important components of the floodplain forests, the water bodies and other open wetlands within State forest, are the subject of specific management strategies and are incorporated in Special Protection or Special Management Zones.
- A strategy for conserving rare and threatened plant species is established.
- Conservation guidelines have been developed for the conservation of habitat for key threatened fauna including Superb Parrot, a range of waterbirds, Squirrel Glider, Brush-tailed Phascogale and Carpet Python. Where existing conservation reserves or Regional Management Prescriptions did not meet critical habitat requirements for particular species, additional measures were taken in State forest. These included defining Special Protection or Special Management Zones and developing specific management objectives for them.

Water management

- Guidelines provide for adaptive management of water on the floodplains according to seasonal conditions and for the coordination of water management and forest management programs to maintain or improve the health and regeneration of the forests.
- Key aspects of the *Code of Forest Practices for Timber Production* (Code) are interpreted for application to the unique environments of the floodplain forests. This will establish a sound basis for the application of the Code for the protection of water quality and riparian vegetation.

Forest production

- Timber volumes supplied from the forests of the FMA will accord with sustainable yield principles. The current legislated sustainable yield of sawlogs is 5 600 cubic metres per annum and up to 25 000 railway sleepers per annum are available. Sawlog licence levels will be reduced to 5 200 m^3 per year in line with the outcomes of the License Renewal Process. Sustainable yield forecasts will be reviewed regularly and when new information becomes available.
- Low intensity harvesting using single tree or group selection silvicultural systems will continue.

Forest grazing

- Grazing management strategies will be developed for licensed areas in partnership with licensees. Priorities have been established to review current grazing licenses. Grazing of specific areas may be modified or excluded to conserve important environmental or cultural values.

Forest protection

- In accordance with Catchment Management Strategies priorities have been established for control of pest plants and animals in State forest to complement actions on adjoining public land and the efforts of private landowners to ensure an integrated approach across all land.

Cultural heritage

- The Plan provides for protection of Aboriginal places of significance in State forest in consultation with Aboriginal communities and for Aboriginal participation in forest management.
- Historic places have been identified in State forest and appropriate measures for their conservation and management established**.**

Landscape, recreation and tourism

- A system to minimise the visual impact of timber harvesting on areas seen from the scenic drive network is established.
- Development for recreation in State forest is guided by a zoning scheme, complementing parks and reserves, especially the River Murray Reserve, to provide for a broad range of opportunities in tourism and recreation.

CONTENTS

Appendices

List of Tables and Figures

Chapter 1
BACKGROUND

1.1 SCOPE AND AIM

The Mid-Murray Forest Management Area (FMA) is located in northern Victoria between Rutherglen, Lake Boga and Murchison. Of a total area of almost 1.86 million ha, some 163 210 ha (about 9%) is public (government-owned) land (Table 2.1 in Chapter 2). Formal conservation reserves, such as State parks and flora and fauna reserves, cover 53 550 ha or almost 33% of public land in the FMA, while water bodies (some of which are in conservation reserves) cover 20 880 ha (almost 13% of public land). This Plan applies to State forest which covers 58 120 ha (just over 35% of the extent of public land or 3% of the FMA) and includes the Barmah and Gunbower State Forests and other forests bordering the Murray River and the lower reaches of the Goulburn and Ovens Rivers.

State forest in the FMA has a wide range of values and uses, including the protection of water quality and flood mitigation, conservation of plants and animals, timber production and opportunities for recreation and tourism. The forests also provide honey, forage and other forest products to satisfy community needs.

The *National Forest Policy Statement* (Commonwealth of Australia 1992a), to which Victoria is a signatory, defines sustainable forest management as "the integration of commercial and non-commercial values of forests so that both the material and non-material welfare of society is improved, whilst ensuring that the values of forests, both as a resource for commercial use and for conservation, are not lost or degraded for current and future generations". These values include biological diversity, Aboriginal and other cultural values, landscape, provision of recreation and educational opportunities as well as a range of forest products.

The primary aim of forest management plans is to ensure that State forest is managed in an environmentally sensitive, sustainable and economically viable manner. Forest Management plans also seek to ensure that planning is a continuing process, responsive to changing community expectations and expanding knowledge of the forest ecosystem.

Management vision for the Mid-Murray forests

The Department of Natural Resources and Environment (NRE) aims to manage the forests for the benefit of all Victorians. Its vision for sustainable management has several characteristics.

- Management will aim to ensure that all indigenous species and vegetation communities on public land survive and flourish across their natural range.
- Use of State forest resources will accord with world-best practice. Standards will be maintained and improved by implementation and review of codes of practice, management guidelines, prescriptions, licensing and regulation of commercial activities on public land and by staff training.
- Forest management will be sensitive to the cultural significance of the forests to the community.
- Use of State forest will contribute to the economic development and employment opportunities of the regional community.
- Sustainable use of the forest for recreation and tourism will be encouraged and facilitated.
- Forest management will be flexible and responsive to new information. Where necessary, change will be introduced in a pro-active but orderly fashion in order to maintain confidence and stability of forest-based industries and the local economy.

Forest management strategies

To achieve its primary aim, this Plan establishes broad strategies for integrating the sustainable use of State forest for wood production and other purposes with the conservation of natural, cultural and aesthetic values across the whole FMA. The strategies comprise:

- **forest management zones.** Areas of State forest are allocated to one of the three zones (see Chapter 2) according to priorities in management for the range of forest values and uses, including nature conservation, forest recreation and timber harvesting. Activities permitted in each zone are also specified.
- **guidelines** for forest managers to facilitate protection or careful management of specific values or uses. Development of these guidelines drew on the best information and expert opinion available to NRE. They provide a basis for management decisions and a framework for reviewing those decisions as more information becomes available. Where insufficient is known about a particular value, a precautionary approach has been adopted.
- **actions,** which NRE is committed to implement, and which will further enhance the management of State forest.
- **a review process** to evaluate and adjust the zones, guidelines and actions of the Plan as circumstances require. This will ensure that the Plan remains current in the context of improving knowledge, changing government policies and community attitudes, and developments in natural resource management. Changes may be required if, for instance, new information becomes available on the location or habitat requirements of threatened species.

The Plan is to apply for ten years unless a substantial change of circumstances (such as a major wildfire, significant new information about resources or major land use changes) warrants a review before then. Flexible management strategies will enable progressive refinement of the Plan in response to new information. While the need for flexibility is clear, the conservation of certain forest values and a suitable land base for timber production must remain secure. Section 12.2 outlines the mechanism by which the status of management zones will be reviewed.

More detailed prescriptions are established at the local level and are reflected in Regional Management Prescriptions and Wood Utilisation Plans. Appendix A is adapted from the *Code of Forest Practices for Timber Production* (Code – NRE 1996a) and provides an outline of the relationship between the public land planning processes in the State and of the various levels of control of the environmental aspects of timber production.

1.2 LEGISLATIVE AND POLICY FRAMEWORK

This Plan is a working plan prepared by and to be put into operation by the Secretary of NRE pursuant to Section 22 of the *Forests Act 1958*. It replaces, but considers the principles and actions of, the Barmah State Park and Barmah State Forest Management Plan (DCE 1992) for the management of State forest.

The Plan has been developed to conform with all Victorian land and natural resources legislation including the *Forests Act 1958, National Parks Act 1975, Land Act 1958, Reference Areas Act 1978, Heritage Rivers Act 1992, Flora and Fauna Guarantee Act 1988* and the *Catchment and Land Protection Act 1994*. It provides for protection of Ramsar wetlands and species and communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and is consistent with the *Native Title Act 1993*. The Plan also addresses the requirements of the *National Forest Policy Statement* and fulfils a requirement of the Code.

The land base to which this Plan applies (State forest) and the associated land uses accord with the *Land Conservation Act 1970* (LCC 1985, LCC 1989, LCC 1991). The Plan is also consistent with the recommendations contained in the Environment Conservation Council's[1] (ECC) Final Report to Government on the Box-Ironbark Forests and Woodlands Investigation (ECC 2001).

Other relevant legislation, policies and plans are referred to in the text.

1.3 ECC BOX-IRONBARK STUDY

In December 1997 the State Government requested the ECC to identify and evaluate the extent, condition, values and uses of the box-ironbark forests and woodlands in northern Victoria and to make recommendations on the balanced use of these areas. The ECC's final recommendations (ECC 2001), tabled in the Victorian Parliament in August 2001, incorporate the Killawarra State Forest within a State park. In November 2001 the Victorian Government accepted in principle the ECC land tenure recommendations. In keeping with the recommendations, this Plan identifies the Killawarra Forest as part of the formal conservation reserve system with commercial timber harvesting to be phased out. NRE's future management of the Box-Ironbark forests and woodlands will accord with the ECC recommendations as accepted by the Victorian Government.

1.4 PLANNING PROCESS

Work commenced on this Plan in 1988 with publication of a brochure – *The Mid-Murray Forests: Planning Their Future* – inviting people to become involved. Responses were received from a number of organisations that represented a wide range of interests. After several public meetings a FMA Advisory Committee was established in 1990 (membership is listed in the Acknowledgments). The Committee met a number of times to discuss major issues, and played an important role in ensuring that the interests and opinions of a cross-section of the community were considered.

A Statement of Resources, Uses and Values (Cuddy *et al.*), published in 1993, provided background information which has been used to devise the management strategies in this Plan. Discussion papers on timber production, flora and fauna, grazing and apiculture, and recreation and tourism, provided opportunity for debate and also assisted with the development of this Plan.

Subsequent finalisation of this Plan was delayed for some time until the release of the Proposed Forest Management Plan (NRE 2001a) for public comment in January 2001.

Twenty written submissions were received during the submission period following publication of the Proposed Plan (submittors are listed in Appendix B). A series of public meetings were called to encourage public interest and comment and detailed discussions were held with interested individuals and groups (a list of these meetings is also included in Appendix B). A summary of the submissions is provided in Appendix C. Following the release of the Proposed Plan, a community based group was established to assist in the review of the submissions (its membership is listed in the Acknowledgments). A summary of the Submissions Reference Group's suggested response to the submissions received and how these are addressed in the Plan is available separately.

1.5 FINAL PLAN

The following summarises the main aspects in which the Final Plan differs from the Proposed Plan. These differences result from the government decision to exclude timber harvesting from the Barmah State Park, the ECC Box-Ironbark Forests and Woodlands Investigation Final Report, public submissions, consultation and new information.

[1] The Environment Conservation Council (ECC) replaced the Land Conservation Council in 1997.

Zoning

The zoning displayed on Map 1 and areas set out in Table 2.1 reflect the following changes:

- Killawarra State Forest (principally SMZ in the Proposed Plan) and a smaller area at Wyuna on the Goulburn River (previously SPZ) are now identified as part of the formal reserve system in accordance with the State government's in principle acceptance of land tenure changes recommended by the ECC Final Report (ECC 2001).
- Special protection zones and special management zones have been reviewed to ensure they contain important values. Important wetland areas within the floodplain forests, for example, are now separately identified and included within SMZ and specific primary effluent streams protected as SPZ.
- The 30 m gazetted Public Land Water Frontage Reserves along either side of major watercourses are recorded as special protection zones where they pass through State forest.

Biodiversity Conservation

- Analyses of the extent of vegetation types are based on the most recent spatial information covering the whole FMA with vegetation descriptions derived from consistent surveys. In particular, this has brought about changes to the relative areas of Black Box Woodland and Northern Plains Grassy Woodland vegetation types. The area of Box-Ironbark Forest in the reserve system has increased as a result of the ECC recommendations.
- The extent of each main vegetation type and its representation in the reserve system is presented according to its occurrence within bioregional provinces as identified through the Biogeographic Regionalisation of Australia.
- A new section has been included to provide guidelines for the conservation and management of wetlands in recognition of the importance of water bodies and other natural open areas in the floodplain forests.
- Management actions for some species (such as Powerful Owl, Barking Owl and Carpet Python) have been modified to include new information and to be consistent with other forest management plans and Flora and Fauna Guarantee Action Statements.
- As a result of regarding the Killawarra State Forest as part of the reserve system, threatened faunal species recorded in that area are no longer featured for specific action within this Plan.
- The appendices listing threatened flora and fauna in the FMA have been updated to include recent records and changes to the threat status, and to focus on those occurring in State forest.

Water Management

- The arrangements and the relationships between the various organisations involved in water management in the FMA are included.
- Interpretation of the *Code of Forest Practices for Timber Production* in relation to the unique characteristics of floodplain environments indicates that effluent and confluent streams should be afforded 10 m filter strips, while a buffer of 20 m should be retained between logging operations and the water-line or saturated zone wherever it may occur at the time of harvesting.

Hardwood Production

- Sawlog production from the Barmah State Park will cease on expiration of the current agreement in 2003. This is reflected in a reduction in the area available for timber production.
- A review of sawlog resources conducted as part of the License Renewal Process indicates that the estimated sawlog licence level is in the order of 5 200 m^3 per year.

Historic Places

- Historic sites in State forest have been identified and, where appropriate, incorporated in the zoning scheme to ensure that they are protected and appropriately managed.

Chapter 2
FOREST MANAGEMENT ZONES

This Plan aims to ensure that management of State forest accords with the *National Forest Policy Statement*. A principal strategy to achieve this aim was to divide State forest into three management zones.

2.1 SPECIAL PROTECTION ZONE (SPZ)

Land in the SPZ will be managed for conservation. Disturbances or processes which threaten the respective natural or cultural values of each component of this zone will be minimised and timber harvesting will be excluded. SPZ complements formal reserves and contributes to the development of a Comprehensive, Adequate and Representative reserve system for the forests of Australia.

Each component of the SPZ was generated by applying the management guidelines and actions set out in the following chapters. The larger components incorporate:

- the habitats of threatened and disturbance-sensitive fauna and threatened plant species and communities;
- representative examples of vegetation types;
- linear reserves, such as along the Goulburn River and along primary effluent streams in the floodplains.

2.2 SPECIAL MANAGEMENT ZONE (SMZ)

Land in the SMZ will contribute to the ecologically sustainable production of timber and other forest products but under conditions directed towards conserving the values identified in the zone.

The components of the SMZ include a range of natural or cultural values, the protection or enhancement of which require modification to timber harvesting or other land use practices rather than their exclusion. The zone contributes to the conservation of important species, particularly fauna. It includes:

- key wildlife habitat;
- areas of high landscape values along popular visitor routes;
- historic sites, research sites and small occurrences of threatened plants or communities.

Management of each component of the SMZ will be considered on a case-by-case basis within the constraints outlined in this Plan. Guidelines, and in some cases, operational plans for the SMZ will be developed at a local level. Such plans could specify seasonal restrictions on some activities, the intensity and timing of grazing or the required outcomes of management in terms of stand structure and density (eg the level of tree retention.

2.3 GENERAL MANAGEMENT ZONE (GMZ)

Forest in the GMZ will be managed for the ecologically sustainable production of timber and other forest products in accordance with the Code and more detailed Regional Management Prescriptions.

Although timber production is a major use of this zone, it complements the other zones and parks and reserves in protection of cultural values and landscape, provision of recreation and educational opportunities and the conservation of natural values.

Integrated public land management

The forest management zones, combined with parks and other formal reserves, provide an integrated conservation system and a framework for sustainable forest use. Table 2.1 shows the extent of State forest management zones

and other land categories in the FMA. Map 1 illustrates the zoning scheme across the FMA, while Map 2 indicates how it operates at a more detailed level. Appendix D lists the main values protected in each component of the SPZ and SMZ. The maps illustrate the zoning scheme but, because of scale, the actual boundaries will be determined by larger scale maps and field checking. The boundaries of the zones may be changed over time to reflect forest dynamics and new information in accordance with the process outlined in Chapter 12.

Table 2.1 Extent of State forest management zones and other land categories in the Mid-Murray Forest Management Area

Land category	Area (ha)	Percentage of all land	Percentage of public land	Percentage of State forest
STATE FOREST				
Special Protection Zone	**9 980**		6.1	**17.2**
Streamside reserves[1]	**490**		0.3	**0.8**
Special Management Zone	**15 920**		9.8	**27.4**
General Management Zone	**31 730**		19.4	**54.6**
State forest sub-total	**58 120**	**3.1**	**35.6**	**100.0**
OTHER PUBLIC LAND				
Parks and conservation reserves[2]	53 550	2.9	**32.8**	
Other Crown land[3]	30 660	1.7	**18.8**	
Water bodies (includes parks)	20 880	1.1	**12.8**	
All public land sub-total	**163 210**	**8.8**	**100.0**	
Private land	**1 696 180**	**91.2**		
Total area of the FMA	**1 859 390**	**100.0**		

Notes:

1 Incorporates gazetted Public Land Water Frontage Reserves within State forest (equivalent to SPZ).

2 Includes the Barmah State Park and Warby Range State Park (incorporating the Killawarra State Forest) and other reserves such as education areas, the River Murray Reserve and a wildlife management cooperative area. Category accounts for land use changes set out in the final report from the ECC's Box-Ironbark forest and woodlands investigation.

3 Includes agricultural research stations, public land outside State forest, water frontage reserves, water reserves and Commonwealth land.

Table 2.2 indicates the activities permitted in each zone. Soil and water conservation, maintenance of native forest cover and wildfire suppression will be high priorities in all zones. Grazing is a conditional use of State forest, and extends across all zones.

Table 2.2 Activities permitted in management zones

Activity	Chapter	Special Protection Zone	Special Management Zone	General Management Zone
Sawlog and sleeper production	5	No	Conditional	Yes
Firewood, posts, poles	5	No	Conditional	Yes
Regrowth thinning	5	No	Conditional	Yes
Stock grazing	6	Conditional	Conditional	Conditional
Apiculture	6	Conditional	Conditional	Yes
Extractive industries	6	Conditional	Conditional	Yes
Fuel-reduction burning	7	Conditional	Conditional	Conditional
Recreation	9	Conditional	Conditional	Yes
Road construction	10	Conditional	Conditional	Yes

Key:

Yes	permitted under standard conditions
Conditional	permitted with additional conditions specified in this Plan, or to the extent that it does not conflict with the values identified for the zone
No	not permitted

Chapter 3
BIODIVERSITY CONSERVATION

Biodiversity (or biological diversity) refers to the variety and variability within and between living organisms and the ecological processes upon which they depend. The *National Forest Policy Statement* (Commonwealth of Australia 1992a), and the *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992b) refer to the importance of ensuring that forest management maintains the diversity of forest flora and fauna and that areas of special conservation significance are protected. The Code requires that objectives and strategies for the conservation and protection of flora and fauna are defined in Forest Management Plans and Regional Management Prescriptions and sets out the range of conservation matters to be considered. The *Flora and Fauna Guarantee Act 1988* (FFG Act) and Victoria's Biodiversity Strategy (NRE 1997b) further support processes that ensure all taxa of Victoria's flora and fauna can survive, flourish and retain their potential for evolutionary development in the wild.

This Plan and Action Statements prepared under the FFG Act are the primary processes through which the biodiversity conservation strategies will be implemented in the Mid-Murray State forests.

The range of management goals for State parks and other conservation reserves and for the Special Protection Zone (SPZ), Special Management Zone (SMZ) and General Management Zone (GMZ) in State forest all contribute to the protection of biological values on public land throughout the FMA. Maintenance of biodiversity is addressed through protection of specific species and communities and by maintaining a range of successional vegetation stages in State forest. The comprehensive strategies for biodiversity conservation outlined in this Plan have drawn on knowledge obtained from a variety of sources. These include scientific literature, NRE's fauna records database the Atlas of Victorian Wildlife, NRE's flora records database the Flora Information System and advice from NRE wildlife biologists and botanists.

Conservation measures for species listed under the FFG Act are identified in Action Statements. Several species found in State forest in the Mid-Murray FMA are listed under the FFG Act and the conservation guidelines and actions in this Plan are consistent with those Action Statements. The Plan may require review when Action Statements for other species are approved. Chapter 12 (Plan Implementation) outlines a process for considering new information and amending the Plan as necessary.

Aim

Ensure that indigenous plant and animal species and communities survive and flourish throughout the Mid-Murray forest planning area.

Mid-Murray Forest Management Area

Most of the original ecosystems of the broad alluvial plains of northern Victoria have been extensively altered since European settlement. Forests and woodlands originally covered an estimated 1.3 million ha of the Mid-Murray FMA (derived from ECC 1997). In particular, grassland and woodland communities that occur beyond the floodplain where flooding is infrequent have been extensively cleared or modified for agricultural development. It is estimated that about 97% of the original grassy woodlands (ECC 1997), for example, and a greater extent of the Northern Plain Grasslands have been cleared or modified and many of the remaining areas are degraded.

Public land in the Mid-Murray FMA supports more than 90 000 ha of forests and woodlands (Table 3.1). River Red Gum forests make up the majority of this area, occurring on the floodplains of the Murray, Goulburn and Ovens Rivers where, prior to regulation, flooding was frequent and for extended periods. Of the 158 000 ha of River Red Gum forests found on public land in Victoria (NFI 1994), 43% occurs in this FMA. Since settlement, these forests have been extensively grazed and harvested to produce sawn timbers, railway sleepers, fencing timbers and fuelwood. The present condition of the forests is an artefact of this utilisation and associated management. However, review of extant

vegetation in relation to the land systems of the region indicates that the bulk of the original River Red Gum forests (principally the Riverine Grassy Forest vegetation type) remains across the floodplains.

Most of the natural wetlands are also modified to some extent. The Barmah-Millewa Forest (an area of forest straddling the Murray River in the Mid-Murray FMA and New South Wales), covering about 60 000 ha, comprises the most extensive and consolidated occurrence of River Red Gum forest in Australia. Gunbower Forest and the contiguous Pericoota and Koondrook Forests in NSW comprise the next largest.

Formal conservation reserves cover some 53 550 ha or almost 33% of public land in the FMA (Table 2.1). State forest covers a further 35%, while water bodies and other public land categories make up the balance.

The guidelines and actions in this chapter provide the basis for identifying areas of SPZ or SMZ which are to be managed for the conservation of particular values, and recognise that the GMZ also contributes to the conservation of flora and fauna and their diversity. Habitat is retained and protected across all timber production areas, and occupies a significant proportion of State forest. The low-intensity harvesting operations and selective silvicultural systems practised in the FMA ensure that a continuum of forest cover is maintained across all timber productive forests (Section 5.2).

The biodiversity conservation strategies in this Plan aim to:

- ensure that depleted forest ecosystems not otherwise protected in formal conservation reserves are included in the State forest SPZ;
- specify measures to conserve threatened flora and fauna in order to maintain species and genetic diversity;
- control processes that may threaten biodiversity.

3.1 NATIONAL RESERVE CRITERIA

The Mid-Murray FMA is not subject to a Regional Forest Agreement (RFA). However, NRE is committed to applying the National Reserve Criteria (JANIS 1997) to the management of non-RFA areas.

In those regions of Australia subject to a RFA, the National Forest Policy Statement (Commonwealth of Australia 1992a) requires the establishment of a Comprehensive, Adequate and Representative (CAR) reserve system as a prerequisite to signing of the RFA. 'Comprehensive', means that the reserve system should: include the full range of forest communities; 'adequate', allow the maintenance of ecological viability and integrity of populations, species and communities; and 'representative', reasonably reflect the biotic diversity of the communities. Accordingly, the Commonwealth and states jointly developed the National Reserve Criteria (JANIS 1997) – called the 'JANIS criteria' – to guide the establishment of a CAR reserve system for protection of biodiversity, old growth and wilderness values (Appendix E).

In protection of biodiversity values, the JANIS criteria set as a general criterion 15% of the pre-1750 (being prior to European settlement of Australia) extent of each forest ecosystem should be protected in the CAR reserve system. The minimum proportion of each forest ecosystem to be reserved is based on the classification status assigned to each, for example, rare and endangered, and vulnerable. The classification considers how much of each forest ecosystem remains relative to its initial extent, size and geographic distribution and its vulnerability to threatening processes (see Appendix E).

The JANIS criteria also provide for flexibility in the application of numerical targets where there may be significant economic or social consequences associated with fully meeting targets.

The JANIS criteria identify three public land components of the CAR reserve system:

- **dedicated reserves**; reserves established by legislation for conservation purposes and for which a Parliamentary decision is required to revoke their status;
- **informal reserves**; areas reserved under other secure tenure or management arrangements where it is not possible or practicable to include the conservation values in dedicated reserves (in Victoria, these principally comprise Special Protection Zones in State forest);
- **protection by prescription**; where the nature of the values makes their protection in specific reserves impracticable.

Evaluation against the JANIS criteria of the reserve system in the Mid-Murray FMA is not yet possible as classification and mapping the pre-1750 extent of the floodplain vegetation types in the FMA is scheduled to be completed by 2003.

3.2 ECOSYSTEM DIVERSITY

Classification of ecosystems

An ecosystem comprises a community of living organisms together with their physical environment. Identification of the variety of natural ecosystems, which occur across the FMA, provides a basis for developing strategies for biodiversity conservation. At the forest level, ecosystems can be usefully represented by vegetation types (ecological vegetation classes – EVC).

NRE has commenced classifying and mapping the EVCs of the floodplain forests according to Statewide standards and a complete description of the range of EVCs for the entire FMA will be available by 2003. To enable an interim evaluation of the representation of vegetation types in the FMA, the vegetation types described in this Plan (Appendix F and Table 3.1) are based on the structural vegetation classification used by the LCC in its reports for the Murray Valley Area (LCC 1983) and Mallee Area Review (LCC 1987). The analyses of the extent of vegetation types are based on NRE's Structural Vegetation electronic data set – SVEG100 (1995). The descriptions of some of the vegetation types have been re-defined to reflect current terminology. Future mapping of EVCs on a bioregional basis may refine the boundaries and descriptions of these vegetation types.

Several recent studies have described EVCs for parts of the FMA, for example the ECC study of Box-Ironbark forests and woodlands (ECC 1997) and vegetation mapping completed by the respective Catchment Management Authorities (CMA). Although these studies have not addressed the entire FMA or the full extent of the River Red Gum forests, they are a valuable adjunct to the LCC vegetation mapping used in this Plan and to the EVC mapping currently underway.

Conservation of ecosystems

This Plan addresses ecologically important areas of State forest by:

- identifying SPZ and SMZ for particularly important areas;
- establishing strategies to maintain or improve structural diversity across all productive forests;
- establishing management actions to address potentially threatening processes;
- modifying grazing strategies to protect areas of high conservation value.

Vegetation types requiring some form of protection in the FMA may be considered in three categories:

- Declining vegetation types include ecosystems known to be undergoing significant decline in range or condition due to the effects of current or historical land uses. For instance, box woodlands of the broad alluvial plains have been reduced to about 15% of their original extent in Victoria as a result of clearing for agriculture. They are characterised principally by Black Box, Grey Box and Yellow Box. Gunbower State Forest contains the largest contiguous area of box species in the FMA.
- Rare or uncommon vegetation types are those that occur within a restricted range in the FMA or are thinly scattered over a more extensive range. For example, Granitic Hills Woodland dominated by Blakely's Red Gum is rare in the FMA, being confined to the lower slopes of the Warby Range State Park.
- Representative vegetation types. Conservation of examples of each ecosystem at the FMA level makes an important contribution to maintaining biodiversity across the State.

Ecosystem conservation in the Mid-Murray FMA is considered at both a regional scale and within biogeographic provinces. Each province is differentiated by its underlying environmental features and reflects the repeating patterns of ecological characteristics in the landscape. In the Mid-Murray FMA, six biogeographic provinces (Figure 3.1) have been identified. The bulk of public land in the FMA is contained in the 'Murray Fans' and 'Victorian Riverina' biogeographic provinces.

This Plan seeks to ensure representation in the reserve system of those vegetation types within each biogeographic province. For each forest and woodland vegetation type on public land in the FMA, Table 3.1 indicates the area and proportion contained within the reserve system (formal conservation reserves and the SPZ), while Appendix G indicates the extent of each forest and woodland vegetation type within each forest management zone and other land tenures within each biogeographic province in the FMA.

Table 3.1 Representation on public land of forest and woodland vegetation types in conservation reserves and SPZ in the Mid-Murray FMA[1]

Vegetation type[2]	Area on public land (ha)	Representation				
		Conservation reserves (ha)	State forest SPZ[4] (ha)	Total in reserve system (%)	State forest SMZ	State forest GMZ
White Box Woodland	135	135	na	100	na	na
Cypress Pine and Buloke Woodland	2 150	2 100	na	98	na	na
Granitic Hills Woodland	2 490	2 490	na	100	na	na
Box–Ironbark Forest	3 080	3 080	na	100	na	na
Heathy and Grassy Dry Forest	4 000	4 000	na	100	na	na
Northern Plains Grassy Woodland	4 275	1 115	1 775	68	480	225
Black Box Woodland	10 175	4 220	3 255	73	5	300
Riverine Grassy Forest	65 675	15 720	3 640	29	12 435	28 730
Non-forest or unclassified vegetation[3]	71 240	(20 700)	(1 800)			
Water bodies	20 885					

Source: vegetation base data – SVEG100 (1995).

Notes:

'na' indicates that little or none of the vegetation type occurs on State forest.

Numbers are rounded to the nearest 5 ha.

[1] Appendix G indicates representation of the vegetation types in the reserve system according to biogeographic provinces in the FMA.

[2] Appendix F indicates nomenclature for the classification of vegetation types.

[3] This comprises natural grasslands, Muehlenbeckia swamps, cleared areas and areas for which the vegetation is not yet classified.

[4] This includes public land stream frontages that fall within State forest.

The most extensive vegetation type on public land in the FMA is Riverine Grassy Forest, comprising mainly River Red Gum stands. On regularly flooded sites, River Red Gum occurs as the only species in the overstorey. The understorey is dominated by grasses, sedges and rushes that have the ability to withstand inundation, possibly for several months (Chesterfield 1986). As flooding becomes less frequent, other woody plant species become evident in the understorey. Table 3.1 indicates that 29% of Riverine Grassy Forest occurring on public land is protected within conservation reserves and SPZ across the FMA.

Each of the woodland communities occurring in the FMA is of high conservation value. White Cypress Pine is a threatened species in Victoria. Remnant stands of this and Buloke occasionally occur amongst box forests and woodlands. The major extent of these species in the FMA is in the Terrick Terrick National Park. Commercial timber harvesting is excluded from all occurrences of Buloke Woodland (*Casuarina luehmannii*), White Cypress Pine (*Callitris glaucophylla*), Black Box Woodland and Northern Plains Grassy Woodland within State forest.

Black Box Woodland across the FMA has been largely cleared for agriculture. Table 3.1 indicates that conservation and informal reserves contain 73% of its area on public land. In addition, areas contained within SMZ and isolated black box ridges too small to display on the map are also protected. The remainder is located on scattered small parcels of other public land.

Northern Plains Grassy Woodland occurs in many small stands in the FMA and consists predominantly of Grey Box and Yellow Box. The more extensive examples of these woodlands in Gunbower and Barmah State Forests and along the Goulburn River are included in the SPZ. While 68% of this vegetation community is within the reserve system (Table 3.1), the exclusion of harvesting from all occurrences of this vegetation community in State forest means that effectively 84% of its area on public land in the FMA is protected.

Many areas of Northern Plains Grassy Woodland and Black Box Woodland are subject to grazing. Current grazing practices in these woodlands will be reviewed in the light of their conservation values. This review will be conducted in consultation with the respective licensees. Grazing may need to be modified or excluded in some cases. Specific measures concerning grazing are set out in Section 6.1.

Moira Grass (*Pseudoraphis spinescens*) plains have been considerably depleted as a result of river regulation. In Barmah Forest they now occupy some 38% of their former extent (Chesterfield 1986). Measures aimed at redressing this and other water related issues are set out in Section 4.2 – Environmental Water Management.

Conservation Guideline

Representative conservation of vegetation types

Where new information indicates that areas of State forest are required to provide for a CAR reserve system, vegetation types should, wherever possible, be selected from areas:

- known to contain, or to have once contained, threatened flora or fauna;
- identified as being good representative examples of the community;
- that support the requirements of other conservation strategies in this Plan;
- that help to establish an inter-linked protected area network across the FMA;
- that are the least suitable for timber production.

ACTIONS

Within 12 months of completion of the mapping of pre-1750 and extant Ecological Vegetation Classes (EVC) in the FMA, review EVC representation according to the JANIS criteria.

Exclude White Cypress Pine, Buloke, Grey Box, Yellow Box and Black Box vegetation communities from commercial timber harvesting in the Mid-Murray FMA and review Regional Management Prescriptions to reflect this.

3.3 STRUCTURAL DIVERSITY

Structural diversity is a major contributor to the biodiversity of a forest. The structural diversity of a forest can be considered in terms of growth stages and habitat components. The development of a forest stand through the growth stages of seedling, regrowth, mature and senescing is reflected by:

- changes in the structure and relative numbers of the different tree, shrub and ground layers;
- increasing size of the trees and their branches, and the eventual decline of their crowns;
- increasing occurrences of relatively large, dead standing trees and fallen trees, which often contain hollows;
- the presence of gaps in the vegetation cover created by small-scale disturbances and death of individual trees, which, in turn, enable the establishment of regeneration.

These patterns of growth are repeated across a forest and, under natural conditions, produce a forest structure comprising a large number of seedlings that established in gaps and, as a result of competition, diminishing numbers of progressively larger stem sizes.

As a stand in a forest progresses through growth stages, a structurally diverse range of habitat and a variety of available food resources is exhibited over time. This, as well as trees of both seedling and coppice origin and stumps of a range of size and condition in managed forests, all contribute to the maintenance of biodiversity. However, older trees generally produce a taller, more open and structurally more complex forest and have more numerous and larger hollows than forests of younger trees. Structurally varied forests also provide diversity at the landscape scale.

Large areas of riverine forest comprise regrowth dating from the late 19th Century and their structure reflects subsequent forest use and management practices. Although an analysis of stand structure in Barmah shows the number of trees and their average size has increased (Appendix H), in many areas of public land the proportion of the forest comprising large old trees would still be lower than it was before settlement. A major goal for forest management is therefore to ensure there are sufficient large old trees across the forest. This goal must be achieved within the constraints of sound silvicultural principles.

Structural diversity will be fostered in the forests of the Mid-Murray FMA by strategies which:

- allow stands in formal reserves and the SPZ to develop naturally;
- employ group-selection harvesting to promote regeneration in the GMZ and SMZ;
- promote the early development of large, open-grown trees where appropriate in the SMZ (by thinning dense regrowth stands);
- protect hollow-bearing trees (see section 3.4);
- provide for the recruitment of trees into the larger size classes.

Old-growth forest

Due to the history of disturbance, the forests of the Mid-Murray FMA are unlikely to contain any substantial areas of 'old-growth forest'. However, they do contain large old trees, most of which are scattered throughout the forests, but some also occur in clumps.

Information from the Statewide Forest Resource Inventory (see Appendix I) may, when completed, identify clusters of large old trees and provide the basis for identifying appropriate zoning. As discussed below, management objectives for State forest provide for the retention and ongoing development of old trees across all forest and woodland communities.

ACTIONS

Ensure the maintenance of a range of successional vegetation stages in State forest.

On completion of the Statewide Forest Resource Inventory, ensure adequate representation of biologically intact sites supporting clusters of large old trees.

3.4 MANAGEMENT OF PROCESSES AFFECTING THE STRUCTURE AND DISTRIBUTION OF ECOSYSTEMS

Many processes occurring in forests, both natural and human-induced, may have the potential to affect the distribution and structure of ecosystems and flora and fauna species. Several processes relevant to the forests of the Mid-Murray FMA that may potentially threaten these values are listed under Schedule 3 of the FFG Act.

Management of potentially threatening processes plays a key role in maintaining biodiversity. This section outlines the management actions of the Plan that address the main processes which may threaten ecosystems or flora and fauna populations within the forests of the FMA.

Water management

(*Alteration to the natural flow regimes of rivers and streams* is listed under the FFG Act as a threatening process.)

The extent and health of vegetation communities growing on the floodplain is largely determined by the flood regime. One of the major threats to these communities is the changed flooding regime resulting from regulation of the rivers for flood control and irrigation. Although dam construction was completed many decades ago, changes to floodplain communities are still occurring and, in some cases, may not become obvious for many decades yet.

Minor differences in elevation on the floodplain determine the species composition and relative productivity of a site. Rushlands and grasslands, for instance, exist where the flood regime is more frequent and lasts for longer periods than that suitable for the survival of River Red Gum (Appendix J).

High flows for irrigation purposes during summer and autumn in the Murray River result in prolonged inundation of parts of the floodplain at a time when, under natural conditions, it should be dry or drying out. Such unseasonable flooding often damages floodplain vegetation and can lead to significant changes to local ecological processes, for example fish and bird breeding triggers. River Red Gum trees at Boals Deadwoods in the Barmah State Forest died as a result of excess watering.

Reduced frequency and duration of flooding (along with the introduction of grazing by large animals and a reduction in the frequency of fire) in other areas have favoured the establishment of River Red Gum in previously treeless Moira Grass plains, while forests on higher areas no longer receive sufficient water to ensure successful regeneration and suffer reduced growth rates. Consequently, River Red Gum at the 'upper' margins of the floodplain is being replaced by box eucalypt species. Moisture stress is also likely to render stands more susceptible to insect and pathogen attack and cause dieback in tree crowns.

The extent and duration of flooding strongly influence waterbird breeding and the breeding of fish is influenced by both the extent and timing of flooding. Aquatic vegetation, fish and waterbirds have declined in the floodplains as a result of river regulation. Altered flood regimes also indirectly affect most other wildlife species of the floodplains through the changes they cause in vegetation communities and food resources.

Several projects, funded by the Victorian Government and the Murray-Darling Basin Commission, are examining the broad-scale flooding requirements of these wetlands and ways of achieving the necessary water allocations. These issues and ameliorative actions are discussed in Chapter 4.

Conservation of large old trees

(*Loss of hollow-bearing trees in Victorian native forests* is listed under the FFG Act as a threatening process. An Action Statement is in preparation.)

Although trees of all growth stages may be utilised by wildlife, live, hollow-bearing eucalypts are especially important as nesting and roosting sites for birds and arboreal mammals. In the forests of the Mid-Murray FMA, Squirrel Gliders, for example, are hollow-dependent, as are most of the parrot and bat species. Compared with small trees, large trees produce more reliable and abundant nectar and provide a greater variety of foraging and roosting sites, such as dead branches, peeling bark and fallen timber. For species such as the larger possums and owls, only large trees have hollows of sufficient size. Dead trees, whether standing (stags) or fallen, and tree stumps are also valuable habitat, providing hollows, denning and basking sites and foraging substrates for a range of animal species.

Hollows tend to occur in mature, senescent and dead trees. A survey by Bennett *et al.* (1994) found that the formation of hollows in eucalypts in the woodlands on the northern plains of Victoria varies between species and the size of the trees. Some 68% of the hollows counted in the box-eucalypt trees were found in trees greater than 70 cm diameter. The faster growing River Red Gums carried similar numbers of hollows when the trees reached at least 100 cm diameter.

Timber harvesting and forest management operations, fire and roadworks have the potential to remove or excessively damage older trees. It is important to maintain sufficient younger trees to replace the losses and ensure continuing supply. In some instances, limited damage to the remaining trees may promote hollow development.

Guidelines for the protection of flora and fauna values, set out in the Code, seek the retention of habitat trees and old-age understorey elements in appropriate numbers and configurations, and the recruitment of potentially hollow-bearing trees within or around coupes. Trees in locations most easily protected from damage during harvesting and subsequent management are preferred.

Public land in the Mid-Murray FMA supports large hollow-bearing trees at varying densities. The extent of hollow-bearing trees across the FMA has likely changed since European settlement of Australia, although comprehensive information is currently unavailable. The Statewide Forest Resource Inventory (see Appendix I) should provide information on hollow-bearing trees. As an outcome of this Plan, nearly all woodlands and about 30% of all River Red Gum forests on public land in the FMA will be excluded from timber harvesting. In addition to these areas, management objectives for the FMA seek to retain specified numbers of trees in a range of size/age classes to recruit into the larger size classes to ensure the ongoing availability of suitable hollow-bearing trees throughout timber productive forest. Regional Management Prescriptions set out the requirements for tree retention. Management of the SMZ may also be directed at retaining a greater proportion of large old trees than in the GMZ. Care must be exercised that the number of large trees retained in timber productive forest does not detrimentally affect regeneration and development of young trees. The implications for silviculture and wood production are discussed further in Chapter 5.

Habitat retention has been the subject of a Statewide review by an NRE multi-disciplinary working group. The working group has recommended a series of objectives and principles for the retention of wildlife habitat within the GMZ of Victoria's State forests. These recommendations consider habitat requirements at the landscape scale and establish processes for the development of habitat retention prescriptions that take into account harvesting methods, the requirements of key sensitive species and the extent of harvesting within forest landscapes. The Statewide habitat retention recommendations will guide the development of management prescriptions appropriate to timber production areas in the Mid-Murray forests and will assist in achieving a balance between the protection of hollow-bearing trees and other important habitat elements and timber productivity.

In accordance with the Statewide habitat retention recommendations, the development of prescriptions for retention of habitat in State forest will consider:

- requirements of hollow-using wildlife populations and their sensitivity to the loss of hollow bearing trees;
- the need to protect sufficient large hollow-bearing trees and of the required tree species;
- the required density and location of hollow-bearing trees or habitat patches in the landscape with regard to the extent and location of forest within dedicated reserves, SPZ and SMZ;
- the presence of patches of large old trees (Section 3.3) and the location and distribution of existing habitat trees within logging areas;
- the need for recruitment of habitat trees of varying age, species and form characteristics and the appropriate silvicultural practices to achieve this;
- retention of dead standing trees;
- protection of understorey species.

ACTIONS

Develop and implement revised habitat retention guidelines and prescriptions for the Mid-Murray forests, consistent with the Statewide habitat retention recommendations, within 12 months of the release of this Plan.

Monitor harvested areas to assess the implementation of the habitat retention guidelines and associated prescriptions through the Code of Forest Practices for Timber Production audit procedures.

Train supervising forest staff in the application of the guidelines for habitat retention.

Management of woody debris

Old standing trees with hollows and dead wood on the ground are important sources of food and habitat for many species of birds, mammals, reptiles and invertebrates and are essential for maintaining forest and woodland nutrient cycles. Many invertebrates and fungi depend on dead wood and make the wood's nutrients available for higher plants. Dead wood is at least as important as the living overstorey, leaf litter and soil components for conserving biodiversity and maintaining ecological processes (ANZECC 2001). Research projects in the Barmah and Gunbower Forests are investigating the relationships between fauna and forest floor woody debris (Appendix R).

The indiscriminate collection of firewood impacts on ground-dwelling fauna. The loss of woodland birds in south-eastern Australia is linked to the diminishment of habitat through firewood collection. In the Mid-Murray FMA, Brush-tailed Phascogale, Grey-crowned Babbler and Carpet Python (discussed in Section 3.6) depend on the shelter offered by woody material on the forest floor. The impacts of firewood collection are of particular concern in the vicinity of popular camping sites in the FMA. Management of firewood collection is discussed in Chapter 5 (Hardwood Production) and Chapter 9 (Recreation).

Trees and other woody debris that fall or wash into rivers, streams and other depressions on the floodplain provide important habitat for aquatic fauna. Removal of this material from wetlands that hold water for considerable periods could threaten the survival of a range of freshwater fish, particularly the threatened Trout Cod and Murray Cod. *Removal of wood debris from Victorian streams* is listed under the FFG Act as a threatening process. A balance is required in the management of woody material in streams as, although in-stream habitat may increase when woody material moves into them during floods, excessive accumulations may obstruct the flow of water and affect wetlands. Water management strategies which include consideration of in-stream habitat values and the effects on water movement of debris and other obstructions in watercourses are discussed in Chapter 4.

Maintenance of contiguous forest

(*Habitat fragmentation as a threatening process for fauna in Victoria* is listed under the FFG Act.)

The Warby Range State Park (including the Killawarra Forest) in the east of the FMA and the Appin and Benjeroop State Forests in the west support large areas of woodlands. In contrast, the Gunbower-Pericoota-Koondrook Forests and the Barmah-Millewa Forests, straddling the Murray River, support extensive areas of River Red Gum forest and associated woodlands. These areas make up the bulk of the public land in the FMA, which comprises less than 9% of its total area. The legacy of widespread clearing for agriculture across the plains of the FMA is a highly fragmented landscape where the woodlands have been extensively depleted.

Impacts of habitat fragmentation on wildlife may include reduction in species richness, changes to the composition of faunal assemblages and changes to ecological processes within the fragments (Bennett 1990). The *Victorian temperate-woodland bird community* (nominated for listing as a threatened community under the FFG Act) is an assemblage of bird species totally or largely restricted to the woodland habitat. Extensively cleared for agriculture, the remnant woodlands are subject to the ongoing impacts of habitat loss, fragmentation and degradation. Each of the woodland vegetation types described in Table 3.1 are excluded from timber harvesting in State forest.

Management of State forest precludes extensive and permanent clearing of the land. Further, the relatively low intensity silvicultural operations and retention of habitat trees in the Mid-Murray FMA will ensure that State forest available for timber production will not be fragmented by harvesting operations. This ensures a continuum of habitat resources across the GMZ and SMZ with adjacent SPZ, conservation reserves, and other areas unavailable or unsuitable for sawlog production.

Management of the use of lead shot in hunting

The *Use of lead shot in catridges for the hunting of waterfowl* is listed as a threatening process under the FFG Act and an Action Statement has been prepared. Spent lead, which results from discharging lead shot from a firearm, can accumulate in the sediment of wetlands and waterways. Waterfowl, especially deep-diving ducks, which feed in or on the edges of wetlands are particularly vulnerable to injesting the deposits and suffering from lead poisoning. The use of lead shot for duck hunting was phased out over 2000–2002 and it is now prohibited across all land tenures across Victoria.

Management of other potentially threatening processes

Table 3.2 lists other potentially threatening processes listed under the FFG Act that are relevant in the FMA and the management action taken to address these processes. Each of these will also be subject to an Action Statement or management plan prepared under the Act.

Table 3.2 Management actions for potentially threatening processes listed under the FFG Act

Process listed under the FFG Act	Management action
Degradation of native riparian vegetation along Victorian rivers and streams	Addressed by the Code requirement for the protection of water bodies and streams, SPZ and by existing frontage reserves.
Increase in sediment input into Victorian rivers and streams due to human activities	Excessive sedimentation interferes with many aquatic ecosystem processes. Addressed in Chapter 4 – Water Management.
Input of toxic substances into Victorian rivers and streams	Addressed by the Code requirements for safe handling of fuel and lubricants which restricts the location and conduct of refuelling operations.
Invasion of native vegetation by environmental weeds	Addressed in Chapter 7 – Forest Protection.
Predation of native wildlife by the Introduced Red Fox Vulpes vulpes	Addressed in Chapter 7 – Forest Protection.
Predation of native wildlife by the cat Felis catus	Addressed in Chapter 7 – Forest Protection.
Prevention of passage of aquatic biota as a result of the presence of instream structures	Addressed in Chapter 4 – Water Management and by the Code requirements for road construction.

A range of other factors have the potential to affect the integrity of ecosystems in the FMA, these include:

Grazing

Some plant species are reduced or eliminated by excessive grazing pressure; others increase or invade. Grazing can also significantly affect some fauna. The potential environmental impacts of grazing and strategies to protect habitat values in areas subject to stock grazing are discussed in Section 6.1.

Fire

Fire regimes strongly influence the structure and composition of many vegetation communities. Fire can stimulate the regeneration of some plant species and, in turn, influence the faunal assemblage of a forest. For example, fire can promote extensive regeneration of Silver Wattle, which is a food source for Squirrel Gliders.

In other cases, repeated burning can deplete shrub layers and ground habitat, such as litter and logs. This can affect wildlife species such as Grey-crowned Babbler, which are dependent on fire-sensitive understorey plants for protection and food and use the litter for shelter and protection.

Unlike other eucalypt communities, fire does not appear to be an essential part of the forest life cycle in the River Red Gum and Black Box communities, its place being taken by flooding. River Red Gum is more susceptible to fire damage than most other eucalypts, including Black Box, and fires of only moderate intensity may kill trees. Low-intensity fire is an important forest management tool and may be used to produce an ash bed to promote germination and rapid early growth of River Red Gum seedlings. Fire management is discussed in Chapter 7 – Forest Protection.

Drainage Water

Drainage water from adjacent freehold land is often disposed of in or through the floodplain forests. In the past, previous water disposal schemes damaged several hundred hectares of River Red Gum in the Gunbower State Forest (see Section 4.2).

3.5 WETLANDS

The wetlands associated with the floodplains of the Murray, Goulburn and Ovens Rivers are outstanding features of the FMA. The Barmah-Millewa Forest is on the Register of the National Estate. The Barmah-Millewa Forest, Gunbower Forest, Broken Creek and the lower Goulburn River floodplain are also listed in 'A Directory of Important Wetlands in Australia' (ANCA 1996).

Wetlands are a dynamic complex of geomorphic features, water regimes, vegetation communities and wildlife habitats. The wetlands comprise the more permanent water bodies such as anabranches, lakes, billabongs and lagoons and temporary water bodies such as effluent streams and flood runners (see glossary for various terms). They also include rushlands or swamps, Riverine Grasslands and River Red Gum forests and woodlands. Northern Plains Grassy Woodlands and Black Box Woodlands are commonly present within and adjacent to the wetland complex and contribute to its diversity.

Wetlands maintain water quality by trapping sediments and utilising and storing nutrients. They also assist in flood mitigation by storing floodwater and releasing it slowly. The dynamics of the wetland system are driven principally by the availability of water and the cycle of drying and refilling is important for invertebrate productivity, which stimulates breeding in fish and waterbird species. Many commercial and recreational fish species depend on wetlands for at least some part of their life cycles.

Temporary water bodies

Temporary water bodies are important components in the diversity of habitats in the floodplain forest. Along with the permanent water bodies, most are identifiable as openings in the forest canopy. They provide variation in the water regime of otherwise relatively homogenous areas of forest. Their floristic composition under wet or dry conditions depends on their individual water regime. When flooded, they provide an aquatic habitat for fish, amphibians and invertebrates, foraging and nesting habitat for waterbirds such as egrets, ducks, bitterns, crakes and rails, watering points for fauna and feeding sites for insectivorous birds and bats. For many perennial plants found in the wetlands, dry periods are important for seed-set, germination and regeneration.

Two principal forms of temporary water body with different ecological characteristics can be recognised. Effluent and/or confluent streams distribute or collect water across the floodplain when the rivers achieve a certain level and are characterised by relatively deep, flowing water. Their bed and banks are usually clearly defined and often support a distinctive riparian vegetation.

The flowing habitat and cross-section of effluent streams contrasts with the shallow (usually less than a metre), enclosed depressions on the floodplain. These retain water as floodwaters recede and gradually dry out unless topped up by additional flooding or rainfall. These water bodies, in association with other open wetland areas and trees immediately surrounding them provide a range of nesting, roosting and feeding opportunities for waterbirds as well as other species such as Barking Owl, White-bellied Sea-Eagle and Southern Myotis. Several threatened plant species such as Small Scurf-pea, Mueller Daisy and Flaccid Flat-sedge, also depend on the floodplain environment.

International agreements

The Barmah and Gunbower Forests are listed under the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (UNESCO 1971) – otherwise known as the Ramsar Convention – to which Australia is a signatory. Obligations of signatories to the Convention include:

- maintenance of the ecological character of listed sites;
- consideration of the conservation of all wetlands during planning to promote their wise use.;

Management strategies set out in this Plan address the obligations under the Convention.

The Ramsar Convention requires management plans be prepared for each listed wetland. A Draft Strategic Directions Statement proposes a set of management objectives and Statewide strategies for all Ramsar wetlands in Victoria (Parks Victoria 2001). More detailed Strategic Management Plans being developed for each Ramsar wetland draw together all management plans relevant to each. Accordingly, the strategic management plans being prepared for the Gunbower and Barmah Forests Ramsar sites, the respective water management plans (Chapter 4) and the Mid-Murray Forest Management Plan are complementary. The relationship between the various management plans is outlined in Appendix K.

The significance of these wetland forests for migratory birds is also recognised by international agreements. The Japan–Australia Migratory Birds Agreement (JAMBA 1974) recognises that certain species of birds migrate between Australia and Japan and that some of these are endangered in one or the other country. Part of the agreement between the two Governments is that both countries will conserve habitats of these species. A similar agreement (CAMBA 1986) exists between the Governments of Australia and China. Birds recorded for the FMA that are covered by one or other of the agreements are Rainbow Bee-eater, Cattle Egret, Great Egret, Greenshank, Glossy Ibis, White-throated Needletail, Sharp-tailed Sandpiper, White-bellied Sea-Eagle, Latham's Snipe, Red-necked Stint, Fork-tailed Swift and Caspian Tern (DCE 1992). Specific guidelines for the management of the habitat of colonially-nesting waterbirds and other species are provided in Section 3.6, while implementation of the management actions to mitigate threatening processes (Section 3.2) will address the other species.

Wetland Protection

Many of the more important water bodies in the Mid-Murray FMA are included in conservation reserves and SPZ.

Primary effluent and confluent streams carry water early and/or late in the flooding cycle. They are the principal migration routes for fish such as cod, Silver Perch and Smelt from the rivers across the floodplain. Species such as the Growling Grass Frog prefer this habitat. These streams are a focus for water management and the amount and configuration of woody debris in them are important considerations for both water management and faunal habitat. Because they contain water for longer than the surrounding forest, there is potential for greater biological productivity in the River Red Gum trees bordering them. In Gunbower Forest, Spur Creek is the primary effluent from the Murray River while Yarran Creek is the primary effluent/confluent stream for water from Gunbower Creek. Water movement through Barmah Forest is facilitated through several streams, the principal ones in State forest being Barmah, Snag, Big Woodcutter, Gulf and Smith (Tullah) Creeks. To protect the intrinsic values of these particular streams, 10 m from either bank in State forest is protected as SPZ.

Other water bodies and natural open areas in State forest are included within the SMZ. These are listed in Appendix D and indicated on Map 1. Guidelines for the management of these wetlands are set out below. This approach is consistent with the directions outlined in Victoria's Biodiversity Strategy (NRE 1997e).

Section 4.4 sets out how the requirements of the Code are interpreted for the protection of water quality, aquatic habitat and soil on the floodplains.

Management Guideline

Wetlands

Remote sensing and field inspections have been used to identify important water bodies and other natural open areas on the floodplain.

In places, as a result of either the natural dynamics of the floodplain or water regulation, River Red Gum is encroaching onto wetland areas, reducing the open area. Each of these wetlands should be evaluated as to its relative importance and the feasibility of restoring a pre-regulation water regime. If the wetland is considered of sufficient importance and restorative action is feasible, the encroaching trees may require removal.

Include each identified water body and other natural open wetland area on the floodplain in SMZ that extends to 50 m around each. Except where restorative action is required as described above, the distance should be measured from the current tree-line.

Research should be undertaken to determine the particular habitat and other values of each open wetland area identified in this Plan.

Grazing strategies are to be developed for each area under licence (Section 6.1). Grazing by domestic stock in and around identified wetlands should be managed to:

- protect the nests of ground-nesting birds from trampling during the breeding season;
- promote the regeneration and continued survival of threatened flora;
- suppress exotic plant species.

Specific management prescriptions may be required to maintain or improve habitat value of forest adjacent to an open wetland in order to:

- improve structural diversity;
- afford additional protection to large trees;
- promote River Red Gum regeneration to provide or restore roosting sites for colonially-nesting waterbirds;
- improve roosting and nesting opportunities for birds, through thinning of dense stands to accelerate the development of heavier branching in the retained trees;
- prevent or reverse forest encroachment onto Moira Grass plains, through suppression or removal of River Red Gum regeneration.

ACTIONS

Establish a 10 m SPZ extending from the top of either bank of Spur and Yarran Creeks in Gunbower Forest and Barmah, Snag, Big Woodcutter, Gulf and Smith Creeks in Barmah Forest.

Establish a 50 m SMZ, extending from the tree-line, around important water bodies and other open areas, such as Moira Grass plains and manage these areas in accordance with the Management Guideline for wetlands and other relevant guidelines set out in this Plan.

Facilitate research to determine the ecological value of the respective water bodies and other open areas in the floodplain forests and an appropriate management regime for each.

Continue to develop and refine the information base on the extent and nature of ephemeral wetlands across the Mid-Murray FMA.

3.6 SPECIES AND GENETIC DIVERSITY

Genetic diversity refers to the variety of genetic information contained in all of the individual plants, animals and microorganisms that inhabit our planet. Genetic diversity occurs within and between the populations of organisms that comprise individual species as well as among species (Commonwealth of Australia, undated).

Conservation of species diversity

Conservation of species and communities across their natural ranges is fundamental to sound nature conservation. Protecting multiple populations across a species' range conserves local diversity and genetic variation. This may also reduce the risk of a species' extinction as a result of isolated populations being destroyed by natural disasters or other factors. It is therefore important that the reserve system in the FMA includes viable examples of ecosystems at different locations across their natural geographic range.

The forests and woodlands of the Mid-Murray FMA are mainly located in a 200 km stretch along the Murray River and some 60 km south along its tributaries, but are patchily distributed. Genetic diversity is conserved in this Plan through representation in formal conservation reserves and SPZ of the principal vegetation types within each biogeographical province (Table 3.1 and Appendix F) and by taking steps to minimise the impact of threatening processes on particular species. Overstorey and understorey flora within the general areas permitted for timber harvesting are also recognised for their contribution to genetic diversity. Some species occur as isolated populations, in very low numbers or are sensitive to some uses of the forest or to certain management practices. These 'featured' species require specific actions aimed at ensuring their survival.

Featured species are derived from those:

- listed as threatened in Schedule 2 of the FFG Act or in Schedule 1 of the Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC Act);
- listed by NRE as Victorian Rare or Threatened Plant Species (NRE 2000b, Flora Information System, NRE), Threatened Vertebrate Fauna in Victoria (NRE 2000a) or, for invertebrates, as Threatened Fauna in Victoria (CNR 1995b);
- listed as being endemic, disjunct or at the edge of range in the planning area.

Approved Action Statements for species listed under the FFG Act or national recovery plans under the EPBC Act will guide management for the particular species; where necessary, these are complemented in this Plan through the use of conservation guidelines for the respective species.

The major cause of the decline in abundance and distribution of most of the species regarded as threatened in the Mid-Murray FMA is likely to have been the extensive clearing of the woodlands for agriculture. Grazing pressure, predation by introduced animals and invasion of native vegetation by environmental weeds are the principal ongoing extensive threats across most public land in the FMA. Altered water regimes in the riverine forests as well as loss of hollow-bearing trees and coarse woody debris, and high recreational pressure are additional processes potentially threatening plant and animal communities. These matters are discussed earlier in this Chapter.

Conservation guidelines

Where appropriate, guidelines have been developed for the management of threatened or sensitive species with major habitat requirements in State forest in the Mid-Murray FMA. The guidelines are based on assessment of the threat status of the species and strategies aimed at reducing or removing the threats. Application of the guidelines assist to establish a network of protected habitat across the FMA. For species listed under the FFG Act, management programs are established through Action Statements.

The guidelines establish comprehensive conservation strategies for the management of featured species in the State forests of the FMA, which may be further developed as more information becomes available. Preparation and implementation of FFG Act Action Statements may require refinement of some guidelines in accordance with the processes outlined in Chapter 12.

In applying the guidelines, consideration is given to the status of the records of the particular species and the quality of habitat in the area. For example, a well-documented and substantial population of a threatened species warrants a higher priority for protection than an area of marginal habitat where the same species was incidentally recorded.

Conservation guidelines for featured fauna are intended to provide appropriate habitat areas to meet their requirements. Depending on the species, this is done in one of two ways:

- **Minimum population level** – establishes a target number of protected records or habitat areas around which key habitat is maintained to ensure the maintenance of viable populations of the species in the planning area.

or

- **Review level** – establishes a pre-determined number of protected records or habitat areas which, once reached, will trigger a review of the species' forest conservation requirements to ensure their relevance and effectiveness.

Conservation of featured flora

Of more than 1 000 species of native vascular plants recorded for the Mid-Murray FMA, almost 79 species fall into one of the featured flora species categories. Of these, 14 are recorded in State forest (Appendix L).

Many of the plant species classified as threatened are located in formal conservation reserves, or frequently occur in vegetation classes which are specifically excluded from harvesting or which are unsuitable for timber production. Others may not be sensitive to the use or management of State forest. Species which warrant specific measures, such as inclusion in the SPZ or SMZ, to ensure their conservation are those that are:

- considered endangered or vulnerable and are potentially sensitive to activities in the forest, such as grazing, timber harvesting or recreation;
- known from only a few populations;
- at the edge of their range in the FMA.

New flora surveys or reviews of the conservation status of plants may result in the listing of additional threatened species in the FMA. Management of these species will be determined following consideration of the threatening processes and consultation with botanists, but will follow the general approach outlined in the following guidelines.

Conservation Guideline

Featured flora

Include all populations of species regarded as *Endangered* or *Vulnerable* at a Victorian or Australian level in the SPZ or SMZ after consideration of their regional status, the level of representation in the existing conservation reserve system and the nature of potential threats.

Populations identified for protection should, wherever practicable, be included in larger parts of the SPZ or SMZ, in combination with other values. The protection zone needs to be of sufficient size to include all of the local population and, where required, should include a buffer large enough to protect the population from deleterious external impacts and identified threats.

Isolated populations of featured flora species should be placed in SMZ (100 m radius) to highlight their presence and the need for site inspection and more detailed planning. Any disturbances proposed in close proximity or within these sites will be planned in consultation with NRE biologists to ensure that the species is adequately protected.

Species classified as *Rare, Insufficiently Known* or *Depleted* should be protected from the identified threats as far as possible. Measures for their protection should be considered at an operational level, such as in coupe plans.

Actions for particular species should complement the approved Action Statements under the FFG Act or national recovery plans under the EPBC Act. If no Action Statement or recovery plan is available, species listed under the respective Acts should be managed in accordance with their conservation status and this guideline.

Small Scurf-pea *Cullen parvum* **Endangered; listed under the FFG Act**

An Action Statement has been published and a recovery plan prepared.

A perennial herb, Small Scurf-pea (previously known as Small Psoralea) grows in grassland and grassy woodland on sites subject to irregular flooding. The Mid-Murray FMA supports the most northerly populations of the species in Victoria. It is recorded at a number of locations in both the Barmah State Forest and State Park, principally on rises in the floodplain supporting Yellow Box or Grey Box (Northern Plains Grassy Woodland) which, in this Plan, are included in SPZ.

The successful regeneration and dispersal of the species appears to depend on floods. The Action Statement identifies the major threat to the species to be grazing and trampling by cattle, although the total pressure by all grazing animals should be considered.

Mueller Daisy *Brachyscome muelleroides* **Endangered; listed under the FFG Act**

An Action Statement is in preparation.

The distribution of this species in Victoria is restricted mainly to sites in and around the Barmah State Forest and State Park.

An annual herb, Mueller Daisy regenerates from seed following heavy rainfall or recession of floodwaters and occurs in seasonally inundated depressions.

ACTION

Where practicable, modify grazing in the relevant areas in Barmah Forest to protect occurrences of Small Scurf-pea and Mueller Daisy and associated Northern Plains Grassy Woodland.

Conservation of featured fauna

More than 330 species of native vertebrate fauna are recorded across all land tenures for the Mid-Murray FMA; of these, 75 are listed in *Threatened Vertebrate Fauna in Victoria* (NRE 2000a). Of these listed species, 42 are recorded in State forest.

Some species have low tolerance of disturbances caused by contemporary human use and management of forests. Those most vulnerable to forest management and utilisation activities include ones that:

- forage over large areas of forest (eg forest owls, Spot-tailed Quoll, diurnal forest raptors);
- are at or near the top of the food chain (eg forest owls, Spot-tailed Quoll, diurnal forest raptors, Carpet Python);
- require combinations of varied specialised habitat resources for nesting, roosting, foraging, perching or basking (eg forest owls, Superb Parrot, possums, Squirrel Glider and Southern Myotis);
- occur naturally at low densities (eg Squirrel Glider, Brush-tailed Phascogale, and higher-order predators, such as forest owls);
- are colonial or social in population structure (several forest bats and some birds);
- occur in small populations and have specialised habitat requirements that may be disrupted by disturbance (eg Bandy Bandy and Woodland Blind Snake).

Other species, while not formally assessed as threatened, may be particularly sensitive to grazing, fire, timber harvesting activities or recreation activities. Additionally, the limit of the natural range of some species occurs in this FMA.

Species with significant habitat requirements in State forest are discussed below. Appendix M describes the management for several faunal species that do not warrant a conservation guideline but have specific habitat requirements that should be protected where records exist. The appendix includes some rare or threatened species that have been recorded in the planning area but whose preferred habitat is not in State forest. These include Regent Honeyeater, Swift Parrot and Spot-tailed Quoll. Although preferred habitat for Powerful Owl has not been found in State forest, conservation guidelines are provided should it be discovered there. Information about the distribution and conservation status of invertebrate species is currently insufficient to enable the development of guidelines. Nevertheless, management of public land and the conservation of habitat for the range of vertebrate species would also provide for invertebrates.

The threatened status of the species described below refer to the conservation status in Victoria and are derived from the report *Threatened Vertebrate Fauna in Victoria* (NRE 2000a) which uses the status categories of *extinct, critically endangered*, *endangered*, *vulnerable*, *lower risk – near threatened* and *data deficient*.

Mammals

Squirrel Glider *Petaurus norfolcensis* **Endangered; listed under the FFG Act**

An Action Statement is in preparation.

The Squirrel Glider is an arboreal gliding possum. Preferred habitat includes open forest and woodland with an overstorey of mixed-age eucalypts, including gum-barked species, and a sparse understorey often containing *Acacia* species (particularly Silver Wattle – *Acacia dealbata*). It nests and roosts in tree hollows and its primary food resources are nectar, sap of acacias and eucalypts, manna, pollen and insects.

Squirrel Gliders occur as isolated populations in Victoria, restricted to the riverine plains and the northern slopes of the western highlands. The FMA supports the bulk of the population in Victoria where its stronghold appears to be along the lower reaches of the Goulburn River. The species has also been recorded from the Killawarra Forest, along the Ovens River and, recently, along the Murray River near Echuca and the Torrumbarry Weir.

Conservation Guideline

Squirrel Glider

A linear SPZ of at least 50 m width is established on either side of the Goulburn River (totalling some 2 050 ha, including the 30 m Public Purposes Reserve) principally to protect habitat for Squirrel Glider. All other State forest along the Goulburn and Ovens Rivers is included in the SMZ (the 30 m Public Purposes Reserve bordering the Ovens River will support additional habitat) and Gunbower State Forest near Torrumbarry is within the SPZ.

Protect key components of Squirrel Glider habitat in the SMZs along the Goulburn and Ovens Rivers, principally the Silver Wattle understorey and an adequate number of large and hollow-bearing trees, during timber harvesting and other operations (see also the section below detailing 'Habitat protection along the Goulburn, Ovens and Murray River forested corridors').

Undertake prescribed burning to promote regeneration of Silver Wattle, where appropriate, in Squirrel Glider habitat.

Develop in association with the relevant licensees, grazing management strategies (Section 6.1) as a priority in areas of key habitat along the Goulburn and Ovens Rivers (identified on Map 1), with a view to fostering satisfactory regeneration of Silver Wattle and other understorey species.

Monitor the effectiveness of the zoning strategy, management of hollow-bearing trees and grazing, and the application of prescribed burning in protecting/developing suitable habitat resources for Squirrel Glider and modify the overall strategy if necessary.

Research should be undertaken to identify other areas supporting suitable habitat for Squirrel Glider for which this conservation guideline may be applied.

Brush-tailed Phascogale *Phascogale tapoatafa* **Vulnerable; listed under the FFG Act**

An Action Statement has been published.

The Brush-tailed Phascogale (or Tuan) is a small, mainly arboreal, carnivorous marsupial that prefers dry, open sclerophyll forests with rough-barked trees. The Box-Ironbark forest type is widely utilised by the Brush-tailed Phascogale in south eastern Australia. The Phascogale forages for insects and other arthropods on the trunks and major branches of the rough-barked trees and on fallen logs. Eucalypt nectar may also be eaten when ironbark and box species are flowering.

Individual females occupy home ranges of up to 60 ha while those for males extend over more than 100 ha and may overlap. Nests may be in tree hollows, stumps, under flaking bark and in fallen logs. Threats to the species include habitat fragmentation, depletion of trees with hollows, predation by foxes and cats, and removal of fallen timber by firewood collectors or fire.

As part of the strategy for conserving the species, the Action Statement sets a target of identifying 40 'priority management areas' (PMA) across the geographic range of Brush-tailed Phascogale in Victoria, with each area to contain suitable habitat to support 25 females and be a minimum of 1 000 ha managed sympathetically for the species. The Wildlife Atlas has no current Phascogale records in State forest within the Mid-Murray FMA.

Conservation Guideline

Brush-tailed Phascogale

Surveys should be undertaken to determine the location and nature of habitat preferred by Brush-tailed Phascogale within the FMA.

For those Brush-tailed Phascogale PMAs identified and confirmed within the FMA, establish a minimum of 1 000 ha of suitable habitat to be managed sympathetically for the Phascogale. The PMAs may incorporate various public land tenures and the boundaries should account for the practicability of management.

Develop prescriptions for the PMA, based on the FFG Act Action Statement, aimed at ensuring that essential habitat elements are maintained and, particularly, that the removal of naturally-fallen wood for firewood is prohibited.

Target fox control programs to the PMA and incorporate Phascogale conservation goals in other fox control programs within the vicinity.

Southern Myotis *Myotis macropus*

Lower risk – near threatened; listed under the FFG Act

Little is known of the distribution of this bat (also called Large-footed Myotis) within the FMA as it typically occurs in low numbers. It is widely distributed across Victoria and has been recorded along the Goulburn, Ovens and Broken Rivers and in Barmah Forest near the Dharnya Centre. Breeding and roosting sites have not yet been located.

Throughout its range, the species is closely associated with slow-flowing streams and permanent water bodies, as it forages exclusively over water, preying on aquatic insects and small fish. The bat usually roosts in caves but, in this FMA, is likely to use tree hollows. Studies elsewhere indicate that the species remains faithful to a roosting area, which is likely to be a number of trees growing close together (say, within a 400 m radius), and close to water. Foraging areas may be more than six kilometres away from roosting areas.

Southern Myotis is likely to benefit from protection of roosting and breeding resources. These would be large River Red Gums with suitable hollows close to water bodies. This will be achieved in the FMA largely through the designation of SMZ around all important water bodies (Section 3.5), protection of habitat in SPZ and SMZ along the Ovens and Goulburn Rivers, application of prescriptions for retaining current or potential hollow-bearing trees, formal reserves and the establishment of the other areas of SMZ and SPZ identified in this Plan. Protection of breeding sites during the breeding season is a priority.

Conservation Guideline

Southern Myotis

Undertake surveys to locate breeding or roosting areas and to improve knowledge of the distribution of Southern Myotis in the FMA.

When breeding and roosting trees are located and confirmed, establish a 250 m radius SMZ around each, for which:

- the breeding and roosting trees and all trees within a radius of 100 m from the breeding and roosting trees will be protected as SPZ;
- management prescriptions are developed, directed at maintaining and, if required, enhancing key habitat elements;
- all potentially disturbing activities are excluded during the breeding season (October to March inclusive).

Birds

Superb Parrot *Polytelis swainsonii*

Endangered (nationally vulnerable); listed under the FFG Act

An Action Statement has been published.

All known nest sites of Superb Parrot in Victoria are located in the Barmah Forest (in both State forest and State Park). Nest trees are typically large, mature River Red Gums with numerous hollows and tend to be close to a waterbody. The birds forage in box woodlands up to about nine kilometres from the nest sites.

All known nest trees in State forest are protected as set out in the following actions. Maintaining the integrity of nesting colonies (clusters of nest trees) is important. Conservation of the parrot may also benefit from the modification of grazing pressure in box woodlands (Section 6.1). Elsewhere, formal reserves, other areas of SPZ, SMZ and implementation of prescriptions for retaining current or potential hollow-bearing trees will help maintain and enhance potential habitat for the species.

A Landcare group is undertaking restoration of Superb Parrot foraging habitat on private land near Picola.

Management of the habitat of Superb Parrot in State forest is in accordance with the FFG Act Action Statement. The following guideline will also apply.

Conservation Guideline
Superb Parrot

For reasons of security, Superb Parrot nest sites should not be identified on maps available to the public.

Establish a 250 m radius SMZ around identified nest trees within which:

- the nest trees and all trees within a radius of 100 m from the nest trees will be protected as SPZ;
- all potentially disturbing activities are excluded during the breeding season (September to December inclusive).

Review the guideline when 50 nest trees have been located in all public land tenures in the Mid-Murray FMA.

Grey-crowned Babbler *Pomatostomus temporalis* **Endangered; listed under the FFG Act**

An Action Statement has been published.

Grey-crowned Babbler lives in groups of up to 12 individuals. Woody litter, sparse grass cover and understorey shrubs, and larger trees with deeply fissured bark appear to be important habitat requirements. An insectivorous bird, it forages partly on the ground and partly on the trunks and branches of trees and shrubs, preferring forest edges, such as along well-treed roadsides and creeks and along the fringes of larger forested areas. Nesting occurs in shrubs or the lower canopy of trees, usually less than six metres above the ground.

Colonies of Grey-crowned Babbler are regularly observed in box forests near the edges of Barmah State Forest (SPZ 105/04 on Map 1) and Killawarra Forest. Although the species was originally thought to prefer box or ironbark woodlands, several colonies have been found nesting in River Red Gum on the western edge of Guttrum State Forest and the southern edge of Benwell State Forest.

Management of the habitat of Grey-crowned Babbler in State forest is in accordance with the FFG Act Action Statement. Further, all box woodlands in the FMA are included in SPZ. Development of structural diversity during silvicultural activities in the River Red Gum forests will provide components of the species' habitat, while a review of grazing in box woodlands (Section 6.1) may also lead to further improvements in addition to the specific measures set out below.

Conservation Guideline
Grey-crowned Babbler

Suspend timber harvesting for five years from within 200 m of active colonies of Grey-crowned Babbler utilising River Red Gum forest on the western edge of Guttrum State Forest and the southern edge of Benwell State Forest.

Monitor Grey-crowned Babbler use of the above areas over the five-year period to identify the species' habitat requirements in relation to stand type and structure. After that period, and if appropriate, redefine the area from which harvesting is suspended.

Suspend timber harvesting from within 100 m of other active colonies of Grey-crowned Babbler in the FMA.

Barking Owl *Ninox connivens* **Endangered; listed under the FFG Act**

An Action Statement is in preparation.

The Wildlife Atlas lists more than 20 records of Barking Owl in the FMA since the 1980s. The more recent records from State forest are in Gunbower Forest and along the Goulburn and Ovens Rivers. It mostly occurs in wooded farmland, dry open forest, box woodlands and riparian River Red Gum; more frequently in edge habitats than in forest interiors. Although Barking Owl is often associated with river and swamp features, knowledge of its habitat requirements and resource use in the FMA is limited. It is known to hunt for prey on the forest floor and amongst the canopy and appears to be less dependent on arboreal prey than the larger Powerful Owl. Barking Owl primarily nests in relatively large tree hollows but none have yet been located in the FMA.

As part of the overall strategy for the species, the draft Action Statement sets a target of protecting suitable habitat for 150 resident pairs of Barking Owl on public and private land across the range of the species in the State. For the selectively-managed State forest in the Mid-Murray FMA, such protected areas (Barking Owl Management Areas – BOMA) would comprise the equivalent of between 600 and 1000 ha of SMZ (if conservation reserves and/or SPZ are present, the area may be proportionally smaller), and would be based on confirmed records. Conservation reserves, SPZ and SMZ established for other species can contribute to the total. Although the number of BOMAs to be established in the FMA is yet to be determined, the SPZ and SMZ along the Goulburn and Ovens Rivers and in Gunbower Forest meet the required level of protection of habitat and contain the more recent records for the owl in State forest.

Regardless of the number of BOMAs allocated to the FMA, the following conservation guideline should be applied to all nesting sites. In addition, the inclusion of important water bodies and other naturally-occurring open areas on the floodplain in SMZ (Section 3.5) and the strategies aimed at retaining and recruiting large hollow-bearing trees across all State forest will also address part of the habitat requirements of this species.

Conservation Guideline

Barking Owl

Establish a buffer of 250 m radius SMZ around all confirmed nesting and roosting trees utilised recently and frequently by Barking Owl within which:

- the nesting and roosting trees and all trees within a radius of 100 m from them will be protected as SPZ;
- the balance of the area is managed to maintain habitat capable of supporting adequate prey species for the breeding owls;
- all potentially disturbing activities are excluded during the breeding season (July to December inclusive).

Powerful Owl *Ninox strenua* **Endangered; listed under the FFG Act**

An Action Statement has been published.

Knowledge of the habitat requirements and resource use in the FMA for Powerful Owl is limited, as is information on the location of nesting sites. The Wildlife Atlas has no record of Powerful Owl nesting in the River Red Gum forests although it is recorded as occurring in River Red Gum woodlands on the plains near the lower Ovens River and has been heard in the region of the Goulburn River in the FMA.

Powerful Owl prefers older forests where large tree hollows provide nesting sites and arboreal prey is plentiful.

As part of the overall strategy for the species, the Powerful Owl Action Statement sets a target of protecting good quality habitat for at least 500 breeding pairs of Powerful Owl on public land across Victoria. Of the 500 Powerful Owl Management Areas (POMA) to be identified in the State, three are allocated to the Mid-Murray FMA. These are located in the Box-Ironbark forest in the Warby Range State Park (which includes the Killawarra Forest). It is uncertain whether the River Red Gum forests provide suitable habitat for Powerful Owl so no POMA target was allocated to these forests in the Action Statement. Regardless of the number of POMAs allocated to the FMA, and as set out in the actions below, any Powerful Owl nesting sites found in State forest will be protected in accordance with the Action Statement, reflected in the following guideline.

Conservation Guideline
Powerful Owl

Establish a buffer of 250 m radius SMZ around all confirmed nesting and roosting trees utilised recently and frequently by Powerful Owl within which:

- the nesting and roosting trees and all trees within a radius of 100 m from them will be protected as SPZ;
- all potentially disturbing activities are excluded during the breeding season (April to September inclusive).

White-bellied Sea-Eagle *Haliaeetus leucogaster* **Endangered; listed under the FFG Act**

An Action Statement has been published.

White-bellied Sea-Eagles favour the forested hinterland of coastal and inland waters. The birds are mostly sedentary once a home range has been established and their stick nests, built on forks in trees or on cliff ledges, may be used for many successive years. They are opportunistic carnivores, feeding on fish, mammals, reptiles and birds, as well as carrion. In the FMA, three nest trees are known in State forest near water bodies in the Barmah and Gunbower Forests and along the Goulburn River. All are included in SMZ according to the following guideline.

Management of the habitat of White-bellied Sea-Eagle in State forest is in accordance with the FFG Act Action Statement.

Conservation Guideline
White-bellied Sea-Eagle

Establish a 250 m radius SMZ around all known nest trees of White-bellied Sea-Eagles within which:

- all potentially disturbing activities are excluded during the breeding season (May to December inclusive);
- at other times, harvesting and road construction will be permitted to within 100 m.

Colonially-nesting waterbirds – various species

Cuddy *et al.* (1993), describes the various waterbirds found in the FMA while DCE (1992) lists those found in Barmah Forest and which are covered by the CAMBA or JAMBA agreements. Table 3.3 lists relatively recent records of several species that colonise in a limited number of sites for breeding and roosting. Three, Little Egret and Intermediate Egret (both listed in NRE (2000) as 'critically endangered') and Great Egret ('endangered'), are listed under the FFG Act and an Action Statement is in preparation.

Table 3.3 Colonially-nesting waterbirds in the Mid-Murray FMA

Common name	Scientific name	General location
*Little Egret	*Egretta garzetta*	Gunbower
*Intermediate Egret	*Ardea intermedia*	Gunbower
*Great Egret	*Ardea alba*	Barmah, Gunbower and Goulburn
*Nankeen (Rufous) Night Heron	*Nycticorax caledonicus*	Barmah and Gunbower
*Royal Spoonbill	*Platalea regia*	Barmah and Gunbower
Great Cormorant	*Phalacrocorax carbo*	Barmah and Gunbower
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Barmah, Gunbower and Goulburn
Little Black Cormorant	*Phalacrocorax sulcirostris*	Barmah, Gunbower and Goulburn
Darter	*Anhinga melanogaster*	Barmah and Gunbower
Australian White Ibis	*Threskiornis molucca*	Barmah, Gunbower and Goulburn

Note:
* identifies those species listed in NRE (2000a) as threatened.

While some species of waterbirds breed in permanent open water bodies such as water storages and depressions supporting reed beds, many breed during flood events in temporary wetlands or in inundated open areas in the River Red Gum forests. Colonially-nesting waterbirds are important indicators of wetland health and functioning. Surveys undertaken since 1993 indicate a considerable decline in breeding events for Nankeen Night Heron, spoonbills, egrets and cormorants compared to previous records. This decline engenders concern for the long-term survival of such species in the FMA, placing particular importance on protection of breeding areas and appropriate water management.

Principal threats to conservation of colonially-nesting waterbirds are alterations to the natural flooding regimes and the concomitant reduction in breeding opportunities, cattle trampling the nest sites of ground-nesting species, predation and disturbance during the breeding season

Water management of wetlands and streams is a key issue for egret conservation. Although they utilise both fresh and saline habitats, egrets show a marked preference for freshwater marshes. Gunbower and Barmah Forests have historically been the main sites from which egret breeding has been recorded. In the FMA, egrets will only nest during flooding events and utilise live River Red Gum saplings and mature trees both within the flooded forest as well as adjacent to open areas surrounded by flooded forest.

Identifiable water bodies and other natural open areas in the floodplain forests of the Mid-Murray FMA are to be managed as SMZ (Section 3.5) in order to maintain or enhance their value as habitat for dependant species, including waterbirds. In addition, water management programs are being established to provide appropriate watering regimes for the floodplain forests, including the more important wetlands (Section 4.2).

Conservation Guideline
Colonially-nesting waterbirds

Facilitate research to identify areas used by, and the habitat requirements of colonially-nesting waterbirds and support annual surveys during the breeding season to determine habitat use and breeding numbers. Incorporate results from the above research into the operational management plans for the SMZs surrounding the respective wetlands (Section 3.5).

Exclude activities likely to disturb breeding activity within 250 m region around current roosting and breeding sites of colonially-nesting waterbirds during the breeding season.

Further surveys of nesting sites will help determine whether this approach requires review.

Reptiles

Carpet Python *Morelia spilota variegata* **Endangered; listed under the FFG Act**

An Action Statement is in preparation.

Intensive research is being conducted in the Murray-Darling and Coopers Creek basins into the ecology and conservation requirements of this species. One project is surveying habitat requirements and population numbers at selected locations within the Victorian range of this species, including the Murray River floodplain.

On public land within the FMA, Carpet Python is mainly restricted to rocky outcrops as well as Black Box and River Red Gum forests and woodlands near water bodies. Tree hollows, fallen logs and other woody debris and shrubby vegetation on or close to the ground are considered to be important habitat components in the riverain forests.

Records of Carpet Python in State forest in the FMA are from Reedy Lagoon in Gunbower Forest and on Barmah Island. The Warby Range State Park contains numerous records and it has been recorded from the Barmah State Park near the Dhanya Centre and the Terrick Terrick National Park.

Processes that contributed to the decline of Carpet Python would include fragmentation and loss of habitat through land clearing, loss of tree hollows due to timber harvesting, loss of ground cover due to grazing and firewood collection, predation (particularly by foxes and pigs), rabbit control works and illegal collecting for trade. Depletion of prey (including rabbit control), altered water regimes in the floodplain forests and fire may also have been factors. The extent to which any one of these processes is a significant ongoing potential threat to Carpet Python populations is unknown.

A strategy to conserve Carpet Python aims to protect quality habitat for a regional population, in Victoria and NSW, of at least 200 adult pythons. Sufficient habitat to support eight sub-populations of 25 adult pythons each is to be distributed across the range of the species, including the Mid-Murray FMA. A sub-population of 25 adult pythons requires a total of 520 ha of suitable habitat (Carpet Python management area).

Conservation Guideline

Carpet Python

Continue to support surveys to gather information on the distribution of Carpet Python in the floodplain forests and to characterise important elements of its habitat.

Identify, based on the conservation strategy for the species, a Carpet Python management area of a minimum of 520 ha within each of the Gunbower and Barmah Forests (preferably including existing confirmed records). Each Carpet Python management area should:

- contain high quality habitat, or potentially high quality habitat, for Carpet Python;
- comprise conservation reserves and, if required, State forest SPZ;
- be managed to protect and promote high quality habitat for Carpet Python.

Where additional State forest SPZ is required to meet the 520 ha target for a Carpet Python management area, timber resource implications of the additional area to be reserved should be considered and preference should be given to options that minimise loss of timber resources.

Where practicable, exclude grazing by domestic stock from the Carpet Python management areas. Where total exclusion of stock is not practicable, manage grazing pressure to ensure sufficient levels of ground cover are maintained. The design of Carpet Python management areas should take account of the practicability of grazing management.

Where hibernating or breeding sites for Carpet Python are confirmed, exclude potentially disturbing activities where practicable for a range of 250 m from each site during the hibernating (April to September inclusive) and breeding (November to February inclusive) periods respectively.

Target fox control programs at Carpet Python management areas and incorporate Carpet Python conservation goals in other fox and rabbit control programs within the range of the species.

Implement education programs where necessary to discourage campers from collecting firewood from Carpet Python management areas.

In accordance with the above guideline, a total of some 660 ha in the Gunbower State Forest, comprising high-quality habitat for Carpet Python in the vicinity of recent records of the species, has been placed in SPZ (SPZs 106/12, 106/13 and 106/14) and is to be managed principally as a Carpet Python management area. This area lies adjacent to the 230 ha Spence Bridge Education Area, which is also regarded as a conservation reserve. Another Carpet Python management area has been identified in the Barmah State Park. Potential Carpet Python habitat is also protected in other conservation reserves, State forest SPZ (particularly Zone 106/30) and SMZ (particularly around wetlands). Implementation of grazing management plans in some box woodlands and parts of the floodplain will also contribute to conservation of the species.

Hooded Scaly-foot *Pygopus nigriceps* **Critically endangered; listed under the FFG Act**

An Action Statement has been published.

A large (to 45 cm length) legless lizard, Hooded Scaly-foot is widely distributed across continental Australia in tropical to temperate climates. The few records for Victoria place it in the north of the State, generally inhabiting areas of clay and clay-loam soils with Black Box, chenopod, grassland and Buloke vegetation. Its stronghold in Victoria is the Terrick Terrick National Park in the Mid-Murray FMA. The species is thought to be largely crepuscular or nocturnal, feeding mainly on surface-active insects and arachnids. It uses fallen timber, rocks, mats of dead vegetation, grass tussocks, burrows and cracks in the soil as shelter and foraging sites.

Bandy Bandy *Vermicella annulata* **Lower risk; listed under the FFG Act**

A nocturnal, burrowing snake of up to 75 cm length, Bandy Bandy is widespread across eastern and south-eastern Australia. There are few records of the species in Victoria, these being from three disjunct populations, primarily on drier northern slopes. Key habitat requirements are unknown but it has been observed sheltering under large rock outcrops; activity appears to increase during the warmer months. Analysis of the stomach contents of museum specimens of Bandy Bandy indicates that its principal prey in Victoria is Woodland Blind Snake (see below), the availability of which may be the limiting resource for Bandy Bandy.

Woodland Blind Snake *Ramphotyphlops proximus* **Vulnerable**

The range of Woodland Blind Snake extends through eastern Australia from northern Queensland to northern Victoria and north-eastern South Australia. It is a small (50–60 cm long), non-venomous burrowing snake which lives in loamy soils, beneath rocks or rotting logs and feeds primarily on the eggs, larvae and pupae of ants. Termites may be also taken. Nocturnal by nature, it is rarely seen on the surface, occasionally coming out on humid nights.

The major cause for the reduction in the ranges and populations of Hooded Scaly-foot, Bandy Bandy, and Woodland Blind Snake is most likely to have been the clearing of woodlands for pasture and agriculture. Soil compaction by hoofed animals, particularly during wet periods, and the removal of woody litter and vegetation cover from the forest floor by grazing, fire and firewood collection also adversely impact their habitat. Introduced predators, such as cats and foxes, would also be a threat and any reduction in vegetation cover or litter could increase the vulnerability of the species to predation.

All box woodlands in State forest within the FMA are included in the SPZ and management of grazing is to take account of the importance of the box woodlands as faunal habitat (Section 6.1).

Conservation Guideline

Hooded Scaly-foot, Bandy Bandy, Woodland Blind Snake

The habitats of these species are similar; in fact Bandy Bandy in Victoria appears to be dependent on the survival of Woodland Blind Snake. Nevertheless, research into the specific habitat requirements of each of these species should be facilitated.

Should any of these species be detected in State forest, SMZ of at least 50 ha should be established around and including the detection site of confirmed records.

For each SMZ:

- grazing by domestic stock should be excluded where practicable. Where total exclusion of stock is not practicable, grazing pressure should be managed to ensure sufficient levels of ground cover are maintained. The location of the SMZ should take account of the practicability of grazing management;
- predator control programs should be targeted at the zone.

Education programs should be implemented where necessary to discourage campers from collecting firewood from the zone.

Fish

Streams, lakes, billabongs, lagoons and other depressions that hold water for extended periods, particularly those containing large, woody debris, provide important habitat and breeding sites for fish species. Some fish are resident in the more permanent wetlands on the floodplains, others, such as cod and perch, are occasional visitors, moving through the area during floods.

The distribution and abundance of many species of native fish has declined in Victoria. The ecological requirements of native fish in the FMA in terms of use of the range of floodplain elements (Section 3.6) and flooding regimes are not fully understood. Further research is needed although the connection of extensive areas of the floodplain with the major waterways during floods in spring is considered to be important. Measures to ameliorate the effects of past alteration to the natural flooding regimes and measures to protect in-stream woody debris as habitat are discussed in Section 4.2. Species potentially affected in the FMA are listed in Table 3.4.

Table 3.4 Threatened fish in the Mid-Murray FMA

Common name	Scientific name	Conservation status	Status under the FFG Act
Trout (Bluenose) Cod	*Maccullochella macquariensis*	Critically endangered[1]	Listed; Action Statement published
Silver Perch	*Bidyanus bidyanus*	Critically endangered	Listed
Macquarie Perch	*Macquaria australasica*	Endangered	Listed
Murray Hardyhead	*Craterocephalus fluviatilis*	Endangered[2]	Listed
Murray Cod	*Maccullochella peelii peellii*	Vulnerable	Listed; Action Statement in preparation
Golden Perch	*Macquaria ambigua*	Vulnerable	

Notes:

[1] This species is also considered endangered Nationally.

[2] This species is also considered vulnerable Nationally.

Other vertebrates

The Barking Marsh Frog (*Limnodynastes fletcheri*), found on the banks of the Goulburn River, is also considered a threatened species but little is known about its ecology. The public land reserve forming the frontage to the Ovens River and measures for the protection of habitat along the Goulburn River (below) will favour this species.

Several other threatened species (listed in Appendix M) occur within the FMA. In many instances, current knowledge of their distribution and ecology is insufficient to provide specific management prescriptions. All species listed under the FFG Act will be the subject of Action Statements prepared according to that Act, and forest management will consider each of these as they are approved.

ACTIONS

Conservation of flora and fauna

Support surveys aimed at increasing knowledge of the location, distribution and abundance of rare and threatened species in the FMA and improving understanding of their habitat requirements.

Continue to record the presence of rare and threatened flora and fauna in the FMA and provide data to maintain currency of the Atlas of Victorian Wildlife and the Flora Information System.

Support research into the role of water, fire and coarse woody debris in the conservation and management of vegetation types and faunal habitat in the FMA.

Manage the habitat for threatened flora and fauna in State forest in accordance with the respective guidelines, relevant legislation and policies and Appendices L and M.

Develop competencies in field staff in the identification of and the management of the habitat for rare or threatened flora and fauna.

Evaluate the effectiveness of the management strategies for State forest and the conservation guidelines through monitoring of either threatened and sensitive faunal populations, or those species that are considered useful indicators of overall forest habitat conditions.

Review the strategies and guidelines for featured species as new information becomes available from survey and research.

Habitat protection along the Goulburn, Ovens and Murray River forested corridors

Public land bordering the Goulburn, Ovens and upper (upstream of Barmah Forest) Murray Rivers form long, relatively narrow forested corridors through largely cleared land. These corridors are important in maintaining regional biodiversity and provide valuable habitat for a range of flora and fauna including, along the Goulburn River, Squirrel Glider, Barking Owl, Southern Myotis and Barking Marsh Frog. The Goulburn and lower Ovens Rivers are also Heritage River Areas under the *Heritage Rivers Act 1992*. (The Murray River was also considered a likely candidate for this classification – LCC 1991).

In 1993 NRE conducted an aerial survey of River Red Gum and Silver Wattle within 200 m of the channel of the Goulburn River. The survey, which gauged the impacts on wildlife habitat values of activities such as grazing and timber harvesting, indicated that habitat values were degraded in some areas but remained high in others.

In recognition of the habitat values of the forest bordering the Goulburn River, principally for Squirrel Glider, a SPZ was identified with a minimum width of 50 m from either side of the river, and including whole bends in places, covering some 2 050 ha (including the Public Purposes Reserve).

State forest along the Ovens and upper Murray Rivers in the FMA support predominantly mature and young regrowth River Red Gum, as well as some large old trees. The Ovens River corridor also supports natural grasslands and areas of River Red Gum Forest-Woodland with intact understoreys of River Bottlebrush (*Callistemon paludosus*), Silver Wattle and *Melaleuca parvistiminea* (LCC 1991). Preliminary studies by NRE (including an aerial survey) indicated that habitat values along the Ovens River and in isolated bends of the Murray River are generally similar to those of the Goulburn River. A 30 m wide Public Purposes Reserve borders both sides of the Ovens and Goulburn Rivers where they pass through State forest (treated as equivalent to a Special Protection Zone in this Plan) and the River Murray Reserve (minimum width 60 m) borders that river.

In recognition of their importance in maintaining regional biodiversity and Heritage River status, all State forest (outside the SPZ, Public Purposes Reserve and River Murray Reserve) along the Goulburn, Ovens and upper Murray Rivers is zoned SMZ. Management of the SMZ along these rivers will generally aim to maintain a greater number of mature trees than in GMZ.

During the life of this Plan, the combination of the zoning strategies and management of hollow-bearing trees along the Goulburn and Ovens Rivers will be monitored, evaluated and compared for their relative effectiveness in protecting the range of environmental values. This will indicate the effectiveness of the variable-width SPZ along the Goulburn River in achieving its aims and if there is a need to undertake a similar exercise for the Ovens River. At the same time the floristic and habitat values and timber resources along Ovens River will be assessed and a potential zoning scheme delineated using the same methodology applied for the Goulburn River.

ACTIONS

Review the numbers and condition of hollow-bearing trees to be retained or promoted in the Goulburn and Ovens Rivers SMZs in the light of the Statewide habitat retention recommendations.

Evaluate the effectiveness of the SMZ and variable-width linear SPZ along the Goulburn River in achieving its aims relative to that of the SMZ and Public Purposes Reserve along the Ovens River and, in the light of that evaluation, investigate the value in establishing a variable-width linear SPZ for the Ovens River forests taking into account floristic, habitat and timber resource information.

Chapter 4
WATER MANAGEMENT

4.1 RIVER REGULATION

During high river flows, the waters of the Murray River, usually augmented by flows from the Ovens, Goulburn and Campaspe Rivers, bank up near Echuca (at the Caddell Tilt). The waters disperse over the floodplains by means of numerous distributaries or effluent streams (see glossary) which have cut through the rivers' natural levees and in overland or sheet flow. Constriction of the Murray's flow at the Barmah Choke (a relict sandhill opposite the Barmah Lakes) further contributes to flooding of the Barmah-Millewa Forest. Below Echuca, the river is usually confined to its banks until it is sufficiently high for the effluent streams to begin to flow. Flooding of the Gunbower Forest, for instance, starts as the primary effluent streams Spur Creek and Yarran Creek begin to flow, with other creeks beginning to flow in turn as the Murray continues to rise.

Successful regeneration and continued survival of most floodplain vegetation communities, such as Riverine Grassy (Red Gum) Forest, reedy swamps and Moira Grass plains depend on winter-spring flooding and a dry summer-autumn period. Appropriate flood events also trigger reproductive cycles for the wide range of floodplain-dependent fauna. Under natural conditions, approximately 80% of the Barmah Forest was flooded for two to three months, in eight of every ten years (Appendix J). Similarly, 85% of the Gunbower Forest was flooded for about four months in eight of ten years (Atkins & Lloyd 1993).

River regulation refers to the control of rivers and water storages for human uses, such as irrigation, and to the control of water for environmental purposes. Most of the major rivers flowing through the FMA are highly regulated for the storage and delivery of irrigation, stock and domestic water. The Ovens River is less regulated and as a result its flows are comparatively natural. Even though pastoralists began diverting river flows in the late 1800s, construction of the Hume Weir across the Murray River in the mid-1930s has been the most significant factor influencing river regulation.

The storage of water during winter and spring and its release in summer and autumn to meet irrigation demands have changed the natural flow and flood regimes of most rivers and wetlands in the Murray River catchment. Major floods in the forests have been little affected by river regulation but, as indicated in Appendix J, the frequency, duration and extent of the smaller winter and spring floods in the Barmah-Millewa Forest are greatly reduced. Flooding of the Gunbower Forest has similarly been affected in that river levels sufficient to cause flows through the primary effluent streams have reduced from 5.8 months to 2 months of the year (URS 2001). Further, the Barmah Forest, particularly, is experiencing frequent low-level flooding in the January to March period (caused mainly by rain-rejection flows) which was almost unknown before river regulation.

As well as affecting their ecological condition (Section 3.4), river regulation has adversely affected economic values of the River Red Gum forests. Because large areas of these forests are now flooded less frequently and for shorter duration, growth is less vigorous, producing markedly lower productivity than would be the case under more natural flooding regimes and successful regeneration is no longer assured. Conversely, low-level floods in the Barmah Forest over the summer period have extended some swamplands but have fostered the survival of River Red Gum seedlings in low-lying areas, which normally would have suffered drought stress.

4.2 ENVIRONMENTAL WATER MANAGEMENT

Water is the primary factor determining the range of ecological processes on the floodplain. The extent of each floodplain vegetation community. The health and functioning of the wetlands (Section 3.5) are largely determined by a unique flood regime (Appendix J). For instance, in 1930, about 4 050 ha (13.5%) of Barmah Forest was occupied by Moira Grass plains. By 1980, however, they occupied only 1 550 ha because reduced frequency of minor flooding favoured encroachment onto the plains by River Red Gum and Giant Rush (Chesterfield 1986). The success of floodplain communities depends upon re-instatement of near-natural flood

regimes. Consequently, appropriate management of water regimes is a high priority for forest management in the FMA. NRE addresses the decline in the health of the floodplain communities and development of appropriate watering regimes through the preparation and implementation of an Integrated Watering Strategy (see later) for Victoria's Murray River floodplain wetlands and the development of water management strategies or plans for the larger forest systems.

Environmental management of floodplain communities along regulated rivers is based on the control of water flow and flood regimes. In addition to the remaining (though much depleted) natural floods, water available for environmental purposes in the Murray River floodplain is derived from specific allocations and rain-rejection flows.

The Mid-Murray FMA is wholly contained within the Murray-Darling Drainage Basin (which extends through four States) and all streams flowing through it are tributaries of the Murray River system. In 1985, the Murray-Darling Basin Ministerial Council, comprising Ministers of Federal and State Governments, was established to define directions for the management of the Basin's natural resources. The Council formed the Murray-Darling Basin Commission (MDBC).

One task of the MDBC is to facilitate and coordinate the development of water management strategies that enhance environmental values in the Basin. The respective State public land management agencies are responsible for preparing the strategies and consulting with the community. Appendix K outlines how the strategies and operational plans for water management link with the relevant management and operational plans for parks and State forest. The former Barmah State Park and Barmah State Forest Management Plan (DCE 1992) lists the guidelines for water management established at that time for the Barmah Forest.

The respective Catchment Management Authorities (CMA) for the Mid-Murray FMA are each developing water management strategies. The Goulburn-Broken CMA is developing a Barmah Forest Water Management Plan, the North Central CMA is developing a similar plan for the Gunbower Forest, while the North East CMA is undertaking a floodplain rehabilitation project in the Murray River corridor between the Hume Weir and Barmah Forest. Parks Victoria is also preparing Ramsar wetland management plans for the Barmah and Gunbower Forests.

Concerned with the environmental impacts of steadily increasing water use in the Basin, the Murray-Darling Basin Ministerial Council imposed a cap on water use, limiting future diversions of water to the volume that would have been diverted under 1993/94 levels of development. Allocations of water for environmental and irrigation purposes within each State must conform to the cap.

Annual Water Allocation

Three specific annual water allocations are available in the FMA for environmental purposes:

- 100 GL (gigalitre) of water under a high security entitlement, to be shared equally between NSW and Victoria for use in the Barmah-Millewa Forest;
- 50 GL of water under a lower security entitlement, to be shared equally between NSW and Victoria for use in the Barmah-Millewa Forest;
- 27.6 GL from Lake Dartmouth for use in Victorian wetlands on the Murray River floodplain (of which 2.6 GL has been allocated to Hirds and Johnsons Swamps).

The 50 GL of lower security entitlement water for the Barmah-Millewa Forest arises from a recommendation in the report *Sharing the Murray* (MWEC 1997) by the Murray Water Entitlement Committee. The Committee was established by the Victorian Government to allocate Victoria's share of the water, made available under the cap, among its irrigators and between irrigation and environmental uses. The Murray-Darling Basin Ministerial Council in 2001 approved this recommendation and agreed to a set of guidelines for delivery of the water to the forest in response to natural flow triggers.

The 100 GL and 50 GL allocations will be managed in accordance with The Barmah-Millewa Forest Water Management Strategy which recognises that these forests should be managed as a single entity. This Strategy was jointly prepared by the respective State land management agencies, the MDBC and the community through the Barmah-Millewa Forum (MDBC 2000). The environmental allocations may be used to replicate near-natural flooding regimes by being added to rain-rejection flows or natural floods to increase the depth or duration of flooding. The strategy includes provision to allow the entitlement to build up over some years to a larger volume, which would then be released to enhance flooding of the forest when the Murray is relatively high. While this strategy provides the broad framework for water management, specific guidelines for storage and release of the environmental water in response to specified flow triggers have been developed in the *Sharing the Murray* report (MWEC 1997) and annual plans developed by the Barmah-Millewa Forum detail specific works and research and monitoring programs (Barmah-Millewa Forum 2000). The Barmah-Millewa Forum ensures coordination of the annual operating plans and expenditure on MDBC funded projects by NSW and Victoria while preparation and implementation of annual programs in Victoria is overseen by the Goulburn-Broken CMA. Their relationship is outlined in Appendix K. The water management plan being developed by the Goulburn-Broken CMA will provide further details on the management of each release.

Other Water Allocation

The *Sharing the Murray* report (MWEC 1997) also proposed two allocations of water to be used for environmental flows in Gunbower Forest. The first, an average of 25 GL about 24 years in 100, designed to top up and extend small to medium sized floods, and an additional 40 GL, about six years in 100, to cause low-level flooding when the forest has been dry for two years. It proposed that the water should come from those 'surplus' flows in the Murray and Goulburn river systems, which cannot be used to meet other entitlements and cannot be stored. As the allocation of this water is not secure, nor is it 'lost' to the riverine environment, NRE is seeking agreement from the other States and the MDBC to consider this water as being not part of the cap mentioned above (NRE 1999). The plan being developed by the North-Central CMA for the Gunbower Forest will provide details of how this allocation might be used. To date, a scoping study prepared for the CMA sets out environmental water requirements and water management options for the forest (URS 2001).

Limited opportunity exists for allocations of water from storages on the Goulburn River for environmental purposes as it is highly regulated. At present, 80 GL is allocated for flushing the river between Lake Eildon and Nagambie Weir (upstream of the FMA) approximately seven out of ten years. There may be opportunity for this allocation to be used to improve conservation values. Further, when inflows to Lake Eildon have been high and the storage is relatively full, 25 GL of water has been made available for environmental purposes over spring. However, as this water is re-regulated at the Nagambie reservoir, it does not reach the lower part of the river. There is also potential for some of the 25 GL allocation from Lake Dartmouth to be used within the Goulburn River system (particularly the lower part) although this would be subject to compensating trades of water between catchments.

Rain-rejection flows may cause small floods in the forests during the irrigation season. The Barmah-Millewa Forest is particularly prone to unseasonable summer-autumn flooding because of the limited capacity of the Murray River's channel at the Barmah Choke and the diversion of excess water via a series of effluent creeks into the forest. If these floods occur in summer or autumn when the forest should be dry or drying out, they can be detrimental to forest health, causing waterlogging of River Red Gum and changes to other flora. These floods must be managed to minimise any impacts on environmental values and forest activities. Downstream of the Barmah Choke, in the Gunbower Forest for instance, summer-autumn flows usually remain within the Murray's banks.

Aims

Ensure that in-stream water quality is not adversely affected by management activities.

Ensure that available water is used to restore and maintain the health and vitality of the floodplain ecosystem.

Ensure that management strategies in the Forest Management Plan and the Water Management Strategies are complementary.

Integrated watering strategies

The Integrated Watering Strategy project (IWS) is an initiative of the Victorian Government developed in conjunction with the MDBC. It conforms to The Barmah-Millewa Forest Water Management Strategy. The IWS aims to:

- describe the hydrology of the Mid-Murray wetlands;
- develop methods for assessing the water requirement of wetlands;
- develop water management strategies for high-value sites;
- formulate an integrated watering strategy for specific Mid-Murray wetlands to link their management with river operations.

The IWS indicates the mechanisms by which watering of the Mid-Murray FMA riverine forests may be improved. It is implemented through a series of water management strategies for individual forest areas. These strategies propose short-term (one-year) and longer-term (five-year) courses of action for each forest area. Interim water management strategies are in place within the FMA for Bruces Bend and the Barmah and Gunbower Forests. Water management plans currently being prepared by the respective CMAs will expand on these strategies.

Appendix N provides samples from these strategies. They include recommendations for:

- new regulators;
- maintenance and revised operation of existing regulators;
- minor earthworks and channel clearing;
- provision of environmental flows;
- exclusion of unseasonable flows;
- appropriate use of rain-rejection flows.

The Barmah Management Plan (DCE 1992) sets out broad actions specifically for the management of water in Barmah Forest and forms the basis for the relevant water management strategy, although this will be detailed within the Goulburn-Broken CMA's Barmah Forest Water Management Plan.

The strategies relate specific actions for individual wetlands to water management within the Murray River system as a whole. Generally, all works aim to provide the appropriate watering regime within the winter to spring period and allow the wetland to remain dry during summer and autumn. Site-specific works range from flooding drought-stressed areas, such as River Red Gum on higher ground, through to halting the disposal of irrigation drainage water into Gunbower State Forest. Coordination of these strategies requires the development of an annual implementation program that also indicates proposals for the following two years. The relationships between the IWS, individual water management strategies, over-arching water management plans and land management plans are outlined in Appendix K. Guidelines for the preparation of water management programs are outlined below.

Water management areas

Elevated features on the floodplain set boundaries for water flow through the forests. These may be natural levees along the banks of the rivers, levees constructed along the forest edges, sand-hills, roads, or other elevated land such as the ridges supporting box eucalypts. Segregated sections of the floodplain that are identifiable by discrete points of inflow and outflow are utilised in water management strategies as Water Management Areas (WMA). Movement of water into and out of a WMA can be controlled using temporary earthen embankments, culverts and regulators. Few are completely isolated, however, and water usually passes from one WMA to another. Most of the water entering Barmah Forest, for instance, returns to the Murray River through Barmah Lake. WMAs allow the application of different flood regimes (frequency, timing, duration and depth) to different parts of the forest. Because of the low relief of the floodplain topography, it is important that effluent streams and other major flood pathways are not obstructed by logging debris and other unnatural obstructions to facilitate efficient management of water movement. However, this must be balanced against the need to retain some in-stream woody debris as this provides important habitat for fish and other aquatic fauna.

While WMAs can be useful in controlling floods within the forest, it is important to retain as far as possible natural flows through the forest to maintain the linkages between river and floodplain.

The boundary of each WMA is identified in the IWS. Eleven have been delineated in Barmah Forest and six in Gunbower Forest. The relatively simple hydrology and small size of other forested wetlands, such as Bruces Bend State Forest and Lake Moodemere, allow each to be managed as one WMA.

Management Guideline

Water management programs

Water management programs should:

- maintain and improve biodiversity values within floodplain forests, including the aquatic and semi-aquatic systems, through management of natural floods, environmental water allocations and surplus and rain-rejection flows;
- be based on the water management strategies;
- use WMAs to facilitate the distribution of available water;
- be coordinated with other forest and park management planning (such as roading, timber harvesting and recreation);
- within the context of maintaining and improving biodiversity values, aim to manage flooding to assist regeneration and regrowth following harvesting;
- indicate, based on WMAs, where flooding is required, and the depth, frequency, duration and priority of such flooding to provide an appropriate water regime for as much as possible of the floodplain environment within each WMA;
- consider previous flooding events;
- be flexible enough to take advantage, when appropriate, of natural floods, environmental water allocations and surplus and rain-rejection flows;

continued next page

Management Guideline – Water Management Programs - continued

- recognise the importance of snags and other woody debris in waterways as habitat for fish and other aquatic organisms by ensuring that the removal of logging debris from the waterways is the minimum necessary to achieve the desired water flows;
- detail those small-scale works that will utilise more effectively surplus or rain-rejection flows or environmental water allocations to allow watering of those forests now frequently under severe stress from lack of natural flooding;
- not cause further decline to the Moira Grass plains, permanent and semi-permanent wetlands and threatened flora and fauna.

Water management programs should be monitored to:

- ascertain their effectiveness;
- determine if follow-up works are required;
- determine if the programs require modification.

For each Water Management Area, river and water management actions should aim to:

- mimic natural flooding characteristics, including frequency, duration and seasonality;
- alleviate drought-stressed forest and wetlands;
- initiate and sustain reproduction of native flora and fauna;
- enhance ecosystem values as knowledge of their requirements improves and expertise in water and ecosystem management increases.

ACTIONS

Participate with relevant land, resource management agencies and relevant advisory groups (such as the Barmah-Millewa Forum) in the development and review of water management strategies, seeking to ensure that they:

- ***complement the strategies established in this Plan;***
- ***provide appropriate flood regimes to ensure the viability of threatened flora and fauna and the range of ecological communities of the forest;***
- ***where consistent with biodiversity objectives, include measures to ensure watering programs contribute to restoring the health and productivity of State forests;***
- ***maintain important floodplain and channel habitat values.***

Participate with the Catchment Management Authorities in the preparation, implementation and annual review of water management programs prepared for the Mid-Murray FMA based on water management strategies, the guidelines for water management programs and relevant legislation and policy.

Undertake habitat assessments prior to carrying out measures to modify in-stream woody debris.

4.3 DRAINAGE SCHEMES

In the Mid-Murray FMA, the extensive riverain (see glossary) forests lie across the natural drainage outfall between farmland on the higher ground and the rivers. Drainage water from farmland is often disposed of in or through the forests. Although additional fresh water may be of some benefit to drought-stressed areas, in some cases disposal of saline water or water at inappropriate times from farmland has adversely impacted on forest values. Surface water management programs designed to minimise impacts on riparian values have been progressively implemented since the 1970s.

While the MDBC sets goals with respect to salinity mitigation in the Murray River, directions for drainage schemes in Victoria are set through a consultative process between Catchment Management Authorities (CMA), Rural Water Authorities, NRE, landowners and local government. Drainage schemes for salinity exist or are proposed for large areas of farmland within the FMA. They are developed under either existing Salinity Management Plans or Surface Water Management Schemes (such as the Loddon-Murray Surface Water Management Strategy - in draft) being prepared as part of the broader Regional Catchment Strategies overseen by the respective CMA. The Mid-Murray FMA overlaps the regions of the North Central, North East and Goulburn-Broken CMAs.

Regional Catchment Strategies ensure that salinity and drainage programs include consideration of the effects of proposals on broader environmental values, including forests and waterways. Alternatives to drainage across riverain forests include on-farm disposal or re-use of the water in schemes such as irrigated agroforestry. The following guidelines refer to drainage schemes that could affect forest values.

Management Guideline

Drainage schemes

The adverse impact on forest uses and values of salinity mitigation and future water-regulation schemes should be minimised by:

- preventing disposal of drainage water into State forest unless there is an identified environmental benefit for the forest and this activity is prescribed in the respective Water Management Strategy;
- ensuring that new schemes do not dispose saline or waste water into State forest unless some environmental benefit can be gained for the forest and this activity is prescribed in the respective Water Management Strategy;
- monitoring current schemes that dispose saline or waste water into State forest and, if adverse effects on natural values are observed, undertaking remedial action.

ACTION

Participate in the development and implementation of Salinity Management Plans and Water Management Strategies to ensure their consistency with maintenance of forest values and uses.

4.4 CODE OF FOREST PRACTICES

The *Code of Forest Practices for Timber Production* (Code) provides minimum standards of environmental protection to be observed during commercial timber harvesting operations. Several of these standards are aimed at protecting water quality and aquatic habitat values. These include:

- retaining a buffer of riparian and other vegetation extending at least 20 m on either side of a permanent stream and around permanent springs, swampy ground, wetlands or other bodies of standing water;
- retaining a filter strip extending at least 10 m on either side of temporary streams and drainage lines;
- the suspension of timber harvesting operations during or following wet weather;
- standards for the design, construction, maintenance and rehabilitation of roads, tracks, bridges, log landings and log dumps.

For soils having low permeability and high potential for overland flow of water during storm events, the Code notes that the width of the buffer beside streams and other water bodies should be increased, and further extended for steep slopes on such soils.

Standards in the Code may be extended to provide enhanced protection for the environment through Regional Management Prescriptions or through the judgement of Forest Officers during the development of coupe plans.

Application of the Code of Forest Practices within floodplain forests

The provisions of the Code are directed principally at protecting the quality of water and aquatic habitat within streams and other water bodies by slowing and filtering water running off logging coupes. Application of the Code for the floodplain forests differs from other forested areas. The soils of the floodplains develop by deposition of sediment from the major watercourses during floods. The presence of sediment in streams is affected more by activities in the catchments than by activities on the floodplains themselves. The topsoils of the floodplains typically consist of silty clay which, if disturbed, would be expected to erode under circumstances of rapid run-off. However, on the floodplain flooding comprises 'run-on' from the watercourses rather than run-off and the low surface profile prevents rapid water movement during river flooding and recession.

Using the definitions in the Code to determine temporary streams, drainage lines and wetlands on the floodplain is a further complication. Wetlands on the floodplain comprise anabranches, lakes, billabongs and lagoons, effluent and confluent streams (see glossary various terms), flood runners (floodways), rushlands, grasslands and River Red Gum forests. Anabranches, lakes, billabongs and lagoons usually contain open water at minimum river flows. Numerous temporary wetlands may occur, depending on seasonal conditions, as runners and depressions fill with water. Indeed, the whole floodplain may be inundated at some time.

In mountain and foothill country, rainwater collects in drainage lines that converge across the landscape to form temporary steams which, in turn, converge to form permanent streams. According to the Code, drainage lines show evidence of the action of periodically flowing water and/or have channels of more than 30 cm deep with clearly-defined beds and banks. Riparian vegetation (which is different from that of the surrounding forest) may or may not be present. Equivalent features on the floodplain are the effluent and confluent streams. These are usually broad, with sharply defined channels that are often bared by the flow of water and their bordering vegetation is usually undifferentiated from that of the surrounding forest.

Local rainfall is not the major influence on water movement in the floodplain environment as it is in the mountain and foothill country. Effluent streams and runners are flood conduits that distribute water across the floodplain when the rivers achieve certain levels. During flood recession, the water moves off the floodplain via runners while the effluent streams, or others, act as confluent streams. Primary effluent (and confluent) streams carry water early (and late) in the flooding cycle. Runners branch and anastomose throughout the floodplain and carry water variously, depending on flood levels and whether the river is flooding or receding. Many support River Red Gum forest.

Regardless of the fundamental differences between the mountain and foothill country and the floodplains, application of the principles of the Code within the unique environment of the floodplain forests aims to protect water quality and the soil surface during timber harvesting activities. In practice, timber harvesting activities are not permitted where there is free water or saturated soil and are excluded from within 20 m of the water-line, wherever it may occur at the time of harvesting. Further, this Plan requires that the Regional Management Prescriptions identify 10 m filter strips on either side of effluent and confluent streams with sharply defined channels.

In accordance with the Code, within the 10 m filter strips:

- machinery must be excluded, except at agreed crossing points where soil disturbance must be minimised;
- trees may be felled, but care must be taken to direct them out of the strip;
- slash accumulation should be minimised;
- soil disturbance from the removal of felled trees should be minimised.

Table 4.1 indicates how the Code's prescriptions apply in River Red Gum forests.

Table 4.1 Application of the principles of the *Code of Forest Practices* within floodplain forests

Code of Forest Practices class	Code minimum requirement	Equivalent floodplain feature	Minimum requirement in floodplain forests
Stream Classes 1 and 4 Permanent streams or permanent springs, swampy ground, wetlands or other bodies of standing water (distinctive riparian vegetation)	20 m buffer	Main rivers and anabranches, lakes, billabongs and lagoons (maintain permanent open water at minimum river flows)	20 m buffer (measured from the distinctive riparian vegetation or current saturated zone)
Stream Classes 2 and 3 Temporary streams and drainage lines 0-20° slope (clearly-defined stream-bed and banks; obvious incision; distinctive riparian vegetation may or may not be present; carry water during wetter periods)	10 m buffer or 10 m filter depending on period of flow	Temporary effluent and/or confluent streams (sharply-defined channels; relatively deep flowing water, the direction depending on the flooding cycle; some overland flow in their immediate vicinity; distinctive riparian vegetation may or may not be present when wet)	In the absence of water a 10 m filter will apply to specific streams or stream sections, to be identified in the Regional Management Prescriptions

Buffers and filter strips will be defined in the FMA according to the above criteria. Other conditions may be placed on timber harvesting activities in order to protect specific values associated with some wetlands (Section 3.5).

In some cases, a gazetted public land water frontage reserve or forest management zone exceeds the minimum buffering required under Table 4.1. This Plan provides a 10 m wide SPZ on either side of primary effluent and confluent streams in State forest in recognition of their role in water management, faunal movement and of the potential for greater biological productivity in their immediate vicinity (Section 3.5). Additional measures include:

- a 30 m public land water frontage reserve which applies to both sides of the Goulburn River, Ovens River and Gunbower Creek;
- a 60 m public land water frontage reserve along the Murray River (in practice, the area protected in the River Murray Reserve usually exceeds this width);
- a variable-width SPZ bordering the Goulburn River (Section 3.6).

The scale of Map 1 prevents the display of the above buffers. However, Map 2 (at a scale of 1:25 000) provides an example of the extent of the public land water frontage reserve and forest management zones in part of the Gunbower State Forest.

ACTIONS

Apply the principles of the Code of Forest Practices for Timber Production in the floodplain forests as set out in Table 4.1 through the relevant Regional Management Prescriptions and Wood Utilisation Plans.

Ensure standard levels of protection are enhanced in the development of coupe plans where:

- ***erosion-prone soils occur within the coupe;***
- ***any other local conditions warrant an extension of standard prescriptions.***

Chapter 5
HARDWOOD PRODUCTION

The National Forest Policy Statement (Commonwealth of Australia 1992a), to which both Commonwealth and Victorian governments are signatories, sets out a strategy for ecologically sustainable management of Australia's forests. The Statement acknowledges the contribution that forest-based industries make to the national economy and regional and local employment. The focus of hardwood production from Victoria's State forests is to supply a sawlog-driven industry that produces value-added wood products within an ecologically sustainable forest management framework. Victoria's forest industry has an annual turnover of around $540 million, generating direct employment of over 4 000 people. Indirect employment is estimated at around 10 000 people. In 1999, the Victorian timber industry contributed around $1.8 billion to Victoria's total Gross State Product of $160.5 billion (NRE 2002).

NRE has adopted a commercial approach to its management of production State forest and current policies give strong support to value-adding utilisation of timber resources. Implementation of these policies will ensure resource security and provide for development and growth of a sustainable timber industry.

Goals and guidelines for the conduct of all commercial timber-growing and timber harvesting activities in Victoria are set out in the *Code of Forest Practices for Timber Production* 1996 (Code).

The Code requires that the harvesting of timber in a FMA be planned in accordance with Wood Utilisation Plans (WUP). WUPs are prepared annually and schedule the location and sequence of harvesting and the kind and quantity of logs to be harvested for the following three years. They are required to maintain the range of environmental values set out in the Forest Management Plan. Each harvesting operation is the subject of a Forest Coupe Plan, which specifies the area to be harvested, and the conditions under which the operation may proceed. Regional Management Prescriptions set minimum standards to be met by all licensed forest operators involved in harvesting operations.

Aims

Provide a long-term sustainable supply of hardwood sawlogs to the timber industry.

Maximise utilisation of sawlogs from timber harvesting operations while continuing to provide other timber products through integrated and silvicultural operations.

Apply silvicultural treatments and prescriptions that are environmentally and economically sound and which improve the overall productivity of the forest.

5.1 TIMBER SUPPLY

Since settlement in the 1840s, the River Red Gum forests along the Murray River have been extensively harvested to produce sawn timbers, railway sleepers, fencing timbers, firewood and fuelwood to power the paddle steamers of the Murray.

The main sawlog-producing species in the FMA is River Red Gum. The Mid-Murray FMA supplies about 80% of Victoria's red gum timber. The grey box woodlands in the Mid-Murray FMA were valued for their unique properties, but now commercial timber production is excluded from grey box stands in State forest. Sawlogs are processed in sawmills and the timber may be marketed as 'green sawn' or kiln dried; waste material is also sold. Timber products from the FMA include:

- *green sawn:* bridge, railway and fencing (posts and droppers) timbers, house stumps, guide posts and survey pegs and garden stakes. Railway sleepers and landscaping timbers may be produced in sawmills or at the stump and are cut from the heads of sawlog trees and from lower grade logs;

- *kiln dried:* furniture timbers, tongue and groove flooring, feature panelling and other appearance timbers;
- firewood, fence posts, poles and chips (for garden features or mulch), which are usually produced as by-products of sawlog and sleeper harvesting and milling operations, from residual trees and during regrowth management operations.

The unusual properties of River Red Gum and the box and ironbark species present unique opportunities for value adding. Obtaining the best use of the harvested wood and the maximum value to the State's economy are greatly assisted by marketing the wood by grade. This has lead to significant investment by the timber industry in seasoning kilns and the development of new wood products. It has also lead to the utilisation of wood unsuitable for sawlogs and sleepers for other products, such as landscaping timbers.

Four licensees have sawlog allocations from the River Red Gum forests of the FMA. Low grade (residual) logs are occasionally made available and may also be supplied to these millers and other licensees under a tender system. Sawmills are located in Benalla, Echuca and Koondrook and, although processing smaller volumes than other parts of the industry in the State, require a specialised workforce to account for the particular properties of red gum and its sawn products. The industry provides an important employment base for the smaller towns in the region.

River Red Gum also yields craft timbers, garden timbers and chips for landscaping purposes and, occasionally, charcoal for barbecues, industrial filters or cosmetics. Links with the historical uses of the forests have also continued in the use of red gum timbers in the construction and fuelling of paddle steamers. Many of the products use wood that might not otherwise be utilised following harvesting of sawlogs, and their production supports local employment.

Area available for timber production

The area of public land designated as State forest, and thereby potentially available for timber production, was established in accordance with the *Land Conservation Act 1970* and the *Environment Conservation Council Act 1997*. In the Mid-Murray FMA, State forest comprises 58 120 ha (Table 2.1).

The net available area is the area available for timber production, once exclusions are made for the Code, Special Protection Zones (SPZ), other forest stands protected by prescription (eg Yellow Box), land inherently unproductive of timber (eg grasslands), and areas that are inaccessible or of insufficient size to be commercial. The net available area of the Mid-Murray FMA consists of the River Red Gum forests (which generally equates to the Riverine Grassy Forest vegetation type listed in Table 3.1 and Appendix G) that occur in the GMZ and SMZ identified in this Plan. These amount to about 41 160 ha, or 25% of all public land in the FMA. Of the net available area, 28 730 ha is GMZ and 12 430 ha is SMZ, where implementation of management guidelines in accordance with this Plan may impose further constraints. The Statewide Forest Resource Inventory (see below) will determine the actual extent and indicate the relative timber productivity of stands within the net available area.

The implementation of current habitat tree prescriptions is estimated to lead to at least 24% of the area of each coupe in River Red Gum forests being occupied by retained trees. Retention of habitat trees at these levels effectively reduces the area of forest that is potentially available for commercial timber production in the GMZ by about 6 900 ha (about 36%), or approximately 4 400 ha in the SMZ. Habitat retention prescriptions for the Mid-Murray FMA are due to be reviewed within 12 months of the release of this Plan (see Section 3.4) and will be included in the Regional Management Prescriptions.

Barmah State Park and other public land

Commercial timber production is currently permitted, through an agreement under Section 25B of the *National Parks Act 1975*, in about 2 500 ha of forest in the Barmah State Park. Sawlog licenses expire in 2003. Until then, the agreement provides for up to 2 000 sleepers and 370 m^3 of sawlogs to be available from the Park each year.

Limited timber production is also permitted within the Loch Garry Wildlife Management Cooperative Area and in about 790 ha of the River Murray Reserve (managed by Parks Victoria). These areas have not been included in the estimate of sustainable yield for sawlogs. Under this Plan timber harvesting will be excluded from the River Murray Reserve in the Mid-Murray FMA.

Resource inventory

To forecast sawlog sustainable yield, the following information is required:

- the area available and suitable for sawlog production;
- the capacity of different parts of the forest to support sawlog trees (productivity class);
- the number (stocking), age and condition of the trees as indicators of existing and future (regrowth) resources;
- the growth rates of the trees within each productivity class under the relevant harvesting, regeneration and stand treatment system;
- the current volume of sawlogs.

The first assessment of the resources of Barmah Forest occurred in 1929/30. Silvicultural management of the forests commenced at about that time. That assessment identified relatively low volumes of trees of sawlog quality compared to the total merchantable volume (which included that in the smaller trees – 'growing stock').

In 1960/61 stands in Barmah Forest were classified, mapped and intensively assessed. That assessment identified a considerable increase in growing stock and total sawlog volume since the 1930s, notwithstanding that significant volumes were harvested in the intervening period.

During the late 1980s, assessments were again conducted in Barmah State Forest as well as Gunbower State Forest and the larger areas along the Goulburn River. Data from the 1980's assessments is described in Cuddy *et al.* (1993). Earlier assessments covered the forests along the Murray River upstream of Barmah and along the Ovens River. The current legislated sawlog sustainable yield and permitted levels of harvesting of sleepers from the FMA derive from these assessments.

Permanent Continuous Forest Inventory (CFI) sample plots enable systematic measurements of timber volumes and forest growth over time. Periodic measurement of trees in CFI plots in State forests of the FMA commenced in 1961. As this period commenced after the completion of most major river regulation structures, the data reflect the reduced growth rates caused by the altered flooding regimes.

The most timber-productive stands are usually associated with floodways and depressions that are regularly flooded and reliably drained, although some stands may be accessing groundwater (Appendix J). Before river regulation, some 75% of the more productive areas received regular flooding for a few months in 7½-8 years in 10 and the average diameter increment of the better class trees was said to be 0.76 cm per annum (Jacobs 1955). By 1983, growth rates had reduced to 0.25 cm per annum across a wide range of tree diameters. Successful long-term sustainable timber production from these forests depends upon near-natural flood regimes.

A new comprehensive inventory and assessment of timber resources, the Statewide Forest Resource Inventory (SFRI - Appendix I), recently commenced in the River Red Gum forests along the Murray River. When completed, SFRI data will be used to identify the relative sawlog productivity of stands within the River Red Gum forests and will be used to develop sustainable yield forecasts.

Management Guideline

Collection of timber resource information

When completed, the Statewide Forest Resource Inventory (SFRI) should be used to provide the basis of future timber resource information in the Mid-Murray FMA.

Continuous Forest Inventory Plots should be:

- maintained and remeasured at prescribed intervals;
- established strategically across the forest, including in thinned stands, to improve knowledge of forest growth after treatment;
- provide growth data that can contribute to SFRI and future sustainable yield forecasts.

Sustainable sawlog supply

The sustainable yield of sawlogs is the estimated rate of sawlog harvesting that can be maintained for a given period without impairing the long-term productivity of the land, taking into account the present structure and condition of the forest and predicted growth. It is determined from available resource data, management plans and existing sawlog utilisation standards. The sustainable yield rate for each FMA in Victoria is listed under the Third Schedule to the *Forests Act 1958*. The rate for the Mid-Murray FMA is set at 5 600 m^3 per year for all grades of sawlogs (NRE 1997a). This figure includes sawlogs from the Barmah State Park made available through an agreement under Section 25B of the *National Parks Act 1975* and which expires in 2003. The actual volume harvested from the FMA may vary annually in accordance with sawlog licence conditions but must be within specified limits over a supply period.

Legislatively, sustainable yield must be reviewed every five years (beginning in July 1991) when there is significant change in the available sawlog resource, or at any other time the Minister considers appropriate. A review of sawlog resources conducted in 2001, as part of the Licence Renewal Process, indicated that the estimated sawlog licence level is in the order of 5 200 m^3 per year. In accordance with principles outlined in *Our Forests, Our Future* (NRE 2002), sawlog licenses will be reduced to 5 200 m^3 per year.

Future reviews for the Mid-Murray FMA will use new data collected from CFI plots and the SFRI, and will take into account the forest management zoning scheme and management strategies set out in the approved Forest Management Plan.

Forecasting sustainable yield for the Mid-Murray FMA

Forecasting the long-term sustainable yield from forests managed under selection harvesting systems is complex compared with the process used for even-aged systems. This is because, with selection systems, a range of products is harvested at different times in the life of a stand, the forest comprises scattered small groups of trees displaying a range of ages, and the competition effect between trees and on regrowth is continuous, varying in intensity with the age and condition of individual trees and with site productivity.

Principles to be factored into a sustainable yield forecasting model for the Mid-Murray FMA include:

- the total number of potentially hollow-bearing trees across public land should not decline (in some locations the number may need to be increased);
- stand condition and overall forest structure must be consistent with sound silvicultural practices;
- available forest should be delineated and any harvesting constraints identified.

Railway sleeper production

Currently a maximum of approximately 25 000 railway sleepers may be made available each year from the FMA. The number of sleepers actually harvested in a year depends on the availability of the resource and the market. Licences are granted to registered cutters capable of producing acceptable quality sleepers with minimal waste. Twelve sleeper-cutters hold licenses in the FMA.

Table 5.1 indicates how timber production from the FMA is distributed between the main forest areas. Output from individual areas varies with time according to local circumstances and the factors outlined above.

Table 5.1 Timber produced from the main forest areas Mid-Murray FMA 2000/2001

Forest area	PRODUCT					
	Sawlog	Sleeper[1]	Residual	Post	Firewood (m^3 gross)	
	m^3 net	m^3 gross	m^3 gross	number	commercial	domestic
State forest						
Barmah	2 631	842	1 056	-	2 534	1 982
Gunbower, Guttrum, Benwell	972	1 169	1 074	-	1 450	4 280
Goulburn, Ovens, upper Murray	842	53	10	-	-	2 243
Killawarra	-	-	-	4 287	-	-
Total for State forest	**4 445**	**2 064**	**2 140**	**4 287**	**3 984**	**8 505**
Barmah State Park[2]	342	166	-	-	-	-

Notes:

[1] One cubic metre of unsawn log (gross volume) yields approximately 4.02 sleepers.

[2] Sawlogs, sleepers and minor forest produce may be harvested from the Barmah State Park in accordance with an agreement under Section 25B of the *National Parks Act 1975* (which expires in 2003).

Residual logs

Residual logs may become available as a by-product of sawlog and sleeper harvesting and regrowth management operations. They may be harvested under annual licence or tender from areas not required for production of commercial and domestic firewood. Residual logs do not meet current sawlog specifications in terms of either defect and/or size. They are utilised for a variety of products where short lengths are suitable and the appearance and strength of the timber are less important. Sale of River Red Gum residual logs in the Mid-Murray FMA has been by way of tender. A tender for up to 6 000 tonnes of residual logs was advertised in July 2000.

Fencing timbers

Fencing timbers are usually cut as a by-product during stand thinning operations aimed at maximising the future production of sawlogs or other higher value products.

Box and ironbark eucalypts are particularly durable and are used for a wide range of fencing applications. The Killawarra State Forest has been an important source of fencing timbers in the Wangaratta region for both commercial cutters and local farmers. The ECC Box-Ironbark Forests and Woodlands Investigation (ECC 2001) recommended that commercial timber production will be phased out from the Killawarra Forest.

Firewood and other wood products

Commercial and domestic licensees harvested more than 12 000 m^3 of firewood from public land in the FMA during 2000/2001 for supply into local and broader markets. Campers also collect large volumes of firewood from State forest, particularly from sites close to the Murray River. An estimated 5 000 tonnes is collected by campers from the Barmah Forest over the summer holiday period.

Under the auspices of ANZECC, a 'National Approach to Firewood Collection and Use in Australia' (ANZECC 2001) has been developed. Its aim is to ensure all firewood collection, including commercial cutting, is ecologically sustainable and not a major cause of loss and degradation of remnant and woodland ecosystems or the habitats of threatened species. A Victorian Action Plan for firewood collection and use will be prepared following public comment on the Firewood Strategy Discussion Paper (in preparation).

In the Mid-Murray FMA, firewood is made available under licence to commercial operators from the residual material produced from sawlog and sleeper harvesting and regrowth management activities. This enables firewood harvesting to be controlled in a sustainable manner and to minimise environmental impacts.

Management Guideline

Firewood harvesting and collection

Commercial and domestic firewood cutting or collection should:

- only be permitted in designated areas;
- occur in conjunction with forest management or production activities (such as timber harvesting or silvicultural operations, or other operations such as road works);
- be targeted at where it has the greatest potential to assist forest management objectives.

Commercial firewood cutting should be managed in accordance with the Code and Wood Utilisation Planning guidelines.

Information sheets should be issued with firewood permits outlining the location of designated firewood areas and conditions of collection.

Licensed firewood cutters should not be permitted to collect naturally fallen wood or to harvest dead standing trees.

In association with Parks Victoria, public education campaigns, particularly for campers along the Murray River, should be undertaken to:

- advise of the importance of woody debris for native fauna habitat;
- discourage the collection of wood from other than designated areas;
- encourage the use of appropriate campfires that conform to regulations and/or alternative fuel sources.

ACTIONS

Complete the Statewide Forest Resource Inventory for the Mid-Murray FMA.

Review the sawlog sustainable yield for the River Red Gum forests of the Mid-Murray FMA following implementation of the Forest Management Plan and completion of the Statewide Forest Resource Inventory.

Provide fencing timbers, firewood, residual roundwood and other wood products as by-products of sawlog harvesting or silvicultural activities according to the relevant guidelines.

5.2 HARVESTING AND REGENERATION SYSTEMS

Regeneration of River Red Gum forests

Large areas of River Red Gum forest, particularly along the Murray River, originate from the extensive regeneration events of the 1870s to 1880s. These probably resulted from a group of good flood years coinciding with reduction of Aboriginal burning practices and preceding the influx of grazing by domestic stock and rabbits (Jacobs 1955). Extensive harvesting activities in the mid-1800s would also have contributed. The current structure of the forests stems from these events, ongoing utilisation and stand improvement works, grazing by stock and rabbits, changed flood regimes and fire.

Successful regeneration of River Red Gum forests relies on a complex interaction of a range of factors including:

- availability of an adequate seed supply;
- a suitable seed bed;
- an appropriate water regime, which includes:
  - a flood event
  - an appropriate period and timing of flood recession (which depends, to some extent, on the nature of the recession; that is, whether it is by evaporation and/or drainage)
  - duration and depth of flooding in the season following germination
  - availability of moisture in the sub-soil
  - an adequate summer rainfall;
- a total grazing pressure by insects and native and introduced animals, including domestic and feral stock, that does not compromise seedling survival;
- low competition from overstorey trees and other vegetation.

Successful natural regeneration is therefore episodic and can be unpredictable, and the periods between regeneration events may be lengthy – up to 15 years or more, resulting in a series of even-aged stands. Success also depends on survival of the seedlings until they develop sufficiently to access reliable groundwater supplies.

As spring and summer rainfall in northern Victoria is too low to support reliable growth of River Red Gum, floods provide the necessary water. As discussed in Chapter 4, the distribution of floodwaters on the floodplain has changed since the 1930s as a result of water management. Some River Red Gum stands have died as a result of excess watering through uncontrolled agricultural drainage or frequent rain-rejection flows and the areas now support wetland vegetation, such as reedbeds. Others are now flooded less frequently, reducing the likelihood of favourable conditions for the successful growth of River Red Gum. Water management to mitigate the effects of excess water in parts of the forest and deficiencies elsewhere (Section 4.2) will assist in improving timber productivity.

Silvicultural systems

Silviculture encompasses the theory and practice of managing forest establishment, composition and growth. A silvicultural system is a planned program of management formulated for the life of a forest (or stand) – it includes tending, harvesting and regeneration.

Successful silvicultural systems in native forests should:

- ensure the long-term conservation of the ecosystem (at the forest level, this requires an age class structure adequately representing all key successional stages of the respective species);
- address the basic requirements of the tree species for establishment and growth;
- ensure adequate regeneration of the correct species mix;
- foster subsequent development of the forest stands;
- where it is an objective, maximise the yield of sawlogs;
- minimise environmental impact;

- incorporate social and economic considerations;
- protect regrowth from significant levels of damage caused by such factors as browsing and disease.

The Code sets out principles for the application of these systems in State forest.

The structure and density of forest stands determine the success of regrowth and stand productivity. Regrowth management considers options such as thinning and removal of overwood to reduce competition with the regeneration and to foster development of timber productive trees.

Aims

Maintain or improve the productive capacity of the forest through the use of silvicultural systems that are ecologically sustainable in both the maintenance of environmental values and in its use of natural resources, and which are economically viable.

Selection silviculture

Although large areas of River Red Gum forest in the FMA comprise even-aged regeneration originating from the late 1800s, subsequent harvesting patterns and restrictions on gap sizes have lead to the creation of a forest largely comprised of uneven-aged stands. This forest structure is maintained and promoted through the application of uneven-aged silvicultural systems. Selection cutting systems are employed in the FMA and range from single tree selection to group selection and can include stand thinning. A timber harvesting operation may consist of more than one silvicultural system depending on the structure and condition of a stand and the management objective.

Single tree selection

Single tree selection involves removal of individual trees from a stand, with their selection determined by the objectives for stand management and the timber products sought. Regeneration and survival of seedlings in such small gaps can be problematic because of competition from surrounding trees. However, regeneration is usually achieved through coppice and lignotuberous growth. Single tree selection is applicable in naturally uneven-aged stands and may be appropriate in some parts of the FMA.

Group selection

The most common silvicultural system applied in the forests of the FMA is described as 'group selection'. This comprises scattered fellings of either individual trees or small groups to produce gaps of sufficient size, generally less than a hectare, to enable seedling regeneration. As mature River Red Gum trees compete strongly for soil water, and trees surrounding a gap readily expand their roots and branches to occupy the site, the size and shape of the gap produced in a harvesting operation is important for successful establishment and growth of the seedlings.

Group selection is appropriate in the more productive River Red Gum stands and where seedling regeneration is more reliable. Under this system, a range of timber products may be harvested from an area of forest on cycles of between 10 and 30 years depending on stand structure, the growth of the trees in the period between harvests, and the products sought.

As timber harvesting produces many small sites requiring regeneration each year, provision must be made to regenerate them to prescribed stocking levels within a reasonable time. The Native Forest Silviculture Guidelines require stocking surveys in areas subject to regular flooding be undertaken 18 to 30 months after the first flood event following harvesting. Seedbed preparation and artificial seeding may be required to produce regeneration on some sites. Where consistent with other management objectives, the seedbed may be prepared through soil disturbance or by burning logging debris, in which case the intensity of the burn should be managed to minimise the potential for damage to retained trees. Preparation of the seedbed may also be timed to take advantage of natural seed fall in spring.

Although germination of River Red Gum seed is usually prolific in the floodplain forests, the longer-term survival of the seedlings is often compromised by a lack of water at the appropriate times. Harvesting and regeneration operations in River Red Gum forests and water management operations should be coordinated to foster establishment and survival of seedlings and subsequent growth.

Management Guideline

Application of silvicultural systems

The application of silvicultural systems in a stand should consider:

- the management objectives for the stand;
- the basic requirements of the tree species for regeneration and growth;
- the current condition of the stand;
- the impact of past timber utilisation practices and events such as fire and disease;
- natural and planned flooding events;
- the requirement for protection of wildlife habitat (in accordance with prescriptions for habitat retention) and other environmental values;
- the products required from current and subsequent harvests;
- supervision and harvesting costs;
- operator safety.

The harvesting and regeneration system may be modified consistent with the Code and this Plan where other values must be maintained. Stand management objectives should be recorded in the forest coupe plan.

The group selection silvicultural system should be used:

- in the General Management Zone and may apply in Special Management Zone where consistent with management objectives;
- on medium to high productivity sites;
- where regeneration can be reliably and economically achieved having regard to likely flooding frequency and duration and the adequacy of seed crops;
- in stands where future thinning operations are likely to be feasible.

The size and shape of patches in group selection systems will depend on the structure and composition of the stand. Patch size should be kept as small as silviculturally and economically feasible and should generally be no more than one hectare in size.

The single-tree selection silvicultural system may be applied:

- on lower productivity sites in the General Management Zone;
- where appropriate in the Special Management Zone.

Only under exceptional circumstances should the seed-tree silvicultural system be applied in the River Red Gum forests (such as salvage operations after a large scale fire).

Harvested areas should be regenerated with species native to the site, in accordance with the Code.

Monitoring of regeneration and stocking should be conducted in accordance with Native Forest Silviculture Guideline No. 10 (NRE 1997d). Site preparation should be conducted in accordance with Native Forest Silviculture Guideline No. 6 (NRE 1998a). If regeneration is unsatisfactory, sites should be treated to ensure adequate stocking.

Guidelines and processes prepared by the Box Ironbark and Red Gum Research and Development Action Group (BIRGRDAG) should be applied.

Overwood management

Maximising future sawlog production from forests requires a silvicultural program that:

- ensures early and adequate post harvest regeneration of the stand;
- minimises competition for light, water and nutrients created by unmerchantable trees;
- maintains stands throughout all stages of their development at stocking levels that optimise wood production on those trees with the potential to produce sawlogs.

Past logging and regeneration practices, changed fire regimes and changed flooding regimes have resulted in over stocking of some stands and under stocking of others. To achieve the sawlog productive potential of these stands, management be directed towards achieving optimal stocking. This may involve thinning of regrowth stands or removal of overwood trees not required for habitat purposes.

Overstorey trees (overwood) may affect nearby regrowth through a range of factors that include the size and condition of their crowns and their proximity to the regrowth, the tolerance of the species to competition and the quality and characteristics of the site. The strong competition for soil moisture by mature trees means that the zone of their influence on seedling establishment and vigour is large. The effect seems to be greater on woodland and low quality forest sites than in high quality forest sites and, for a given site, greater where the mature tree has a healthy vigorous crown (Florence 1996). Opie (1969) described the effects of large mature River Red Gum on the development of regrowth and noted that the affected area increases with increasing tree diameter and with decreasing site quality. The radius of this zone around each tree will be between 1.7 to 3 times the radius of the tree's crown, depending on the vigour of the tree and the availability of site resources (Bassett and White 2001) and the intensity of its effect diminishes with distance from the tree.

Habitat trees retained in accordance with the guidelines for tree retention (current at the time of printing) are estimated to occupy at least 24% and up to 36% of a stand. It is important that a balance is achieved between the aim to maintain timber productivity of the forest, particularly in the GMZ, with the commitment to provide adequate levels of habitat for arboreal fauna. This is an important consideration in the review of prescriptions for habitat retention, as discussed in Section 3.4. Reducing competition by falling or otherwise treating unmerchantable trees in timber production areas improves the growth of the remaining trees and may provide suitable conditions under which regeneration can occur. Assessment on a coupe basis of the effects of overwood competition on regrowth and productivity would build on research by Bren (2001) to help refine future prescriptions.

Management Guideline

Overwood

Overwood treatment should be conducted in accordance with the Native Forest Silviculture Guideline for treatment of non-merchantable trees (NRE 1999b).

Overwood may be treated as required to improve timber productivity and structural diversity where:

- the trees are not required for other management purposes such as retention of habitat trees (according to prescriptions);
- the site is capable of producing commercial quantities of sawlogs.

Unmerchantable trees selected for overwood treatment should be considered on a site-by-site basis as to whether these trees should be felled or left standing for habitat value.

Overwood treatment operations should be included in the Wood Utilisation Planning (WUP) process.

Thinning

In order to improve or maximise future sawlog production from young forests, management techniques such as thinning can be used.

Thinning involves removal of some trees from a stand to make more of the site's resources available to those trees selected to be retained. Thinning does not aim to establish regeneration, but to concentrate future growth of a stand onto selected trees.

Thinning treatments can be 'pre-commercial', in which no merchantable timber products are harvested. Such treatments are sometimes carried out in younger stands. Thinning of older stands can yield commercial wood products (such as small sawlogs, sleepers, posts, poles and firewood) while maximising growth on trees retained for the future production of sawlogs. Techniques described in the Native Forest Silviculture guidelines for thinning of mixed species regrowth (NRE 1997f) provides useful information for planning and implementing commercial and pre-commercial thinning operations in Red Gum forests.

Management Guideline

Thinning operations

Thinning treatment should be directed to regrowth stands on the more productive sites to optimise the growth of sawlogs.

Commercial markets should be sought for wood produced during thinning operations.

The relevant prescription for habitat retention will apply.

Thinning operations should be included in the Wood Utilisation Planning (WUP) process.

Salvage

Events such as wildfire, wind storms or disease may kill or damage large areas of forest. Timber salvage operations may be implemented in the GMZ and SMZ to recover valuable timber resources and to replace damaged growing stock with productive stems following such events. Generally, wildfire is unlikely to permanently destroy the values of the SPZ and salvage would not be proposed.

Salvage harvesting is subject to preparation of a salvage plan in accordance with the Code and Wood Utilisation Planning guidelines which considers environmental and cultural values as well as the urgency in recovery of any merchantable timber.

ACTIONS

Coordinate coupe scheduling with water management programs to facilitate adequate regeneration and development of productive River Red Gum stands.

Apply the appropriate silvicultural systems and implement overwood and thinning programs in accordance with:

- ***the Code of Forest Practices for Timber Production;***
- ***the Management Guidelines for the application of silvicultural systems;***
- ***Native Forest Silviculture Guidelines.***

Undertake stocking surveys in harvested areas and any necessary remedial works in accordance with relevant guidelines.

Support research into mitigating the deleterious effects of water management and the impact of overwood on timber productivity.

Chapter 6
OTHER FOREST USES

6.1 GRAZING

Most areas of forest in the FMA have been used for grazing of domestic stock more-or-less continuously since European settlement. Currently, more than 68 000 ha of public land in the FMA is licensed for stock grazing, providing supplementary income for around 300 farmers and forage for about 6 000 head of cattle. Cattle are the preferred type of stock on the floodplain forests because they are less selective, do not graze as close to the ground and are less likely to inhibit tree and shrub regeneration than sheep.

Depending on land tenure, grazing licences may be issued under either the *Land Act 1958* or the *Forests Act 1958*. Grazing in State forest in the FMA is authorised and managed under either annual licence or, in the cases of Barmah State Forest and the bulk of Gunbower State Forest, agistment permit. Licences usually specify allowable stock numbers and requirements for stock control and pest plant and animal control.

Aim

Provide grazing access consistent with the conservation of biodiversity and cultural management goals for State forest.

Environmental impacts of grazing

The effects of excessive grazing pressure on plant species diversity and other values are documented in Chesterfield *et al* (1984), Wilson (1990) and Harrington *et al* (1984). However, the extent of the combined impacts of introduced and native herbivores requires further examination. These effects may include:

- replacement of perennial plants by annuals. The invading plants are typically introduced species;
- reduction in the distribution of relatively palatable and short lived shrubs and an increase in unpalatable species;
- competition for the food resources of native fauna;
- simplification of habitat and reduction of foraging, nesting and roosting opportunities for many animals, including waterbirds;
- introduction and spread of pest plants in cattle dung. Soil disturbance by cattle can also provide a suitable surface for establishment of pest plants (Section 7.2);
- pugging of the soil and road surfaces. On wetland margins, this affects the feeding and breeding opportunities of aquatic fauna and sometimes leading to an increase in turbidity and sediment loads in water bodies. Trampling and pugging may also impact on the habitat of some reptiles;
- either an increase or decrease in fire hazard. Stock can reduce the fire hazard by trampling and browsing long dry grass and other fine fuels. On the other hand, selective grazing may favour an increase in less palatable and flammable native species or invasion by flammable weed species, and thereby increase the fire hazard of the understorey (Section 7.1);
- damage to Aboriginal cultural sites (Chapter 8).

Many of the observed adverse impacts occurred in the past when less controls were in place, but there are few areas from which grazing has been excluded for a sufficiently long period to serve as a reference for current impacts.

It is the combined impact of native herbivores, pest animals, and feral and domestic stock that comprises the potential threat to natural systems, particularly where grazing is continuous. Even relatively few animals can degrade fragile habitats such as wetlands or beside watercourses, or where they congregate, such as on the ridges when floodwaters force the animals to higher ground. Grazing pressure peaks during drought and on the dry sites during extended periods of flooding.

If the total grazing pressure is severe, the changes can be irreversible. However, moderate or light grazing may involve only minor differences in the relative abundance of the component species and the plants and stock assume a dynamic balance that may be managed over time (by adjusting grazing pressure) without obvious long-term detriment.

Management of grazing in State forest

Grazing by stock is permitted in the floodplain forests of the FMA where it does not compromise forest values and in the adjoining River Murray Reserve and Barmah State Park (both managed by Parks Victoria). It may continue in some areas of SPZ provided it does not compromise the particular values of the zone.

Fencing on the floodplain is often impractical because frequent submergence in water and movement of large debris through floodwaters causes damage to fences.

Management of grazing involves controlling the timing, period, frequency and intensity of grazing to achieve specific outcomes and is achieved through manipulation of the numbers of stock and their movement. The principle behind grazing management on public land is that adjustments to stocking numbers should be based on the condition of the ecosystem rather than the condition of the animals and that the composition, structure and functioning of the system should be recoverable once grazing is removed. Sampling the survivability and regeneration of the range of native plant species used as forage or a measure of the total biomass of forage species may be used as indicators of the pressure or permissible levels of grazing.

Fundamental to the management of grazing in State forest in the FMA will be the development of objective criteria for assessing the ecological condition of the grazing areas, the ability to manage the grazing pressure on environmentally or culturally sensitive areas or exclude grazing where necessary and a process of review. The criteria and processes described in SFNSW (2000) should be used as a guide (Appendix O).

Management Guideline

Grazing

Management of grazing in State forest should:

- be subject to licence conditions and guidelines;
- minimise grazing impacts on water, soil, flora, fauna, cultural, recreational and landscape values and infrastructure;
- be based on maintaining or enhancing natural ecosystems and minimise off-site impacts;
- encourage grazing licensees to use stock management practices that avoid the introduction and proliferation of pest plants in the forest;
- prohibit supplementary feeding of stock in State forest except under exceptional circumstances with the written approval of the NRE Regional Manager;
- consider the reintroduction of stock to an excluded area if the grazing is to achieve specific ecological or fire protection goals, with the approval of the Senior Forester.

The construction of boundary fences between private land and State forest should be encouraged.

Grazing management strategies should be developed in consultation with licensees. Each strategy should address:

- limits to stock numbers based on ecological conditions and the period and duration of grazing;
- regeneration of native vegetation and protection of regrowth following timber harvesting;
- rehabilitation of sites degraded by past grazing;
- any fencing requirements;
- criteria to assist NRE and licensees to monitor the environmental impacts of grazing, including impacts on fine fuels in relation to fire management;
- modification of grazing strategies to protect areas of high conservation (such as wetlands – see 3.5);
- pest plant and animal control on the licensed areas.

Management of grazing in State forest adjacent to Barmah State Park and the River Murray Reserve should be coordinated with Parks Victoria.

A number of areas of State forest included in SPZ are not licensed for stock grazing. These include the Appin and Benjeroop State Forests, Reedy Lagoon on Gunbower Island, north of Kanyapella (SPZ 103/03) and several areas along the Goulburn River, such as near Kotupna.

This Plan identifies several additional areas of high conservation value in State forest (see Table 6.1 and Map 1) where licensed grazing is to be reviewed as a priority, in consultation with licensees, with a view to its modification or, if necessary, exclusion. These include areas of particular value for Squirrel Glider along the Goulburn and Ovens Rivers (primarily zoned SMZ) which may require temporary withdrawal from stock grazing until native vegetation, particularly Silver Wattle, has sufficiently re-established. Control may also be required over the movement of stock in the vicinity of popular recreation areas along the Murray River to avoid inconvenience or hazards to visitors. Relevant licensees will be consulted to minimise any impact on their enterprises.

Table 6.1 Areas within which licensed grazing is to be reviewed as a priority

Site number[1]	State forest area (ha)	Locality	Zone	Main vegetation type
GUNBOWER STATE FOREST				
106/30	4000	Gunbower south (associated with River Murray Reserve)	SPZ	River Red Gum, Grey Box, Black Box
BARMAH STATE FOREST				
105/04	92	Goose Swamp	SPZ	Black Box
105/26	102	Long Plain & Waiting Plain	SPZ	Grey Box, Buloke
105/28-29	253	Grinters Ridge & Cherry Tree	SPZ	Grey Box, Yellow Box
105/30	63	Tongalong Ridge	SPZ	Grey Box, Buloke
GOULBURN RIVER STATE FOREST				
part 103/01,	1814	downstream of Shepparton	SPZ	River Red Gum, box species
part 103/02,			SMZ	
103/05		(Cooma Bend)	SMZ	
103/04	90	Bunbartha Creek	SPZ	Grey Box
OVENS RIVER STATE FOREST				
part 118/01	42	Peechelba	SMZ	River Red Gum, box species
part 118/01	140	near Killawarra	SMZ	River Red Gum, box species

Note:

[1] Site numbers are those indicated on Map 1 and listed in Appendix D. Although the modification of stock grazing is associated with many of the sites indicated on Map 1, it is not necessarily restricted to the boundaries of those sites.

ACTIONS

Permit existing licensed grazing to continue in State forest in accordance with standard licence conditions and guidelines and where it is consistent with other forest management objectives.

Encourage research into the combined impacts of introduced and native herbivores on native vegetation and fauna, particularly the impacts on vegetation communities that are threatened or of limited extent, and on the control of fine fuels in relation to fire management. Research should commence within two years of the release of this Plan.

Review current grazing licences and develop a grazing management strategy for each licensed area, in accordance with the grazing Management Guideline and the priority set in Table 6.1. The review of priority areas listed in Table 6.1 should be completed within 12 months of the release of this Plan.

In conjunction with Parks Victoria, and in consultation with the respective agistees, develop a grazing management strategy, which addresses similar matters to those outlined in the conservation guideline above, for each area under agistment.

Establish a program to monitor the effectiveness of the grazing strategies and review the grazing strategies as required to incorporate relevant data arising from research.

6.2 APICULTURE

The forests of the FMA are a major source of nectar and pollen for the apiculture (bee keeping) industry. River Red Gum, which produces an abundant but intermittent nectar flow, is a source of particularly good quality honey, Grey Box produces honey of excellent flavour while Black Box is one of the best bee forage trees.

Some studies suggest that honeybees may both adversely and positively affect native ecosystems (Paton 1996), although the magnitude of these effects has not been evaluated. Competition for resources such as nectar and pollen by introduced honeybees may result in displacement of native fauna, causing a long-term decline in native pollinator populations. The occupation of tree hollows by feral honeybees is of concern in this and other parts of the State where the supply of hollow-bearing trees is limited. Potential effects on native flora species include hybridisation of plant species, inefficient pollination and the enhancement of seed production of a number of native plants whose native pollinators have declined substantially. Large bee populations may also interfere with recreational activities by creating a nuisance for picnickers and campers.

Aim

Continue to provide access to State forest for bee keeping while minimising any adverse impact on other forest values.

Apiculture is consistent with the broad management of State forest, provided care is taken with the location and management of bee sites. There is no general requirement to exclude beekeeping from SPZ and all existing sites will continue to be available unless specific conflicts with the values of the SPZ become apparent. Applications for the establishment of new sites within SPZ will be considered where the protected values will not be compromised by the presence of large numbers of bees or associated apiary management activities. It would be inappropriate, for example, to permit new apiary sites to be located in the vicinity of the breeding sites of a threatened species.

Access to sites in public land for bee keeping is controlled by annual licences and temporary (three or six month) permits, issued under either the *Forests Act 1958* or the *Land Act 1958*. The strategies in this Plan have been developed in accordance with NRE policy 21.5PL - *Apiculture (beekeeping) on Public Land* (NPS 1995).

Apiary licences and permits allow access to a site for locating hives and, usually, exclusive access to forest nectar and pollen resources in a radius of 1.6 km from annual sites or 0.8 km from temporary sites. Annual licences are usually automatically renewed subject to the licensees' compliance with licence conditions and, as they may be transferred from one licensee to another, are often called 'permanent' licences. Temporary permits enable licensees to capitalise on prolific flowering seasons while ensuring orderly and efficient utilisation of the resource. The locations of all sites are pre-determined, with 82 sites available under annual licence in the FMA and 67 temporary sites.

A range of forest and water management activities may impact on bee keeping and access to bee sites. Smoke and heat from fuel reduction or site preparation burning, for instance, may kill foraging bees and damage buds and flowers required for nectar. NRE endeavours to coordinate burning activities with the use of forest areas by beekeepers to minimise conflict.

Large bee populations may cause concern to visitors to the forests. NRE avoids licensing sites in the vicinity of recreation areas, particularly during periods of heavy public use. In accordance with NRE prescriptions, no bee site may be located within two kilometres of reference areas scheduled under the *Reference Areas Act 1978*.

Management Guideline

Apiculture

Effective and regular liaison with bee keeping industry organisations should be maintained.

The current level of access to the forest to beekeepers should be permitted where the activity remains compatible with forest values and management objectives.

Bee keeping activities should not conflict with the purpose of forest management zones. Where there is conflict, sites should be relocated progressively over time in consultation with the licensees.

Bee sites should not be established within 2 km of the Top Island Reference Area (located in Barmah State Park adjacent to State forest), 500 m of developed recreation sites or 40 m of major visitor routes (Chapter 9).

Bee sites should be allocated to designated areas permanently identified in the field. Those under annual licences should be located not less than 3.2 km apart; those under temporary permits should generally be located not less than 1.6 km apart.

New temporary sites may be established as required based on site inspections, which consider (at a minimum):

- Departmental Policy No. 21.5PL – *Apiculture (beekeeping) on Public Land* (NPS 1995);
- the general suitability of the site and its proximity to other annual or temporary sites;
- fire protection requirements;
- the standard of access to the site and the cost of maintaining access;
- the breeding and habitat requirements of threatened species within the general area;
- the need for a suitable cleared area for the location of hives.

A degree of overlap between sites may occur if there are no management impediments, and if the affected licensees consent.

Licensees should be consulted when timber harvesting, fuel reduction burning, water management or other forest management activities may affect their sites, or when sites must be relocated.

ACTIONS

Permit apiculture to continue in State forest in accordance with standard licence conditions and the above Management Guideline and where it is consistent with other forest management objectives.

Continue to mark all bee sites for annual licences and temporary permits for apiculture in the field as an aid to location and management.

Encourage research aimed at investigating the creation of colonies of feral bee, their activities and at the removal of colonies of feral honeybees from key areas of native forests.

6.3 MINING AND EXTRACTIVE INDUSTRIES

Sand, rock and minerals are extracted from only a few public land sites in the FMA. While supplies of hard rock are scarce in the area, sand is relatively abundant. Pits on both public and private land exploit the sand resources of relict stream courses and lunettes on the floodplain. Sand pits are located in the Barmah, Benwell and Guttrum State Forests. Sand is also sometimes extracted from the beds of the major rivers under conditions that seek to ensure its removal does not detrimentally affect riparian values (Cuddy *et al.* 1993).

Under the *Mineral Resources Development Act 1990*, access to State forest for exploration and mining requires a licence and approval of a Work Plan by Minerals and Petroleum Victoria (a division of NRE). Mining Work Plans include rehabilitation plans, and are approved only after consultation with the relevant land management agency. Exploration Work Plans do not require rehabilitation plans, but are subject to a set of conditions that include rehabilitation measures. Local government planning scheme approval of mining activities is usually required except where an Environmental Effects Statement has been prepared and approved.

Extractive materials include rock, gravel, sand, clay and soil. All extractive sites in State forest, both private and NRE managed sites, are authorised under the *Extractive Industries Development Act 1995* and are subject to the consent of, and any conditions specified by, the Secretary of NRE.

Mining and extraction of sand or stone are comparatively minor industries on public land within the FMA and, in many instances, suitable alternative supplies of sand and stone are available from private land. Sand is extracted from only a few sites on State forest but the effect of each operation on the immediate site and its surroundings is often significant, particularly where large areas remain cleared of vegetation for extended periods. The combination of the dry climate and comparatively poor soils in the FMA increases the need for prompt and effective site rehabilitation to hasten the return of native vegetation and to minimise the visual impact of the mined areas.

Some forms of mining and extractive industries can effectively preclude other potential uses from the affected area of public land. Poorly situated or managed operations may degrade Aboriginal Places or other forest values such as landscape or geomorphological features, and may cause soil erosion and siltation of streams.

Aims

Provide for mining and exploration in State forest in accordance with the* Minerals Resources Development Act 1990*.

Provide for the controlled use of other non-renewable resources such as sand and gravel in accordance with the* Extractive Industries Development Act 1995*.

Minimise the impact of exploration, mining or extraction activities on State forest values.

Management Guideline

Mining and extraction activities

Operational and rehabilitation requirements and approved work plans for all exploration, mining and extraction activities should effectively protect forest values, particularly those identified in the SPZ and SMZ. At a minimum these should address:

- biodiversity conservation;
- protection of catchments and streams;
- impacts on forest recreation and tourism;
- impact on sawlog resources;
- impacts on cultural and landscape values;
- management and maintenance of forest roads;
- rehabilitation and revegetation of affected sites;
- pest plant and animal control.

Extractive activities in State forest should be limited to

- the provision of material for the maintenance of forest roads and other forest management operations;
- only those private or commercial uses where the resource cannot feasibly be obtained from private land;
- sites and operations that conform to the *Extractive Industries Development Act 1995*.

The conditions to be applied should take account of the potential environmental and other impacts of the proposal, including impacts on the values to be protected under the zoning scheme set out in this Plan.

No new extractive activity will be permitted within the SPZ, unless it will significantly contribute to the regional economy, and unless the values within the SPZ can be maintained or be provided elsewhere.

NRE's management of extractive activities should be in accordance with a work plan which details proposed access, drainage, overburden storage areas, excavation area and rehabilitation and public safety measures.

Disused quarries and gravel pits should be progressively rehabilitated.

ACTIONS

Seek to ensure that identified forest values are effectively protected during exploration, mining and extraction activities through application of the Management Guideline above.

Progressively rehabilitate disused extraction sites managed by NRE.

6.4 OTHER OCCUPANCIES OF STATE FOREST

State forest may be leased or licensed for a range of public and private uses. These include buildings used for private or community purposes, rubbish tips, or for utilities such as power lines, communications facilities and water or gas pipelines.

Most licences are for a particular use and issued on an annual basis. Leases that provide for exclusive occupancy are generally issued for a longer period, with rent paid annually. All occupation licences or leases are subject to conditions that aim to ensure that management of the occupancies is appropriate for public land.

A number of licences or leases for occupations and utilities exist for areas of State forest within the FMA.

Aim

Regulate the private and institutional occupation of State forest to those uses that are dependent on access to State forest, conform to environmental standards and provide a high level of public benefit.

Rubbish tips for small settlements have traditionally been located in nearby public land because it was regarded as a convenient and low cost source of land. Rubbish tips may be fire and litter hazards and may intrude on natural landscapes.

Overhead cables and telecommunications towers used for power supply and communications require permanent clearing of vegetation from the easement or site and are visually intrusive. A code of practice developed under the *State Electricity Act 1958* defines clearing standards for powerlines. Installation of underground telecommunication cables causes temporary site disturbance but vegetation is usually allowed to grow back over the cable alignment.

The juxtaposition of public land with most permanent rivers and streams means that, by necessity, many pump houses and pipelines are located on public land. NSW procedures ensure that applicants for new structures along the Victorian bank of the Murray River are referred to the relevant authority (usually NRE) for comment.

A related issue concerns the impact of residential development in the vicinity of public land boundaries. In some areas, particularly around Echuca, developments have restricted public access to sections of the public land (Crown land) water frontage.

Management Guideline

Occupancies and utilities

Proposals for private or institutional occupation of State forest may be considered following assessment to ensure that the proposed use:

- does not substantially conflict with conservation, forest production or recreation objectives;
- cannot feasibly be located on freehold land;
- contributes to the management of State forest;
- provides a public benefit that outweighs social or environmental cost.

Rubbish tip sites on public land should be rehabilitated and revegetated by the users when operations cease. No new rubbish tips should be established on State forest.

No new easements or telecommunication sites should be permitted in the SPZ or SMZ if they would conflict with forest values.

Pump-houses and pipelines should be shared where feasible.

New pumping facilities should be located on flat ground away from stream banks.

The aesthetic impacts of pump-houses should be minimised by ensuring they are visually unobtrusive and are constructed with noise-reducing materials to the minimum necessary dimensions.

ACTIONS

Assess current licences, leases, and any new applications for further tenure, to determine if they meet the above Management Guideline.

Liaise with municipal authorities to ensure new developments do not restrict public access to sections of Crown land water frontage.

Chapter 7
FOREST PROTECTION

7.1 FIRE MANAGEMENT

Wildfires are an ever-present danger during the summer and autumn in south-eastern Australia. In hot, dry conditions fires have the potential to develop quickly. However, most fires in the FMA are controlled while they are still small. Fire may also be used as a tool to prepare seedbeds for forest regeneration, to manipulate plant and animal habitat, and to reduce fuel loads as an aid to the control of wildfire, particularly close to townships.

Fire management on public land in Victoria is governed by the *Forests Act 1958*, *National Parks Act 1975* and accords with the *Code of Practice for Fire Management on Public Land* (CNR 1995a). Specific fire-protection strategies for the Mid-Murray FMA are detailed in Fire Protection Plans for the Shepparton District and Bendigo Region.

Section 62(2) of the *Forests Act 1958* requires NRE to "carry out proper and sufficient work for the prevention and suppression of fire in every State forest, national park and on all protected public land".

Aims

Ensure that management strategies established in this Plan and the respective fire protection plans covering the FMA are complementary.

Ensure that fire-protection strategies consider ecological values in conjunction with the requirement to provide adequate protection of adjacent landholders and forest assets.

Before European occupation, Aboriginal populations in the Murray Valley were relatively dense and there was regular light burning of the floodplain forests (Margules *et al.* 1990). During the past 150 years, the timing, frequency and intensity of forest fires have changed. In carrying out its statutory duty, NRE also imposes a fire regime that differs from that which prevailed originally. Active suppression of naturally occurring fires has reduced fire frequency in some areas. Elsewhere, for instance in the riverine environment, visitors have increased the incidence of fires, but suppression efforts tend to minimise the areas burnt.

A key element of Fire Protection Plans is a fuel-management strategy based on five zones.

Zone 1 - asset protection - provides the highest level of strategic protection to human life, property and important assets and other values on public land. This Plan has sought to minimise overlap of the SPZ and SMZ and this zone.

Zone 2 - strategic fuel reduced corridors - provides strategic corridors of sufficient width and continuity to provide a substantial barrier to the spread of wildfire.

Zone 3 - broad area fuel reduced mosaic - provides an irregular mosaic of areas of fuel reduction which complement works in Zones 1 and 2 in reducing the severity of wildfires.

Zone 4 - specific flora and fauna management - is defined where prescribed fire is required for the active management of the habitat of specific species or communities of plants and/or animals and where the broader objectives of the other strategic zones are considered inadequate. This may be the case, for instance, where fire may be required to encourage the regeneration of Silver Wattle as part of the process of improving habitat for Squirrel Glider.

Zone 5 - exclusion of prescribed burning - prescribed fire is excluded from areas of vegetation in which there would be a high potential for economic, ecological or cultural loss if they were subject to fire.
Fuel-reduction burns are undertaken in Zones 1, 2 and 3 to maintain fuel to defined hazard levels in strategic locations. This strategy is designed to help protect life, property and public assets while taking into account environmental, economic and social factors. Fires usually burn at a lower intensity in fuel-reduced areas than in areas carrying higher fuel levels, and assist in making fire suppression safer and more effective.

Fire may be used to control some pest plant infestations. However, frequent fuel-reduction burning may adversely affect certain biological values or kill young regrowth resulting from previous fires or timber harvesting. River Red Gum can tolerate only low-intensity fires; therefore, fuel-reduction burning on the floodplain is confined to strategic locations near settlements and assets (Zone 1 - asset protection).

Interim Guidelines and Procedures for Ecological Burning on Public land in Victoria (Fire Ecology Working Group 1999) have been established to provide a consistent understanding and approach to planning and implementing ecological burning programs amongst Victoria's public land managers. The guidelines outline key information, standards and planning procedures required to carry out prescribed burns for ecological management and for the monitoring and reporting of outcomes. Although no ecological burning is undertaken in the Mid-Murray FMA, Melbourne University, in collaboration with the Goulburn-Broken CMA, is investigating the feasibility of using fire to prevent and reverse the encroachment of River Red Gum onto Moira Grass plains.

ACTIONS

Carry out fire protection and management works in accordance with the respective strategic fire protection plans covering the FMA and associated fire operations plans.

Investigate the ecological value of fire in floodplain forests.

In reviewing Fire Protection Plans and Fire Operations Plans, consider:

- ***strategies for protecting high quality timber stands, particularly advanced regrowth and thinned areas, from wildfire;***
- ***the appropriateness of fuel-reduction burning within high quality timber stands;***
- ***strategies that consider the ecological values of the SPZ;***
- ***strategies for protecting important cultural values from wildfire;***
- ***the purpose and objectives of the forest management zoning scheme established in this Plan;***
- ***timing, distribution, intensity and extent of burn within fuel-reduction burning zones.***

Permit other activities in areas defined as Zone 1 in the Fire Protection Plans where they do not significantly affect the management objectives of the zone.

7.2 PEST PLANTS AND ANIMALS

Plants and animals are considered as pests in the management of public land where they impact adversely on the biological, productive and/or aesthetic values of natural ecosystems. Pest plants compete for resources of native plants and can reduce their health, vigour and regenerative capacity. Changes in vegetation composition through invasion of pest plants may result in associated loss of native wildlife habitat. Pest animals disrupt natural ecosystems through competition for resources, predation on native species, or by grazing native plants and disturbing soil. Soil disturbance through grazing or burrowing can lead to erosion and allow invasion by pest plants on susceptible sites.

Weed and disease-dispersal mechanisms and pest animal territories cross land management boundaries. Control efforts on one parcel of land may be ineffective if infestations on adjoining land remain untreated. Effective control of pest plants and animals must be independent of whether the land is State forest, park or private land and involves cooperation between managers of all neighbouring lands. Group pest control schemes result in better success and yield greater benefits to the community.

NRE monitors pest infestations and control programs using the Integrated Pest Management System (IPMS), a computerised database (Backholer 2001). This system supports:

- preparation of pest management plans;
- allocation of resources and the implementation of control programs;
- monitoring the effectiveness of control programs.

Two Acts direct pest control in State forest:

- *Catchment and Land Protection Act 1994* provides for the classification of weeds and pest animals and for their eradication or control. It also establishes a system of community consultation through Catchment Management Authorities, which prepare Regional Catchment Strategies.
- *Flora and Fauna Guarantee Act 1988* lists predation of native wildlife by cats and foxes and invasion of native vegetation by environmental weeds as potentially threatening processes.

The *National Forest Policy Statement* (Commonwealth of Australia 1992a) calls for forest management agencies to monitor and appropriately control the threat to publicly-owned native forest ecosystems posed by feral animals, exotic plants, pests and diseases. Consistent with this, the *Code of Forest Practices for Timber Production* (NRE 1996a) requires that forests be 'protected from the introduction of and spread of pest plants and animals, including plant diseases and insect pests, and managed in a manner which limits the development of epidemics of endemic pests and pathogens'.

Eradication of well-established pest species is not usually feasible, so control programs aim to reduce the impact of such pests on specific values or areas.

Aims

Minimise the impact of pest plants, animals, insects and diseases on the ecological, economic and cultural values of State forest.

Prevent the introduction of new pests into the Mid-Murray FMA, and the spread of pests into sensitive areas.

Planning and programming for pest plant and animal control

Effective pest plant and animal control requires well-planned and designed programs. Priorities for control of pest species in State forest should have regard for not only the management goals of State forest but also the overall catchment priorities expressed in the Regional Catchment Strategies and associated action plans. Consultation and coordination with regional Catchment Management Authorities (CMA) and, where necessary, with Landcare groups and individual landholders to develop agreed priorities and implement joint action is also required.

The *Good Neighbour Program* in Victoria currently provides most of the resources for cooperative weed and pest animal control programs on the freehold/public land boundary. Under the program, NRE works with landholder groups and local government to identify pest control needs and to undertake coordinated work on both public and private land consistent with the respective Catchment Management Strategy. On areas under licence for grazing, control of pests and weeds is a responsibility of the licensee in accordance with standard licence conditions.

This Plan introduces rolling three-year works planning for the control of pest species. This approach contributes to implementation of the Weed Management Strategy which lies within the overall framework for pest control, the *Draft Victorian Pest Management Framework* (NRE 2001b). The draft Strategy sets the objective of ensuring ongoing coordinated management of weed problems within Victoria.

The works plans will:

- ensure pest plant and animal control programs will be implemented within the framework established by this Plan;
- provide a vehicle for consultation with CMAs and community groups;
- ensure funding is allocated to areas of greatest need;
- ensure any necessary follow-up works are identified in advance and included in annual programs.

Management Guideline

Pest plant and animal control programs

Programs should be conducted:

- with due regard to cost and efficiency;
- using methods which are defined in relevant NRE policies and guidelines;
- in consultation with relevant Catchment Management Authorities (CMA) and Landcare groups;
- with an evaluation program.

Preparation and implementation of pest management programs for State forest in the Mid-Murray should be based on the framework established by this Plan, the respective CMA Regional Catchment Strategies and action plans and relevant legislation and policy. These programs should be prepared on a rolling three-year basis and include:

- maps showing the location of areas proposed for treatment;
- any cooperative management arrangements with adjoining land managers;
- the nature of infestations;
- the threat posed by infestations;
- control methods to be used;
- necessary follow-up works;
- program evaluation.

Priority areas for pest control

Pest control programs will focus on limiting the damage caused by pests to the priority areas listed in Table 7.1. Small, isolated infestations of potentially harmful pests on State forest, that could feasibly be eradicated, will also be given a high priority.

Table 7.1 Priority areas for control of pest species in State forest

Site	Priority
Where indicated in conservation guidelines in this Plan and areas adjoining conservation reserves where compatible work is being undertaken	High
Known sites of species or communities listed under the *Flora and Fauna Guarantee Act 1988*	High
Areas where NRE and adjoining landowners have cooperative projects to control pest species	High
Sites containing threatened flora and nesting sites of threatened fauna	High
River frontages	Medium
Popular recreation and historic sites	Medium

Pest plants

Many exotic plants have become naturalised and several species are widespread with populations too numerous for existing technology to achieve total eradication or to prevent re-establishment. Several species are capable of aggressive invasion of forest areas. New infestations require prompt recognition and treatment before the particular pest can proliferate.

Propagules of pest plants are introduced and spread through the forest by:

- dumping of garden rubbish and soil;
- vehicles and machinery (in tyres, radiators or in adhering mud);
- movement of sand and soil;
- animals, including native animals (seeds dropped during feeding or in the coat or dung);
- movement of water.

Pest plants are widespread throughout the floodplain forests. Elsewhere, infestations occur mainly along the boundaries with private land, beside roads and tracks, along watercourses, and on disturbed sites such as picnic areas.

Although most depend on disturbances such as grazing or the movement of machinery to provide the conditions under which they can out-compete native species, some pest plants have been assisted by the natural regime of disturbance associated with flooding and the dispersal of seed and other propagules by water. For this reason, floodplain communities are particularly susceptible to invasion by pest plants. Conversely, infestation of regularly flooded areas is low; probably reflecting the degree of specialisation required to occupy this environment (Margules *et al.* 1990).

Pest plants may be declared to be 'noxious weeds' under the provisions of the *Catchment and Land Protection Act 1994* which considers the impact of the plants on agricultural production, the environment or community health. The Act also categorises weeds according to their potential to spread (Table 7.2).

Table 7.2 Classification of weeds under the *Catchment and Land Protection Act 1994*

Category of weed	Definition
State Prohibited	a) does not occur in Victoria or b) occurs in Victoria but it is reasonable to expect that it can be eradicated from the State
Regionally Prohibited	a) is not widely distributed throughout the region b) is capable of spreading further in the region and c) it is reasonable to expect that it can be eradicated from the region
Regionally Controlled	a) occurs in the region b) is capable of spreading further in the region and should be stopped from doing so and c) to prevent its spread, continuing control measures are required
Restricted	a) is a serious threat to primary production, Crown land, the environment or community health in another State or Territory b) has the potential to spread into and within Victoria c) if sold or traded in Victoria there would be an unacceptable risk of it spreading within Victoria and to other States or Territories

Regional Weed Action Plans, have been developed in response to Regional Catchment Strategies, provide a strategic approach to management of the risks posed by weeds. These specify priority species and locations, and the required management actions. Priority is given to State Prohibited Weeds and those of regional significance (Regional Priority Weeds) as determined by the respective Catchment Management Authority. Emerging weed threats are also identified, as are actions for their eradication before they become well established. Appendix P lists the State Prohibited Weeds and Regional Priority Weeds identified by the respective Catchment Management Authorities for the Mid-Murray FMA as well as new and emerging weeds in the region.

Some plants that are not necessarily proclaimed as noxious weeds nevertheless have the potential alter the composition and structure of native plant communities or affect forest production through competition with regrowth. These plants, regarded as 'environmental weeds', are often escaped pasture or garden species or may be native species located out of their normal range or that have been favoured by altered environmental conditions. *Invasion of native vegetation by environmental weeds* is listed as a threatening process under the FFG Act. Appendix P lists the more significant environmental weeds found in State forest in this FMA.

Mistletoe, a native hemi-parasite, forms clumps on the branches of trees, sometimes gradually taking over the crown and killing its host. Measures to minimise its impact on important nature conservation or timber values may include improving the vigour of the stand and removal of heavily infested trees.

Chemical, physical and biological methods may be employed to eradicate or control pest plants. Although biological controls may be available for some weed species, in most cases herbicides and some mechanical removal currently provide the only economic and effective controls. NRE is continuing to investigate improved methods of pest plant control.

Management Guideline

Control of pest plants

Allocation of resources in State forest for the control of pest plants should accord with the following priorities:

- State Prohibited Weeds;
- Regional Priority Weeds impacting on State forest values (Appendix P);
- new and emerging weeds of any classification which can be feasibly eradicated;
- environmental weeds impacting significantly on ecosystem diversity.

Allocation of resources and methods of treatment of particular infestations should account for:

- impact on nearby agricultural land (in keeping with the Good Neighbour Program) and values on adjoining public land;
- impact on threatened species and values within SPZ, SMZ and other sites of importance in State forest;
- the potential for successful eradication or control.

The effectiveness of weed control programs should be monitored to:

- ascertain the rate of control or further spread;
- determine if follow-up work is required;
- determine if control practices require modification.

Hygiene standards should be applied to all machinery working in areas known to have significant infestations of pest plants. Specifically:

- hygiene standards for NRE machinery should be detailed in works prescriptions;
- contract road construction and maintenance machinery should conform to machinery hygiene standards through the inclusion of appropriate clauses in contracts;
- hygiene standards for timber harvesting machinery should be incorporated in Regional Management Prescriptions and coupe plans.

Fodder containing seeds or any part of a noxious or emerging weed should not be brought into State forest (see also Section 6.1).

Pest animals

Feral pigs, horses, foxes, dogs, cats, goats, rabbits and hares are the major threats to native flora and fauna in the FMA; some cause damage to cultural sites.

Myxomatosis remains an effective control mechanism for rabbits and has more recently been augmented by the introduction of the Rabbit Calicivirus Disease (RCD). Rabbits are the known vectors of the disease, birds and insects may also contribute, but only European Rabbits are susceptible. Experience in the release of other biological control agents shows that successful rabbit eradication in an area will still require traditional control measures, such as using 1080 (sodium monofluoroacetate), shooting, fumigation and ripping of burrows, in concert with outbreaks of RCD and Myxomatosis. In addition to the *Good Neighbour Program*, the *Rabbit Busters* program, aimed at capitalising on the impact of RCD, also contributes resources to rabbit control. The program is principally for private lands and the interface with public lands.

Management Guideline

Control of pest animals

Priority should be given to the control of Prohibited, Controlled, Regulated or Established pest animals as required by the *Catchment and Land Protection Act 1994* and to the management of threatening processes listed in Schedule 3 of the *Flora and Fauna Guarantee Act 1988*. The species specifically targeted and the methods of control are listed in Table 7.3.

Direction of resources to particular pest species should account for the potential for successful eradication and control as well as for their impact on:

- State forest environmental or economic values;
- the conservation of rare or endangered native flora and fauna;
- neighbouring parks, reserves and reference areas;
- neighbouring agricultural land.

Pest control programs should be monitored to:

- ascertain effectiveness of control;
- ascertain effects on non-target species;
- determine if follow-up work is required;
- determine if control practices require modification.

Table 7.3 Pest animals on public land in the FMA and methods of control

Pest animal	Main control method	Other approaches to control
Fox and feral pig	Poisoning where threatened fauna are not at risk (off target or secondary poisoning)	Shooting programs in conjunction and coordinated with landholders
Feral horse	Mustering and removal	
Rabbit	Enhance the natural spread and effect of RCD and Myxomatosis, with 1080 poisoning, burrow fumigation and ripping. Care required in relation to cultural sites and the habitats of Carpet Python and other threatened species	
Feral cat	Cage-trapping or shooting	Poisoning where threatened fauna are not at risk

Protection of non-target species is an important component of any program for the control of pest animals. Where poisoning campaigns may affect non-target wildlife such as the endangered Spot-tailed Quoll, control programs are carried out in consultation with NRE wildlife biologists. In order to minimise the chance of poisoning susceptible animals, guidelines have been developed for predator control programs using 1080. These guidelines, outlined below, should be considered as interim measures until the Strategic Plan for Wild dog Control and associated action plans (prepared by NRE and CMAs) are implemented.

Management Guideline
Use of 1080 in State forest

In order to minimise the chance of poisoning susceptible species, predator control programs using 1080 should adopt the following principles:

- The proposed treatment area should be surveyed for the presence of sensitive non-target species.
- Bait stations should be excavated to ensure the bait will be placed below ground level. Sieved earth should be spread over the surface and smoothed. Bait stations constructed in this manner are easy to maintain and the friable surface enables better identification of animal tracks.
- Baits should be buried to a depth of 10 cm or greater and only one bait should be buried in each bait station at any one time.
- The distance between bait stations should be varied depending on terrain and pest species activity. A minimum separation of one kilometre between baits is recommended to limit the possibility of a single animal taking multiple baits.
- The use of free feeding for a period before burying poison baits should be considered. Free feeding encourages the resident feral animals to visit the bait station and provides information about the numbers and kinds of animals visiting the bait station.

Pest insects

Of the range of insect pests that attack River Red Gum, the Gum-leaf Skeletoniser (*Uraba lugens)* and psyllids (*Cardiaspina* spp.) are among the most significant.

Both can cause severe defoliation of extensive areas of forest. Although the trees seldom die, even after severe attacks, death can occur where the attacks are sustained over a period of years, or where trees are stressed by abiotic factors such as drought or fire. The trees usually recover rapidly, but growth is temporarily retarded, leading ultimately to a general decline in tree vigour and susceptibility to further damage by a range of secondary destructive insects.

Gum-leaf Skeletoniser

The moth of the Gum-leaf Skeletoniser lays its eggs mostly on low foliage, often on regeneration or coppice growth. After hatching, the larvae gradually move up the trees, consuming leaves.

Infestations occur when the absence of flooding coincides with the larval stage. Without flooding, the insect matures and large numbers of eggs are laid, increasing the potential population for the next generation. Severe and extensive defoliation has occurred at about ten-year intervals, although lesser infestations occur more frequently. Up to 40 000 ha have been defoliated on at least two occasions (for instance, in the valleys of the Murray and Goulburn Rivers in 1975). Populations tend to crash when severe defoliation causes the larvae to starve.

Floodwaters between spring and mid-summer and through autumn provide the humid conditions favourable for the spread of particular fungi, which kill the larvae; some larvae and cocoons may also drown. Appropriate flood regimes are thereby a key to controlling the insect. Dense regeneration of River Red Gum seedlings following timber harvesting may also foster development of the insect, although thinning of the stands, which opens up the crowns and prevents direct movement of larvae between trees, and the removal of coppice, low crowns and debris to reduce habitat, may also assist in its control.

Psyllids

The species of psyllids most common to River Red Gum are *Cardiaspina albitextura* and *C. retator*. These feed on sap from the leaves and young shoots of the host plant and construct coverings (lerps) from starchy material derived from the host beneath which the immature phases (nymphs) shelter.

Psyllids can cause chronic damage to foliage on trees, especially on roadsides and farmlands, and in eucalypt plantations and native forests dominated by River Red Gum. They were responsible for defoliating stands of River Red Gum on the Murray River floodplains of NSW during 1991-92 and for damaging plantations of, predominantly, River Red Gum in the Shepparton irrigation area through repeated attacks (Collett 2001).

As psyllids are most active during summer, attacked foliage tends to desiccate rapidly so that, by late summer, tree crowns carry little foliage. Outbreaks of psyllid on River Red Gum appear to occur when a succession of dry summers combine with very wet winters within the same year (*ibid*).

A combination of natural and artificial control mechanisms (biological, direct, cultural and genetic) may be appropriate in plantation and farmland situations. In native forests, natural biological control of low-level infestations is provided through indigenous predators such as birds, spiders, mites, other insects (like wasps) and fungi. As high levels of psyllids are often found on the lower branches of trees at the beginning of outbreaks, and where large numbers of psyllids have established on some individual trees, pruning and thinning of trees at an appropriate time may assist in reducing the severity of attacks.

ACTIONS

Coordinate pest control operations across the public/private land boundary in accordance with strategies and Action Plans developed by the relevant Catchment Management Authority.

Prepare and implement rolling three-year pest species control programs for State forest based on the priority listing in Table 7.1, the Management Guidelines for control of Pest Plants and Pest Animals, action plans prepared under the appropriate Regional Catchment Strategy and relevant legislation and policies.

On areas licensed for grazing, liaise with licensees to ensure adequate pest and weed control works are carried out. Seek to incorporate pest and weed control measures into grazing management plans as they are developed.

Carry out community awareness programs aimed at reducing the dumping of rubbish and garden waste in State forest.

Maintain comprehensive records of the occurrences of pest species and control methods taken.

Develop competencies in field staff in the identification of and control methods for pest species.

Continue to develop improved methods for the control of pest species.

Chapter 8
CULTURAL HERITAGE, NATIVE TITLE AND LANDSCAPE

Public and private lands in the Mid-Murray contain evidence of past human use. In State forests, this includes sites of both Aboriginal occupation and those demonstrating recent history.

Places of traditional and contemporary significance for Aboriginal people (Aboriginal places) and other areas highly valued for their aesthetic, historical, social or landscape values form part of our cultural heritage.

Protection of Aboriginal places is addressed as part of the broader government approach of reconciliation with Aboriginal Australia.

Aims

Protect and maintain the cultural and historic values of State forest.

Encourage sensitive use of selected historic places for the education and enjoyment of the public.

Establish and maintain relationships with local Aboriginal communities and provide for their greater involvement in forest management.

8.1 ABORIGINAL HERITAGE

In line with the State government's commitment to building effective relationships with Victoria's Indigenous communities, NRE has developed an Indigenous Partnership Strategy. This Strategy seeks to strengthen relations with Aboriginal communities and empower them to become actively involved in natural resource management. In Mid-Murray FMA this will involve:

- developing improved mechanisms for consulting with Aboriginal communities and involving them in decision-making processes;
- promoting greater awareness of Aboriginal culture amongst staff, clients and forest users;
- identifying employment opportunities for Aboriginal people in natural resource management;
- identifying and protecting Aboriginal places.

Aboriginal places

Aboriginal places include areas of traditional and continuing significance to Aboriginal communities and sites with material evidence of Aboriginal occupation and use. They are recognised for their cultural, scientific and educational values. Aboriginal places may include:

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

Outcomes of Regional Forest Agreements in other parts of Victoria include the need to develop Statewide guidelines for the management of cultural heritage values, to provide cross-cultural awareness training for NRE staff and to identify opportunities for increased participation of Aboriginal communities in forest management activities. The Statewide guidelines aim to ensure the appropriate management of Aboriginal heritage including the maintenance of traditional historic uses and values. These guidelines and the Aboriginal heritage management system currently being developed in consultation with Aboriginal communities across Victoria, aim to establish formal consultation mechanisms with Aboriginal communities and processes for ongoing identification, assessment and protection of Aboriginal heritage values.

A Regional Cultural Heritage Program in Victoria established five regional bodies to act within their respective regions as resource agencies in cultural heritage matters. One of the roles of the program is to ensure that all appropriate people are consulted and involved in decision-making.

Local Aboriginal communities are the primary custodians of Aboriginal places and Aboriginal Affairs Victoria (AAV), a division of NRE, is the State government agency responsible for site identification and recording. All Aboriginal places, whether recorded or not, are protected under the Victorian *Archaeological and Aboriginal Relics Preservation Act 1972* and the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act). The ATSIHP Act requires that the protection of Aboriginal places and objects be in consultation with the Aboriginal communities with an interest in them.

Under the ATSIHP Act, six Aboriginal community organisations have specific powers relating to the disturbance of sites and places in the Mid-Murray FMA. These organisations are:

- Bendigo Dja Dja Wrung Aboriginal Association Incorporated;
- Njernda Aboriginal Cooperative Ltd;
- Rumbalara Aboriginal Cooperative Ltd;
- Shepparton Aboriginal Arts Council Cooperative Ltd;
- Swan Hill and District Aboriginal Cooperative Ltd;
- Yorta Yorta Murray–Goulburn Rivers Clans Incorporated.

In addition, native title claimants and the North East Regional Aboriginal Cultural Heritage Program and North West Regional Aboriginal Cultural Heritage Program have direct interests in heritage matters.

The locations of many places, such as burial or natural sacred sites, may be known to members of local Aboriginal communities but are not yet listed on the AAV site register. Protection of such sites from unintentional damage will benefit from improved awareness and communication between NRE and Aboriginal communities.

Protection of Aboriginal places

Some uses of the forests have the potential to threaten the integrity of Aboriginal places, albeit unintentionally.

Grazing and trampling by domestic and feral animals and burrowing by rabbits can degrade and erode sensitive sites. Protection of sites by fencing is not always practicable due to frequent flooding of the forest. Moreover, obvious demarcation may lead to deliberate site desecration (Bonhomme 1990). Education of forest users about Aboriginal heritage and review of grazing of the floodplain forests will assist the protection of Aboriginal places and values.

The locations of Aboriginal places are not comprehensively recorded for all of the Mid-Murray forests. Forest activities, such as roading or logging operations, have the potential to damage yet-undiscovered sites. Priorities and processes for archaeological surveys will be developed in consultation with appropriate Aboriginal

communities and AAV. Wherever possible, appropriate community representatives, as determined by local Indigenous communities, should have the opportunity to participate in surveys.

The actions outlined in this section accord with the recommendations of Bonhomme (1990) for the protection of sites in Barmah Forest.

ACTIONS

Develop a protocol between NRE, Aboriginal communities and related agencies on the processes for ongoing consultation and management of Aboriginal heritage values.

Establish and maintain forums for regular liaison between NRE, Aboriginal communities and related agencies to facilitate sharing of information and provide opportunities for input into forest management decisions.

Apply the Statewide cultural heritage guidelines, once they are developed.

Encourage Aboriginal community participation and employment in forest management activities.

Improve cross-cultural awareness among NRE staff through training involving appropriate Aboriginal representatives.

In association with Parks Victoria, liaise with appropriate Aboriginal representatives to develop public education programs about Aboriginal heritage in Barmah Forest (including utilisation of the Dharnya Centre).

Incorporate agreed measures to protect Aboriginal sites into the Regional Management Prescriptions.

8.2 HISTORIC PLACES

Past European uses of the forests of the FMA principally comprised grazing and the harvesting of timber products. Much of the historical value of sites in State forest relates to the events that took place in the past rather than what remains today. An opportunity exists for a written interpretation of the association between the range of settlement, river transport, agricultural, forestry and social activities in the FMA and its forests. The structure of the forests, for instance, is an artefact of their use.

Historic places in State forest are managed in accordance with the principles of the Burra Charter (International Council on Monuments and Sites). Basic principles inherent in the Charter include: acknowledging the importance of a place itself; understanding its cultural significance; recognising that the fabric, setting and contents of the place are important; making decisions about the future of the place based on information methodically collected and analysed; and keeping accurate records about decisions and changes to places. The most significant or representative sites in State forest are placed in SPZ or SMZ.

Thirty-two historic sites, two of which are of State significance, have been identified in State forest in the FMA. Listed in Appendix Q, these include several sawmill sites, stockyards and grave sites. The appendix includes a statement of the management actions for each site. In many cases, an historic site is included in SPZ or SMZ delineated to protect other values.

Additional sites may be discovered in the course of forest management activities or as the result of further research. These will be assessed and any significant sites protected. The major emphasis will be to protect such sites from human disturbance and inappropriate development and to establish a process for their long-term management.

Management Guideline

Historic places

Forest management activities should be planned so that they do not impinge on the fabric of significant sites. Consultation with NRE's Historic Places Section should occur where proposed forest management activities may disturb historic sites listed in Appendix Q, or where new sites are found. Consultation with Heritage Victoria is to occur where proposed forest management activities may disturb sites on the Victorian Heritage Register.

Measures to protect historic sites in State forest may include:

- limitations on heavy machinery movement to specified crossing points;
- removal of vegetation that may cause damage to the site;
- allocating the site to an appropriate management zone, based on its significance and susceptibility to loss or damage;
- erection of signs explaining the reasons for leaving artefacts on the site and penalties for their removal.

Management plans for historic sites or themes should be progressively developed for the most significant and vulnerable sites.

Sites used for education and interpretation should be:

- accessible;
- close to current recreation facilities or a grouping of sites illustrating a theme (or themes) of forest activity;
- robust to disturbance so that integrity of the place is maintained.

ACTIONS

Manage sites according to the Management Guideline for Historic Places.

Incorporate measures to protect historic sites into the Regional Management Prescriptions.

Ensure that proposed activities do not adversely affect historic places, in line with the guideline above, through review of and input to annual operational plans such as the Wood Utilisation and Fire Operation Plans.

8.3 NATIVE TITLE

The *Native Title Act 1993* (NT Act) recognises and protects native title and regulates activities that may affect native title.

Indigenous people can apply to have native title rights on Crown lands and waters in their traditional lands recognised by Australian law by applying for a determination of native title with the Federal Court. Native title cannot exist over private freehold property or leasehold land and can only exist on Crown land and waters if it has not been extinguished or removed by an act of government.

The Act enables native title holders and claimants to participate in decisions about the use, management, protection, exploitation and cultural interpretation of public land and resources. The NT Act also enables native title claimants to negotiate over matters that may affect their native title rights and interests before they formally receive recognition.

In 1994, the Yorta Yorta Murray–Goulburn Rivers Clans Incorporated 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 (reference VG6001 of 1995). The Federal Court 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. An appeal against this decision was heard and a single judge ruled in favour of the Federal Court determination. An appeal against this decision has been lodged with the full bench of the High Court however, at the date of preparation of this Plan, has not been heard.

The North West Nations in 1997 lodged an application with the National Native Title Tribunal for determination of native title over additional land areas. Recently this claim was redefined into five smaller claims. Two of these claims, the Dja Dja Warrung People (reference V6001/2000 (NNTT VC00/1)) and the Wamba Wamba, Barapa Barapa and Wadi Wadi People (reference V6005/2000 (NNTT VC00/5)) include land covered by this Plan.

The NT Act makes provisions for agreements concerning the use of land where native title has been determined to exist or where it is claimed to exist. These Indigenous Land Use Agreements (ILUA) when registered, bind all parties to the terms of the agreement. An ILUA gives the claimants a 'right to negotiate' over matters which may affect their rights without the prior requirement of formal recognition of native title.

All proposed actions (known under the NT Act as 'future acts') on Crown lands and waters must be considered in light of the 'future act' provisions of the Act. This must occur regardless of whether a native title claim is lodged. This consideration may give rise to procedural rights to the relevant native title parties, such as the right to comment on proposals. The future act provisions only apply if native title has not been extinguished.

As the manager of public land in the State, the Victorian Government carries out many future acts which potentially impact on native title. The Government's approach to native title applications is resolution through negotiation and mediation, in preference to litigation. As such, the Government supports the ILUA process. It is important that native title is dealt with as part of the normal approval process for activities on public land.

This Plan is not an ILUA and is not intended to pre-empt the development of an ILUA. Nor is it regarded as a future act under the NT Act. The Plan may, however, assist in future consultative processes with Aboriginal people and communities interested in the management of the Mid-Murray forests.

ACTION

***Ensure all future acts undertaken within State forests are done so in accordance with the provisions of the* Native Title Act 1993.**

8.4 LANDSCAPE

The distinctive natural landscape elements of the FMA comprises open park-like forests, large old trees, billabongs, grassy plains, and the tree-lined river and creek frontages.

The natural landscapes of the Mid-Murray comprise part of the region's attractiveness to tourists and contribute economic benefits to the area. NRE is responsible for managing a large proportion of the natural landscape and endeavours to protect landscapes of high scenic quality and viewer interest.

Aims

Minimise the visual impact of forest management activities on the landscape.

Protect landscape values, especially areas of greatest scenic and aesthetic quality and viewer interest.

Landscape quality

Management actions can impact on the landscape viewed by visitors to an area, and what they see may strongly influence their perceptions of native forest management. If not managed properly, intensive recreation, timber harvesting activities and structures can have a major impact on the forested landscape, particularly when viewed from close proximity. Careful design and management of these factors can minimise impacts on the quality or diversity of the landscape.

The topography of the floodplains means that no prominent feature provides a scenic lookout over State forest. Nevertheless, corridors of relatively undisturbed vegetation can preserve the character of the landscape adjacent to, for example, popular travel routes.

Landscape management on public land is guided by the Visual Management System (VMS) (Williamson and Calder 1979). This uses a combination of scenic quality, visitor sensitivity and distance classes to set visual quality objectives for an area. The VMS can be used for detailed landscape planning, or to develop broader landscape management strategies.

Table 8.1 outlines the guidelines followed for protecting landscape values in the FMA. According to the level of recreational activity and these guidelines, corridors of SPZ or SMZ have been established along popular tourist roads in the floodplain forests (Table 8.2). The guidelines apply principally to the management of harvesting in SMZ and GMZ in the vicinity of the roads.

Table 8.1 Objectives and guidelines for management of roadside vegetation

Visual quality objectives	Guidelines for management of roadside corridors[1]
VMS Zone A – forest management zone SPZ	
Inevident alteration Alterations should range from being visually inevident to temporarily (less than one year) apparent	• Retain large old trees close to the roads (subject to public safety). • During peak periods of visitor use, conduct only those timber harvesting operations and silvicultural works (like thinning) which maintain visual amenity in the vicinity of the roads. • Ensure logging debris is removed from the corridor. • Site log landings and sleeper cutting decks at least 60 m from the roads.
VMS Zone B – forest management zone SMZ	
Apparent alteration Alterations may range from being visually apparent to temporarily (less than two years) obtrusive	• Retain large old trees close to the roads (subject to public safety). • During peak periods of visitor use, conduct only those timber harvesting operations and silvicultural works (like thinning) which maintain visual amenity. • Ensure logging debris is removed from the corridor. • Regularly maintain recreation facilities and other structures and redesign visually dominant facilities.
VMS Zone C – forest management zone GMZ	
Dominant alteration Alterations may be visually dominant provided they conform with the characteristics of the surrounding area	• Ensure landscape impacts are kept to a practicable minimum for all activities and operations. • Regularly maintain recreation facilities and other structures.

Note:

[1] The extent of the corridor and particular guideline to be observed depend on assessment of the characteristics of the respective site or road and Table 8.2.

Table 8.2 Zones to protect visual corridors along roads in State forest

Road	Zoning[1]	Width	Comments
Barmah State Forest			
River Road	SPZ	60 m	abuts the River Murray Reserve between the eastern and western parts of Barmah State Park
	SMZ	20 m	around Yielima private property
River Track	SPZ	20 m	abuts the River Murray Reserve on Barmah Island
Sand Ridge Track	SMZ	60 m	
Moira Lakes Road	SMZ	60 m	
Gulf Track	SMZ	60 m	
Tongalong Track	SMZ	20 m	
Newmans Track	SMZ	20 m	
Four Mile Track to Sapling Landing Track	SMZ	20 m	
Gunbower State Forest			
River Track	SPZ	20 m	
Iron Punt Track	SMZ	20 m	
Rifle Butts Track to Five Sleepers Track to Thompson Track	SMZ	20 m	for the whole length of the route
Nursery Track	SMZ	20 m	
Stanton Break[2]	SMZ	20 m	
Lock Road[2]	SMZ	20 m	
Benwell and Guttrum State Forests			
River Track	SPZ	20 m	

Notes:
[1] The corridors apply to both sides of the road where relevant.
[2] Lock Road and much of Stanton Break (Gunbower State Forest) are included in a larger area of SPZ.
[3] Map 2 indicates the extent of roadside corridors in part of the Gunbower State Forest.

ACTION

Manage the landscape viewed from recreation facilities and major tourist roads in accordance with Tables 8.1 and 8.2.

Significant trees

Several River Red Gum trees of outstanding silvicultural form have been identified in the FMA. Those that have been measured range from 35 m to some 46 m tall; they are a valuable seed resource for propagating the species. One, the 'Assessor's Pile', collapsed during a flood and its trunk is now on display at the Dharnya Centre. Other trees that have grown in more open conditions have adopted a massive spreading form. Such unusual trees contribute to the structural diversity of the forests, provide valuable habitat and add to the landscape interest of the floodplains. The relative significance of the trees will be assessed and those considered outstanding will be managed according to the following guideline.

Management Guideline
Significant trees

Large trees in the FMA should be assessed for their relative significance in terms of silviculturally desirable form and/or scenic value.

Those considered to be outstanding should be included in NRE's Historic Places database as 'significant trees' and nominated for inclusion in the Register of Significant Trees maintained by the National Trust of Australia (Victoria).

Each tree assessed as 'significant' should be included in a 20 m radius SMZ.

Forest management activities should be planned so that they do not damage significant trees.

ACTIONS

Manage identified significant trees according to the above Management Guideline.

Incorporate measures to protect significant trees into the Regional Management Prescriptions.

Heritage Rivers

The Goulburn River and the Ovens River, downstream of Killawarra, are two of eighteen 'Heritage River Areas' scheduled under the *Heritage Rivers Act 1992*. This is an overlying classification to protect important recreation, scenic, cultural heritage and/or nature conservation attributes and in which the existing land tenure continues. All public land bordering these rivers within the Mid-Murray FMA is included in the respective Heritage River Areas.

This Forest Management Plan and plans being prepared under the Heritage Rivers Act for the Goulburn and Ovens Heritage River Areas (NRE 1997c) are complementary. In accordance with the Act, timber production is permitted to continue within the State forest sections.

The Murray River was also considered to be "an obvious candidate if a national heritage river system were to be developed" and for the purposes of establishing priorities for management should be considered "as if it were a Victorian heritage river" LCC (1991).

The SPZs and SMZs identified in this Plan along the Goulburn, Ovens and Murray Rivers protect botanical, wildlife and heritage values identified in LCC 1991. Further, management provisions for grazing and timber production protect other biological values.

Chapter 9
RECREATION AND TOURISM

Tourism authorities promote the public land forests and wetlands as primary attractions of the Murray Valley.

Of approximately 644 000 visitor-days spent each year in the Mid-Murray area, about 80% include a visit to the parks and reserves along the Murray River. Most visitors also use or, at least, pass through State forest. Major forest-based activities include pleasure driving, horse-riding and camping, which can also form the base for fishing and boating (popular activities also when the floodplain forests are inundated). Many visitors are local residents, but the majority travel long distances to enjoy extended stays in the unique riverine forest environment.

Aim

Provide public land recreation and tourism opportunities that are of high quality, diverse in their nature and setting, satisfying and safe. They should also be environmentally sustainable, economically viable and offer equity of access.

NRE's Tourism Strategy

Tourism provides significant regional employment and has potential to expand. Nature-based tourism is experiencing strong growth in Australia, reflecting the community's interest in environmental issues and its desire to seek alternative tourism options.

NRE's Tourism Strategy (NRE 1996b) recognises the complementarity between State forest sites and services and those in parks and other reserves managed by Parks Victoria and, to a lesser extent, the tourist attractions run by the private sector in towns and on freehold land. It recognises that many of the more popular attractions are found in the forests managed by Parks Victoria but that NRE also has an existing and on-going role in providing for the traditional recreation pursuits that attract the majority of visitors to State forest. The strategy recognises the need for a range of sites and services within budgetary limitations and the need to manage environmental impacts of visitors at high-use sites.

It is important that nature-based tourism develops within a framework that ensures that the natural and cultural values of the forest are protected and that opportunities for passive or isolated recreational pursuits are not reduced.

NRE's strategic approach to recreation management and that presented in this Plan consider recreational opportunities in the context of all public land, and the role of the private sector in providing services to tourists and recreationalists. They focus on improving the range of facilities available to visitors and may help to resolve conflicts between recreational and other forest users.

NRE's contributions to tourism include:

- enabling a wide range of forest-dependent recreational activities to occur while protecting and enhancing the quality and diversity of recreational experiences;
- providing appropriate infrastructure at key day-use and camping sites;
- providing robust, appropriately sited and well-maintained recreation facilities;
- developing (in consultation with other land managers and tourism authorities) touring circuits, linked to key campsites and attractions;
- maintaining forest drives, walks and picnic stops that service key tourist hubs;

- providing information on forest activities, facilities, routes and destinations, both in printed form and the World Wide Web;
- erecting signs for forest roads, tracks and recreation sites;
- interpreting natural and cultural features found on State forest;
- facilitating the use of State forest for licensed commercial tours;
- managing and conserving natural and cultural features, including landscape, particularly along designated tourist routes.

NRE is keen to facilitate the ongoing development of nature-based tourism that is ecologically sustainable and yields appropriate economic and social benefits, provided activities are conducted in a manner that maintains other forest values. A wide range of licensed commercial tours provides opportunities for forest-based recreation including four-wheel-drive tours, horse-riding, canoeing and bushwalking. Such activities are regulated through NRE's Licensed Tours Permit System, which operates across all public land.

Ongoing and future commercial operations will be assessed on their merits, compatibility with maintenance of forest values, directions set by recreation management zones, Regional Tourism Development Strategies and through the appropriate participation of stakeholders.

The Dharnya Visitor Centre is a key focus of tourism in the Barmah Forest. It is managed by Parks Victoria under the direction of a committee of management.

The number of small group tours undertaking specialised activities, such as canoeing, nature study and horse riding, is increasing. These use existing facilities and provide visitors with an experience in the forest environment. NRE has developed a five-kilometre canoe trail around the wetlands of Safe's Lagoon at Sandy McNab Bend on Gunbower Creek and a 38 km interpreted forest drive in Gunbower State Forest. Both interpret natural and cultural attributes and relevant aspects of water management and timber harvesting.

Recreational opportunities

Because much of the land in the region has been cleared for agriculture, the importance of public land in the FMA in providing recreational opportunities associated with predominantly natural settings is emphasised. A wide diversity of both passive and active recreational opportunities is available.

Visitors to State forest in the FMA undertake a variety of different activities. The type of forest setting sought by visitors to enjoy their respective activities also varies. The aim of NRE is to manage forest settings and the activities that occur within them to provide visitors with opportunities to enjoy a broad range of recreational experiences.

To ensure that the management of State forest enhances current and future recreational opportunities, this Plan considers recreational management and development according to a framework based on the Recreation Opportunity Spectrum (ROS). Cuddy *et al.* (1993) discusses the ROS and describes the recreational opportunities within the FMA. A recreational opportunity class can be assigned to a parcel of land based on the opportunity it provides for activities in a particular setting.

Enjoyment of recreation is reduced where incompatible activities take place in the same area. Conflicting activities can be separated by the strategic location of facilities and zoning of the forest to provide different levels of facilities in various settings. It is also essential to coordinate recreation management, planning and enforcement of controls across all public land, particularly near the Murray River. Accordingly, the ROS has been applied to State forest, the River Murray Reserve and associated riverine regional parks (Map 3). Table 9.1 outlines the type of setting, activities and level of development intended in each recreation opportunity class and, together with Map 3, provides the framework for management of recreation activities and facilities on State forest.

Table 9.1 Level of development appropriate to each recreation opportunity class

Level of development	Settings	Expected extent of facility development	Common activities
Developed and semi-developed class			
Most developed	Substantially modified setting eg Dharnya Centre and beaches near townships on the River Murray Reserve or regional parks	Gravel vehicle bays Formal campsites Toilets Drinking water Shelters Interpretative facilities Visitor information	Community education Coach-based tourism Concentrated activities eg group-based activities
Semi-developed class			
Moderate development	Modified environment eg smaller river-based campsites such as along Gunbower Creek between Cohuna and Koondrook	Vehicle bays Fireplaces Tables Drinking water Shelters Interpretative facilities Visitor information	Vehicle-based touring Group activities including camping
Roaded natural class			
Limited development	Predominantly natural appearance within one kilometre of vehicular tracks	Fireplaces Tables	Dispersed activities including camping, horse-riding, vehicle-based touring
Roaded natural class			
Undeveloped	Scope to provide semi-remote experience if vehicular network is reduced	Little or no facilities expected to be provided	Informal camping Isolated activities Nature observation

Notes:

1. Map 3 indicates the extent of each recreation opportunity and development class on State forest, the River Murray Reserve and associated riverine regional parks.
2. Sites within the developed and semi-developed classes will be designed and constructed to protect environmental values. Access will be designed to allow two cars to pass safely or for a bus to travel under normal conditions.
3. Parcels of public land in the FMA are generally too small, and the diversity of use too great, to enable any area to be managed in accordance with the Remote classification of the ROS.

NRE will promote opportunities for those recreational activities that are best suited to each zone. For areas used intensively, such as adjacent to the Murray River, activities such as short walks, picnicking, two-wheel-driving and formal camping are suitable. Areas with minimal facilities are more suited for visitors seeking opportunities for more remote activities, such as horse riding, bushwalking, hunting, four-wheel-driving and isolated camping.

To support the recreation opportunity framework, mechanisms are required to assist the orderly management of the zones. Although education should be used as the primary means of modifying inappropriate visitor behaviour, the need for regulatory controls remains. Regulations concerning camping, fire, hunting, timber harvesting and vehicular use exist. Additionally, the development of 'codes of conduct' will be encouraged for specific activities that benefit from self-regulation (like the horse-riding code and the 'Tread Lightly' campaign).

Most of the parks, the River Murray Reserve and State forest in the FMA are contiguous. Wherever appropriate, regulations for visitor use should be consistent across all public land tenures.

Future management of recreational opportunities will concentrate on:

- establishing priorities for recreational access;
- identifying areas available for future development of facilities;
- identifying areas where access and facilities will be limited.

Development and management of recreation facilities

Most recreation facilities on public land in the FMA are in parks and the River Murray Reserve and are generally managed by Parks Victoria on behalf of the government. The few located in State forest were generally developed on an *ad hoc* basis. Visitor surveys in the FMA and elsewhere in Victoria have indicated a consistent demand for forest camping and day-visitor facilities and services. These may include fireplaces, picnic tables, basic toilets, rubbish-collection services and drinking water.

While some visitors enjoy the environs of the forests from commercial accommodation on nearby private land, many enjoy camping within the forests. Providing appropriate facilities is a means of managing recreation within the various forest settings. However, there is no intention to permit accommodation ventures within State forest in the FMA as the infrastructure and scale of most such ventures are largely incompatible with the management objectives for recreation and other forest values as well as with the flood-prone nature of most of the forests.

NRE will ensure that no facility developed in State forest will dominate the natural environment. The specific location and design of facilities will be determined following appraisal of the site within the context of the ROS Classification of the forest indicated on Map 3. Other forest values, access, soils and flooding, and the nature of existing uses will also be considered.

Determining the standards and location of facilities provides a mechanism to disperse recreation activities. However, more specific measures in some areas will enable separation of conflicting activities and avoid overcrowding. It is legal to use licensed firearms in State forest, for instance, but this activity should be separated from areas that receive high visitor usage.

The gentle terrain allows easy access for most vehicles along an extensive network of tracks. Many tracks in the forests become impassable during wet periods, however, and must be closed to ensure visitor safety and to protect the tracks from damage (Chapter 10).

Management Guideline

Recreation facilities

New facilities

The types of recreation facilities provided in State forest should be consistent with the settings defined by the ROS and the capability of potential sites to support the level of usage.

No new developments should be permitted where they will cause fragmentation of narrow strips of forest (such as where only narrow frontages exist along streams).

Recreation facilities should be designed to blend with the natural forest surroundings and managed to minimise environmental impacts.

Surveys of the levels of use of existing facilities and the requirements and expectations of visitors should be conducted periodically to determine if new recreation facilities are required.

Existing facilities

Each recreation site should be regularly assessed to determine:

- if replacement, repair or removal of damaged facilities is required;
- whether environmental impacts are occurring as a result of its use or design.

Problems at a site may be minimised by:

- education and/or enforcement programs;
- increasing the level of management;
- changing the number or type of facilities (such as increasing or rationalising car-parking) or their design or location;
- providing alternative sites;
- closing and rehabilitating the site.

Day-visitor areas

These should be:

- designated only within the developed and semi-developed recreation class;
- the focus of self-guided tours, walking tracks and interpretative facilities.

Facilities for disabled people should be included at several day-visitor areas in suitable locations.

Camping should be excluded from some day-visitor areas, particularly adjacent to rivers, creeks and other water bodies.

Forest camping

Formal camping facilities should be confined to the developed and semi-developed recreation class.

Informal dispersed camping should be provided for, and encouraged, in the roaded natural recreation class.

continued next page

Management Guideline – Management of recreation facilities - continued

Information
Information on recreation facilities and activities should be provided for contiguous areas of public land, regardless of tenure.

The information may be contained in various forms (such as display boards, brochures, maps, information sheets, nature trails or scenic drives) but should provide details on:

- day-visitor areas;
- points of interest;
- areas suitable for access by the disabled;
- scenic drives;
- forest camping areas;
- firewood collection areas and controls;
- potential hazards;
- fire and other relevant regulations;
- waste disposal.

Display boards should be located at strategic entry points and areas of high visitor use.

Interpretative material should be developed for self-guided tours of State forest (particularly for the Barmah and Gunbower State Forests).

Waste disposal
Visitors should be encouraged to dispose of rubbish appropriately.

The policy that rubbish should be taken home should be reinforced in NRE publications, brochures, on-site signs and other interpretative facilities.

Toilets provided at camping and day-visitor facilities within the developed and semi-developed recreation class sites should be in accordance with regulations.

Firewood
Visitors should be encouraged to bring their own firewood to campsites or use alternative heat sources, as firewood gathering by campers and day-visitors is concentrated near riverine sites and can significantly deplete important floral and wildlife habitat resources.

Recreation activities

Some recreation activities that are excluded or restricted in parks (such as hunting, dogs accompanying visitors and large-scale organised recreation events) may, where appropriate, be provided for in State forest.

Some uses can damage environmental or cultural values and must be controlled within the scope of relevant legislation. For example, repeated and uncontrolled access to a site by large groups of horses can result in environmental damage and can reduce the recreational enjoyment of other visitors. Digging for bardi grubs for fishing bait often involves removal of vegetation, particularly where machinery is used. The activity may also disturb Aboriginal sites and expose artefacts or skeletal remains. One of the greatest impacts of recreational use of forests is depletion of habitat resources for native fauna through collection of firewood close to access routes and around campsites.

Organisers of large-scale events on public land are required to seek prior approval from NRE.

Voluntary codes of practice have been developed by NRE and other land management and environmental agencies for a range of popular activities including horse-riding, four wheel drive touring, bush-camping, trail-bike riding, mountain-bike riding and bushwalking. While some of these refer to activities in particular conservation reserves, they have a general application and serve as a useful guide to users of State forest. The Codes are available from NRE and Parks Victoria information centres and offices throughout the region.

Management Guideline

Recreation activities

General

Recreation activities should not significantly affect forest environmental values.

Opportunities should be provided for appropriate recreation activities in State forest, including activities that are excluded or restricted in Parks and reserves (eg hunting, dogs accompanying visitors and large-scale organised recreation events).

Planning, management and delivery of recreation programs should be guided by Table 9.1 and Map 3 and coordinated between all land tenures to ensure that the diversity of recreation opportunities is maintained and to assist in separating incompatible uses. In particular, close liaison should be maintained with Parks Victoria where assets adjoin.

Recreation activities which are incompatible with other State forest values or uses, or which are not forest-dependent, should be discouraged through community education or, where necessary, regulation.

Commercial recreation activities should be facilitated where the activities are consistent with other forest management objectives. Licensed tour permits should address the need to protect environmental values and to minimise the impact of large groups on other users.

NRE should work with organisers of commercial recreation activities or large-scale events to ensure adequate measures are taken to protect environmental values, assisted by the use of a permit system.

Regular liaison should be maintained with major community-based recreation groups to facilitate communication and to promote recreation codes of practice.

continued next page

Management Guideline – Management of recreation activities - continued

Vehicle-based recreation
The *Land Conservation (Vehicle Control) Act 1972*, prohibiting off-road vehicle use (including motorcycles), should be enforced.

Tracks that become impassable when wet should be closed to ensure visitor safety and to protect the tracks from damage.

Four-wheel-drive clubs and local government should be consulted about permanent and seasonal road closures.

Horse riding
Horse riding activities should be conducted in accordance with the *Horse Riding Code* (CNR 1993).

A brochure should be prepared describing preferred horse-riding routes and providing guidelines for the location and management of camps.

Horse-riding camps should generally be located within the semi-developed and roaded natural recreation classes and should only be permitted in State forest for the duration of the ride.

Hunting
Liaison with relevant hunting organisations should take place to determine acceptable areas for hunting.

Restrictions may need to be imposed on hunting in some areas, particularly SPZ and SMZ, to avoid disturbance of fauna during breeding.

For reasons of safety and amenity, hunting areas should be located away from popular visitor-use areas and should not be permitted within the developed and semi-developed recreation classes shown on Map 3. Information about suitable locations should be made available to visitors.

Grubbing
Digging for bardi grubs for fishing bait (grubbing) is permitted in State forest only with a permit under the *Forests Act 1958*. It is not permitted in parks, the River Murray Reserve or public land water frontage reserves.

Guidelines and permit conditions to control grubbing should be prepared to ensure that cultural sites are not damaged and sites of biological importance are protected.

State forest is occasionally used for training exercises by such organisations as the Army, Victorian State Emergency Service and Victoria Police. As their impacts are similar to those of most recreational activities, the guidelines set out above should also apply to such exercises. The NRE policy *Defence Force Training on Public Land* (NRE 2001c) provides detailed guidelines, procedures and legislative framework for the conduct of defence force training.

ACTIONS

Plan and manage recreation facilities and activities in State forest according to the zoning indicated on Map 3, the levels of development set out in Table 9.1 and the Management Guidelines for the management of Recreation Facilities and Recreation Activities.

Facilitate the development of forest-based tourism ventures.

Collaborate with Parks Victoria, the relevant managers of other public land in the FMA and regional tourism organisations in the development of guidelines for and the provision of recreational opportunities and facilities on public land.

Encourage development of self-guided and interpretative tours and explanatory information for walkers and vehicle-based visitors which:

- ***incorporate existing recreation and interpretative facilities;***
- ***interpret scenic and historic features;***
- ***describe and explain State forest management strategies and activities;***
- ***may include privately operated features (like art and craft shops or tea rooms);***
- ***are regularly reviewed to ensure they remain up to date.***

Develop coordinated regulations for visitor management across the FMA, giving particular emphasis to camping areas, firearms, waste disposal, firewood, and protection of Aboriginal sites.

Chapter 10
FOREST ROADS

NRE is responsible for an intensive road and track network within State forest (few areas in the FMA are more than one kilometre from vehicular access). This network feeds into the systems managed by Parks Victoria, municipalities and the Roads Corporation (VicRoads). It provides access to the forest for a range of uses including forest management, timber extraction, recreation and fire management and access to adjacent parks, reserves and private property.

Most roads in State forest in the FMA were constructed prior to the introduction of the *Code of Forest Practices for Timber Production* (Code). The Code stipulates the standards of design and maintenance for timber-haulage roads to minimise environmental damage and ensure public safety. Roads in State forest are classified according to a uniform Statewide system comprising five classes. These range from Class 1 – an all weather, surfaced, two-lane primary road on which speed is not unduly affected by grades or curves, to Class 5 – a single-lane, unsurfaced vehicular track, generally of four-wheel-drive standard, on which speed is severely restricted by grades and curves.

Peak demand for the range of forest activities in the floodplain forests coincides with the warmer, drier months. This, combined with the flat terrain, means that access is possible for the majority of forest users on unsealed roads for extended periods.

Frequent floods and the high cost of transporting gravel prevent the development and maintenance of a surfaced road network on the floodplains. As a consequence, many of the roads become unusable during floods and extended wet weather and are closed in consideration of public safety, environmental damage and damage to the road surface.

Future water management activities may render some roads impassable for a period and necessitate upgrading of the drainage for others. The relationship between roading and water management activities is addressed in Chapter 4.

Aim

Provide and maintain a forest road network suitable for forecast levels of forest utilisation, recreation and fire management and to standards adequate for intended uses, safety and minimal environmental impact.

Road maintenance

Floods and indiscriminate use by four-wheel-drive vehicles damages the unsealed roads in flood-prone areas. Cattle and horses can also cause extensive pugging of wet roads. As a result, annual maintenance of roads is often necessary to allow safe traffic by two-wheel-drive vehicles and log trucks. Stream and channel crossings along routes used by heavy vehicles must also be constructed and maintained to a high standard.

As the cost of maintaining all roads to a high standard is excessive, resources must be targeted according to the frequency of use and function of each road. Current levels of use do not justify the high cost of construction and maintenance of Class 1 roads. Although roads on the floodplains are seasonally inundated, their classification accords to the period over which they may be used. Major timber-haulage and visitor-access roads are generally maintained to Class 3 standard – that is, single lane, substantially all-weather minor roads which may or may not be surfaced and on which speed is considerably reduced by grades and curves.

Management Guideline

Road maintenance

A comprehensive register of all required and authorised roads should be established and maintained and all road maintenance works recorded.

The road system should be reviewed, and roads closed or relocated where necessary to reduce public danger, damage to sites of natural or cultural significance or duplication. Any new roads or road upgrades should conform to the Code and Regional Management Prescriptions and minimise stream crossings, encroachment on sensitive sites (such as SPZ) and environmental effects.

Three-year road maintenance schedules should be developed according to projected usage and funding sources, taking into account, where appropriate, the respective water management strategy.

The main visitor and timber-haulage routes, listed in Table 10.1, should be maintained to Class 3 standard.

Channel and creek crossings should be constructed where necessary on Class 3 and 4 roads to improve the drainage and serviceability of low-lying sections.

Access to all developed sites within the Developed and Semi-developed recreation class areas (Map 3) should be upgraded, where necessary, to Class 3 standard.

Expenditure of roading funds for the extraction of timber should be planned in consultation with Timber Industry Roading Advisory Committees. The expenditure of NRE funds earmarked for 4WD recreation tracks should be planned in consultation with the appropriate peak body of recreation users.

Seasonal road closures should be publicised.

Table 10.1 Roads in the Mid-Murray FMA to be maintained at Class 3 standard

Barmah State Forest	Gunbower, Benwell and Guttrum State Forests
River Road (in conjunction with Parks Victoria)	River Road (in conjunction with Parks Victoria)
Gulf Track	Iron Punt Track
Newmans Track	Koondrook Track
Sand Ridge Track	Nursery Track
Tongalong Track	Robertson Track
	Rifle Butts – Five Sleeper – Thompson Track link
	Stanton Break

ACTION

Maintain a strategic road network according to the Management Guideline for road maintenance and Table 10.1.

Chapter 11
RESEARCH AND EDUCATION

11.1 RESEARCH

An increased understanding of forest ecosystems, management activities and their interaction is achieved through forest research programs conducted by NRE and other organisations. Continued research activity is an integral part of responsible forest management. Some research may involve establishment of temporary plots for a one off survey or measurement (for example the flora and fauna surveys undertaken for mapping ecological vegetation classes or sawlog volume plots measured for the Statewide Forest Resource Inventory program). Other research may require a series of measurements at the same site through time, to ascertain changes that may have occurred. This latter type of research may require the exclusion of an area of forest from certain management practices while the research is still active.

Aim

Improve knowledge about forest ecosystems and management activities and their interaction.

State forest research is usually undertaken by NRE or educational institutions, mainly universities. NRE facilitates organisations or individuals to undertake research on public land and may specify conditions in some cases.

The long-term exclusive use of areas of State forest for research purposes may conflict with some forest uses or activities. In some cases management activities, which are incompatible with the objectives of the research, may need to be excluded. Appendix R lists current and potential research projects in the Mid-Murray FMA; NRE permanent forest growth plots are both listed in the appendix and identified on Map 2. Consultation with the relevant managers of approved research projects is required prior to any activities occurring within research areas.

Management Guideline

Assessment of research project proposals

Where required, approval for applications to undertake research should consider the duration, type and method of the study and other NRE requirements or conditions.

The use of existing research sites and reference areas or education areas in preference to State forest should be encouraged, particularly if the nature of the intended research may require suspension of normal management activities.

Exclusive use of an area of State forest may be permitted depending upon:

- the public benefit of the study;
- other uses or requirements for the proposed study area;
- the duration of the study.

ACTIONS

Encourage research projects that may increase knowledge about forests or assist forest management.

Permit research projects in accordance with the Management Guideline for Assessment of Research Project Proposals.

Maintain a register of research sites in State forest.

Exclude management actions that are incompatible with the objectives for approved research projects, until such time as the areas are no longer required.

11.2 EDUCATION AND INTERPRETATION

A good community understanding of the role of State forests and of forest management will aid the implementation of forest management programs. Providing access and resources for school and community groups is a useful basis for improved understanding.

Aim

Improve community understanding and awareness of the role of State forests and of forest management.

Students from secondary schools and tertiary institutions occasionally visit State forests as part of teaching programs in earth sciences or environmental studies. NRE facilitates access to the forest for educational use, as well as provides information for use by students and others through guest speakers, printed resources and the NRE web site.

Two Education Areas, designated for education and the study and manipulation of natural systems, were set aside in the FMA in accordance with the *Land Conservation Act 1970* (LCC 1985). One, Spence Bridge is in Gunbower Forest. The other is situated within Killawarra Forest, which has in principle been accepted by the Victorian Government for addition to a State park, as recommended by the Environment Conservation Council (ECC 2001). Permanently reserved under the *Crown Land (Reserves) Act 1978*, Education Areas are an appropriate focus for forest use for educational purposes.

ACTIONS

Continue to make NRE staff available as guest speakers for schools and community groups, having regard to other management commitments.

Continue to develop educational resource material applicable Statewide, for a variety of educational users (primary to tertiary level) to facilitate educational uses of State forest and, in particular, the Education Areas.

Chapter 12
PLAN IMPLEMENTATION

Responsibility for implementing this Plan rests with the Secretary of the Department of Natural Resources and Environment (NRE). Executive authority for State forest management is delegated to the Executive Director, Forests Service.

NRE is a multi-disciplinary natural resource management agency responsible for the development, conservation and protection of Victoria's natural and cultural resources. NRE's responsibilities include:

- management and the control of fire on public land;
- management of State forests;
- commercial forest operations within State forests;
- management of flora and wildlife;
- management of cultural heritage, including Aboriginal cultural heritage;
- management of soil and water values and control of pest plants and animals, in partnership with landholders;
- the administration of mining and extractive industries;
- the administration of Crown land licences and leases, including those for State forest;
- management of fisheries and aquatic ecosystems.

The Executive Director, Forests Service in conjunction with the Regional Services Division is responsible for plan implementation.

12.1 WOOD UTILISATION PLANNING

While the zoning scheme establishes the area of State forest available for timber harvesting, the volume of forest products to be supplied is specified in sawlog licences that are issued based on sustainable yield forecasts. Sawlog licence conditions require NRE to provide licensees with Wood Utilisation Plans (WUP) by 31 March each year. WUPs specify the individual areas (coupes) of State forest that are approved for harvesting to meet licence commitments. They are supplied to sawlog licensees who organise the harvesting and transport of logs. Harvesting is supervised by NRE and must be conducted by licensed operators in accordance with the Code of Forest Practices for Timber Production.

The current WUP process involves specific consideration of every proposed logging coupe to ensure compliance with policy commitments to conserve forest values (flora, fauna, cultural heritage, landscape, soil and recreation opportunities). The information used to check individual coupes has been incorporated into the management strategies and zoning scheme in this Plan. The Plan and zoning scheme will thus streamline preparation of WUPs. New information will be considered with a view to the possible amendment of the zoning scheme or management strategies rather than considering coupes in isolation.

ACTIONS

Continue to prepare rolling three year Wood Utilisation Plans in accordance with NRE guidelines and consistent with the content of this Plan and licence requirements.

Coordinate wood utilisation planning and water management planning to achieve both conservation of biodiversity across the floodplain forests and successful regeneration and development of productive forests.

12.2 REVIEWING THE PLAN

The management of Victoria's State forests is based on the best available information and an innovative and progressive approach to natural resource management. This Plan provides for refinement of management guidelines, prescriptions and the zoning scheme in response to new information or changes in government policy, community expectations, technology and timber market conditions. A key feature of this Plan is the use of management guidelines for natural and cultural values, and the translation of these into Management Zones. Inherent in the process is the provision to improve management guidelines and the zoning scheme in response to new information. Refinements will be made in an objective, systematic manner to avoid disruption to the forward planning and conduct of timber harvesting operations. A multi-disciplinary approach is essential to this process.

This Plan will apply for ten years after the date of its approval or until circumstances warrant a major review. A guideline for reviewing management strategies, guidelines, management prescriptions and the zoning scheme is set out below.

A Review of the Plan will be required within the next two to three years when mapping and analysis of the EVCs for the FMA are completed. This will enable evaluation of the reserve system in the FMA to determine its degree of compatibility with the JANIS criteria for achieving a comprehensive, adequate and representative reserve system for natural ecosystems.

Where a change to zoning is warranted, any significant proposed change will be made available for public viewing and comment. Following consideration of comments received and relevant specialist advice, approval will be sought from the Secretary of NRE or his/her nominee for adoption of the revised zone. Approvals for changes of minor nature and operation procedures for amending the zoning scheme will be detailed in the Regional Management Prescriptions. The following Management Guideline sets out a process for reviewing the zoning scheme, management guidelines and prescriptions.

Management Guideline

Reviewing management guidelines and prescriptions and the zoning scheme

Management guidelines and prescriptions in this Plan may be reviewed:

- when new information on the impact of forest management or utilisation activities on biological or cultural values becomes available;
- if the status of a threatened species changes;
- if new species are identified that are considered to be threatened;
- when monitoring of the practical implementation of the Plan indicates that improvements can be made;
- as required by new legislation, policies or Action Statements.

Management zone boundaries may require review if:

- changes to management strategies for certain species or values mean that the zoning system is more or less than adequate for those values;
- field inspections or better mapping indicate that minor amendments are required to create practical management boundaries or to more accurately define the location of a particular species or value. (At the scale of mapping used in this Plan, the boundaries of some values cannot be accurately defined.);
- the zone does not contain the values for which it was identified – amendments may be required to ensure that conservation targets are met;
- new records are listed for species whose conservation targets have not been met;
- new records of some species warrant changes to zones to include areas of good quality habitat in exchange for areas of poorer quality habitat;
- existing boundaries are found to place unreasonable restrictions on practical access to areas for timber production or for infrastructure development (easements etc).

Proposed changes to the zoning scheme will be assessed according to whether they:

- ensure the reserve system is consistent with the JANIS Reserve Criteria (following completion of the EVC mapping – see Section 3.2);
- ensure there is no net deterioration in the level of protection of identified values[1];
- conserve the values highlighted in the zoning scheme register of this Plan[1];
- at least maintain the timber production capacity of State forest in terms of volume, species and quality[1];
- minimise practical problems for timber harvesting or access;
- make the best use of areas that are unavailable for timber harvesting due to other considerations such as access and site quality;
- avoid conflict with strategic burning zones.

Note:

[1] The basis for the relative comparison of values may change following the completion of EVC mapping and subsequent review against the JANIS criteria.

ACTIONS

Continually review this Plan and consider new information to maintain its currency and, if necessary, make recommendations on possible refinements or amendments to the management strategies or the zoning scheme according to the above Management Guideline.

On completion of the EVC mapping for the FMA (Section 3.2), undertake a review of the zoning scheme set out in this Plan to ensure that the reserve system in the FMA accords with the JANIS criteria, as far as practicable, taking account of social and economic considerations.

Develop and maintain Management Zone plans and associated Regional Management Prescriptions that provide detailed information relevant to implementation of this Plan.

Consult with affected stakeholders and invite comment where significant changes are proposed to management strategies or zones.

Maintain a register of zoning scheme amendments showing the area and purpose of all changes.

Maintain the currency of the forest management zoning layer and maps.

12.3 MONITORING

Integral to sustainable forest management is the development of criteria and indicators against which the effects of forest management and utilisation activities can be determined.

In response to the *National Forest Policy Statement*, a working party was established to develop a set of national baseline standards against which the criteria for forest management and utilisation activities can be assessed. The working group determined that such standards should be progressively developed and incorporated into codes of practice for forest operations (JANIS 1997).

Monitoring is an integral component of NRE's Ecologically Sustainable Forest Management (ESFM) system.

Monitoring of biodiversity

ESFM provides information on the relative success of forest biodiversity management programs and provides a basis for review and improvement of these programs.

NRE faces a number of challenges in the design and implementation of biodiversity monitoring programs. These include the need to adopt programs that are:

- related to forest management objectives;
- of known and appropriate statistical power for detecting changes in the condition of forest assets or relationships between planning goals and related outcomes;
- relevant to current management practices and strategies and are able to inform decisions about changes in approach;
- accepted by stakeholders;
- cost-effective and practical to implement.

The currently favoured approach is to select species or processes that allow broader conclusions to be drawn about the condition of forests. Relevant species are identified according to rarity, population dynamics, spatial dynamics and life history parameters. Additionally, consideration needs to be given to habitat requirements at the population level, including the scale at which these operate. Potential candidates for monitoring include:

- large forest owls which range over large areas and which are directly sensitive to changes in the structure of forests and prey on species which may in turn be sensitive to changes in the condition of the forest;
- aquatic invertebrates and vertebrates which may provide an indication of trends in water quality and in turn, the health of aquatic ecosystems;
- arboreal mammals which are relatively easy to survey and which are sensitive to changes such as a declining abundance of hollow-bearing trees;
- diurnal birds that may be already in decline although not yet to the level of being classified as threatened and are dependent on a variety of habitat elements in the forest;
- nectarivorous birds that may be dependent on the flowering capacity of large old trees;
- a variety of plant species of different life histories;
- fire and timber harvesting history to ensure the extent and distribution of these processes are maintained within planned parameters;
- pest and weed populations, which may be either a symptom or cause of changes in the condition of the forest, are important but need to be assessed in the context of impact on biodiversity assets;
- common species as surrogates for the range of species in forests used for timber production.

In addition to the general indicators of forest biodiversity, specific monitoring of populations of threatened species should be undertaken to ensure early detection of population trends.

Victoria's Biodiversity Strategy (NRE 1997b) establishes a requirement for monitoring on a bioregional scale. NRE has established a number of Bioregional Networks, which have the task of reporting on the condition of biodiversity assets in each bioregion across all land tenures. Reporting on forest condition will be conducted in this framework.

NRE has a number of processes in place to monitor forest management and utilisation activities in the FMA.

- regular audits of timber harvesting operations in State forest are undertaken to provide information on implementation of the Code;
- water quality in State forest streams is regularly monitored through the Victorian Water Quality network. This data can be used to detect trends in water quality and yield in forest catchments;
- forest areas subject to timber harvesting and other management operations are recorded each year, and timber volume and area harvested are compared to licence commitments and conditions;
- the Statewide Forest Resource Inventory project is establishing a consistent description for forests throughout the State and will provide a baseline for future monitoring of changes in the condition of the forests;
- forest sawlog growth and standing sawlog and residual volume are monitored through measurement of the Permanent and Continuous Forest Inventory plots;
- the Integrated Pest Management System provides a means to record pest infestations and to report on the effectiveness of control programs;
- the Wildlife Atlas and Flora Information System provide means of collecting and reporting on flora and fauna data collected by a wide variety of sources;
- Victoria's Biodiversity Strategy establishes a requirement to maintain ecological processes and biodiversity and undertake monitoring activities.

Australia is a signatory to the Montreal Process and has therefore agreed to develop a set of regional indicators, consistent with criteria established under that process for assessing sustainability of forest management.

Geographic Information Systems assist in data recording and storage, and enable analysis of spatial information to examine the effects of proposed forest operations on forest management zones and to determine the area subject to harvesting.

ACTIONS

Continue existing monitoring activities including, in particular, audits of the Code of Forest Practices for Timber Production, and the collection of data on areas and volumes of timber harvested.

In conjunction with other public land managers and private forest owners, establish appropriate monitoring programs for forest biodiversity, water quality and other environmental values at a bioregional scale and progressively monitor appropriate indicators within relevant time scales and in accordance with the Montreal Process.

12.4 REPORTING

Implementation of this Plan is a vital step in ensuring sustainability of forest management in the FMA. Accordingly, it is important to regularly review and report on its implementation. Reviews will provide the basis for systematically adapting the Plan to changing information and circumstances; thus ensuring it remains relevant.

ACTIONS

Upon adoption of the Forest Management Plan, the Regional Forest Manager will be responsible for preparing an annual report. This report may include:

- ***implementation of biodiversity management guidelines, new records of threatened species, and any observed responses to management initiatives;***
- ***key timber production data such as area and volume harvested by product type, areas thinned or subject to other stand improvement operations critical to the maintenance of sustainable yield, and the outcomes of regeneration and stocking surveys;***
- ***water quality prescriptions;***
- ***implementation of pest plant and animal control guidelines;***
- ***recreation and tourism initiatives;***
- ***major road maintenance or construction works;***
- ***compliance with the Code;***
- ***significant research outcomes;***
- ***progress on implementation of the Actions and commitments in this Plan;***
- ***recommendations for amendments to this Plan where required.***

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ACKNOWLEDGMENTS

Contributors at various stages in the planning process include Tony Bartlett, Vic Betts, Jon Cuddy, Tony Edgar, Lucy Gannon, David Harvey, Rob Jolly, Bruce Kilgour (dec.), Malcolm McKinty, Andrew Morrow, Ross Potter, Ben Roberts, Karl Rumba, Ruth Ryan, Peter Tange and Paul Turnbull. David Holmes, Ian Miles, Andrew Maclean, Ross Penny and Kylie White provided valued guidance. David Adams, George Mansour and Rolf Willig undertook the initial map preparation and analyses, while Wayne van der Stelt completed the work. Others that contributed to the progress of the Plan include Jerry Alexander, Chris Ashe, Hugh Bramwells, Stan Brown, Mick Caldwell, Daniel Catrice, John Cooke, Barrie Dexter, Craig Dyson, Peter Fagg, Gordon Friend, David Goodwin, Kathy Gosby, Fiona Hamilton, Peter Kelly, Peter Keppel, Tony Long, Kim Lowe, Lindy Lumsden, Malcolm Macfarlane, Arthur (Howie) Marshall, David Miller, Ben Munro, Charlie Pascoe, Bill Peel, Rob Price, Julia Reed, Kevin Ritchie, Peter Robertson, Ross Runnalls, Murray Thorson, Greg Turner, Richard Wadsworth, Anna Siora, Mike Sutton, Keith Ward, Andy Warner, Rolf Weber, Gary White, Greg Wood and Martin Woodward.

The Mid-Murray Forest Management Area Advisory Committee comprised representatives of the local community with a broad range of interests in forest management. It provided valuable advice on community concerns and attitudes about forest management, particularly during the early stages of the plan. The Department gratefully acknowledges the contribution of the Committee who, at the time of completion of the Proposed Plan, comprised:

Ms Janina Gawler (chair) (Echuca)	recreation, cultural interests
Mr Stan Brown (Nathalia)	grazing (and local government)
Mr Bob Bruce (Bendigo)	union interests
Mr Doug Chamberlain (Lake Meran)	grazing, farming
Ms Judith Frankenberg (Albury)	science, conservation
Mr Dennis Leavesley (Shepparton)	conservation
Mr Paul Madden (Koondrook)	timber industry
Mr John Mitchell (Bethanga)	conservation, regional development
Mr Des Morgan (Echuca)	Aboriginal interests
Mr Windsor Tickell (Leitchville)	grazing, timber production

The Advisory Committee and planning team note with regret the death in July 1997 of Mr Steve Buckley of Echuca. Steve was a member of the Advisory Committee from its inception and was a regular and active participant in its meetings. His contribution to discussions and representation of the timber industry and local community perspective proved invaluable to the preparation of the Proposed Plan.

A Submissions Reference Group was established to assist in review of the submissions received in response to the Proposed Plan. Lead by Peter Box, this committee met twice and provided valuable suggestions to the planning team on appropriate responses to the submissions. The Committee comprised:

Mr Stan Brown (Nathalia)	grazing
Ms Carla Hull (Cohuna)	timber industry
Mr Roger Griffiths (Cohuna)	local government
Mr Scott Keyworth	Murray-Darling Basin Commission
Mr Paul Madden (Koondrook)	timber industry
Dr Doug Robinson (Shepparton)	conservation
Mr Mick Trevaskis	agriculture

Many other interested individuals and organisations provided input during the planning process as well as in submissions. Their contributions are also gratefully acknowledged.

GLOSSARY OF TERMS AND ACRONYMS

ANZECC – Australian and New Zealand Environment and Conservation Council

anabranch – a stream that leaves a river and re-enters it lower down

basal area – the cross-sectional area of the bole of a tree measured at 1.3 m (breast height) from the ground. Basal area is expressed as square metres per hectare (sq.m per ha) and is derived from the sum of the cross-sectional areas of the boles of the trees on the site. It may be estimated directly with specialist survey equipment or calculated following measurement of the diameters of the trees on a sample plot of known size

billabong – enclosed depression of predominantly open water, which is retained for extended periods after floodwater recedes. Once directly connected to the river

biodiversity – (or biological diversity) refers to the variety and variability within and between living organisms and the ecological processes upon which they depend

buffer (strip) – under the terms of the Code, a protective margin of vegetation abutting a stream, spring, wetland, body of standing water or swampy ground, which protects it from potentially detrimental disturbances in the surrounding forest. Buffer width is defined as the horizontal distance from which various operations are excluded

cap – limit placed on taking water from streams in the Murray-Darling Basin

Code – Code of Forest Practices for Timber Production – a set of principles and, in some cases, minimum standards for the conduct of timber harvesting and associated works in forests in Victoria

competition – (in the context of forest growth) the contest between plants of the same or different species for limited resources, such as water, nutrient and light, producing differential growth

confluent – streams that collect water from across the floodplain during flood recession, delivering water to rivers. Usually characterised by clearly defined beds and banks, they often contain water for longer than the surrounding forest

CFI – continuous forest inventory (plots) – plots established throughout the forest on which tree growth information is calculated. The plots are measured periodically (every five or ten years, for example), and growth on the plot can be determined from the difference between measurements

coppice stems – regrowth stems originating from dormant buds on the stump, or the base of the trunk of a damaged eucalypt

coupe – an area of forest of variable size, shape and orientation from which logs for sawmilling or other processing are harvested

developed recreation site – an area with developed recreation facilities (including toilets and tables) designed for a high level of visitor use

DBHOB – diameter at breast height over bark – the diameter of the tree trunk at 1.3 m from the ground

disturbance – any range of factors affecting the condition of natural areas. Disturbance may be natural or human-induced. Natural disturbance includes wildfires, floods and rainstorms and is part of natural ecological processes. Human-induced or 'unnatural' disturbance includes timber harvesting, clearing, mining and grazing. The factors that are important when considering disturbance are the origin, duration and intensity of the disturbance and its impact on the environment

diversity – a measure of the physical or biological complexity of a system. It refers to a range of features from artefacts to species present

drainage water – irrigation water that is discharged from farmland usually into streams

ecological vegetation classes – the components of a vegetation classification system. They are groupings of vegetation communities based on floristic, structural and ecological features

ecosystem – a functional system which includes the organisms of a natural community together with their environment

effluent stream – flood conduit that distributes water across the floodplain. Usually characterised by clearly defined beds and banks, they often contain water for longer than the surrounding forest. Late in the flooding cycle effluents often act as confluents

environmental weed – a naturalised non-indigenous plant species outside the agricultural or garden context, or a native species out of its normal range or favoured by altered environmental conditions, which adversely affects the survival or regeneration of indigenous species in natural or partly natural vegetation communities

epicormic – a shoot arising from an accessory bud in the bark of the stem of a tree

even-aged stand – a forest stand where all or most of the trees are of the same age, that is, they have regenerated from the same event (eg a particular flood or fire)

fauna – a general term for animals (including birds, reptiles, marsupials, fish and insects)

f**ilter strip –** under the terms of the Code, a narrow strip of ground retained either side of a drainage line or temporary stream. In the strip trees may be felled subject to certain conditions and machinery entry is only permitted in certain circumstances

fire management – all activities associated with the management of fire-prone public land values, including the use of fire, to meet land management goals and objectives

fire protection – all activities designed to protect an area (including human life, property, assets and values) from damage by wildfire

fire regime – the season, intensity and frequency of fire in a given area over a period of time

flora – a general term for plants of a particular area or time

forest coupe plan – a plan that must be prepared for each harvesting operation in public native forest. They contain a map identifying the area and a schedule incorporating the specifications and conditions under which the operation is to be administered and controlled

FMA – Forest Management Area – the basic unit for forest planning and management in Victoria. The *Forests (Timber Harvesting) Act 1990* identifies fifteen Forest Management Areas in the State

Forest Management Plan (Plan) – a plan developed to address the full range of values and uses in State forest by Forest Management Area

forest management zone – an area of similar physical capability or forest value to which a particular NRE strategy and specific prescriptions may apply. Three zones apply: Special Protection Zone (SPZ), Special Management Zone (SMZ) and General Management Zone (GMZ)

forest – vegetation formation with the tallest stratum comprising trees which project a foliage cover for greater than 30% of the site (*cf* woodland)

forest type – a classification of forests according to their life form, height of the tallest stratum and the projected foliage cover of the tallest stratum

GMZ – General Management Zone – delineates the area to be managed for the broad range of forest values available in the area

Gigalitre (GL) – one thousand million or 10^9 litres

group selection system – an uneven-aged silvicultural system, involving the felling of all trees in small patches (or groups) at intervals (generally every 10-15 years) over the rotation. The gaps created are scattered over the coupe. Gap size is usually no more than about 2 tree heights in diameter, so that seedfall from surrounding trees can be used to regenerate the gap. Deliberate seedbed preparation is generally required, involving soil disturbance or burning of slash

growth stages – the different forms exhibited by trees at various stages in their development eg regeneration, regrowth, pole, mature and senescent

guidelines – the directing principles adopted to establish decisions (zoning, actions or prescriptions) for the protection and management of forest values. They are not necessarily mandatory; rather they are to be interpreted and applied based on the information available and in context of the protection and management of other values in the forest

habitat tree – a tree that has been identified as providing important habitat for wildlife and which is given additional protection during forest operations

heritage – things that are or may be inherited. They include places, objects and folklore

IBRA – Interim Biographic Regionalisation of Australia – a regional framework delineating natural regions based on biophysical, environmental and vegetation considerations – such as climate, soils, landform, vegetation, flora and fauna, and land use – that allow cross-border regionalisation

JANIS – Joint Australian and New Zealand Environment and Conservation Council/Ministerial Council on Forestry, Fisheries and Aquaculture National Forest Policy Statement Implementation Sub-committee

land system – a complex mapping unit that contains a pattern of land components each of which has little variation in climate, lithology, landform, soil and indigenous vegetation. The land system is regarded as a unit of management for broad scale land use

lignotuber – a woody swelling, partly or wholly underground at the base of the stem of many eucalypts. It is composed of food reserves and dormant shoots that can emerge for survival if the plant's aerial parts are destroyed

long-term sustainable yield – the theoretical rate of harvest that can be maintained in perpetuity; i.e. when the condition of the available forest is equal to the theoretical yield of the normal forest. It is a general goal for forest managers to work towards (*cf* sustainable yield)

mature – forest stands and/or individual trees where the tree crowns are well foliated and rounded. The height and crown development of the trees has effectively ceased (compared with regrowth) but decline of the crown (loss of limbs, development of epicormic growth) has not yet significantly begun (as in the senescent or over-mature growth stage)

merchantable – used to describe trees suitable for processing into forest produce and for which a market exists

multi-aged – trees in the stand or forest have originated from a number of discrete disturbance events

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 as well as the present community

national park – land described as a national park on Schedule Two of the *National Parks Act 1975*. These are generally extensive areas of land of nationwide significance because of their outstanding natural features and diverse land types

old-growth forest – "Forest which contains significant amounts of its oldest growth stage in the upper stratum – usually senescent trees – and has been subjected to any disturbance, the effect of which is now negligible" (Woodgate *et al.* 1994)

overwood – trees left after harvesting that compete with regeneration for light, water and nutrient. (may include trees retained for habitat or seed supply and unmerchantable trees)

prescribed burning – the planned application of fire under selected weather and fuel conditions so that the fire is confined to a pre-determined area and burns with the intensity and rate of spread necessary to achieve the objectives of management

prescription – the standards specified according to the principles of the *Code of Forest Practices for Timber Production* and the guidelines of the Forest Management Plan which prescribe acceptable practices

public land – unalienated land of the Crown managed and controlled by the Minister for Environment and Conservation, the Minister for Agriculture and Natural Resources, Minister for Aboriginal Affairs, or the Secretary of Natural Resources and Environment, whether or not occupied under a licence or other right (but not including vested land or land occupied under a lease)

rain-rejection water – water released into the river from storage in response to earlier requests by irrigators but unused due to local rain providing sufficient watering of the crops and which adds to flows in the river

Recreation Opportunity Spectrum – the range of opportunities for a person to participate in specific recreational activities in specific settings in order to realise predictable recreational experiences

regeneration (noun) **–** the young regrowth of forest plants following disturbance of the forest such as timber harvesting or fire

regeneration (verb) **–** the renewal of forest by natural or artificial means

RFA – Regional Forest Agreement – 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

regrowth – (a) a forest stand regenerated either naturally or by seeding following death or removal of the forest overstorey; (b) a growth stage of a forest stand or individual tree in which the crowns have a narrow conical form and where trees are actively growing

rehabilitation – restoration and revegetation of a site of disturbance usually associated with fire damage, forest road works, landings and mining

residual log – produced as a by-product of sawlog harvesting and regrowth management operations. Comprises a log too small to meet sawlog or sleeper specifications or may meet sawlog specifications for size but with greater than 50% defect. Includes low quality logs suitable for conversion into sawn products or those unsuitable for sawing, like firewood or pulpwood

retained trees – trees retained on a coupe during harvesting operations to provide habitat for wildlife, or to grow on after thinning

richness – a measure of the abundance of individual elements within a particular place. For instance, the species richness of an ecological vegetation class is the number of species that typically occur within that vegetation class

riparian – of, or located on, the banks of a river

riparian vegetation – vegetation that requires free or unbound water, or conditions that are noticeably moist along the margins of streams, drainage lines and lakes

riverain – of a river or its neighbourhood

salvage logging – logging to recover a resource that would otherwise be lost through damage by fire, pests or disease

sawlog – any length of a log of merchantable species which is at least 2.7 m in length, has a small end diameter of 25 cm or greater, does not have a sweep or crook which exceeds 1/5 diameter from a 2.4 m straight edge and is of grade D or better

sclerophyll – of trees, hard-leaved (eg members of the genera *Eucalyptus* and *Acacia*)

security (of water supply entitlements) **–** the extent to which holders of water entitlements can rely on supplies

selection systems – trees are harvested either singly or in groups at relatively short intervals indefinitely. Used to harvest and regenerate particular forest types. By this means regeneration is established continually and an uneven-aged forest is maintained

senescent – a growth stage of a forest stand or individual tree that is characterised by declining crown leaf area and irregular crown shape due to the loss of branches and epicormic growth. This term is interchangeable with 'overmature'

silviculture – the theory and practice of managing forest establishment, composition and growth, to achieve specified objectives (a harvesting and regeneration system)

single tree selection system – an uneven-aged silvicultural system, involving the felling of scattered individual mature trees at intervals (generally every 10-15 years) over the rotation. Regeneration is often from coppice, but may be from seedlings or lignotubers. Deliberate treatment to obtain regeneration is not required

site preparation – preparation of the ground to provide conditions suitable for regeneration from seed or by planting seedlings

snigging – the towing or winching of a log from the stump to the landing site

SMZ – Special Management Zone – delineates an area to be managed to maintain specified values, such as flora and fauna or habitat, while catering for timber production under certain conditions

SPZ – Special Protection Zone – delineates an area to be managed for the conservation of natural or cultural values and where timber harvesting is excluded

stand – a group of trees in a forest that can be distinguished from other groups by their age, species composition, condition etc

stand condition – the health, age and size-class distribution and stocking of a forest stand

State forest – as defined in Section 3 of the *Forests Act 1958*

State park – land described as a State park on Schedule 2B of the *National Parks Act 1975*. These are generally tracts of land containing one or more land types complementing those found in national parks to provide a system representing the major land types of the State

stocking – density of any given forest stand, usually expressed in terms of the number of trees per hectare

stocking survey – Stocking surveys are the means by which the distribution and density of seedlings and other components of the forest are measured

streamside reserve – under the terms of the Code, a strip of vegetation retained along a stream and extending out at least 20 m (measured horizontally) from the bank. The actual width of the reserve will be determined by the width of the saturated stream flat, the nature of the forest operation to be undertaken in the adjacent forest and the ground slope

succession – the progressive change of species composition within a stand over time. If left undisturbed this succession will continue to a climax where the species composition will remain largely unchanged.

sustainable yield – rate of harvest of timber that can be maintained for a defined period in the future This figure may increase in the future if the condition of the forest is improved but should not decrease except in the case of a catastrophic event such as fire (*cf* long-term sustainable yield)

threatened (flora or fauna) **–** a collective term used to denote taxa that are Extinct, Endangered, Vulnerable, Rare or Insufficiently Known, or have restricted colonial breeding or roosting sites

thinning – the removal of a proportion of trees from a (usually even-aged) stand, with the aim of increasing the growth rate and/or health of the retained trees. No regeneration is required

timber harvesting – includes tree felling and snigging, and the marking, sorting, loading and carting of forest produce within a forest

timber production – growing and harvesting of timber from native forests

uneven-aged (forest or stand) **–** forest or stand which contains a continuum of age classes resulting from more-or-less continuous regeneration over a number of years

unmerchantable – trees which are unsuitable for processing into forest produce and/or for which a market does not exist

unstocked sites – sites previously well forested with timber producing eucalypt species which have been disturbed by natural or artificial agencies and, as a result, the eucalypts have been replaced with non-eucalypt tree and/or scrub species of little or no value for timber production

value adding – the further processing of commodities into higher quality, high value goods

vigour (of plants) **–** the health and vitality of growth of the plants

wildfire – fire which is not intentionally lit as part of the management program, in grass, scrub or forest

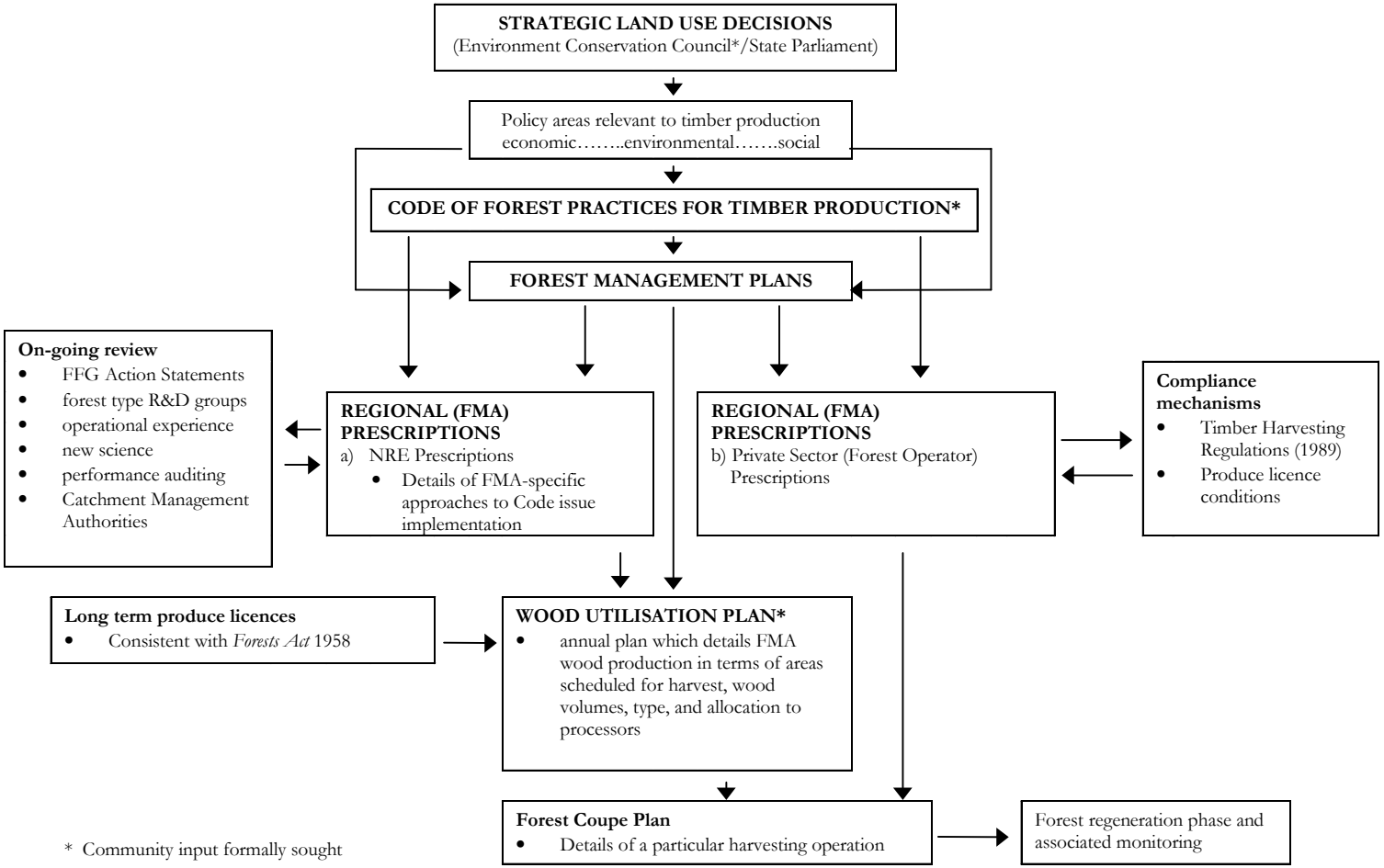
woodland – vegetation formation with the tallest stratum comprising trees which project a foliage cover on less than 30% of the site (*cf* forest)

WUP – Wood Utilisation Plan – details the areas to be harvested and the type 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

APPENDICES

APPENDIX A

PLANNING AND CONTROL OF THE ENVIRONMENTAL ASPECTS OF TIMBER PRODUCTION OPERATIONS ON PUBLIC LAND IN VICTORIA



APPENDIX B

PUBLIC CONSULTATION FOLLOWING PUBLICATION OF THE PROPOSED MANAGEMENT PLAN

Individuals and organisations who forwarded submissions on the Proposed Plan

Name	Organisation
Mr Elwyne Papworth	North-Eastern Apiarists Association
Mr Stan Pelczynski	The Bendigo and District Environment Council Inc
Ms Carla Hull	CJ and GJ Hull P/L
Dr W.N. Holsworth	Bendigo Field Naturalists Club Inc.
Ms Heather Frostick	Barmah Forest Cattlemen Association Inc.
Mr John Killmister	
Ms Barbara Pelczynska	
Mr Barrie Dexter	
Mr Graeme Gooding	Victorian Association of Forest Industries
Mr Paul Clavin	

Name	Organisation
Mr Dennis Black	Albury-Wodonga Environment Centre
Mr Geoff Thompson	
Mr Paul Madden	Arbuthnot Sawmills P/L
Dr Doug Robinson	Goulburn Valley Environment Group
Mr John Riddiford	North East Catchment Management Authority
Mr Jason Doyle	Victorian National Parks Association
Mr Denis Fleet	Goulburn-Murray Water
Mr Carsten Nannestad	North Central Catchment Management Authority
Ms Caroline Winter	Albury-Wodonga Environment Centre
Ms Robyn Elphinstone	Barmah-Millewa Forum

Groups briefed and meetings held following publication of the Proposed Plan

Date	Place	Group
9/2/01	Melbourne	Goulburn Valley Environment Group
21/2/01	Melbourne	Victorian Association of Forest Industries
14/3/01	Cohuna	Public Meeting
15/3/01	Shepparton	Public Meeting
20/3/01	Nathalia	Barmah Forest Preservation League
20/3/01	Nathalia	Broken Creek Field Naturalists
28/3/01	Shepparton	Goulburn Valley Environment Group

Date	Place	Group
2/4/01	Barmah	Barmah Cattlemans Association
27/4/01	Wodonga	Albury Wodonga Environment Centre
1/5/01	Barmah	Yorta Yorta Clans
18/5/01	Moama	Barmah-Millewa Forum
30/7/01	Echuca	Submissions Reference Group
29/8/01	Melbourne	Victorian National Parks Association
31/8/01	Echuca	Submissions Reference Group

APPENDIX C

SUMMARY OF COMMENTS RECEIVED IN WRITTEN SUBMISSIONS AND NRE RESPONSE

The table below is a summary of the matters raised in written submissions and a summary of NREs response. A detailed report with the recommendations of the Submission Reference Group is available in a separate document.

Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
Representation (EVCs)		
Emphasise the importance of completing pre-1750 mapping so JANIS criteria can be applied to ensure a Comprehensive, Adequate and Representative Reserve System. Use JANIS criteria across GRUs to ensure adequate representation.	The pre-1750 mapping is scheduled for completion by 2003. Interim evaluation is based on representation of principal ecosystems within each biogeographic province.	Section 3.1, 3.2
Delay Plan until EVC mapping complete.	The timeline for mapping precludes delaying the Plan. When the mapping is complete, representation will be reviewed according to JANIS criteria.	Section 3.1, 3.2
Reduce representation levels to the 15% required under the JANIS Criteria.	The 15% target is calculated as a proportion of current extent to pre-1750 extent of EVCs. EVC information is currently unavailable.	Section 3.1
Include summary of JANIS Criteria.	JANIS Criteria is included as an Appendix.	Appendix E
More of the important riverine grassy forest type should be protected.	The proportion of each forest ecosystem reserved is based on relative abundance and vulnerability to threatening processes.	Section 3.1
All endangered or vulnerable forest types should be SPZ.	The interim vegetation type classification recognises *Declining* and *Rare or Uncommon* categories. A greater level of protection for these has been afforded.	Section 3.2
Threatened Species		
Include specific actions for threatened flora and make SMZ.	Endangered flora Small Scurf-pea and Mueller Daisy have specific actions. Management of other threatened flora is according to the featured flora guideline and may include zoning depending on existing representation and threats. More specific actions may be developed in the future with new information.	Section 3.6, Appendix L
Actions for threatened fauna are inadequate.	Protection measures (general or specific) are based on best available information, are precautionary and are considered to adequately protect threatened species.	Section 3.6, Appendix M
Guidelines are inconsistent with other Plans.	Guidelines have been reviewed for consistency. Some guidelines are different to previous Plans due to new information or differences in planing areas.	Section 3.6
The need to promote understorey regeneration for the Squirrel Glider is inadequately addressed.	Understorey regeneration is addressed in the Squirrel Glider guideline through prescribed burning, grazing management, SPZs, and SMZs with modified harvesting. Effectiveness will be monitored.	Section 3.6
Specific actions required for threatened fish species.	An action to assess habitat before manipulation of in-stream woody debris has been added in the Environmental Water Management section.	Section 3.6, Section 4.2
Protect more habitat for threatened species and for species near threatened.	Conservation measures aim to maintain viable populations of species across their known range in the Mid-Murray. NRE aims to protect the species through habitat conservation and addressing threatening processes, rather than individuals.	Section 3.6

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Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
Emphasise the need and commit to more flora and fauna surveys.	The plan commits NRE to support surveys aimed at increasing knowledge of rare and threatened species as well as to ongoing surveys.	Section 3.6
Need joint strategies across land tenures.	NRE is involved in a number of joint programs eg pest, plant and animal control and water management strategies.	Section 7.2, 4.2
Use insects as bio-indicators.	Monitoring programs to be established will select indicator species according to rarity, population dynamics, spatial dynamics and life history parameters. Invertebrates may be useful indicators for aquatic ecosystems.	Section 12.3
Habitat Trees		
Increase the number of habitat trees required for protection of hollow-dependent fauna. More research on habitat tree distribution is required. Consider tree lifespan and hollow development in research.	Revised habitat retention prescriptions are scheduled for review within 12 months of the release of this Plan. Tree lifespan and hollow development will be considered in the review.	Section 3.4
Mark habitat trees permanently.	Not necessary as prescriptions require specific numbers for protection each time an area is harvested.	
Current habitat tree prescriptions are excessive, unjustified and impact on regeneration and growth. Based on findings by Leon Bren, reduce the number of habitat trees.	The review of prescriptions will ensure a balance between protecting habitat trees and productivity. All relevant research will be considered in the review.	Section 3.4
Wetlands		
Provide suitable watering regimes for colonial nesting waterbirds and the forest. Barmah Forest needs more water for timber production and birdlife.	NRE participates in the development of water management strategies seeking appropriate flood regimes for threatened flora, fauna and forest communities.	Section 4.2
Need to better define significant wetlands and include in zoning scheme.	Many of the more important wetlands are in conservation reserves or are now SPZ, while others have been mapped with 50 m SMZ buffers applied.	Section 3.5 Appendix D
Need to balance leaving woody debris for habitat and the need for unobstructed flow.	Any removal of debris from waterways should be the minimum necessary to achieve desired water flows. An action to assess habitat before modifying in-stream woody debris has been added.	Section 3.4, 4.2
Specific actions are required to protect large woody debris as habitat.	Woody debris in the SPZ is protected. Various conservation guidelines have specific actions regarding woody debris. Firewood collection is directed at specific areas subject to other forest management activities eg logging coupes.	Section 3.4, 5.1
Areas with high concentrations of debris should be SPZ.	In establishing SPZs the concentration of woody debris was considered. Other measures eg conservation guidelines provide for protection of accumulating debris.	Section 5.1
Consider using strategic replacement of woody debris.	This could be considered in future management options for the protection of woody debris.	Section 3.4
Keep flood runners free from obstructions. Concerned about blocked creeks causing water flow across the floodplain, in turn causing waterweeds to grow (Budge Ck, Barmah Forest).	NRE aims to balance retaining in-stream debris for habitat and the removal of excess debris to allow water flow.	Section 3.4
Specify that any de-snagging of runners to be in accordance with Land and Water Resources Research and Development Corporation guidelines.	Appropriate operational procedures will be adopted.	Section 4.2
Silting up of lakes or Pondages, is reducing open pondage and water depth.	Water Management Strategies prepared by the CMAs should consider this issue.	Section 4.2
The Code does not go far enough to protect water quality and habitat along temporary streams.	Measures in the Code and prescriptions are based on the outcomes of studies on stream quality before, during and after disturbance such as roading.	Section 4.4
Emphasise Gunbower Forest as a Ramsar wetland.	Greater emphasis now placed with a new wetlands section.	Section 3.5

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Summary of comments received in written submissions and NRE response continued

Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
Cultural Heritage and Landscape		
Gunbower Forest contains several historic sites. Identify and list these in the Plan with appropriate management guidelines.	Historic sites are identified and appropriate management listed in an appendix.	Section 8.2 Appendix Q
Remnant forests and woodlands are significant to Aborigines as an important link to the past.	The Plan recognises the importance of the Mid-Murray forests to local indigenous communities.	Section 8.1
Visual buffers along roadsides create an impression of the forest that does not reflect reality.	Roadside buffers aim to preserve the character of the landscape, which is important along major roads or tourist routes.	Section 8.4
60 m buffers on some roads/tracks are excessive. Reduce to 20 m, with fire protection measures within.	NRE considers the 60 m SPZ on River Rd and 60 m SMZ on three other roads in Barmah are warranted, as they are key roads or tourist routes.	Section 8.4
Apiculture		
Due to the potential for bees to occupy hollows, bee sites should be removed from Killawarra State forest, the vicinity of all SPZs, SMZs and Superb Parrot records.	Where bee keeping conflicts with the purpose of SPZs or SMZs, sites will be relocated over time, in consultation with licensees.	Section 6.2
The Plan correctly identifies the Mid-Murray as an important bee keeping region.	Noted.	Section 6.2
Agree with consultation with licensees/industry prior to altering or limiting access to State forest.	Noted.	Section 6.2
The Plan incorrectly implicates managed honeybees with the feral bee population.	The text now clarifies wether the discussion refers to introduced honeybees or the feral bee population.	Section 6.2
The issues of potential concern listed in the apiary section are unsubstantiated.	A recent study is now referred to and the text includes the potential negative and positive affects of honeybees.	Section 6.2
Grazing		
Support grazing management plans and closer monitoring of impacts.	Noted.	Section 6.1
Limit or stop grazing in the forest or at the very least, reduce stocking rates by half in the GMZ. Actions should commit to remove grazing from all SMZ, SPZ and areas containing sensitive plant species by cancellation of licence or fencing.	Grazing is generally permitted across State forest, subject to conditions, guidelines and where consistent with other objectives. Grazing management plans will consider stocking rates in light of ecological conditions.	Section 6.1
Specific time lines (eg within two years) are required for the priority grazing licence review areas.	A specific time frame is now included (within 1 year of this Plans release).	Section 6.1
The fencing of private property and State forest should be required, not encouraged. NRE could offer fencing materials and alternative water sources for stock.	Fencing on the floodplain is often impractical because of frequent flooding. Fencing requirements and options will be explored in developing grazing management plans.	Section 6.1
Grazing licensees monitor stock and conditions closely, governing rates accordingly.	Grazing management plans will be developed to include detailed specifications on control measures, monitoring and regulations.	Section 6.1
Responsible grazing aids weed control, reduces fuel loads thus fire frequencies and intensity and has little impact on wattle regeneration and growth.	The Plan commits to research into the impacts of grazing on native vegetation, fauna and control of fine fuels in relation to fire management.	Section 6.1
Hardwood Production		
Explicitly recognise the contribution of the timber industry to social and economic development.	The recognition of the timber industry's contribution has been strengthened.	Chapter 5
The Plan is inadequate in providing security of supply that the Red Gum timber industry requires.	NRE aims to provide a long-term sustainable supply of sawlogs. Sustainable yield figures must be subject to review to account for new information.	Section 5.1
Need an explicit statement that existing licensed timber volumes will be provided.	The provision of licensed timber volumes will be in accordance with the outcomes of the Licensing Renewal Process.	Section 5.1 NRE 2002

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Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
Need to address long term licences for timber cutters to plan for the future.	In a process outside the Plan, a new licensing system will be introduced in line with the outcomes of the Licensing Renewal Process.	Section 5.1 NRE 2002
River Red Gum is an even-aged species so sustainable forest management should be based on an even-aged system ie, gap or group selection.	The Plan defines clear objectives for the selection and employment of silvicultural systems.	Section 5.2 Appendix H
Excess stems in Barmah Forest need thinning or trees will deteriorate.	The Plan provides for thinning operations. Areas are identified for thinning at the district level and implemented through the WUP process.	Section 5.2
Timber harvesting should be allowed adjacent to river areas.	As is consistent with LCC recommendations, timber harvesting in the River Murray Reserve along the Murray River is generally not permitted.	Section 4.4
Culling of live and dead trees >30 cm dbh should be stopped.	Overwood treatment is conducted according to management objectives within constraints, while providing for habitat retention.	Section 5.2
What effect will modified timber harvesting due to SMZ constraints have on sustainable yield?	Factors such as modified timber harvesting in SMZ will be considered in the next review of sustainable yield.	Section 5.1
Sustainable yield must take note of growth potential under altered flooding regimes./The Plan provides no evidence that tree growth is adequate to provide a sustainable supply of wood.	Sustainable yield calculation incorporates the latest information about current tree growth from Continuous Forest Inventory plots.	Section 5.1
Who determines sustainable yield and are forest ecologists involved?	The Plan establishes the land base and other constraints that contribute to sustainable yield. It does not actually determine sustainable yield.	Section 5.1
Phase out domestic/recreational firewood collection and in the interim, prohibit removal of large woody debris.	NRE aims to provide for the collection of firewood to local communities in designated areas and according to guidelines.	Section 5.1
Reduce the pressure of firewood collection by promoting firewood plantations on private land.	A statewide Firewood Strategy currently being developed and will consider the use of plantation firewood.	Section 5.1
Recreation		
Number campsites and use a booking system in peak camping times to reduce impacts.	Parks Victoria manages camping within the River Murray Reserve. The management of campers in State forest is considered at a local NRE level.	
Introduce a gas fire only rule.	A statewide Firewood Strategy currently being developed will consider alternatives to firewood.	Section 5.1
Reduce vehicle tracks, consider "no-go" areas to allow regeneration and sanctuary for fauna.	NRE periodically reviews roads and closes or relocates those with damage to sites of natural or cultural significance or where roads are duplicated.	Chapter 10
Need to address the impact of bardi grubbing.	The collection of bardi grubs requires a permit. Guidelines and permit conditions will be developed to ensure important sites are protected.	Chapter 9
Emphasise educating forest users to encourage more responsible recreation.	The importance of this is acknowledged. Information is provided in various different forms for forest users providing details on responsible recreation.	Chapter 9
Pest Plants and Animals		
Include an action to eradicate all pest animals stranded on box ridges during flood times.	Pest control programs focus on identified priority areas reflecting overall catchment priorities.	Section 7.2
Emphasise the eradication of foxes and cats, particularly for the protection of the Carpet Python.	The Carpet Python guideline now emphasises this.	Section 3.6
Target popular recreation sites as priorities for control measures.	Popular recreation sites are now identified as medium priority for pest control .	Section 7.2
Fire management plans should consider fire to promote regeneration of River Red Gum and to control unwanted plants including River Red Gum regeneration encroaching on moira grass plains.	The impacts of these suggestions have not been assessed. Research on the ecological value of fire in the floodplain forests is currently underway.	Section 7.1

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Summary of comments received in written submissions and NRE response continued

Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
Water Management		
Clearly define the role, responsibility and relationship between agencies involved in water management.	This is shown in an appendix and has been clarified within the water management chapter.	Appendix K Chapter 4
Emphasise the importance of integrated management strategies and planning, including cooperation with NSW.	This is emphasised in the environmental water management section.	Section 4.2
Water management must be in accord with the Murray-Darling Basin Commission's Water Management Strategy for the Barmah-Millewa forest. Needs greater recognition.	The water management section has been amended to reflect that water management must be in accord with water management strategies.	Section 4.2
Forest Managers strongly encouraged to participate in development and implementation of Salinity Management Plans and Water Management Strategies.	NRE commits to participation and implementation of these processes in the Plan.	Section 4.3
Acknowledge the reasons why adequate environmental flows are difficult to deliver.	This is discussed in the environmental water flow section of the plan.	Section 4.2
Stress the importance of adjacent land management practices (eg run-off from farms).	Regional Catchment Strategies address such issues. The Plan includes a drainage schemes management guideline.	Section 4.3, Appendix N
Visual buffers impede the use of low banks along roads to help spread water.	Visual buffers are in place to preserve the character of the landscape. Trees are unlikely to significantly impede water flow.	
SPZs or SMZs along rivers (eg Goulburn) threaten access to water for pumping stations. Clarify the guideline that states no new easements should be permitted in the SPZ or SMZ.	The guideline states that no new easements should be permitted in the SPZ or SMZ *if they would conflict with forest values.*	Section 6.4
Appendix E: examples of planning for a proposed water regulation structure - cite recent publication.	The examples are intended to provide a range of the structures.	Appendix N
Zoning		
Re-zone SPZ 106/11 to GMZ as there is no evidence of rare and/or endangered flora/fauna and trees have deteriorated since the area has been closed.	The values were reviewed and the area re-zoned part SMZ for wetland and colonially-nesting waterbird values, and part GMZ.	Appendix D Map 1
Trees in SPZ 106/11 are affected by and are spreading mistletoe. Convert to GMZ, with equivalent area of GMZ added to SPZ 106/13, creating a continuous habitat corridor along Gunbower Creek.	There is provision within the Plan for trees outside SPZ infested with mistletoe to be removed to improve stand vigour. SPZ 106/13 (Proposed Plan) has been expanded to include surrounding wetlands and Black Box stands.	Section 7.2
Apply a SMZ to Charcoal Swamp, Gunbower, as an important habitat for birds.	This area is zoned SMZ for wetland and colonially-nesting waterbirds.	Appendix D
SPZ would be more appropriate for Heritage River classification areas such as the Ovens River.	The SMZ approach, with a view to maintain a greater number of mature trees is consistent with LCC recommendations.	Section 3.6
Most SPZs are too small to protect the values for which they have been designed.	SPZs are specifically designed to be large enough to protect the values they are established for and reflect best available information.	General
Corridors between reserves should be a minimum of 200 m wide eg Tullah Creek, Barmah Forest.	NRE considers that 200 m wide corridors are unnecessary in River Red Gum forests, as selection harvesting systems maintain a level of habitat continuity.	Section 5.2
Implementation		
The Plan refers to future developments and reviews, rather than actions to be taken now.	The Plan must address future actions in addition to immediate/ongoing actions.	General
Support the Monitoring section, but would like to see greater commitment to this.	The Plan provides a clear commitment to continue existing monitoring and to establish new monitoring programs for biodiversity and other environmental values. This includes monitoring appropriate indicators of sustainability in accordance with the Montreal Process.	Section 12.3

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Summary of matters raised in written submissions	Summary of NRE's response to matters raised	Reference
The ten-year timeframe for the Plan seems too long.	The ten-year timeframe of the Plan represents a balance between providing long-term directions and setting a timeline for formal review.	Section 12.2
An action is to consult with stakeholders. Stakeholders should be listed in the report. Aboriginal communities should be acknowledged as an important stakeholder.	Where specific stakeholders should be consulted, these groups are referred to in relevant chapters. The importance of consulting with Aboriginal communities is recognised in the Plan.	General, Section 8.3
General		
Present research to support the management guidelines and directions.	Relevant research reports are referred to throughout the text.	General
The relationship of the Plan to the Barmah Management Plan is not clear.	The relationship is now clarified in the text.	Section 1.2
Considering the large scale clearing in the Mid-Murray area, all public land should be managed for biodiversity protection (including prohibiting cattle grazing).	The Plan aims to provide for the balanced use and care of State forest for the wide range of values and uses. Grazing is generally consistent with management objectives.	Section 1.1, 6.1
The entire Barmah-Millewa area should be National Park.	Land use of the Barmah-Millewa area is consistent with Land Conservation Council recommendations.	Section 1.2
Should re-look at some of the words used and be more precise with some things.	Text has been reviewed and significant changes made to improve clarity and reduce complexity.	General
Add to summary section: *Forest Grazing* - explain grazing is strictly monitored; *Forest Protection* - add reference to programs in place (people either read summary or guidelines); *Cultural Heritage*, dot pt 2 - change to "plan provides guidelines for management/preservation of places of historic value".	The summary section has been reviewed.	Summary
Add to guidelines/summary a paragraph to emphasise the importance of the Timber Industry and state recreation facilities and activities to be developed and managed to co-exist with timber harvesting.	The value of the timber industry is emphasised in the timber production chapter. Recreational facilities and activities are managed to co-exist with all forest uses.	Chapter 5 Chapter 9
Language in the Plan implies that where values conflict, management will favour utilisation over biodiversity conservation. How is 'balanced use' determined?	An important aim of the Plan is balanced use of State forest. The network of reserves, SPZ, SMZ, guidelines, prescriptions, Code etc provide for the protection of environmental values while allowing for utilisation and other uses.	Section 1.1 Section 2.1

APPENDIX D

ZONING SCHEME REGISTER

Refer to Map 1 for the Areas and sites listed below.

Forest Block and site number	Zone	Area (ha)	Attributes[1] / Comment
MAP 1 – AREA 1			
Lakes (Benjeroop State Forest)			
112/01	SPZ	333	Black Box Woodland and Grasslands; not licensed for grazing
Murrabit (Benwell State Forest)			
113/01	SMZ	59	wetland habitat
Murrabit (Guttrum State Forest)			
113/02	SMZ	105	*Guttram Swamp*; wetland habitat
113/03	SMZ	61	*Reed Bed*; breeding site for colonially-nesting waterbirds
113/04	SPZ	22	landscape - main tourist access road
MAP 1 – AREA 2			
Gunbower (Gunbower State Forest)			
Gunbower Creek			Public Purposes Reserve 30 m on either side of *Gunbower Creek* in State forest managed as SPZ; historic site - *Condidorio's Bridge*
106/01	SMZ	9	*Marshall Lagoon;* wetland
106/02	SMZ	20	White-bellied Sea-Eagle nest site
106/03	SMZ	7	wetland
106/04	SMZ	3	wetland
106/05	SMZ	3	*No. 2 Swamp*; wetland; Egret nesting colony
106/06	SMZ	33	wetlands
106/07	SMZ	132	*Long Lagoon, Little Gunbower Creek, Crayfish, Black Creek*; waterbird habitat
106/08	SMZ	27	*Iron Punt Lagoon, Little Punt Lagoon*; breeding site for colonially-nesting waterbirds - cormorants, Greater Egret, Intermediate Egret, Darter, Royal Spoonbill
106/09	SPZ	72	*Sandy McNab Bend, Safes Lagoon;* Riverine Grassy Forest, Riverine Grassland; canoe trail
106/10	SPZ	75	*McCutchell Bend*; Riverine Grassy Forest, Riverine Grassland
106/11	SMZ	4	wetland
106/12	SPZ	109	*Black Swamp*; Black Box Woodland, Riverine Grassy Forest; Riverine Grassland; part Carpet Python management area
106/13	SPZ	213	*Reedy Lagoon*; Riverine Grassy Forest; part Carpet Python management area; historic site – Tobacco Farm; VROT Flora; not licensed for grazing
106/14	SPZ	338	*Horse Shoe Lagoon*; Black Box Woodland, Riverine Grassy Forest; part Carpet Python management area
106/15	SMZ	7	wetland
106/16	SMZ	3	research site, River Red Gum growth plot
106/17	SMZ	22	*Whistlers Lagoon*; breeding site for colonially-nesting waterbirds; Nankeen Night Heron
106/18	SPZ	10	*Yarran Creek*; primary effluent/confluent stream
106/19	SMZ	14	*Green Swamp*; waterbird habitat; historic site – timber-cutting
106/20	SMZ	57	*Corduroy Swamp*; wetlands
106/21	SMZ	54	*Little Reedy Lagoon*; waterbird habitat - spoonbills, cormorants, Great Egret, Intermediate Egret, Nankeen Night Heron
106/22	SMZ	118	*Charcoal Swamp* and adjoining forest; research site, River Red Gum growth plot; breeding site for colonially-nesting waterbirds - spoonbills, cormorants, Great Egret, Intermediate Egret, Nankeen Night Heron
106/23	SMZ	7	wetland
106/24	SMZ	7	*Barton Swamp*; wetland
106/25	SPZ	180	Black Box Woodland – several locations
106/26	SPZ	75	Northern Plains Grassy Woodland (predominantly Yellow Box) - four stands
106/27	SMZ	11	wetland

continued next page

Zoning scheme register continued

Forest Block and site number	Zone	Area (ha)	Attributes[1] / Comment
106/28	SPZ	187	*Dalton Reserve*; Black Box Woodland and Riverine Grassy Forest; wetland
106/29	SPZ	7	*Spur Creek*; primary effluent/confluent stream
106/30	SPZ	4 230	Gunbower south; Black Box Woodland, Northern Plains Grassy Woodland (predominantly Grey Box) and Riverine Grassy Forest; suitable habitat for Carpet Python and Barking Owl; wetlands (*Harrison Lagoon, Pig Swamp, Black Charlie Lagoon*); grazing management to be reviewed
106/31	SPZ	77	landscape - main tourist access roads
106/32	SMZ	71	landscape - tourist access roads
106/33	SMZ	3	VROT Flora
Echuca			
119/01	SPZ	45	landscape - Echuca township; Northern Plains Grassy Woodland
119/02	SPZ	108	landscape - Echuca township; Riverine Grassy Forest, Black Box Woodland; historic site - timber bridge over the Murray River
MAP 1 – AREA 3			
Appin (Appin State Forest)			
109/01	SPZ	312	Black Box Woodland; not licensed for grazing
Forest Block and site number	**Zone**	**Area (ha)**	**Attributes**
MAP 1 – AREA 4			
Barmah (Barmah State Forest)			
Broken Creek			Public Purposes Reserve 30 m on either side of the *Broken Creek* in State forest managed as SPZ; Variable Spike-sedge at *Goose Neck*.
State forest generally			Superb Parrot nesting sites; Southern Myotis
105/01	SPZ	214	*Barmah Tip Rd*; Northern Plains Grassy Woodland (Yellow Box, Grey Box), Riverine Grassy Forest
105/02	SMZ	45	wetland
105/03	SPZ	11	*Barmah Creek*; primary effluent/confluent stream
105/04	SPZ	112	*Goose Swamp, Rowes Swamp*; Black Box Woodland; Grey-crowned Babbler habitat along forest edge; grazing management to be reviewed (currently permitted for approximately two weeks each year at muster time)
105/05	SMZ	1	historic site – settlement site
105/06	SMZ	5	research site, River Red Gum spacing trial
105/07	SMZ	5	research site, River Red Gum growth plot
105/08	SMZ	325	*Boal's Deadwood, Rabbit lagoon, Paddy Farrell Lagoon*; breeding site for colonially-nesting waterbirds; Straw-necked Ibis and Sacred Ibis colony
105/09	SPZ	9	*Big Woodcutter Creek*; primary effluent/confluent stream
105/10	SMZ	11	*The Glue Pot*; wetland
105/11	SMZ	26	*Horse Shoe Lagoon*; wetland
105/12	SMZ	10	*McDonalds Waterhole*; waterbird habitat
105/13	SMZ	15	*Bucks Lagoon*; wetland
105/14	SMZ	207	*Duck Hole Plain*; wetland complex
105/15	SMZ	324	*Reedy Lake, Gulf Creek*; wetland complex; breeding sites for colonially-nesting waterbirds including cormorants, Little Black Cormorant, Darter, Royal Spoonbill; Moira Grass plain; alternate use of nest by White-bellied Sea-Eagle and Wedge-tailed Eagle (depending on flooding)
105/16	SMZ	65	*Harbours Lake*; wetland
105/17	SMZ	29	*Little Rushy Swamp*; wetlands
105/18	SMZ	12	*Compass Swamp*; wetland
105/19	SMZ	12	*Tarma*; wetland
105/20	SMZ	11	*Top Lake*; wetlands
105/21	SMZ	24	wetland
105/22	SPZ	<1	historic site – Well Site
105/23	SMZ	5	wetland
105/24	SPZ	93	*Smiths (Tullah) Creek*; primary effluent/confluent stream, VROT Flora
105/25	SPZ	11	*Gulf Creek*; primary effluent/confluent stream
105/26	SPZ	102	*Long Plain* and *Waiting Plain*; Northern Plains Grassy Woodland (predominantly Yellow Box) and Buloke; VROT Flora; Grazing management to be reviewed

continued next page

Zoning scheme register continued

Forest Block and site number	Zone	Area (ha)	Attributes[1] / Comment
105/27	SPZ	37	Northern Plains Grassy Woodland (predominantly Yellow Box), several stands; VROT Flora
105/28	SPZ	131	Northern Plains Grassy Woodland (predominantly Grey Box), several stands
105/29	SPZ	122	*Grinters Ridge* and *Cherry Tree*; Northern Plains Grassy Woodland, includes Yellow Box, several stands; VROT Flora; historic site – Cherry Tree Yards; grazing management to be reviewed
105/30	SPZ	63	*Tongalong Ridge*; Northern Plains Grassy Woodland (predominantly Yellow Box) and Buloke, two stands; VROT Flora; grazing management to be reviewed
105/31	SPZ	58	Northern Plains Grassy Woodland (predominantly Grey Box), several stands; VROT Flora
105/32	SPZ	11	*Gowers Gate,* Black Box Woodland
105/33	SPZ	115	landscape - main tourist access roads; historic site - Long Plain Mill Site
105/34	SMZ	243	tourist access roads
105/35	SPZ	8	historic site - Murrays Mill; Black Box Woodland
105/36	SPZ	1	historic site - Correy's Old Mill
105/37	SMZ	3	VROT Flora
105/38	SMZ	3	VROT Flora
105/39	SMZ	3	VROT Flora
Goulburn (Goulburn River State Forest)			
State forest generally			Heritage River; wildlife corridor; Riverine Grassy Forest; habitat for Squirrel Glider and Barking Owl; Southern Myotis; Grazing management to be reviewed in several areas of importance for Squirrel Glider
103/01	SPZ	2 052	Public Purposes Reserve 30 m on either side of the Goulburn River in State forest (managed as SPZ) plus variable-width buffer; historic sites - Wyuna Homestead Site and Sheep Dip, Homestead and Grave, Site, Ardpatrick Outstation Site
103/02	SMZ	7 746	Heritage River; wildlife corridor; VROT Flora
103/03	SPZ	339	*Kanyapella*; Northern Plains Grassy Woodland, Riverine Grassy Forest, Black Box Woodland; not licensed for grazing
103/04	SPZ	121	*Bunbartha Creek*; Northern Plains Grassy Woodland; grazing management to be reviewed
103/05	SMZ	44	*Cooma Bend*; breeding site for colonially-nesting waterbirds - Little Pied Cormorant, Little Black Cormorant, Great Egret, Sacred Ibis; White-bellied Sea-Eagle nest site
Murray (upper Murray River)			
117/01	SMZ	3 676	Upstream from *Ulupna Creek* to FMA boundaryRiverine Grassy Forest; Heritage River values (also extends into Area 5 – see below); historic site – Charcoal Kilns; VROT Flora
MAP 1 – AREA 5			
Lower Ovens (Lower Ovens State Forest)			
Ovens River			Public Purposes Reserve 30 m on either side of the *Ovens River* in State forest managed as for SPZ
118/01	SMZ	2 241	Heritage River; wildlife corridor; Riverine Grassy Forest; habitat for Squirrel Glider and Barking Owl; Southern Myotis; grazing to be reviewed in two areas of potential habitat for Squirrel Glider.

Note:

[1] Local name shown in italics

APPENDIX E

JANIS CRITERIA

Nationally agreed criteria for the establishment of a Comprehensive, Adequate and Representative (CAR) reserve system for the forests of Australia (JANIS 1997).

BIODIVERSITY CRITERIA

1. As a general criterion, 15% of the pre-1750 distribution of each forest ecosystem should be protected in the CAR reserve system with flexibility considerations applied according to regional circumstances and recognising that as far as possible and practicable, the proportion of dedicated reserves should be maximised.

2. Where forest ecosystems are recognised as vulnerable (such as approaching a reduction in areal extent of 70% within a bio-regional context and/or subject to continuing threatening processes) then at least 60% of their remaining extent should be reserved. These ecosystems include those where threatening processes have caused significant changes in species composition, loss or significant decline in species that play a major role within the ecosystem, or significant alteration to ecosystem processes.

3. All remaining occurrences of rare and endangered forest ecosystems should be reserved or protected by other means as far as is practicable.

4. Reserved areas should be replicated across the geographic range of the forest ecosystem to decrease the likelihood that chance events such as wildfire or disease will cause the forest ecosystem to decline.

5. The reserve system should seek to maximise the area of high quality habitat for all known elements of biodiversity wherever practicable, but with particular reference to:
   - the special needs of rare, vulnerable or endangered species
   - special groups of organisms, for example species with complex habitat requirements, or migratory or mobile species
   - areas of high species diversity, natural refugia for flora and fauna, and centres of endemism
   - those species whose distributions and habitat requirements are not well correlated with any particular forest ecosystem

6. Reserves should be large enough to sustain the viability, quality and integrity of populations.

7. To ensure representativeness, the reserve system should, as far as possible, sample the full range of biological variation within each forest ecosystem, by sampling the range of environmental variation typical of its geographic range and sampling its range of successional stages.

8. In fragmented landscapes, remnants that contribute to sampling the full range of biodiversity are vital parts of a forest reserve system. The areas should be identified and protected as part of the development of integrated regional conservation strategies.

APPENDIX F

TRANSLATION OF VEGETATION TYPE CLASSIFICATIONS

Vegetation types described in this Plan (Table 3.1)	Vegetation types described in the Statement of Resources Uses and Values[1]	Vegetation types described in the Land Conservation Council classification[2]
Riverine Grassy Forest (River Red Gum forest on the current floodplain)	*River Red Gum forest and woodlands*	River Red Gum – Open Forest III and Open Forest II (greater and less than 28 m)
Black Box Woodland	*Black Box woodlands*	Black Box
Heathy and Grassy Dry Forest (Red Stringybark with or without Blakely's Red Gum)	*Mixed-species forest*	Red Stringybark, Blakely's Red Gum
Box–Ironbark Forest (Mugga Ironbark–Grey Box)	*Box–ironbark forest and woodlands*	Red Ironbark, Mugga Ironbark, Grey Box
Granitic Hills Woodland (pure Blakely's Red Gum)		Blakely's Red Gum
Northern Plains Grassy Woodland (also known as Low Rises Grassy Woodland)	*Riverine box woodlands*	Yellow Box, Grey Box, mixed box
Cypress Pine and Buloke Woodland	*Cypress pine woodlands*	White Cypress Pine
White Box Woodland		White Box
Riverine Grassland (on current floodplain)		
Northern Plain Grassland (on older alluvial terrace)	*Grasslands and herblands*	Grasslands
Muehlenbeckia Swamp		

Notes:

[1] Cuddy *et al.* (1993)

[2] LCC (1983)

APPENDIX G

REPRESENTATION OF FOREST AND WOODLAND VEGETATION TYPES WITHIN IBRA PROVINCES

Six bioregional provinces overlap the Mid-Murray FMA. The Central Victorian Uplands bioregional province contains no public land in the FMA and is not included in the following table. The proportion of each vegetation type included in the reserve system is summarised in Table 3.1, Chapter 3.

Bioregional Province		Representation				
Vegetation type within each bioregional province	**Area on public land in each province (ha)**	**Parks and reserves (ha)**	**State forest SPZ[2] (ha)**	**Total in reserve system (%)**	**State forest SMZ (ha)**	**State forest GMZ (ha)**
Goldfields						
Black Box Woodland	2	2	-	100	-	-
non-forest or unclassified[1]	223	16	-	-	-	-
water bodies	77					
Murray Fans						
Black Box Woodland	5 030	1 006	3 205	83	7	300
Riverine Grassy Forest	47 983	11 812	1 952	28	4 918	28 700
Northern Plains Grassy Woodland	3 145	615	1 761	75	435	224
non-forest or unclassified[1]	16 711	6 408	1 017	-	1 738	2 421
water bodies	2 813					
Murray Mallee						
Cypress Pine and Buloke Woodland	3	3	-	100	-	-
Black Box Woodland	347	215	-	61	-	-
non-forest or unclassified[1]	1 768	1 385	-	-	-	-
water bodies	75					
Northern Inland Slopes						
White Box Woodland	133	133	-	100	-	-
Cypress Pine and Buloke Woodland	2 143	2 095	-	98	-	-
Granitic Hills Woodland	2 490	2 490	-	100	-	-
Box–Ironbark Forest	2 967	2 967	-	100	-	-
Heathy and Grassy Dry Forest	3 998	3 998	-	100	-	-
Northern Plains Grassy Woodland	587	322	-	55	-	-
Black Box Woodland	39	-	-	-	-	-
Riverine Grassy Forest	498	184	10	39	223	-
non-forest or unclassified[1]	4 923	2 343	3	-	28	-
water bodies	278					
Victorian Riverina						
Cypress Pine and Buloke Woodland	3	3	-	10	-	-
Box–Ironbark Forest	111	111	-	100	-	-
Northern Plains Grassy Woodland	427	107	15	27	46	-
Black Box Woodland	4 638	2 978	51	64	-	-
Riverine Grassy Forest	15 271	3 581	1 676	32	7 292	32
non-forest or unclassified[1]	28 472	10 474	780	-	1 230	54
water bodies	17 536					
Grand Total						
White Box Woodland	133	133	-	100	-	-
Cypress Pine and Buloke Woodland	2 150	2 100	-	98	-	-
Granitic Hills Woodland	2 490	2 490	-	100	-	-
Box–Ironbark Forest	3 078	3 078	-	100	-	-
Heathy and Grassy Dry Forest	3 998	3 998	-	100	-	-
Northern Plains Grassy Woodland	4 274	1 045	1 776	68	481	224
Black Box Woodland	10 173	4 200	3 256	73	7	300
Riverine Grassy Forest	65 672	15 576	3 638	29	12 434	28 732
non-forest or unclassified[1]	71 237	20 698	1 800	(32)	2 997	2 474
water bodies	20 885					

Source: vegetation base layer - SVEG100 (1995).

Notes:

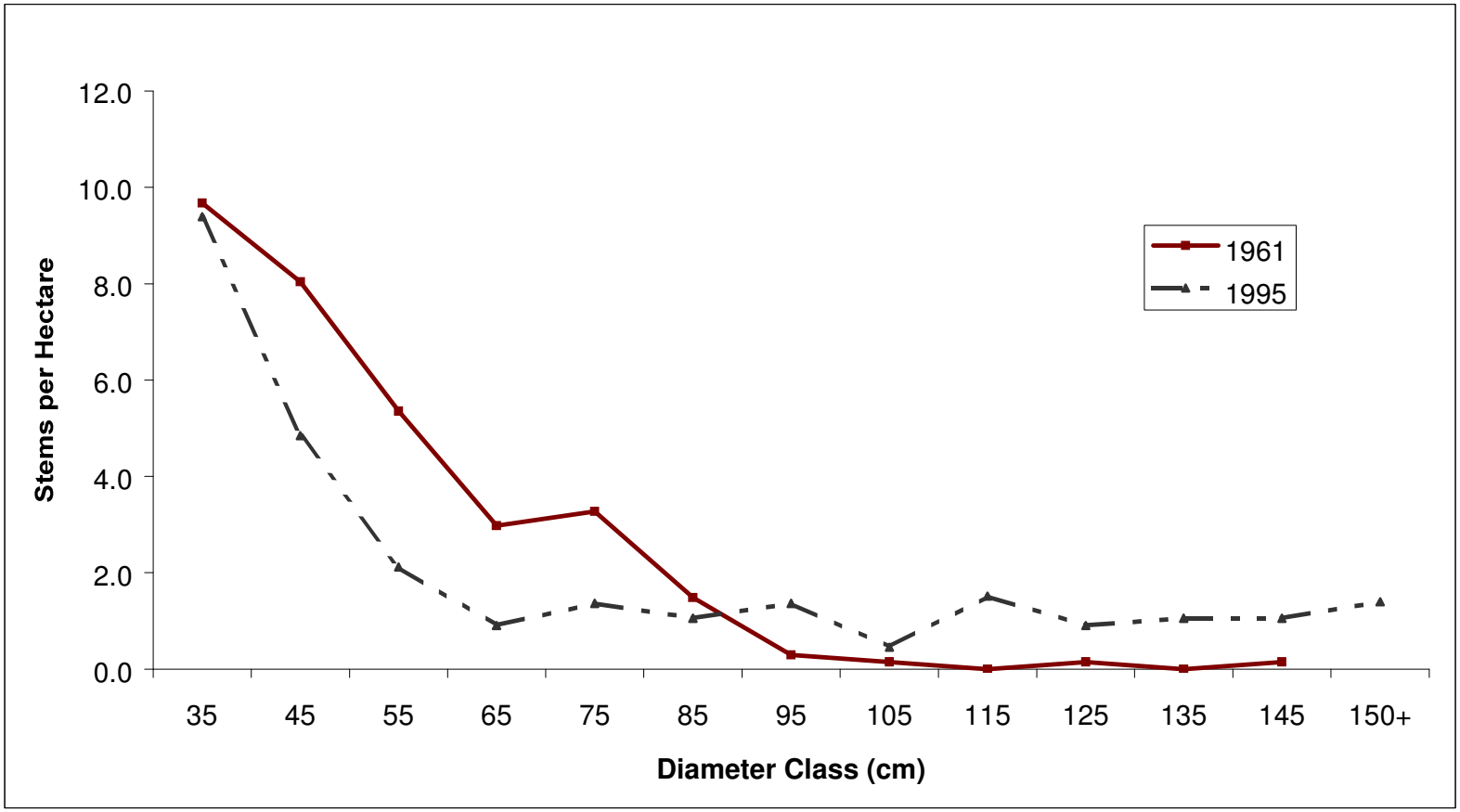
[1] This comprises natural grasslands, *Muehlenbeckia* swamps, cleared areas and areas for which the vegetation is not yet classified.

[2] This includes public land stream frontages that fall within State forest.

APPENDIX H

TREE DIAMETER DISTRIBUTION IN BARMAH FOREST

Diameter-class distribution of merchantable and potentially merchantable stems showing the increase over time of the number of larger trees in the forest and a reduction in the number of trees in the smaller size-classes.



APPENDIX I

STATEWIDE FOREST RESOURCE INVENTORY

A Statewide Forest Resource Inventory (SFRI) was initiated in 1994/95. This is a large-scale inventory program which includes mapping of about 3.5 million ha of State forest and sampling of productive mature and over-mature forests to determine the volume of sawlogs of all grades (A, B, C and D). The program will also provide the necessary base data to enable development of new growth models for a significant number of forest types, thereby enhancing the capacity to forecast timber yields. Specifically, the new inventory will:

- update the State's timber resource data, replacing data collected primarily in the 1960s and 1970s, which will be independent of forest product standards
- be the State's first complete forest resource inventory based on a single inventory design and standard
- provide a consistent classification of all vegetation on public land across the State
- enable new growth and yield models to be developed for many of the State's native forests
- enable resource estimates to be made to a uniform standard of utilisation
- have the capacity to adjust to new utilisation standards
- provide a basis for resource estimates, sustainable yield forecasts and management planning well into the next century

Other products of the SFRI include:

- environmental data - slope, aspect, tree hollows - collected at each sample plot and digital elevation model information, which will be applicable for biodiversity and habitat modelling
- information about stand disturbance by factors such as timber harvesting, fire and disease
- crown cover and crown form information, which can assist old-growth analyses for the purposes of Regional Forest Agreements

The SFRI program for the riverain forests has commenced with interpretation of aerial photographs of the region as the first step.

APPENDIX J

FLOOD REGIME AND VEGETATION TYPE

Barmah–Millewa Forest

Flood regime[1]	Main vegetation type					
	Rushlands	**Moira grass plains**	**River Red Gum forest**			**Box forest and woodland[2]**
			SQ I	***SQ II***	***SQ III***	
Ideal time	July – January	September – January	August – December			occasional short flood
Frequency						
- natural	every year	every year	9 years out of 10	7 years out of 10	4.5 years out of 10	1 year out of 10
- minimum required	7.5 years out of 10	every year	7 years out of 10	5 years out of 10	3 years out of 10	none required
- current	8 years out of 10	7 years out of 10	6 years out of 10	4.5 years out of 10	2.5 years out of 10	1 year out of 10
Duration						
- natural average	10 months	8 months	5 months	3 months	1.2 months	1 month
- minimum required	2 months	2 months in Spring	1 month	1 month	0.5 month	none required
- current average	5 months	3 months	2 months	1.5 months	0.7 month	0.5 month

Sources: MDBC 1992, 2000

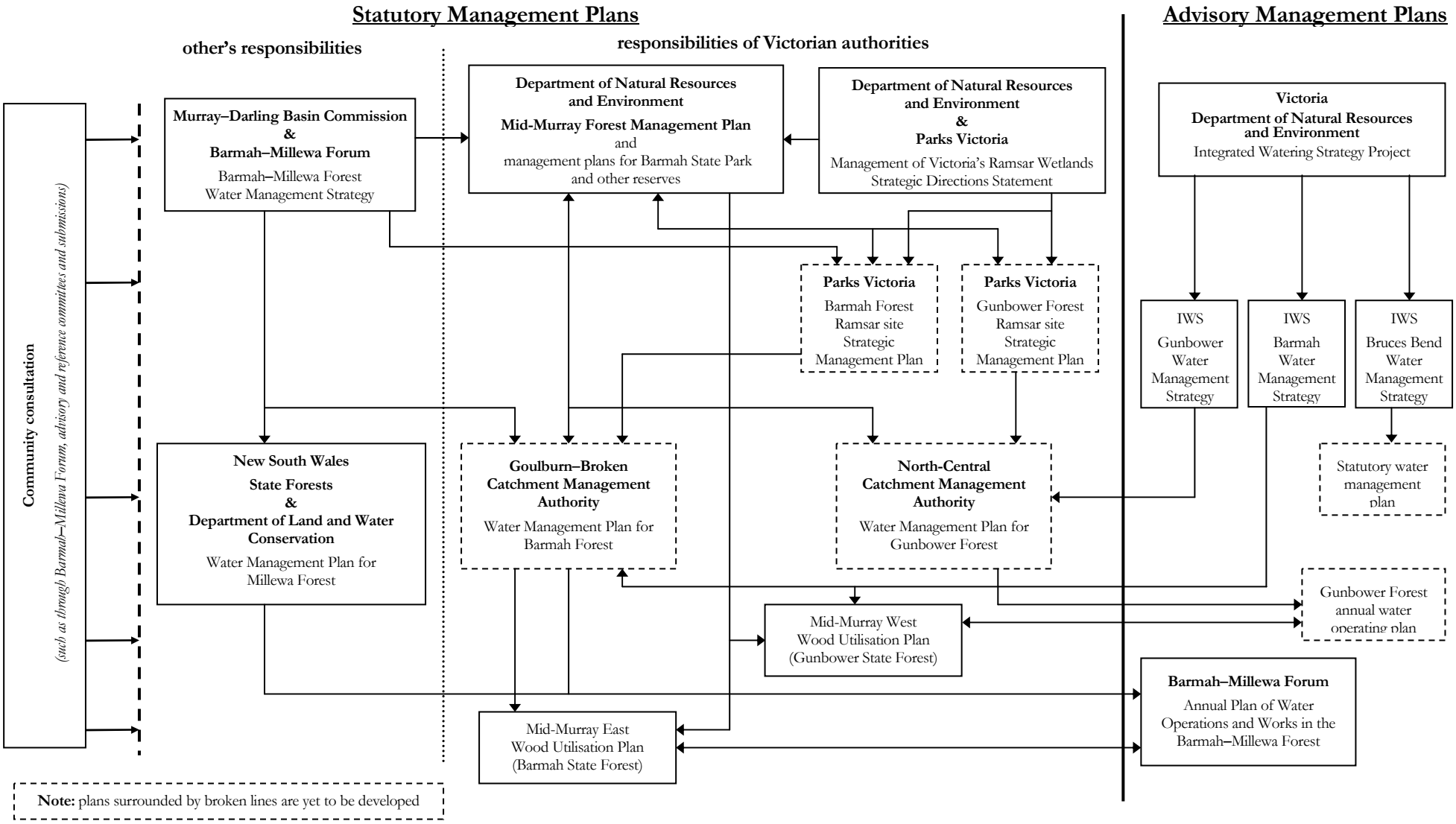
Notes:

[1] The base parameter is that 80% of the forest is flooded for at least one month.

[2] Includes Black Box Woodland and Open Woodland, which is usually briefly inundated in less than 30% of years. Yellow Box, Grey Box, Murray Cypress Pine Woodland and Open Woodland are seldom, if ever, flooded (Parsons *et al.* 1991)

APPENDIX K

RELATIONSHIP BETWEEN PLANS AFFECTING WATER MANAGEMENT IN THE MID-MURRAY FMA



APPENDIX L

RARE OR THREATENED FLORA OCCURRING IN STATE FOREST IN THE MID-MURRAY FMA

Conservation status for flora

Victoria

VROTS - listed in *Rare or Threatened Vascular Plants in Victoria-2000* (NRE 2000b).

CE – Critically Endangered **E** – Endangered
V – Vulnerable **LR** – Lower Risk - near threatened

FFG - listed under Schedule 2 of the *Flora and Fauna Guarantee Act 1998*.

N – Nominated for listing **L** – Listed
A – Listed and an Action Statement prepared

Australia

EPBC – listed under the *Environment Protection and Biodiversity Conservation Act 1999*

CE – Critically Endangered **E** – Endangered
V – Vulnerable **LR** – Lower Risk - near threatened
DD – Data Deficient

ANZECC – listed in *Australian and New Zealand Environment and Conservation Threatened Australian Flora List* (ANZECC 1999a) or *Australian Rare or Threatened Plants* (Briggs and Leigh 1995).

E – Endangered **V** – Vulnerable
R – Rare **K** – Insufficiently known

FLORA LISTED (OR NOMINATED FOR LISTING) AS THREATENED UNDER THE COMMONWEALTH *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* AND THE VICTORIAN *FLORA AND FAUNA GUARANTEE ACT 1988* RECORDED IN STATE FOREST

The conservation measures for rare and threatened flora are detailed within Chapter 3.

Species Name	Common Name	Status			
		VROT	FFG	EPBC	ANZECC
Amphibromus fluitans	River Swamp Wallaby-grass	K		V	V
Cullen parvum (syn. *Psoralea parva*)	Small Scurf-pea	E	A	E	E
Lepidium monoplocoides	Winged Pepper-cress	E	L	E	E

OTHER THREATENED FLORA SPECIES RECORDED IN STATE FOREST

Species Name	Common Name	Status	
		VROT	ANZECC
Alternanthera nodiflora	Common Joyweed	K	
Amyema linophylla ssp. *orientale*	Buloke Mistletoe	V	
Austrodanthonia sp. (syn. *Danthonia procera*)	Tall Wallaby-grass	K	
Desmodium varians	Slender Tick-trefoil	K	
Elymus multiflorus	Short-awned Wheat-grass	K	
Eragrostis tenellula	Delicate Love-grass	E	
Fimbristylis aestivalis	Summer Fringe-sedge	K	
Ixiolaena sp. (syn. *Leptorhynchos panaetioides*)	Woolly Buttons	R	
Lipocarpha microcephala	Button Rush	V	
Poa fordeana	Forde Poa	K	
Swainsona phacoides	Dwarf Swainson-pea	E	

APPENDIX M

RARE OR THREATENED FAUNA – MID-MURRAY FMA

The species listed in this table consist of rare or threatened species with current records in State forest and other Featured species with no current records. Featured species are derived from those listed as threatened under the FFG Act, EPBC Act or listed by NRE as a Victorian Rare or Threatened Species. The conservation measures for many featured species are detailed within specific management guidelines as referred to in this table.

Conservation status for fauna

Victoria

Vic (Vertebrates) - listed in *Threatened Vertebrate Fauna in Victoria* (NRE 2000a).
CE – Critically Endangered **E** – Endangered
V – Vulnerable **LR** – Lower Risk - near threatened
DD – Data Deficient

Vic (Invertebrates) - listed in *Threatened Fauna in Victoria* (CNR 1995).
E –Endangered **V** – Vulnerable
R – Rare **K** – Insufficiently known

FFG - listed under Schedule 2 of the *Flora and Fauna Guarantee Act 1998*.
N – Nominated for listing **L** – Listed
A – Listed and an Action Statement prepared

Australia

EPBC – listed under the *Environment Protection and Biodiversity Conservation Act 1999*.
CE – Critically Endangered **E** – Endangered
V – Vulnerable **LR** – Lower Risk - near threatened
DD – Data Deficient

ANZECC – listed in *Australian and New Zealand Environment and Conservation Council List of Threatened Australian Vertebrate Fauna* (ANZECC 1999b).
E – Endangered **V** – Vulnerable

SCIENTIFIC NAME	COMMON NAME	STATUS				MANAGEMENT
		FFG	VIC	EPBC	ANZECC	
MAMMALS						
Dasyurus maculatus	Spot-tailed Quoll	A	E	E		No current confirmed records in State forest. If found, management will be in accordance with the Action Statement (currently under review).
Myotis macropus	Southern Myotis	L	LR			See Conservation Guideline (Chapter 3).
Petaurus norfolcensis	Squirrel Glider	L	E			See Conservation Guideline (Chapter 3).
Phascogale tapoatafa	Brush-tailed Phascogale	A	V			No current confirmed records in State forest. See Conservation Guideline (Chapter 3).

continued next page

Rare or threatened fauna – Mid-Murray FMA continued

SCIENTIFIC NAME	COMMON NAME	STATUS				MANAGEMENT
		FFG	VIC	EPBC	ANZECC	
BIRDS						
Anas rhynchotis	Australasian Shoveler		V			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Ardea alba	Great Egret	L	E			See Conservation Guideline for colonially-nesting waterbirds (Chapter 3).
Ardea intermedia	Intermediate Egret	L	CE			See Conservation Guideline for colonially - nesting waterbirds (Chapter 3).
Biziura lobata	Musk Duck		V			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Botaurus poiciloptilus	Australasian Bittern	L	E			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Burhinus grallarius	Bush Stone-curlew	A	E			Management will be in accordance with the Action Statement. Protection is provided through the conservation of all Box woodlands in the SPZ and the Grazing Management Guideline (Chapter 6).
Coturnix australis	Brown Quail		DD			Protection is provided through the conservation of all Box woodlands in the SPZ and the Grazing Management Guideline (Chapter 6).
Egretta garzetta	Little Egret	L	CE			See Conservation Guideline for colonially-nesting waterbirds (Chapter 3).
Grantiella picta	Painted Honeyeater	L	V	V		Protection is provided through the conservation of all Box woodlands in the SPZ and habitat retention prescriptions.
Haliaeetus leucogaster	White-bellied Sea-Eagle	A	E			See Conservation Guideline (Chapter 3).
Ixobrychus minutus	Little Bittern	L	E			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Lathamus discolor	Swift Parrot	L	E	E	V	Current records are found only in the preferred habitat of the Box-Ironbark forests in the Killawarra Forest. If found in State forest, protection is provided through the conservation of all Box woodlands in the SPZ, other SPZ and habitat retention prescriptions.
Neophema pulchella	Turquoise Parrot	L	LR			Protection is provided through the conservation of all Box woodlands in the SPZ, other SPZ and habitat retention prescriptions.
Ninox connivens	Barking Owl	L	E			See Conservation Guideline (Chapter 3).
Ninox strenua	Powerful Owl	A	E			See Conservation Guideline (Chapter 3).
Nycticorax caledonicus	Nankeen Night Heron		V			See Conservation Guideline for colonially-nesting waterbirds (Chapter 3).

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Rare or threatened fauna – Mid-Murray FMA continued

SCIENTIFIC NAME	COMMON NAME	STATUS				MANAGEMENT
		FFG	VIC	EPBC	ANZECC	
Oxyura australis	Blue-billed Duck	L	V			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Phalacrocorax varius	Pied Cormorant		LR			See Conservation Guideline for colonially-nesting waterbirds (Chapter 3).
Platalea regia	Royal Spoonbill		V			See Conservation Guideline for colonially-nesting waterbirds (Chapter 3).
Plegadis falcinellus	Glossy Ibis		V			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code and the Water Management Guideline (Chapter 4).
Polytelis swainsonii	Superb Parrot	A	E	V	V	See Conservation Guideline (Chapter 3).
Pomatostomus temporalis	Grey-crowned Babbler	A	E			See Conservation Guideline (Chapter 3).
Struthidea cinerea	Apostlebird	L	V			Protection is provided through the Conservation of all Box woodlands in the SPZ and the Grazing Management Guideline (Chapter 6).
Turnix pyrrhothorax	Red-chested Button-quail	N	V			Protection is provided through the conservation of all Box woodlands in the SPZ and the Grazing Management Guideline (Chapter 6).
Tyto novaehollandiae	Masked Owl	L	E			One current record adjacent to Goulburn River, which is included in the SMZ. Management will be in accordance with the Action Statement, when prepared.
Xanthomyza phrygia	Regent Honeyeater	A	CE	E	E	Current records are found only in the preferred habitat of the Box-Ironbark forests in the Killawarra Forest. If found in State forest, management will be in accordance with the Action Statement.
REPTILES						
Chelodina expansa	Broad-shelled Tortoise		V			Protection is provided through the Wetlands Management Guideline (Chapter 3), the Code, the Water Management Guideline (Chapter 4) and the Grazing Management Guideline (Chapter 6).
Diplodactylus tessellatus	Tessellated Gecko		LR			Protection is provided through the Management of woody debris (Chapter 3), the Code, SPZ and the Grazing Management Guideline (Chapter 6).
Morelia spilota variegata	Carpet Python	L	E			See Conservation Guideline (Chapter 3).
Pygopus nigriceps	Hooded Scaly-foot	L	CE	CE		No current confirmed records in State forest. If found, management will be in accordance with Conservation Guideline (Chapter 3).
Ramphotyphlops proximus	Woodland Blind Snake		V			See Conservation Guideline (Chapter 3).

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Rare or threatened fauna – Mid-Murray FMA continued

SCIENTIFIC NAME	COMMON NAME	STATUS				MANAGEMENT
		FFG	VIC	EPBC	ANZECC	
Suta suta	Curl Snake		V			No current confirmed records in State forest. Protection is provided through the Management of Woody Debris (Chapter 3), the Code, SPZ and the Grazing Management Guideline (Chapter 6).
Varanus varius	Tree Goanna		DD			Protection is provided through the Management of Woody Debris (Chapter 3), the Code, SPZ and habitat retention prescriptions.
Vermicella annulata	Bandy Bandy	L	LR			No current confirmed records in State forest If found, management will be in accordance with Conservation Guideline (Chapter 3).
FISH						
Bidyanus bidyanus	Silver Perch	L	CE			See discussion of threatened fish (Chapter 3).
Craterocephalus fluviatilis	Murray Hardyhead	L	E	V	V	See discussion of threatened fish (Chapter 3).
Gadopsis marmoratus	River Blackfish		DD			Protection is provided through the Code, SPZ, the Water Management Guideline (Chapter 4), and public land reserve frontages.
Maccullochella macquariensis	Bluenose (Trout) Cod	A	CE	E	E	See discussion of threatened fish (Chapter 3). Management will be in accordance with the Action Statement.
Maccullochella peelii peelii	Murray Cod	L	V			See discussion of threatened fish (Chapter 3).
Macquaria australasica	Macquarie Perch	L	E	E		No current confirmed records in State forest. See discussion of threatened fish (Chapter 3).
Melanotaenia fluviatilis	Crimson-spotted Rainbow fish	L	DD			Protection is provided through the Code, SPZ, the Water Management Guideline (Chapter 4), and public land reserve frontages.
AMPHIBIANS						
Limnodynastes fletcheri	Barking Marsh Frog		DD			Protection is provided through the Code, SPZ, and public land reserve frontages and variable-width conservation zones along the lower Ovens and Goulburn Rivers (Chapter 3).
Litoria raniformis	Warty Bell Frog	L	V	V		Protection is provided through the Water Management Guideline (Chapter 4), SPZ, the Code, and public land reserve frontages on various rivers.
INVERTEBRATES						
Euastacus armatus	Murray Spiny Cray	N	K			Protection is provided through the Water Management Guideline (Chapter 4), SPZ, the Code, and public land reserve frontages on various rivers.
Myrmecia sp. 17	Bull ant	L	V			No current confirmed records in State forest. Protection is provided through the conservation of all Box woodlands in the SPZ and Management of Woody Debris (Chapter 3).

APPENDIX N

EXAMPLES OF PROPOSED WATER REGULATION STRUCTURES

BRUCES BEND STATE FOREST - Beovich *et al.* (1993)

- A control structure proposed in Beovich *et al.* (1993) has now been constructed on the outlet from Big Reedy Lagoon.

This structure is being operated to prevent the rapid draw down of winter-spring floodwaters from the lagoon; extending its flooding period to between July and November.

BARMAH FOREST (Barmah-Millewa Forum 2000)

- Along River Road, on tertiary effluents that are active during rain-rejection flows, open blockages, construct small pipe regulators at their mouths and construct small timber bridges to allow general forest access.
- Restoration of river banks and erosion control works.
- Construct a regulator on Black Engine Creek.

GUNBOWER FOREST (Atkins & Lloyd 1993)

- Minor earthworks (removal of sill and debris at the effluent at Kate Mallone Bend; re-opening of tertiary effluents along the River Track; provision of culverts for tertiary effluents).
- A new regulator at Worthy Bend to re-instate natural flooding to box woodland at high river flows.
- Planning and construction of regulators to provide through-flows and controlled flooding to Little Gunbower Creek and Bullrush Lagoon.
- New regulators at Deep Creek and Hipwell Road to provide a greater extent of forest flooding during mid-range river flows.

APPENDIX O

GRAZING STRATEGY FOR NSW RIVERINA STATE FORESTS

Extracts from SFNSW (2000) – *Grazing Strategy for Riverina Region*, State Forests of New South Wales, Sydney.

State Forests of New South Wales developed a system for the management of stock grazing in State forest aimed at striking a balance between conservation and production.

The basic objectives were to restrict adverse environmental impacts to sustainable levels and to use grazing as a management tool to achieve conservation outcomes.

Two grazing strategies are to be applied depending on the predominant forage type and the desired outcome. Each strategy is aimed at assisting recruitment and survival of perennial plant species, especially native grasses.

- Winter grazing (rest period November to April inclusive) in areas dominated by introduced annual species. The rationale is that winter grazing will reduce flowering and seed-set of introduced annuals, while a summer rest period will allow native perennials to seed freely.
- Summer grazing (rest period May to October inclusive) in areas dominated by competitive native perennials. The rationale is that conservative stocking in summer will provide areas of bare soil between tussocks for colonisation by native forbs.

The strategies require establishment of an upper limit to the level of stocking in the summer grazing areas and a lower limit in the winter areas, the levels to be such that the establishment and survival of native species are fostered. The biomass of herbaceous material is to be used as the indicator of grazing intensity or the allowable level of stocking. SFNSW (2000) also notes that stocking adjustments should account for abnormally wet and dry periods as recruitment of perennial species is linked to wet periods while grazing during dry periods increases the risk of mortality.

A range of other measures, such as control of pest plants and animals and native grazers, a prohibition on supplementary feeding, and investigation of the ways that the ground layer may be rehabilitated form part of the overall strategy. Also required is the exclusion of stock from environmentally sensitive areas or the setting of a grazing regime appropriate to the most sensitive area (provided it occupies more than 5% of the licensed area). Stock grazing is to be deferred from wetlands until the wetland sediments are dry and water plants have flowered and set seed.

APPENDIX P

WEED SPECIES IN THE MID-MURRAY FMA

State prohibited weeds

These may or may not occur in the FMA. They must be excluded from Victoria or, if they are found in the State, eradicated if possible. NRE is responsible for the control of State prohibited weeds regardless of land tenure.

Common name	Scientific name
Alligator Weed	*Alternanthera philoxeroides*
Black Knapweed	*Centaurea nigra*
Camelthorn	*Alhagi maurorum*
Ivy-leaf Sida	*Sida leprosa*
Largarosiphon	*Largarosiphon major*
Marijuana	*Cannabis sativa*
Mesquite	*Prosopis* spp.

Common name	Scientific name
Nodding Thistle	*Carduus nutans*
Parthenium Weed	*Parthenium hysterophorus*
Perennial Ragweed	*Ambrosia psilostachya*
Poverty Weed	*Iva axillaris*
Salvinia	*Salvinia molesta*
Tangled Hypericum	*Hypericum triquetrifolium*
Water Hyacinth	*Eichhornia crassipes*

Regional priority weeds

The following are declared 'noxious weeds' under the *Catchment and Land Protection Act 1994* (CaLP Act) and are considered to pose a threat to native vegetation in State forest in the Mid-Murray FMA. All except African Love Grass and Serrated Tussock are priorities in the Goulburn–Broken, North East and North Central Catchment Regions for the development of Weed Action Plans.

Common name	Scientific name
African Love Grass	*Eragrostis curvula*
Blackberry	*Rubus fruiticosus*
Boneseed/Bitou Bush	*Chrysanthemoides monilifera*
Boxthorn	*Lycium ferocissimum*
Broom	*Cytisus* and *Genista* spp.
Dodder	*Cuscuta epithymum*
Furze/Gorse	*Ulex europaeus*

Common name	Scientific name
Horehound	*Marrubium vulgare*
Noogoora Burr	*Xanthium strumarium*
Patersons Curse	*Echium plantagineum*
Prairie Ground Cherry	*Physalis viscosa*
St. Johns Wort	*Hypericum perforatum*
Serrated Tussock	*Nassela trichotoma*
Sweet Briar	*Rosa rubiginosa*

New and emerging weeds

These are not declared under the CaLP Act but are considered to have potential to invade public land in the FMA.

Common name	Scientific name
Arrowhead	*Sagittaria* spp.
Chilean Needle Grass	*Nassella neesiana*
Parrots Feather	*Myriophyllum aquaticum*

Environmental weeds

Common name	Scientific name
Smilax	*Myrsiphyllum asparagoides*
Willows	*Salix* spp.

APPENDIX Q

HISTORIC SITES IN STATE FOREST

The following list is derived from NRE's Historic Places Section database.

HPS No.	Site description	Location	Significance	Management	Site No.
Barmah State Forest					
1473	Trickeys Mill	Ramp Track	Of interest	No ground disturbance	
1474	Correy's Old Mill	Bunyip Waterhole	State	50 m radius SPZ	105/36
1476	Eddies Track Mill	Eddies Track	Of interest	No ground disturbance	
1477	Tarma Mill Site	Tarma	Of interest	No ground disturbance	
1480	Long Plain Mill Site	Long Plain Track	Of interest	No ground disturbance	
1483	Cherry Tree Yards	Gulf Road	Regional	Protect historic fabric	
2302	Murray's Mill	Gulf Track	Local	Protect historic fabric	
7454	Well Site	Tram Island	Local	10 m radius SPZ	105/22
7460	Barmah Yards & Barmah Forest Pound	Sand Ridge Track	Local	Protect historic fabric	
7469	Windmill and Tank Stand	Gowers Gate	Local	Protect historic fabric	
7471	Settlement Site	Gowers Gate	Local	100 m radius SMZ	105/05
7473	Mill Site	Barmah Creek	Of interest	No ground disturbance	
7474	Cornalla Landing Mill Site	Cornalla Landing	Local	Protect historic fabric	
7475	Pontoon Cutting No. 1	Cornalla Landing	Local	Protect historic fabric	
7476	Pontoon Cutting No. 2	Boals Deadwoods	Local	Protect historic fabric	
7477	Pontoon Cutting No. 3	Boals Deadwoods	Local	Protect historic fabric	
Goulburn River State Forest					
7462	Windmill	Arcadia	Of interest		
7463	Homestead and Grave Site	Steens Bend	Local	50 m radius SPZ	103/01
7465	Hotel Site	Johns Bend	Local	Protect historic fabric	
7466	Timber Bridge Site	McCoys Bend	Of interest	Protect historic fabric	
7467	Ardpatrick Outstation Site	Comboona Road, Cooma Bend	Of interest	No ground disturbance	
7470	Wyuna Homestead Site and Sheep Dip	Cahills Bend	Local	50 m radius SMZ	103/01
7472	Haulage Track	Weir Bend	Local	Protect historic fabric	

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Historic sites in state forest continued

HPS No.	Site description	Location	Significance	Management	Site No.
Gunbower State Forest					
2969	Condidorio's Bridge	over Gunbower Creek	State; VHR	10 m SPZ either side of bridge abutments	PPR
7455	Shillinglaw's Regulator	junction of Five Sleeper Track and River Track	Local	Protect historic fabric	
7458	Robson's Mill	River Track	Of interest	No ground disturbance	
7459	FCV Nursery	River Track	Local	Protect historic fabric, including introduced trees	
7461	Old Cohuna Headworks	River Track near McGillvrays Track	Local	Protect historic fabric	
7478	Tobacco Farm	Reedy Lagoon	Local	Protect historic fabric	
7479	Farrants Dam	Gunbower Creek at end of Mathers Road	Local	Protect historic fabric	
7464	Timber Cutting Stage	junction of Five Sleeper Track and Thompsons Track	Local	Protect historic fabric.	
Murray River State Forest					
7468	Charcoal Kilns	Bourkes Bend	Local	Protect historic fabric	

Key:

HPS No:

Provides the Historic Places Section reference number for each site.

Significance:

VHR - Site listed on the Victorian Heritage Register.

Management:

Protect historic fabric - The site and all associated artefacts should be left *in situ*.

No ground disturbance - Activities such as excavation or digging for bardi grubs are prohibited.

SPZ - No timber harvesting or machine movement is permitted within the specified distance from the site

SMZ - Special Management Zone for the specified distance from the site. Timber harvesting may be permitted within the zone provided that it does not disturb the historic site, or detract from the site's significance.

Site No:

Refers to Forest Block and Site Number assigned in the zoning scheme register - Appendix D.

PPR - Public Purposes Reserve

APPENDIX R

SURVEY AND RESEARCH PROJECTS AND SITES IN THE MID-MURRAY FMA

CURRENT

Project	Nature of project	Number of sites	Future management	Management Zone
Continuous Forest Inventory	NRE		ongoing	
Statewide Forest Resource Inventory	NRE	n/a	n/a	n/a
Identification and mapping of Ecological Vegetation Classes for the riparian environment	NRE	n/a	n/a	n/a
Response to thinning	NRE	4 plots	ongoing	SMZ 105/07
Growth studies under various spacing of trees	NRE	15 plots	ongoing	SMZ 105/06
Growth of untreated stands	NRE	2 sites	ongoing	SMZ SMZ
Faunal responses to manipulation of coarse woody debris in floodplain forests		n/a	n/a	
Terrestrial macroinvertebrate's use of coarse woody debris in floodplain forests	PhD	n/a	n/a	
Ecology and conservation of ground-foraging woodland birds of the Victorian riverina	PhD	4, 100 ha sites	n/a	n/a
River Red Gum regeneration on high ground	NRE	1, 10 ha site	n/a	n/a
Feasibility of using fire to prevent and reverse the encroachment of River Red Gum onto Moira Grass plains	Melbourne University & CMA			
Floodplain rehabilitation program for the Murray River corridor	CMA			

POTENTIAL

The Plan highlights a number of research and survey projects that would improve knowledge and management of State forest. These and other potential projects are listed below.

Description	Chapter
Flora	**3**
Ecology of threatened communities and significant flora	
Distribution and population surveys of rare or threatened plants	
Fauna	**3**
Components of critical habitat and mapping of suitable habitat	
Qualitative and quantitative assessment of faunal habitat requirements for tree hollows	
Ecological requirements of native fish species in the floodplain forests	
Water management	**4**
Wetland ecology and mechanisms of water movement	
Location and operation schedules for water management structures	
Timber production	**5**
Growth rate of River Red Gum in a range of site qualities under different water regimes	
Growth rate of commercial forests under different grouping and spacing of retained trees	
Develop a long term sustained yield model for River Red Gum forests	
Complete inventory of areas not recently assessed	
Determine sustainable yields for miscellaneous forest products	
Grazing	**6**
Effects on plant populations and fire fuel in relation to grazing pressure	
Monitor condition of understorey in areas rested and excluded from grazing	
Develop an inventory of indicator plants for grazing pressure	
Pest plants and animals	**7**
Investigate biological control of vermin and noxious weeds	
Aboriginal culture	**8**
Complete surveys for significant sites	